POVERTY REDUCTION AND SHIFTING CULTIVATION STABILISATION IN THE UPLANDS OF LAO PDR: TECHNOLOGIES, APPROACHES AND METHODS FOR IMPROVING UPLAND LIVELIHOODS

Proceedings of a workshop Held in Luang Prabang January 27 - 30, 2004

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter 1: Overview of challenges, opportunities and experiences in uplands development</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Role and Importance of the Agriculture and Forestry Sector in Poverty Eradication</td>
</tr>
<tr>
<td>Anonth Khamhung</td>
</tr>
<tr>
<td>Review of Policies and Practices in Upland Areas of the Lao PDR</td>
</tr>
<tr>
<td>David E. Thomas</td>
</tr>
<tr>
<td>How Do We Know an Upland Solution When We See One?</td>
</tr>
<tr>
<td>John Raintree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 2: Understanding the complexity of shifting cultivation stabilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livelihoods and Forest Resources in Katu Villages in Sekong</td>
</tr>
<tr>
<td>Charles Alton and Houmphanh Rattanavong</td>
</tr>
<tr>
<td>Shifting Cultivation and Poverty Eradication: A Complex Issue</td>
</tr>
<tr>
<td>Olivier Ducourtieux</td>
</tr>
<tr>
<td>The Balanced Approach to Opium Elimination in the Lao PDR</td>
</tr>
<tr>
<td>Leik Boonwaat</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 3: The social and ecological impacts of shifting cultivation stabilization and poverty reduction programs in the uplands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernard Moizo</td>
</tr>
<tr>
<td>Resettlement: An Alternative for Upland Development?</td>
</tr>
<tr>
<td>Laurent Romagny</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

This publication is based upon the papers presented at the NAFRI organized workshop on “Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland Livelihoods”. The workshop was held in Luang Prabang from January 27 – 30, 2004.

This workshop was a truly collaborative event and much of its success was due to the efforts of a number of individuals, projects and organizations that contributed to the workshop.

NAFRI would particularly like to thank the Lao-Swedish Upland Agriculture and Forestry Research Program and the Swedish International Development Cooperation Agency (Sida) for financially supporting the workshop.

The workshop was chaired by Dr. Bounthong Bouahom, Director General of NAFRI, who actively supported the planning of the workshop. A number of NAFRI staff played key roles in organizing the workshop, including: Mr. Phouthone Sophathilath, Mr. Xaypladeth Choulamany, Mr. Thongphath Leuangkhamma, Mr. Khamphay Manivong, Mr. Somphong Pradichit and Mr. Sisongkham Mahathilath, Mr. Houmchitsavath Sodarack, Mr. Bounthan Keoboualapha, Bandith Ramangkoun.

The Information Management and Strategic Planning Division/NAFRI oversaw and managed the workshop planning and organization. The Northern Agriculture and Forestry Research Centre was responsible for all the excellent organizational and logistic arrangements in Luang Prabang

NAFRI would also like to acknowledge the efforts of those who volunteered to facilitate the working group sessions. This included:

1. Land management/allocation issues and strategies: Thongphath Leuangkhamma (FIPD/DOF) and Peter Jones (NAFRI/LSUAFRP)
2. Plantation Crops: Phoui Visonnavong and Olivier Ducourtieux (PDDP/Phongsaly)
3. Agro-biodiversity: Bounkong Souvimon (HRC/NAFRI) and Pernille Dyg (FAO)
4. Ethnic and gender considerations in uplands farming systems: Dr. Monthathip Chanpengsay and (NAFRI) Ingrid Baken (FAO)
5. NTFP development and issues: Sounthone Keptanh (FRC/NAFRI) and Joost Foppes (SNV)
6. Scaling up and institutional mechanisms required: Viengxay Photakoun (NAFES) and Dr. Joanne Millar (CIAT)
7. Appropriate cropping systems for the uplands: Bounthan Keoboualapha (NAFReC/NAFRI) and Bruce Lundquist (NAFRI/IUARP)
8. Livestock Systems Development: Viengsavan Phimphachanhvongsod (LRC/NAFRI) and Peter Horne (CIAT)
9. Developing an Upland Source Book for Lao PDR: Julian Gonsalves and Phouthone Sophathilath (NAFRI)
NAFRI would also like to thank Mr. Chun Lai who assisted “facilitating the working group facilitators”.

The organizers would also like to thank all the projects, district staff and villagers who hosted the five field trips, including:

1. **Pak Ou District**, Integrated Upland Agriculture Research Project
2. **Phonxai District**, Lao-Swedish Upland Agriculture and Forestry Research Program
3. **Ban Lak Sip and tour of Northern Agriculture and Forestry Research Centre at Houay Kot**, MSEC, IWMI, SSLC, NAFReC
4. **Xiengnan District**, Forages and Livestock Support Program/CIAT/LRC/NAFRI
5. **Tad Kuangsi Waterfall Park**, Provincial Agriculture and Forestry Office Luang Prabang

The workshop documenters included: Dirk Van Gansberghe, Carl Mossberg, Peter Jones, John Raintree and Michael Victor

Special thanks goes to the Provincial Authorities of Luang Prabang which graciously hosted the workshop and allowed the workshop to be held on the grounds of the provincial meeting hall.

NAFRI would also like to thank all the projects and organizations which sponsored staff to attend the workshop and exhibited displays at the information market. Finally, NAFRI would like to thank all the participants who made presentations and prepared papers for this proceedings.
The uplands of Laos are of key development interest for both the Government of Lao PDR and international and donor agencies. On the one hand, the uplands of Laos sustain a diverse range of ethnic groups, biodiversity and ecosystems. On the other, the highest incidence of poverty is also found in Upland areas.

Recognizing the challenges for improving upland livelihoods and stabilizing agricultural production, the Ministry of Agriculture and Forestry has initiated a bold range of policy and institutional reforms. Both the Decentralization Act and the Strategic Vision for the Agriculture Sector call for an area-based conservation and livelihood systems approach to development with a demand-driven research and extension system that supports local people’s active involvement in their own development.

In response, several research and development programmes have been initiated in collaboration with international donors and aid agencies. Each has gained valuable experiences and generated a number of technical options, approaches and methods. Yet, there have been few opportunities to systematically share experiences and feedback these back to policy-makers.

As part of its five year anniversary celebrations, NAFRI took the opportunity to organize a workshop on upland research and development in order to bring together the range of technical knowledge and experiences that have been gained both within NAFRI and in other projects and programs working in upland areas.

The main purpose of the workshop was to better understand the status of technical experiences (both positive and negative) available for improving upland livelihoods and farming systems. The rationale for this was that by cataloguing the range of technical experiences, valuable policy recommendations would be raised but in the context of offering viable solutions. The objectives of the workshop were to:

- Review existing knowledge and share relevant information between researchers, extensionists, development practitioners and academics.
- Provide feedback from the field to policy makers, researchers, academics and donors to improve the implementation of policies related to shifting cultivation stabilisation and poverty eradication.

The Uplands Workshop was truly a unique event. Attended by more than 300 participants, the workshop was probably the largest gathering of agriculture and forestry professionals working in Laos. As many participants commented the workshop was exceptional for the open and frank discussions that took place throughout the four days. Because of this the workshop highlighted both the range of options emerging as well as some of the key bottlenecks that have emerged in implementing government policies and programmes.

For NAFRI, the workshop is part of a longer-term strategy to develop an integrated and responsive research program to contribute to the National Growth and Poverty Eradication Strategy of the Government of Lao PDR and improve the livelihoods of upland people. NAFRI focuses primarily on adaptive research in order to provide technical options, recommendations and results to support agriculture, forestry and fisheries
development and strategic formulation of policies and programs in accordance with the government policy. This workshop is a good example of how we intend to do this.

In general, two strong inter-related issues emerged during the workshop. The first is that uplands development is a complex issue for which there is no single solution. This calls for an integrated programmatic approach and a high degree of collaboration and coordination so as to generate a diversity of solutions. The second is that technical solutions cannot be developed in a vacuum and need to take into consideration social, economic and policy considerations.

For NAFRI this confirms the need to continue working in an integrated farming systems research and extension approach which seeks to work hand in hand with farmers to develop appropriate solutions. Moreover, this implies that NAFRI will need to continue developing its capacity to conduct multi-disciplinary research as well as create closer interactions with extension agents, relevant NGOs and all economic sectors, including the private sector.

This publication is also part of an emerging body of knowledge on uplands development in Laos and follows upon a number of workshops organized by MAF and its development partners to review the state of knowledge on potential solutions to upland agro-ecosystem development. This includes two previous workshops. The first workshop was held in 1993 in Nabong and focused on shifting cultivation stabilisation. The second was held in 1997 and focused more specifically on the contribution of livestock in uplands farming systems.

A number of other information materials have been generated as a result of this workshop. This includes a workshop summary and CD-Rom which contains all the presentations, speeches, draft papers, and other materials presented and shared at the workshop. In addition, NAFRI, in collaboration with NUOL and NAFES, is producing a Lao Uplands Sourcebook which will be a compendium of best practices, lessons learned and experiences gained by those working in the uplands and will provide field workers (district and provincial level staff) with practical, easy to understand ways to solve problems facing uplands development.

We hope this publication proves useful in your own work. Most importantly, we hope that the publication contributes to greater collaboration to find joint solutions to the major livelihood crisis of the uplands.

Dr. Bounthong Bouahom
Director General
NAFRI
Workshop Summary

Introduction

Recognizing the challenges for improving upland livelihoods and stabilizing agricultural production, the Ministry of Agriculture and Forestry has initiated a bold range of policy and institutional reforms. In response, several research and development programmes, in collaboration with international donors and aid agencies, have been established. Each has gained valuable experiences and generated a number of technical options, approaches and methods. Yet, there have been few opportunities to systematically share experiences and find joint solutions to the major livelihood crisis of the Uplands.

Five years after its establishment, the National Agriculture & Forestry Research Institute (NAFRI) of the Ministry of Agriculture and Forestry organized its first major technical workshop called “Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of Lao PDR: Technologies, approaches and methods for improving upland Livelihoods”. The workshop was held in Luang Prabang from January 27 – 30, 2004.

More than 300 participants both from abroad and around the country participated in the workshop. Along with the 41 presentations made by research organizations, development projects, the private sector and government agencies, an information market allowed participants to share and exchange information. One day was also set aside for field trips so that participants could talk with farmers and see examples of technologies and approaches being used.

This workshop summary provides an overview of the key issues, outcomes and recommendations that came out of the workshop.

Policy level considerations on poverty reduction and shifting cultivation

Technical solutions cannot be isolated from the policies or institutional setting within which they are implemented. While the focus of the workshop was on reviewing the range of technical options developed to strengthen upland livelihoods, a number of policy challenges (both in policy formulation and implementation) need to be addressed if the government strategy to eradicate poverty and leave behind the status of least developed country is to be achieved.

Less time was spent discussing the nature, causes and trends of rural poverty. This is because rural poverty in Lao PDR has been the focus of several well-documented studies carried out during the last few years by both the Lao government and the donor community (State Planning Committee, ADB, UNDP, IFAD, WFP, etc.).

Most of these poverty studies also concluded that rural poverty is a relatively recent phenomenon in Lao PDR due to disruptions in livelihoods caused by various factors, including poor implementation of the government policy in shifting cultivation areas. Poverty is therefore generally perceived as being linked to shifting cultivation and ethnic minorities.

1 This summary is an abridged version of the summary report on the workshop. If you would like the full version of the summary report please contact NAFRI.
Several presentations revealed that rural communities practising shifting cultivation are clearly put under pressure in many ways through various government schemes and that ineffective implementation of government policies often impoverishes cultivators. One presentation showed that, in a low population density context, isolated forest villages are generating more income than villages along the roads that are assisted by local authorities. Another presentation showed that several poor villages located near productive forest areas receive few benefits from logging enterprises operating near them. Moreover, these communities are put at more risk since their roads and forests are destroyed by incoming logging concessions. Yet another gave precise figures on higher mortality rates among villagers after relocation from uplands to lowlands.

The underlying issue seems to be that, even when population density is low, too many restrictions are put on shifting cultivators who are then not able to sustain their livelihoods by utilizing natural resources. As many of the presentations showed, local government authorities lack the capacity and resources to deliver the required compensatory assistance needed to avoid major socio-cultural and economic disruptions. This could partly be explained by the decentralisation processes occurring in Lao PDR that give more power to provincial and district authorities to decide on the tools to reach central government targets for policies related to:

- Eradication of shifting cultivation by the year 2010
- Eradication of opium by the year 2005
- Reduction of the number of village administration units
- Land use planning and land allocation

In response to the studies and the uneven pace of development in the uplands, the government has recently developed the National Growth and Poverty Eradication Strategy (NGPES). The aim of NGPES is to bring about more collective and collaborative efforts across concerned line agencies and with the provinces to ensure that action plans and resource allocations are harmonized and focused to agreed target areas.

Unfortunately, in Lao PDR the main beneficiaries of the NGPES are also the main targets of all those restrictive policies. It is thus easy to understand why several presentations readily illustrate the adverse social and economic impacts of the present implementation of government policies on shifting cultivation communities. However, as one participant pointed out, it is not yet clear whether the present impoverishment of some communities is only a short-lived event or is a long-term phenomenon. It is also necessary to keep in mind that examples of past successful transitions from shifting agriculture to permanent agriculture were not presented during the workshop although they definitely exist in Lao PDR.

Such inconsistencies were clearly raised in regards to the criteria used to define achieving the stabilisation of shifting cultivation (area of upland rice or area of allocated land?). It was explained that shifting cultivation policy refers to the halting of pioneer shifting cultivation which results in the clearance of primary and new forest areas. This does not apply to productive secondary forests that are part of shifting cultivation-NTFP production systems. With that said, it is important to keep in mind that local authorities do not generally distinguish between these types of shifting cultivation systems when they are implementing government policies.
Box 1: Key recommendations from the closing remarks of NAFRI’s Director General Dr. Bounthong Bouahom

**Recommendation 1:** A major issue raised was the need to review past shifting cultivation stabilization policies and implementation issues in relation to the new vision of NGPES. It is felt that these two are not currently in full harmony.

**Recommendation 2:** Such a mismatch in policies was highlighted in many of the presentations on land use planning and land allocation. There is a clear need for an appropriate planning and implementation model for land-use planning and land allocation, especially in relocated villages. Such a model focuses on bringing populations and their livelihood needs into balance with land and water resources, and access to roads and market opportunities.

It also does not assume that all populations need to move down to lowlands where there are limited resources. Whereas a more cost effective solution in some cases might be to extend road and market access, develop water supplies and provide basic services in favourable highland locations, where it is possible. It would also place greater emphasis on taking the time to work with the communities on village boundary delineation and agro-ecological zoning so that villagers can express their own ideas about land use alternatives.

Fortunately, the workshop brought to light a number of positive experiences from action research being carried out by projects using this new process-oriented land use planning model. This new model focuses on bringing populations and their livelihood needs into balance with land and water resources, roads and market access opportunities.

**Recommendation 3:** Greater attention should be given to Private Sector – Development linkages where there is great potential for rapid gains in improving rural economies. Farmers not only need markets, but businesses are also in search of expanded product supply in order to meet their orders. Private sector presentations also called for projects and development agencies to give greater attention to their needs and support market oriented extension systems and fair business practices.

**Recommendation 4:** Improved extension support and other services (such as credit and village development funds) are needed to scale up successful practices. There is also a need to improve communication and coordination between researchers, extensionists and trainers and educators. There are many different extension methods and many new technologies are emerging. One natural place for researchers, extensionists to meet are regional and provincial level training centers. Such institutions exist and need to be supported.

**Recommendation 5:** In order to effectively implement NGPES improved linkages and communication mechanisms between different levels of institutions working in the uplands will need to be in place, including:

1) Between farmers in different villages.
2) Between districts within provinces, and
3) Between provinces
4) From central level down to province and district level. For example there will be a need for a massive effort to communicate clearly and effectively about the new NPEP policies to ensure there is a common understanding about how it can be implemented.

**Recommendation 6:** An improved extension system also needs capable staff and the appropriate resources at the district level. There was a clear recommendation for a new effort among donors to truly support district level capacity building. In addition, NAFRI through its action research is experimenting with new implementing mechanisms. For this to be scaled up there will be a need for a higher degree of collaboration with NAFES and other institutional partners. A new programmatic approach such as this calls for a new kind of program support from development partners.
Ironically, shifting cultivation stabilisation policies aimed to improve the conservation of biodiversity are in fact the biggest threat to this biodiversity. In the rush to transform upland rotational systems to more sedentary ones, Laos risks losing much of its unique natural heritage. Recent research suggests much of the biodiversity found in the uplands has actually been created by upland farming systems. The highest diversity of upland rice gene stock in the world, outside of India, is found in the uplands. One presentation on NTFPs also showed that the highest diversity of NTFPs occurs in secondary forests which are part of long duration fallows. Another presentation on upland cropping systems showed the necessity of a rotational system so as to interrupt pest and disease cycles.

With regard to poverty alleviation the most important message is that if there is no drastic change in the tools presently used by upland “development” programmes at district or community level among shifting cultivation communities, the government will not reach its targets of poverty alleviation as stated in the NGPES.

Indeed the recommendations made at the end of the workshop clearly express a need to further readjust the shifting cultivation stabilisation policy and its implementation arrangements to really match the goals of the NGPES (see Box 1). It was also recommended that rural migrations and village relocation from the highlands to the lowlands should be well planned and prepared to avoid all the associated problems as described in several presentations.

Outcomes of the parallel sessions and working groups

The outcomes presented below are based on the outputs of the parallel sessions and working groups.

Upland cropping systems

Developing options for cropping systems on sloping land under shifting cultivation is of crucial importance for shifting cultivation stabilisation, especially under shortening fallows. As seen from many of the papers in this proceedings, there is now a growing number of emerging technical options that field workers can choose from (many of which have been developed by NAFRI and its partners) compared to ten years ago

Three main agro-ecosystems in relation to packages of options were distinguished:

(i) Marginal upland areas,

(ii) Upland areas with good access and slopes less than 40%, and

(iii) Lowland paddies in upland valley floors.

When considering the range of technical options it is important to also take into account a number of factors including: (i) duration of fallow period, (ii) local technical knowledge (tools, planting materials, cultural practices), (iii) level of “intensification” (“modern” techniques, “modern” varieties, purchase of inputs, etc.), (iv) labour availability, (v) level of integration into the market economy (cash crops, NTFPs, etc.), (vi) agro-ecological conditions (topography, soil type, altitude, etc.), (vii) land tenure, etc.

The cropping systems working group identified four major issues as well as specific ones for the three different agro-ecological zones mentioned above.
1. **Food security vs. income generation.** Most experience suggests farmers are first interested in satisfying their own food security before venturing into income generating activities. A good example of this is Southern Xayabury, which has good market access with many farmers engaged in cash crop production. However, farmers still want to grow rice to meet their consumption needs. Also, in remote areas food security is important as there are limited opportunities for income generation. If farmers are to engage in cash crop production, there is a need for secure markets. Furthermore, policies need to be put into place which protect farmers against cash crop failures. Given the risk involved in cash crop production, diversity is a hedge against crop and market failures. If farmers move out of upland rice production it will be step-wise, thus, assuring that the income generating options have multiple uses (cash, food or livestock feed). This will make the transition easier. Where lowland paddies exist, these areas should be intensified to help meet rice needs, this leaves the opportunities for other crops in the upland fields.

2. **Fencing.** Fencing is considered a big problem in cropping system intensification and livestock integration. Therefore, it is recommended to carry out more research into developing appropriate living and non-living fences.

3. **Labour requirements.** There is a necessity to understand the labour requirements and opportunity costs of labour when developing new technologies. There are many promising technologies that fail because of high labour requirements.

4. **Institutional arrangements.** There is a need for institutionalisation of research, which involves staff of PAFOs, DAFOs as well as NGOs.

Specific discussion on the different agro-ecosystems included:

(a) **Marginal upland areas**

- **Hedgerows.** Issues regarding hedgerows included: (i) hedgerows seem more appropriate where systems can be intensified into annual cropping systems, (ii) hedgerows should also have additional benefits than agronomic and erosion control values, (iii) there is a need to consider labour requirements in these systems, and (iv) there are very few examples of farmers adopting hedgerows on their own.

- **Upland cropping systems under shortening fallows.** The following comments were made: (i) there are needs for higher yielding varieties, for good nutrient management, for having crop rotations in any sustainable rice system, and system intensification and for developing post harvest technologies, (ii) there is a need to expand the “agro-ecology approach” to other more marginal upland areas, (iii) there is a need for more research on other crops than rice (varieties and cropping systems), (iv) there is a need to work on drought-coping strategies (varieties and cropping systems), and (v) there is a need to further work on the domestication of NTFPs and possibly integrate these into the cropping systems.

(b) **Upland areas with good market access and slopes less than 40%**

Two major “technologies” were discussed: (i) the agro-ecology systems approach (mulching, direct seeding, cash crops) and (ii) fruit trees/pineapple and bananas. For these two, there is a need to study them in more marginal upland areas because these approaches have presently been tested in more favourable environments (easy market access and slope less than 40%).
(c) Lowland paddies

Regarding the development of lowland paddies in upland valley floors two development opportunities were identified: (a) improvement of wet season rice productivity and (b) dry season intensification (soybean and tomato). The first was to be supported by (i) better pest management (during and after the crop growth), (ii) optimum nutrient management (toxicity) to improve productivity, and (iii) selecting varieties suited to highland paddy production. For dry season intensification it was felt that (i) cold coping strategies are needed and (ii) other crops and opportunities need to be investigated.

Plantation crops

Several plantation schemes have been supported by local authorities as “alternatives” to shifting cultivation, especially along the Lao-Chinese borders. The main plantation crops include rubber, sugar cane, tea, cardamom and coffee. Some are successful but others have proven very controversial and in certain cases quite disastrous for villagers both economically and environmentally speaking.

To address the difficulty of finding alternative crops which are profitable for farmers and environmentally safe, three conditions were identified to successfully introduce a plantation cash crop:

(i) The cash crop must reach a higher labour productivity than shifting cultivation.
(ii) The cash crop must offer more security than shifting cultivation products.
(iii) The cash crop produce must be easy to transport.

In general it was recommended to:

› Improve the legal framework for fair competition between traders and the farmer organizations.
› Develop a policy with a sector vision.
› Develop information systems on prices and markets.
› Give priority to market-oriented approaches over product-oriented ones (with market surveys before agronomic trials, participation in international fairs and studying experiences from neighbouring countries).

Livestock and fishery systems

Livestock is an important livelihoods source for Lao shifting cultivators. Chickens, pigs, goat, buffaloes and cattle are generally found in most upland villages. Fisheries are also very important for upland communities as fish from both streams and fish ponds are an important source of protein in upland diets.

Four important issues were identified:

(a) Technical management issues

Intensification of livestock systems as an alternative to shifting cultivation could be done using hard technologies adapted through participatory research. Improving feed resource management and animal health are also important for scaling such systems up.
For fisheries, there is a need to improve the production and supply of fingerlings or froglings and conduct research on fresh water fish varieties appropriate for pond production in the uplands. In some cases small-scale frog production could be promoted to generate food and income especially when there is a lack of off-season crops.

Experiences in intensified pig and poultry production show the following gaps and opportunities: (i) need for new feed resources apart from Stylosanthes, (ii) monitoring of epidemic disease outbreaks is required, (iii) need for improving basic/simple livestock management (housing, water, breeding, accident prevention to improve survival, strategic vaccination, mineral nutrition, better feed utilization), (iv) opportunities to use Stylosanthes leaf meal for supplementing pigs during feed shortages, and (v) in-breeding is a major problem in villages.

Recommendations to intensify small livestock production (pig and poultry) include:

- Conduct on-station and participatory research on cassava, maize and sweet potato varieties and production systems compared with local varieties and systems.
- Strengthen disease surveillance and diagnosis knowing there are few skilled staff.
- Review the existing guidelines on improved livestock management, identify the gaps, fill the gaps and make the new guidelines accessible, and, implement them in partnership with farmers in a holistic or systems approach (implement and evaluate systems and social impacts).
- Conduct research on production and feeding systems using leaf meal, and disseminate practical guidelines for selection and mating systems to avoid in-breeding (especially in confined management systems).

(b) Poverty, gender and ethnicity issues

Experiences show that the poorest people in the village often have few livestock, no large animals or the land or resources to carry out fish production.

To address the problems of the poorest, there are opportunities to establish credit schemes but there is a need to develop better approaches. It is often hard to reach the poorest at the beginning. Credit schemes for the poorest sometimes lack technical support and follow-up resulting in high mortality and greater indebtedness for the poor. Credit schemes are also under represented in rural areas. The set of recommended actions include the following: (i) evaluate credit approaches for livestock (village credit committees, livestock banks with offspring returned, delayed “negotiated” credit within the village to target the poorest after livestock systems have been intensifying), (ii) engage in a dialogue with credit providers and provide key technical information and suggestions for follow-up, (iii) develop livestock credit schemes that are specifically targeting smallholder farmers in the uplands, and (iv) explore forms of credit schemes that could also target mechanisms enabling livestock intensification such as fencing.

Another option to involve the poorest is to investigate opportunities for negotiating with experienced villagers about how to provide credit for those who have been left behind so they can develop small livestock (pigs, goats) systems learning from the existing village systems. Recommended action is to evaluate and test options in villages that already have developed widespread, intensified livestock systems.
Experiences also show that small livestock systems are usually dominated by women and by the poor. Pig production is common in remote areas among ethnic groups. There is an opportunity to focus on the production problems of small livestock systems as a way to reach women, remoter ethnic groups and the poor. One way to do this would be to ensure that women trained as Village Veterinary Workers for small livestock and men for large livestock. The main recommended action is to develop, evaluate and test improved feed, management and disease control options for pigs in villages.

(c) Agro-enterprise issues
In regards to agro-enterprise development, the following should be considered: (i) there are opportunities to develop pasture seed production for local supply and export, (ii) there is a potential for developing feed mills in the provinces, (iii) there is a need for analysis of agro-enterprise opportunities in livestock systems using market chain approach (such as sausages, animal skins, more efficient slaughtering systems?), (iv) there is a need to develop appropriate methods to assess the impact of livestock-based agro-enterprises, and (v) the possibility of milk production and feedlots still need to be investigated

(d) Institutional issues
One issue related to improving the institutional roles and relationships between NAFRI (research), NAFES (extension) and DoLF (policy)? It is also necessary to implement and strengthen the roles and responsibilities of livestock staff at different levels (national, province and district) as defined in MAF’s strategy. There is a need for technically competent staff in the field who have a basic understanding of livestock systems and basic technical skills. Mechanisms need to be developed to exchange experiences and resources between DAFO, LRC and non-formal education centres to ensure that training materials produced by both are standardized, technically correct and are realistic so they can be supported by DAFO. It is also important to develop systems to reach remote villages effectively. Finally, it is necessary to strengthen disaster preparedness in case of emergency problems such as the avian bird flu.

Agro-biodiversity
Agro-biodiversity is a fairly new concept in Lao PDR but is quickly becoming an important issue, especially because of the incredible agro-biodiversity found in the uplands and the role this plays in upland livelihoods and food security. Recognizing this, NAFRI is in the process of developing an agro-biodiversity programme in collaboration with FAO.

It is generally recognized that traditional upland farming systems are responsible for much of the genetic biodiversity found in Laos as compared to the more “modern” lowland farming systems. As the areas under shifting cultivation decrease, or are affected by shortening fallows, the range of biodiversity created by shifting cultivation systems could be seriously under threat. A number of key issues and recommendations were highlighted.

Lao IRRI has already collected about 7,000 lines of traditional rice varieties developed by Lao farmers. Collection of germplasm should be extended from rice to other crops for in-situ and ex-situ conservation.
Experiences have shown that many other crops and vegetables (including NTFPs) are found in upland rice-based cropping systems. Unfortunately, there has yet to be any studies on the impacts of shifting cultivation stabilisation in relation to the agro-biodiversity heritage of Lao PDR. It is recommended to study the impacts of the evolution of upland farming systems on agro-biodiversity.

At the broader level, there is also a need to generate awareness among the public and farmers on Lao PDR’s rich genetic agriculture biodiversity. In addition, it was recommended to strengthen the legal framework related to agro-biodiversity and to allow flexibility in government strategies for improved fallows and shifting cultivation to conserve agro-biodiversity in the uplands. Likewise, there is a need for decision-makers to understand the treaty on Plant Genetic Resources and its implications for Lao PDR.

**Land Management**

The implementation of land use planning & land allocation (LUP/LA) policies has been perceived as a major source of problems in many rural areas. In some cases it is further complicated by village migration and resettlement (voluntary or not).

A number of challenges and issues have emerged in implementing LUP/LA procedures including:

- Present focus is on achieving quantitative targets with less emphasis on sustainable livelihood needs (it is not “process oriented”).
- Relocation (planned or spontaneous) to lowlands are causing land use and socio-economic problems.
- Resources and capacities for LUP/LA (Land Use Planning/Land Allocation) are limited, LUP/LA decreases access to forest resources and agriculture land.
- Fallows are decreasing and better-off people are benefiting from LUP/LA process.

Fortunately, presentations on LUP/LA showed a number of new process-oriented approaches are emerging which focus on bringing upland populations and their livelihood needs into balance with other factors such as sustainable resource management as well as access to roads and markets. Such new approaches also place greater emphasis on working with communities on LUP/LA so that they can express their own needs about land use alternatives.

The presentations also highlighted a number of opportunities to build upon. There are opportunities to improve district strategies, planning and inter-agency cooperation as well as using inter-village networking to improve forest and land management. It was felt that there is also willingness from district staff to investigate adaptations of LUP/LA approaches and procedures. Better implementation of LUP and village networking could also improve wildlife and forest monitoring and management.

The recommended actions from both the parallel sessions and working group discussion on land management included:

- Review/evaluate programs on shifting cultivation, opium reduction & relocation to facilitate appropriate LUP/LA approaches.
Review/document the impact of LUP/LA to understand how the program is influencing the livelihoods of rural people.

- Balance targets and livelihood needs (treat LUP/LA as “process” and not as “one-off exercise”).
- Test agro-ecosystems analysis and agro-ecological zoning to identify land use potentials.
- Increase village involvement in allocation and management of forest and land to ensure “ownership”.
- Identify alternative development options to reduce population concentration (access roads, in-situ water supplies and other services).
- Improve communication on policy intentions and land management guidelines (Central-province-district-village) as well as prepare and disseminate rapidly definitions and guidelines for LUP/LA to province and district levels.
- Characterise villages and undertake LUP/LA based on appropriate criteria and village readiness.
- Define and quantify sustainable livelihood models that contribute to the decision making process of Land Use Zoning and Land Allocation.
- Include land capacity assessment in LUP procedures.
- Ensure that relocation planning takes into account socio-economic, cultural and ethnic complexity.
- Review reallocation plans and develop strategies and measures to cope with spontaneous migration.

**Non-Timber Forest Products (NTFPs)**

Gathering of Non-Timber Forest Products (NTFPs) is an important element in the livelihood of most Lao rural families, especially for those living in the uplands. Interestingly, NTFPs were renamed “Non Timber Fallow Products” in light of the fact that shifting cultivation has created a wide range of niches where NTFPs flourish. While NTFPs have the potential to play both a role in food security and income generation, a number of challenges were identified, including:

- Emerging markets are creating opportunities for income but there are risks due to unstable prices causing depletion of NTFPs.
- Population increase and movements creates more conflicts and competition between villages which collect NTFPs.
- NTFP stock are rapidly depleting due to forest conversion and implementation of government policies which restrict shifting cultivation and thereby reduce NTFP availability.

Based on working group discussions the following priority issues were identified:

**NTFP use & management.** While a number of examples of sustainable uses have been documented (e.g. bitter bamboo shoots, rattans, aquatic products and wildlife).
There is a need to improve community based management systems. The recommended actions include: (i) need for more cross-visits, and (ii) develop sustainable community-based systems for different objectives (e.g. watersheds, NTFPs and wildlife).

**Marketing & processing.** The main lessons were (i) lack of community organizations in marketing (e.g. low and unstable prices), (ii) raw materials are exported, and (iii) lack of market information on prices, quota and quality criteria. **Recommended actions include:** (i) consider village networking for marketing, (ii) establish clear and easy rules for export, (iii) have clear agreements with traders, (iv) encourage more processing efforts, (v) establish provincial marketing boards, and (vi) strengthen provincial trade offices.

**NTFP domestication.** While there are opportunities for domesticating NTFPs, expectations over planting NTFPs may be over-rated. *It was recommended to study first what is in natural forests and carry out cost-benefit analysis before considering plantations. There is also a need to clarify the benefits of ownership in the context of government policies.*

**Capacity building.** Experiences highlighted: (i) the need for more trained staff with appropriate skills in NTFP development, (ii) the lack of knowledge on the resource base (e.g. problems of over-exploitation are not well understood), and (iii) the need to also consider the problem of NTFP exploitation in resettlement plans. **Recommended actions are:** (i) train more provincial and district staff, (ii) develop community rules for resource management, and (iii) review the affect of decreasing fallow periods on NTFP diversity.

**Socio-economic impacts.** The following lessons were highlighted: (i) low understanding of role of NTFPs for food security, (ii) some families over-exploit NTFPs, and (iii) loss of NTFPs are not considered when converting natural forests into plantations of rubber, coffee, sugarcane, tree crops, etc. **Recommended actions include:** (i) use NTFP income for reinvestment in village development funds and (ii) conduct risk analysis together with cost-benefit analysis.

**Policy.** Since there are few clear laws or regulations to manage NTFPs in a sustainable manner, *it was recommended to set up a process for developing a clear legislation for sustainable use of NTFPs, with special emphasis on clarifying village level management systems.*

**Wildlife hunting and use**

Wildlife plays an important role in ecosystems and in the livelihoods of upland people. The main issues identified include: (i) unsustainable harvest rates of wildlife for subsistence consumption and (ii) uncontrolled trade and hunting threatening poverty alleviation efforts in rural Laos. To address declining wildlife stock, there is an opportunity to use village Land Use Planning, Village Agreements and inter-village networking as tools to improve management and control of hunting.

Main recommendations include: (i) reduce wildlife trade, (ii) increase urban public awareness on the impact of wildlife trade on villager livelihoods, (iii) increase enforcement in urban markets and road checkpoints, (iv) evaluate wild meat preferences in rural nutrition and food security, (v) limit and monitor access roads to protected areas, (vi) limit
and control access to protected area core zones, and (vii) develop village models for sustainable wildlife use.

**Forestry**

Forestry was not selected as priority topic for discussion. However several interesting presentations on forestry demonstrated the important role forests and trees play in upland livelihoods. A forestry cover study in an NBCA showed changes could be caused by migration into the protected area, reduction of agricultural area with ban on shifting cultivation, reduction of dense forest in spite of logging ban and decrease in grassland due to forest fallow regeneration into secondary forest.

Another study catalogued 24 distinct local agroforestry systems in 17 villages, of interest for research and development activities. Main types were: (i) home gardens, (ii) rotational and intercropping systems, (iii) NTFP plantation, (iv) improved fallow practices, (v) fishponds, and (vi) livestock grazing practices in forest falls.

A presentation on village-based forest conservation and afforestation experience showed that: (i) village water supply could be used as entry point, (ii) benefit sharing is important to create ownership, (iii) strengthening village leadership is necessary, (iv) using community nurseries is better than centralized nurseries, (iv) conservation farming could be combined with agroforestry, and (v) headwater protection should be undertaken first for villagers. It is also recommended to provide participation incentives, to domesticate NTFPs, to redo the LUP/LA process and to encourage community-based marketing.

Three other presentations focused on the technical aspects of plantation forestry. A study on *Aquilaria crassna* (“May Ketsana” or “Agar Wood”) highlighted: (i) important genetic variations, (ii) small investment required for forest domestication if natural forests are marked and protected, (iii) benefits of planting single “ornamental” trees around houses and streets, and (iv) high investment required and high risk if grown as a plantation crop. For Aquilaria it is recommended to concentrate on woodlots and agroforestry plantings, to collect seed and “wildlings” from mother trees and trees with oil, and to be wary of high investment in plantations as returns may be less than expected.

Another presentation was based on the involvement of villagers in tree seed collection and management. The presentation highlighted seed demand and marketing as critical issues. To solve these issues communication between stakeholders and government support at local and national level the following is essential. In addition, the following recommendations were made: (i) conduct demand tree seed survey, (ii) formulate policies to support the use of quality seeds, (iii) organize marketing and promotion, (iv) improve networking and communication, (v) establish agreements on seed collection, and (v) continue government support.

The final forestry related presentation focused on community woodlots species for the uplands. Nine priority species were identified for the northern region. Five other were identified more specifically for the Xieng Khouang plateau and for the southern region. Main recommendations include: (i) carefully select priority tree species to match biophysical conditions, (ii) balance socio-economic and biophysical parameters of tree species when establishing community woodlots, (iii) use problem analysis with villagers before selecting a particular tree species, and (iv) further discuss identified constraints with local authorities and communities.
Development and scaling up approaches

In addition to the review of the existing “technologies” for the uplands, the workshop also explored the range of institutional mechanisms required and the different approaches used by development programmes to move beyond small-scale trials. Various development agencies and projects presented their experiences as well as some private sector companies.

A “formula for development” was proposed for Lao PDR as follows:

“Communities + Government + NGOs + Donors + Private Sector = Lao PDR Development”.

Results of the parallel sessions have been summarised by combining all presentations around three primary areas: (a) Extension System, (b) Village Capacity Development and (c) Private sector. In addition, the outcomes of the working groups on Scaling up approaches and Gender and ethnic considerations are presented.

Systems for extension

A number of projects and programmes have developed successful models for extension at the local level, yet until recently there was no effective extension service. One presentation focused on this and showed how NAFES has developed a sustainable agricultural extension system based on participatory principles. In general a number of problems and issues were identified to improve the extension system:

Need to reform and localize the extension system. Lessons learnt have shown that it is necessary to focus on village extension service through activation of village assigned representatives, who are paid for services. Lack of training and resources is considered a gap and recommended action is to reinforce cooperation between government and donors/NGOs/projects.

Need to shift responsibilities for extension from government to local communities to create ownership. Lessons learnt show the necessity to work with groups of farmers and farmer-to-farmer extension. There are opportunities to select and train proper persons in facilitation skills and it is recommended to change the role of district staff to act more like “facilitators” rather than “implementers”.

Appreciate reasons for slow development and change. Lessons show that people need to be made aware and take decisions on their own. There are opportunities for awareness raising and training and also for using process oriented rather than target setting thinking. It is recommended to appreciate that there is not one situation/solution but many.

Lack of appropriate infrastructure. There are opportunities to continue to expand infrastructure to create access and opportunities. There are also opportunities to rely on loans and projects. It is recommended to improve coordination between sectors.

Risks of forgetting the poor and the women in extension work. Experiences have shown the need to build structures for targeting the poor and women within project planning and structures. There are opportunities for tapping experiences generated by projects and it is recommended to organize discussions in between government and projects to tap that knowledge.
**Village Capacity Development**

If an extension system is to be effective, then there will be a need to develop village capacity to identify and solve their own problems. In the course of discussions, the following issues were highlighted:

**Remote upland villages only understand shifting cultivation for survival.** Experiences show the relevance of using awareness raising and dialogue to understand and stimulate thinking. There are opportunities to develop simple material in local languages to explain and motivate people, and it is recommended to respect the “time factor” and local wisdom.

**Communication difficulties due to language and culture.** One option presented was to engage villagers on pay basis for extension work. However there is a risk that villagers may not accept such assignments due to preoccupation. Once again it is recommended to respect the time factor.

**Villagers do not necessarily listen and learn from outsiders.** Experiences have shown that it is relevant to apply the farmer-to-farmer approaches for transfer of ideas and work with groups for farmers and clusters of villages. There are opportunities to organize on-the-job training and local study visits as an efficient way to train and convince. It is recommended to develop cooperation between ongoing projects.

**Upland villages often lack knowledge, funding and access to markets.** There is an opportunity to create mini-projects to stimulate thinking and development, and also try to link up with private sector. Moreover, there are opportunities to apply saving and loan concepts possibly with a top up through projects. The main recommended action is to develop cooperation between ongoing projects to create understanding about what may work.

**The lack of a “database” on knowledge and ideas being used or tested.** It was recommended that this workshop used as a starting point for continuing a dialogue between projects. There are opportunities to establish periodical meeting on pre-decided topics to learn and share ideas. To complement this, it is also recommended to develop a database of all available knowledge and make it available to any user.

**Shifting cultivation practices are labour intensive and time consuming with little reward.** It was suggested that there is a possibility to apply opportunity cost thinking in discussions with villagers. There are opportunities to support livestock and fishery since they may be rewarding starting points for permanent agricultural practices. It is also recommended to use the proposed “knowledge bank” to get ideas and relevant experiences.

**Experiences from the private sector**

The private sector presentations brought a refreshing perspective to the workshop and allowed participants to understand some of the challenges they face. Private companies often have difficulties to get permits for start up and operation. In addition, there is no standardized tax code, laws and taxation of traders. Another issue regarded the problem of farmers honouring production contracts. They also pointed out that projects and donors often distort the market by providing free inputs, or unrealistic credit with subsided interest rates. Another issue concerned limited cooperation with public sector projects and lack of knowledge about different opportunities among farm-
ers. In addition, there was a lack of awareness on market opportunities for products from the sector. Finally, quality control was an issue as there is more of a focus on quantity rather than quality.

The private sector called for the introduction of simplified rules by the government to get permits for start up and operation and to standardized tax laws.

The issue of inflation of prices by projects requires more discipline (coordinated efforts) by donors and projects. Often prices become inflated because projects provide free inputs to farmers or unrealistic credits with subsided interest rates not reflecting the real market interest rates and in the end not very viable financial tools for farmers. This may complicate sound economic development. It is recommended to raise awareness and establish more discipline.

The problem of limited cooperation with public sector projects should be tackled through intensification of information sharing. There are opportunities for organizing regular meetings and it is recommended to initiate and maintain the dialogue between private sector and donor-assisted projects. One private sector presentation explained that they cannot afford providing extension services to farmers and this would be an ideal role for projects and/or the public sector.

The issue of “major market opportunities for products from the sector” should be addressed as there are many emerging market opportunities to explore in Lao PDR and neighbouring countries. It is recommended to initiate and maintain a dialogue with projects and farmers to identify and explore these market possibilities.

Regarding the problem of “quality versus quantity” lessons learned show that bulk production will never be competitive from a regional perspective. There are opportunities to develop quality, niche products and it is recommended to initiate and maintain a dialogue with projects and farmers.

**Scaling up approaches**

Scaling up was the focus of a working group discussion. A number of issues and potential recommendations were identified.

**Linking research, extension, village communities and the private sector.** There is still little coordination between all these actors. The following actions were recommended: (i) identify key actors (roles, objectives, capacities), (ii) work with village groups not individuals, (iv) develop networks between groups and actors, (v) develop facilitation capacity of all staff, and (vi) focus on scaling up as a SOCIAL LEARNING PROCESS.

**Developing local level extension systems.** To improve local extension it was recommended to: (i) use local knowledge, (ii) use village extension staff supported by villages, (iii) use demand-driven extension approach, and (iv) redefine responsibilities of government extension system.

**Establish networks across villages, districts and provinces.** There are a number of experiences from projects and programmes that should be built upon. It was also stressed to look for processes which have worked rather than focusing on technologies.

At the village level, it was recommended to use local people as trainers, village networking, provide extension material in visual form. At the district/province level, hold
annual workshops, use pool of experiences for reports, training and technology development, develop networks for extension staff with PAFO taking lead role (VES, DAFO, project staff). It was recommended that projects be encouraged to not only test out pilot ideas but also put in place village extension workers, trainers, extension materials and technical information. Finally, there is a need for recognition and coordination at national and provincial levels.

**Ensuring funds reach the poorest of the poor.** The following actions were recommended: (i) use different types of village saving funds (e.g. savings/credit/revolving fund/village bank/Agricultural Promotion Bank), (ii) voluntary membership to village contribution fund with management committee, (iii) provide training and capacity building, (iv) provide revolving fund guide, and (v) reach agreement among farmers on interest rates.

**Gender and ethnic considerations**

Gender issues related to shifting cultivation communities and ethnic minorities are less studied and well-known than in lowland communities. While there was no presentation focused specifically on gender and ethnicity, the topic is cross-cutting and was thus considered an important working group topic.

Six major problems were identified in relation to gender and ethnic issues:

**Difficulty to establish dialogue because of language and cultural barriers.** It was recommended to adopt the approaches used by many projects such as promoting local and ethnic staff as part of the programme strategy. It is recognized that the knowledge level may initially be low and there will be a need to organize adequate training and education to build capacities. However, over the long-run this will help establish local capacity.

**Lack of female staff at district levels.** Experiences show that a key to success in dialogue with villages may rely in having more female staff. The main gap is that even if women have priority for training in the sector the number of female trainees is low. It is thus recommended to consider special incentives to attract more women for studies. Parents should be encouraged to send girls to school starting from primary school. Projects should actively promote women staff by requesting government that they would like to have a certain percentage of their staff women. This means that projects should consider lowering the needed qualifications for women staff and invest more in on-the-job training.

**Need to respect different cultures at time of introduction of “modern” knowledge.** Experiences have shown that it is important to respect the “time factor”. There are opportunities to develop simple awareness and training material and it is recommended to learn from and discuss with other projects that have dealt with these issues.

**Little attention given to gender/ethnic issues in design of development efforts.** If gender and ethnic considerations are to be mainstreamed into projects, then it is important to set the rules and requirements before the project starts and not after. Two recommendations were made in this regard: (i) “don’t plan for a project but for long term development”, and (ii) learn from other projects.
Women lack time to consider development options. Participatory approaches which are geared toward women often assist in ensuring that women are not excluded for perceived “lack of time”. The example of the “farmer field school” approach is one such way to reach women. Focusing on homegarden, small livestock (chickens) simple labour saving technologies could also attract women. Finally, it was suggested to identify times when women can meet. Often men and women have different times when they are busy, so if there is a focus on including women, there is a need to understand their working preferences.

Emerging labour constraints due to a very young population and migration of young men. In many villages, the children (below 15 years) represent the majority of the population. Experiences show that this means a double burden for women (family raising tasks and work). It is thus recommended (i) to keep this in mind when discussing activities with women, (ii) learn from other projects and (iii) focus on improving the livelihoods and reducing the workload of women. This will result in more free time for girls to hopefully attend school.

Upland source book for Lao PDR

The feasibility of a source book for shifting cultivation stabilisation in Lao PDR was also a subject for a working group. The development of a source book offers one way to synthesize the range of learning and experience in uplands development over the last 5-10 years. It is also a way to further the continue the networking and sharing of experiences that was started at this workshop.

It is envisaged that the source book will be a compendium of best practices, lessons learned and experiences gained by those working in the uplands and will provide field workers (district and provincial level staff) with practical, easy to understand ways to solve problems facing uplands development. A compilation is proposed that cuts across themes to cover policy, market-related, social, institutional and technical issues relating to the general topic of Stabilisation of shifting cultivation.

It should not be considered as a book of guidelines with recipes to success but rather as a menu of options. Lessons learned will be featured, not reports of accomplishments. It will have short articles (4 pages) with a lot of illustrations in black and white. It will be photocopy friendly and no longer than 250 pages, without copyrights.

While it was decided at the workshop that NAFRI would be the lead agency in developing the sourcebook, a multiple agency effort is envisaged so that the best (tested) ideas are featured in a single compilation.
The Role and Importance of the Agriculture and Forestry Sector in Poverty Eradication

Anonth Khamhung

Abstract

This paper explores the response of the Lao Agriculture and Forestry sector to the National Growth and Poverty Eradication Strategy (NGPES), which by its very nature is most concerned with uplands development. The article discusses successes and remaining challenges from government policy over the past twenty-five years, and assesses the general situation of agriculture and forestry development in the forty-seven focal districts of the NPEP. Finally, the author presents a list of planned projects and activities designed to achieve the aims of the NGPES.

Role and importance of the agriculture and forestry sector in poverty reduction

The agriculture and forestry sector is not only important to national economic development, but due to its close linkage with food production, the sector has had a long and meaningful history in alleviating poverty for Lao people. The historic role of the agriculture and forestry sector in poverty reduction can be divided into two main stages.

The first phase covers a period from 1976 to 2000. During this time, the Ministry of Agriculture and Forestry (MAF) and its development partners were able to address some basic problems associated with food production. In particular, annual rice production doubled from 200 kg per capita in 1976 to 400 kg per capita in 2000. In other words, there has been some success in the drive towards poverty eradication. However, this success occurred mainly in the lowlands, while the larger extent of poverty in isolated upland areas - where most of the poor are found - remained unsolved. Overcoming the problems in the uplands has become a big challenge due to many reasons. Among the most important of these are unsustainable land uses and practices, such as shifting cultivation on steep slopes, forest degradation and opium production.

Since 2000, national policy has been expressed through the resolutions of the Seventh Lao Revolutionary Party Congress, through Prime Minister's Decree No. 010/PM (25/6/01) and through the government's socio-economic development plan. The overall emphasis is on achieving specific targets and outputs by taking local conditions into account. The agriculture and forestry sector has followed national policy in producing a strategic vision that contains a master plan and specific development projects. In particular, MAF's organisational set up has been improved through, for instance, the establishment of NAFRI, NAFES, and the Departments of Planning and Inspection, and through the decentralisation of staff to grassroots levels.

Regarding the actual implementation of projects to reduce poverty in the field, a number of good lessons can be drawn from many areas, such as the production of livestock, coffee, cardamom, corn, Job's tears, and other cash crops, plus the establishment of micro-
credit systems in remote areas, and a cattle bank in Xiengkhuang province. All of these activities are considered as production models that are supplementary to already known rural development practices.

In parallel to these positive points, there are still a number of fundamental shortcomings that urgently need resolving. These include:

- Past performance has not shown a clear concentration on poverty reduction.
- Action plans and projects are still too vague or general.
- Poor coordination between relevant sectors at all levels.
- Imbalanced investment among sectors and regions, and between infrastructure development, investment, extension and utilisation management.

To ensure the efficient implementation of relevant activities, there is therefore a need to conduct a thorough situation assessment in the NGPES focal districts. This would provide an important basis for consistent planning and resource allocation.

**General assessment of the 47 focal districts**

*Location and topography*

The National Committee for Poverty Eradication has identified 47 focal districts where poverty shall be eradicated between 2003 and 2006. These districts are mainly located in remote upland areas at altitudes of more than 600 metres above sea level (with the exception of Sukhuma district in Champasack). Conditions within these districts differ considerably. Rice paddy, for instance, exists in scattered small-scale plots at the foot of the hills in some districts, but is totally non-existent in others. While some districts still have abundant forest areas, the land areas of the other districts are dominated by barren mountains. Roads in almost all of these districts are poor and can be used in the dry season only, while some villages can only be accessed on foot.

*Socio-economic conditions*

In these 47 districts there are 3,597 villages with a total population of more than 1,233,000 people, of whom 614,274 are females (about half of the total). Out of the total number of 201,666 households, 118,850 (60%) are poor, while 2,898 villages (81% of the total) are classified as poor. Among the 47 poor districts, 39 (83%) are facing problems related to rice deficit and 38 have been identified as focal sites for integrated rural development.

*General constraints to agriculture and forestry development in focal districts*

- Lack of effective production, communication and transport systems for agriculture and forestry commodities in remote upland areas.
- Staff insufficiency in both number and quality.
- Limited infrastructure for agriculture and forestry development. This includes technical training centres, micro-irrigation schemes and crop multiplication centres to produce good quality seedlings for industrial and medicinal crops and NTFPs. There is also a lack of good quality breeding stock for livestock and fish.
Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR

- Limited technical transfer through extension to farmers in remote areas.
- Very limited research, tests and demonstrations on livelihoods that are suited to tradition and local ecological conditions.
- Limited market information and market access.
- Very limited access to medium- and long-term rural credit (only covering about 16% of the 47 districts).
- Weak livestock health care system and lack of additional nutrition and improved species of forages for animals.

**Opportunity/potential**

People living in these poor districts all have a long tradition of working hard and working collectively and have their own traditional ways of production. Lao Soung people, for instance, have a long tradition of cattle raising and growing maize, as do the Lao Huay in raising pigs and poultry; the Tai Leu in growing rice, cash crops and weaving; the Akha in raising pigs and mulberry paper production; the Phou Noy and Ho in services; the Tai Dam in planting fruit trees and sewing, the Phou Tai in producing cotton and silk, and the Taven group in basket and weaving handicrafts.

In addition, these 47 poor districts still have abundant forest, land and water. These natural resources and the suitable climate provide high potential for crop production, livestock and fish raising, planting industrial trees and collecting NTFPs. Another important potential is market availability. For example, cattle have a large market throughout the sub-region. Other products that could be potentially accepted by markets in neighbouring countries such as China and Vietnam include corn, Job’s tears, soy beans, ground nuts, tobacco leaves, garlic, sesame, mulberry paper, tropical fruits, silk, NTFPs (cardamom, makkha, peuak meuak, dokkaem, bitter bamboo shoots, peuak bong, mak ka, wild honey, yan, rattan), and industrial trees (rubber, eagle wood etc.). In addition, natural fish is seen as a potentially important product for domestic consumption and export.

**Identification of focal districts:**

The 47 focal districts were identified based on criteria which include: health, education, road infrastructure and agriculture production. Other factors were also considered such as population pressure, population density in relation to the availability of agricultural land, risks associated with UXO, extent of paddy fields, availability of water for two crops per year, and accessibility.

**Districts with high population pressure on agriculture lands:**

a. Districts where all agricultural land is already exploited: Nalae, Beng, Namor, Phoukhoun, Nonghed, and Sukhuma districts.

b. Districts where access to agricultural land is limited because of high incidence of UXO: Xaysomboon, Khoune, Vilabuly, Sepone, Ta Oi, Samuoi, Bachiangchaleunsook, Kaleum, and Dakcheung districts.

- Low UXO risk: Xiengkhor, Viengxay, Thathom, Nga, Bolikhanh, Bualapha, Phouvong, and Sanxay.
Districts with rice production potential:


b. Inner districts: Nga, Beng, Hoon, Pak Xeng, Phoukhoun, Bolikhanh, and Bachiangchaleunsook.

Districts with potential in upland crop, perennial crop, livestock and NTFPs:

Nhot Ou, Samphanh, Long, Viengphoukha, Nalae, Pha Oudom, Xayabury, Namor, Nga, Hoon, Pakbeng, Pak Xeng, Nonghed, Thathom, Viengthong, Sepone, Nong, Samuoi, Phouvong, Sanxay, Kaleum, and Dakcheung.

Direction, measures and projects

Based on the situation mentioned above, MAF has laid out the following directions, measures and agriculture development plans and focal development projects for the eradication of poverty in the Lao PDR:

1. Placing high emphasis on the application of techniques and technologies in agricultural production, using existing resources to transform the natural economy into a modernised economy in order to enable sufficient production of food and ensure the existence of stock.

2. Ensuring stability and reducing negative impacts from natural hazards and vulnerability.

3. Promoting value-added commodity production as well as increasing quantity of commodities.

4. Forming production groups to increase the benefits from value-added produce for poor farmers in rural areas.

5. Core implementing measures:
   - market-oriented commodity production;
   - people’s participation;
   - decentralising responsibility to localities;
   - sustainable resource management;
   - multi-sectoral integration and coordination.

Priority development projects for 2003 - 2004

In order to concentrate on development and poverty eradication within the focal 47 districts, the agriculture and forestry sector intends to focus on the implementation of priority projects that contribute to achieving the targeted figure (50,000 households) set forth by the government in the socio-economic plan for fiscal year 2003-2004. Priority development projects include:
a. Commodity production projects to increase people’s income
1. Commercial crop and fruit production (51 projects within 43 districts).
2. Tea plantation (one project planted in 100 ha to support 30 households in one district).
3. Sugar cane plantation (one project planted in 100 ha to support 35 households in one district).
4. Silk production (five projects in five districts).
5. Maize production (one project planned for 1,300 ha to support 961 households within one district).
6. Coffee production (three projects to support seven villages within three districts).
7. Larger animal promotion (37 projects in 35 districts).
9. Pig raising (nine projects in nine districts).
10. Goat raising (seven projects in seven districts).
11. Fish raising (four projects in four districts).
12. NTFP domestication and collection (19 projects to support 2,400 households within 18 districts).
13. Industrial tree plantation (eagle wood, rubber, teak; seven projects in seven districts).

b. Food security projects
1. Rice yield improvement (13 projects in 12 districts).
2. Rice banks (eight projects in eight districts).
3. Revolving fund establishment and occupational promotion (eight projects in eight districts).

c. Production-supportive infrastructure development projects
1. Establishment of production fields (34 projects in 31 districts).
2. Small-scale irrigation surveying and designing projects (34 projects in 18 districts).
3. Small-scale irrigation construction and renovation (77 projects in 43 districts).
4. Land allocation and permanent occupation arrangements (24 projects in 21 districts).

d. Supporting projects implemented jointly by central, provincial and district authorities
1. Rehabilitation and expansion of fish fingerling production centres.
2. Animal health care and improvement of check points.
3. Research on sustainable NTFP management and utilisation.
4. Technology development on basic seed multiplication.
5. Improvement of the national health care centre.
6. Small-scale irrigation development and rehabilitation.
7. Nursery development for fruit and industrial trees.
8. Upland agriculture and forestry research.
9. Research on harvesting fruit and vegetables.

**Fundamental actions for securing poverty eradication**

In order to secure the effective implementation of priority projects at villages or focal sites, the following enabling factors or basic activities need to be put in place:

1. Development planning, particularly at district level.
2. Improvement of research and extension systems in provinces and focal districts.
3. Government investments that are well-suited to local conditions.

**Planning at district level**

An integrated planning approach with the following characteristics must be applied:

- Participatory or ‘bottom-up’ planning.
- Regional planning, particularly in upland areas.
- Zoning in accordance with watershed boundaries or areas where irrigation is available.
- Ensuring appropriate land use linked to socio-economic development, in order to secure sustainable use of natural resources while minimising negative impacts on the economy and environment.

**Improvement of research and extension systems at district and focal site levels**

- Placing extension networks in villages.
- District staff should perform extension work as generalists.
- Provincial staff should act as subject matter specialists to train and assist district staff in solving specific problems.
- Establishment of demonstration plots in representative focal sites.
- Establishment of model families, model villages and model focal sites.

**Author**

Mr. Anonth Khamhung is Director General, Department of Planning, Ministry of Agriculture and Forestry, PO Box 811, Vientiane, Lao PDR, Email: mafncbp@yahoo.com
REVIEW OF POLICIES AND PRACTICES IN UPLAND AREAS OF THE LAO PDR

David E. Thomas

Abstract

Under the National Poverty Eradication Programme (NPEP) overall visions for agriculture, integrated watershed management and forestry seek to coordinate sectors in facilitating a holistic transformation of upland livelihoods to reduce rural poverty and conserve natural resources. Operational policies, however, still centre on stabilising shifting cultivation, eliminating opium production, land use allocation, land use planning, and focal site development with village relocation and consolidation. Responsibility for planning, implementation and meeting targets is increasingly delegated to provincial and district offices. As a result, the overall policy environment tends to segregate lowland agriculture and upland forests, overwhelm local capacity with mandates under decentralisation, and place strong constraints on land use while new livelihood opportunities are still vague. The impacts of this are disrupting diverse household livelihood systems and bringing turbulence and uncertainty to many upland communities.

Government efforts to strengthen support for upland agriculture and forestry focus on the development of responsive, demand-driven research and extension services. Although the National Agriculture and Forestry Research Institute (NAFRI) is progressing, initial visions of improved extension services under the National Agricultural and Forestry Extension Service (NAFES) appear promising, and pilot projects are helping point the way, much more effort is needed to build capacity at increasingly important village to provincial levels.

In terms of improving livelihood component technologies, a great deal of progress has been made in lowland rice production, livestock health, and some field and tree crops. Nonetheless much important work remains to be done in horticulture, agroforestry, non-timber forest products, smallholder timber, irrigated production in small upland valleys, community-based natural resource and landscape management, as well as local processing, micro-enterprise and marketing chains. Organic and/or diverse niche products will require more effort to develop market opportunities, local identities and product lines, local entrepreneurial skills, and locally-adapted technologies.

While the challenges are many, the experienced and motivated people participating in this workshop may be able to help expand the range of promising alternatives, and further build and accelerate efforts under NPEP to improve livelihoods in upland communities.

This paper provides a brief overview of upland policies and practices. The emphasis is on policy themes and directions, implementation issues, livelihood impacts, as well as emerging institutions, technologies and approaches to commercial production.

Major upland visions and policies

Given the nature of land use patterns, practices, and livelihoods in upland zones of Laos, agriculture, forest and natural resource management are closely intertwined in the government’s visions for development. The major guiding framework, strategic visions and core policies of most concern for upland development include:
The Lao Government recently launched its new framework for rural development, known as the National Poverty Eradication Programme (NPEP) (CPC 2003). This programme is central to the Government’s ambitious strategy for Laos to leave the ranks of least developed countries (LDC) by 2020. Efforts began with the articulation of criteria for operationally defining poor households, villages and districts, and a strategy to promote access to:

- Agriculture and forest technology.
- Markets through roads and information.
- Social services.
- Human development.
- Financial resources.

Emphasis is on grassroots initiatives to alleviate poverty through development in their own areas (CPC 2003).

A range of activities have assessed rural poverty, reviewed experiences in implementing policies and projects, and refined implementation approaches for NPEP. Based on experiences gained by the Participatory Poverty Assessment (ADB 2001) in classifying districts according to poverty levels, classifications were further refined for the NPEP. The 72 districts identified as poor and the 47 districts identified as very poor are shown in Figure 1. The paper in this volume on NPEP is useful to keep in mind while reading this review of upland policies and practices.

**Visions of Agriculture & Natural Resource Management**

The direction of upland development policies and programmes reflects the Lao Government’s strategic thinking and its visions of the future. Dimensions of strategic thinking linked with upland development are being articulated in a series of ‘vision’ documents.

**Agriculture**

Major elements of the government’s strategic vision for agricultural development (MAF 1999) have been incorporated into all plans and programmes, including the NPEP. Key elements are:

- **Identification of two major agro-geographical zones:** (a) Mekong Corridor Flatlands, where agricultural transformation has begun; (b) Sloping lands, where subsistence agriculture and resource degradation result in poverty and negative downstream impacts. Development in the uplands is to centre on area-based conservation and livelihood systems.

- **Identification of generic types of farming systems** with different development strategies directed toward systems in each agro-geographical zone. While types of
farming systems reflect different altitudes and terrain, they all include several components in varying proportions, typically rice (paddy or rainfed), livestock, aquaculture, semi-permanent and cash cropping, which are supplemented by gardens, non-timber forest products, fishing and hunting.

- Reorganisation of The Ministry of Agriculture and Forestry (MAF) to enhance its capacity to respond to farmer needs in an evolving market economy. A bottom-up approach focuses on District and Provincial Agriculture and Forestry Offices (DAFO, PAFO), and central support services are consolidated into the National Agriculture and Forestry Research Institute (NAFRI) and a National Agriculture and Forestry Extension Service (NAFES).

By 2001, this strategic vision was supplemented by a Master Plan Study on Integrated Agricultural Development (JICA 2001), providing a more detailed action plan, including outlines for 110 projects classified by priority for different timeframes, areas, and sectors.

Integrated Watershed Management (IWM)

The Government's commitment to a major watershed management component in its overall land use planning approach is presented in its new strategic vision for integrated watershed management (MAF 2003a). Since it sees upland development resource allocation linked with integrated watershed management plans, the Committee for Planning and Cooperation (CPC) will need to collaborate with MAF in integrating mechanisms into national planning processes.

Under the vision, provinces develop strategies and priorities for sub-watersheds in their province, and districts develop watershed plans either by themselves or together with neighbouring districts, depending on physical watershed boundaries. Such plans are to be in place for the whole country by 2010. Within the plan for 2001-05, focus is on eight northern provinces, which include highest priority watersheds, as well as high levels of shifting cultivation and poverty. The main challenge now is to develop staff capacity in basic technical and facilitation skills (MAF 2003a).

While watershed classification places restrictions on land use according to physical characteristics, the IWM approach uses a more holistic area-based planning process that distinguishes between provincial level, where sub-watersheds and strategic options for larger watersheds should be identified, and district level where watershed zoning, ‘buffer zones’, conservation areas and specific development efforts are to be agreed upon by district sub-sectors through a seven-step process. As presented thus far, this is neither a simple nor an easy process, and it is not yet clear how it will interface with other programmes. Hence, a phased approach is beginning with pilot areas and priority provinces. Given its integrative framework and character, it is a potentially important policy with many implications for upland development under NPEP.

Forestry

Forestry in the Lao PDR is changing, as reflected in the 1996 Forestry Law and associated decrees and regulations. A forestry sector strategy to the year 2020 was presented in draft form, and is now being revised (MAF 2003b). The new strategy seeks balance among the multiple roles played by the forestry sector:
One of the fastest-growing sectors of the economy, providing foreign exchange, materials, jobs and revenue for both public and private sectors.

A safety net for rural livelihoods providing timber and non-timber forest products (NTFPs) for both home use and sale.

Maintenance of soil and water resources and flood protection.

Protection of biodiversity of national, regional and global significance.

The draft strategy includes considerable discussion of forest land classification processes and issues important for village land use in upland areas at multiple levels:

**Forest Classification.** Forests are classified into five categories that total 85 percent of the land area of Laos. Three classes are delineated on large-scale maps:

1. *Production forests* for timber and forest products for national and local needs;
2. *Conservation forests* to conserve species, habitats and other entities;
3. *Protection forests* to protect watersheds and areas for national security and the environment.

Two classes focusing on 'stabilising' shifting cultivation are identified by village land allocation processes:

5. *Regeneration forests* are fallows or other areas targeted for regeneration into permanent forest;
6. *Degraded forests* are areas with little forest targeted for tree planting or land allocation.

**Village Forest Lands.** Through land allocation processes, forest within village boundaries is classified using the same categories as the national system, with production forest being named Village Production Forest, and so on. Thus, village forests are being demarcated on lands located within national and provincial conservation, production and protection forests. While this double-layer classification reflects reality and appears necessary, there are no clear criteria for delineating village land-use areas, and their legal status is unclear. In 2001, village forest provisions were consolidated, and NTFP collection for sale was allowed under approved management plans; a 2002 decree allows villagers a role in managing production forest under village contracts with districts (MAF 2003b).

Potential Reforms that the draft strategy proposes for more articulation and discussion include to:

- Revise land-related laws to include overall land use planning systems.
- Clarify definitions and legal status of village forest lands.
- Increase flexibility for land allocation according to socio-economic conditions.
- Clearly define shifting cultivation types and study environmental impacts of each.
- Set targets for improved livelihoods, instead of are under shifting cultivation.
- Assist villagers with overall village land and forest management plans, with focus on common lands and forests, watershed areas, income generation, etc.


**Evolving operational upland policies**

Policy visions for upland development seek to incorporate, and improve coordination among, existing lines of policy that have set the direction for development programmes during recent years. Five major policy themes are particularly relevant for upland development:

**Shifting Cultivation**

As in the wider montane mainland Southeast Asia (MMSEA) eco-region (Thomas 2003), upland agroecosystems in Laos have long included shifting cultivation practices that employ periods of forest regeneration to sustain their productivity, in systems that vary by ethnic group and location. Estimates in 2000 indicated that 39 percent of the population of the Lao PDR depended on shifting cultivation, which covered 13 percent of the total land area (JICA 2001).

Concern about negative impacts of shifting cultivation has been a consistent theme of government policy since liberation. Although implementation of early decrees prohibiting shifting cultivation was very limited, the landmark 1989 National Forestry Conference proposed forestland allocation to villagers as a policy to rationalise forest use and introduce alternatives to shifting cultivation (MAF 2003b). Subsequent land-related policies have had ‘stabilisation’ of shifting cultivation as a central objective and by 1998 the government acknowledged that rural development priorities up to that point had been aimed mainly at gaining national rice self-sufficiency and restricting shifting cultivation (SPC 1998).

Increasingly serious environmental impacts are attributed to ‘slash-and-burn’ practices of ‘unsettled’ families. Claims are made that for shifting cultivation to be sustainable, a cycle of 20 to 25 years is needed to give forests a chance to fully recover before being ‘slashed-and-burned’ again, which is not possible because of population pressure (SPC 1998). Thus, the Government sees shifting cultivation as unsustainable, and intends to stop it by:

- Making agriculture sedentary through farming system diversification and agroforestry.
- Opening market access through feeder roads and market information delivery.
- Land use zoning based on slope and land capability.
- Rural savings and credit.
- Land allocation and land use entitlements (MAF 1999).

Every major policy, programme, and project document related to agriculture, forestry or natural resource management in mountain areas includes similar arguments. The Seventh Party Congress set targets endorsed by the National Assembly to ‘stabilise’ pioneering shifting cultivation by 2005, with complete stabilisation (eradication) by 2010 (MAF 2003b). Five mountain provinces of the North are the main focus, and each receives an annual target for reduction. In response, during 1990 – 2001 shifting cultivation is said to have dropped in land area from 249 thousand ha to 110 thousand ha, with the number of people involved falling from 210 thousand families to 99 thousand families. There are no statistics on occupations and livelihoods of farmers who ‘abandoned’ shifting cultivation, but various reported successes are promoted as models (MAF 2003b).
Opium eradication

Opium production in highland zones is another feature of recent history in MMSEA, and Laos has been no exception. For highland villagers, opium has provided cash income to compensate for poor rice productivity at high elevations. Furthermore, since highland paddy sites are scarce, opium is often viewed as a special case of the ‘shifting cultivation problem’. In neighbouring Thailand, income from opium actually received by mountain villagers was low enough that crop substitution programmes (combined with enforcement once viable alternatives are in place) were successful (Renard 2001). Experience with such programmes has evolved into what is now called ‘alternative development’ for drug control.

Systematic efforts to control opium production in Laos began in the nineties with a central commission, provincial committees, and a Comprehensive Drug Control Programme (CDCP) for 1994-2000. The 1999 Opium Elimination Strategy aims at elimination of production by 2006, while the 7th Party Congress resolved to eliminate it by 2005, with support from international agencies. A review of work during 1989-2001 (Kuhlmann 2002) indicated that progress and constraints (except for special issues like drug addiction, etc.) are similar to those generally encountered by development projects in mountainous areas of Laos. Given their focus on high elevation zones, most effort focuses on sub-tropical and temperate tree crops, as well as giving high priority to alternative income sources to replace cash obtained from opium. However, marketing experience is still quite limited and temperate fruit tree development is likely to require at least 20 years before it is fully viable.

Land and forest allocation

Consistent with the desire to stop shifting cultivation and opium production, government visions for the uplands see ‘settled’ communities practising permanent agriculture on defined land parcels, with access to infrastructure and social services linking them with wider economic and social systems. Key tools developed during 1989-96 to help achieve this vision include land use planning, and land and forest allocation. Their stated objectives are to:

- Promote crops to replace shifting cultivation through allocation and titling of land for production.
- Protect forest through classification and stabilisation of shifting cultivation.

Main components are:

- Allocation of degraded land to households, with a three-year land use certificate for cropping, tree planting or grazing. Satisfactory performance leads to household land title.
- Village forest land is classified (use, protection, rehabilitation, etc.) and agreements on rules governing each class are signed (MAF 2003b).

Under Ministry of Agriculture and Forestry (MAF) guidelines, the land use planning and land allocation (LUP/LA) process is to involve local communities through an eight-step Participatory Land Use Planning (PLUP) methodology.

A Central Committee for Land and Forest Allocation set and reviewed annual targets, and from 1996 to 2002, land allocation was carried out in some 6,200 villages (>50% of the national total) and more than 379 thousand households (>60% of all agriculture house-
holds), covering more than eight million hectares of land area. Thus, LUP/LA has been characterised as one of very few forest related programs with clearly defined policy objectives, detailed instruction for field implementation, and nationwide implementation (MAF 2003b).

**Focal site strategy and village relocation and consolidation**

The ‘focal site’ strategy has been a central feature of rural development strategies in Laos for nearly ten years. It is an area-based approach that begins with a strategically selected set of locations where bundles of activities implement policies in a coordinated manner. In principle, the approach aims to be both a ‘pilot project’ to test systematic and coordinated implementation under a wide range of conditions, and a ‘demonstration area’ to show the process and its results, thus facilitating its further implementation and adoption.

The strategy began in 1994 under the National Development Programme (JICA 2001). The Central Leading Committee for Rural Development and province counterparts selected clusters of villages from lists submitted by provinces, based on criteria that included a need for poverty alleviation, potential for economic development, as well as risks due to opium, unexploded ordinance, or floods (SPC 1998, JICA 2001). By 1997, a total of 62 focal sites had been identified throughout the country, with an average of 16 villages and 5,200 people per site.

Progress of the focal site approach was assessed and rearticulated in 1998 (SPC 1998), and re-assessed in 2001 (JICA 2001). Village participation did not appear convincing, and sites were biased toward poor and politically important areas, with few areas having high potential for development. Roles were unclear, monitoring and evaluation systems were absent, operational targets were not clear, and staff capacity at provincial levels was weak. Nevertheless, the approach is seen as warranting further effort because:

- It has the potential to conduct necessary integrated planning and implementation that is difficult for line agencies.
- It is the most effective way to use a limited budget and scarce local human resources.
- It has potential for bottom-up participatory planning and implementation essential for rural development.

The 1998 focal site rearticulation included rationales for village consolidation and relocation, which centred on perceived needs for efficient extension services and community development structures to bring local people into development planning and implementation. In this way, ‘unsettled families’ living in ‘scattered, remote communities’ whose ‘traditional methods of slash-and-burn cultivation are no longer sustainable’ are to be attracted to sites with improved access to development services. Indeed, such ‘pull-effects’ can already be seen as some villagers are voluntarily establishing new settlements along new road corridors.

NPEP seeks to expand core elements of the focal site approach to all of the poorest districts. Recognising close links between rural poverty and agriculture in Lao society, responsibility for planning and coordinating rural development was shifted back to MAF. The new strategy sees the ‘focal development area approach’ targeting both remote areas with endemic poverty and areas with growth potential. The focal development approach:
- Allows integrated development by more access to remote areas.
- Stabilises shifting cultivation.
- Facilitates increasingly market-oriented economic activities.
- Improves social services access.
- Ultimately aims to integrate all regions into a dynamic national economy.

Development is concentrated in zones where activities in agriculture, social sectors, institutional capacity building, and physical access to villages and markets are conducted in a synergistic manner to boost household income and human development in order to eradicate basic poverty (CPC 2003). Since most poor districts are in upland areas, this newest focal site strategy remains important for upland development.

**Decentralisation**

All the above policies and visions place strong emphasis on decentralised approaches, reflecting natural resource governance trends across MMSEA (Dupar and Badenoch 2002). Decentralisation in Laos is aligned with a 2000 directive that redefined central-local relations with provinces as strategic planning units, districts as planning and budgeting units, and villages as implementation units (CPC 2003). For example, after the government recognised problems with village resettlement and consolidation, the rearticulated focal site programme saw its 'cornerstones' as consultation, coordination and strengthening of provincial and district institutions, with village level focus on volunteers and committees (SPC 1998); human resource development is seen as key to strengthening local capacities to implement the strategy. While policies such as reduction of shifting cultivation, land and forest allocation, and others, have set annual targets at central levels, most implementing decisions are delegated to provinces and districts, often with little apparent consideration of their capacity or the resources available.

Given its mandates related to agriculture, forestry and rural development, the Ministry of Agriculture and Forestry (MAF) was reorganised to better meet decentralisation objectives. As indicated in Figure 2, this 'demand-driven' approach sees villagers interacting directly with district staff, under guidance and support from provincial offices. Central support services are channelled through NAFRI and NAFES. Consolidated central adaptive research services were launched under NAFRI through reorganisation and elaboration of the existing set of research units within various departments of the old ministry structure. However, since the consolidated extension agency needed to be newly created, its establishment could not be so rapidly accomplished. Development of staff capacity at PAFO and DAFO levels has been more problematic due to constraints on human and financial resources.

**Implications of the overall policy environment**

Three key themes emerge from this brief review of visions and policies, each of which has substantial implications for land use and livelihoods of upland communities.

**Lowland agriculture and upland forests**

Although not an explicit government policy, segregation of agriculture and forestry is a common theme of policy and planning at multiple landscape levels, reflecting a general
direction in land management. At a broad level, the vision for agriculture divides the country into upland and flatland regions, as indicated in the map to the left in Figure 3, and suggests overall strategy directions for farming systems in each zone, as indicated in Figure 4.

On comparing development strategies for flatlands and sloping lands, two patterns appear evident: (1) flatland agriculture has already started to intensify and commercialise, giving rise to concerns about a growing gap between the zones; and (2) there is a much stronger emphasis on zoning, conservation and natural resource management in the sloping lands zone.

Special conservation concern for upland areas relates to the watershed and biodiversity protection services they provide for wider society, with both perceived as being linked to dense natural forest cover. The middle image in Figure 3 shows the watershed classification system and its land use restrictions, while the right image displays overall tree density in and around Laos with boundaries of internationally registered protected areas. If the economic role of the production forestry sector is added, the emphasis on forest cover in the uplands becomes clear.

What direction, then, will agricultural development take in upland areas, and how will the livelihoods of people be affected? The aim is clearly not to resettle people from uplands to farms in the Mekong corridor flatlands. Rather, emphasis is on carrying the conservation theme through to more detailed planning processes conducted at provincial and district levels. As an example of how this translates to the provincial level, Figure 5 displays images of both current land use and the desired pattern emerging from land use planning and forest zoning. The current land use image shows much land in fallow, while the zoning map shows a huge majority in protection and conservation forest.

Such change requires a major transformation of land use practices across much of the province. Agriculture is seen as becoming ‘settled’ and much more intensive than traditional systems using shifting cultivation. While future use of extensive fallow areas now designated ‘regeneration forest’ is not yet clear, aims to vastly increase permanent forest cover are very clear. How to transform land use while improving local livelihoods is a big challenge for provinces, districts, and villages.

**Decentralised mandates overwhelming local capacity**

Tasks associated with achieving land use and livelihood transformations are now often overwhelming local capacities to effectively conduct the programmes. In reviewing its programmes, the government recognises both the importance of effective decentralis-
tion, and the limitations faced by local administrations. While institutional weaknesses exist at all levels, projects have helped increase capacity at the central level. However, major institutional weaknesses continue to plague levels of government from province down to district and village. Nonetheless, as examples in Figure 6 indicate, duties under decentralising upland programmes emphasise work at these levels. Major weaknesses inhibiting effective implementation of such programmes have been identified as:

- Lack of skills.
- Lack of logistical support due to financial constraints.
- Lack of motivation, related to low salaries and inadequate incentive for field travel.

<table>
<thead>
<tr>
<th>Flatlands: Emphasis on</th>
<th>Sloping lands: Emphasis on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensify cash crop, livestock and fisheries production through farmer demand driven extension</td>
<td>Landuse zoning based on physical and socio-economic features</td>
</tr>
<tr>
<td>Expand value-added commodity processing for domestic consumption and exports</td>
<td>Participatory land allocation and land-use occupancy entitlement</td>
</tr>
<tr>
<td>Commodity market research and information delivery</td>
<td>Farming system diversification and agroforestry development through on-farm adaptive research, trials and demonstrations</td>
</tr>
<tr>
<td>Agriculture product grades and standards development and regional marketing link promotion</td>
<td>Community management of natural resources</td>
</tr>
<tr>
<td>Strengthen and expand competitive credit facilities</td>
<td>Intensive small-scale community managed irrigation systems</td>
</tr>
<tr>
<td>Strengthen agribusiness lending by banks</td>
<td>Farmer demand driven research and extension</td>
</tr>
<tr>
<td>Rehabilitate and expand dry season irrigation system and community management transfer</td>
<td>Soil erosion control, afforestation and conservation</td>
</tr>
<tr>
<td></td>
<td>Savings mobilization and micro-credit, interest subsidy to poor</td>
</tr>
<tr>
<td></td>
<td>Strengthen capacity and legal framework of banks</td>
</tr>
<tr>
<td></td>
<td>Market access through road and market information delivery</td>
</tr>
</tbody>
</table>

Figure 3: National Distribution of Terrain and Tree Cover Characteristics

Figure 4: General Strategies for Flatland & Sloping Land Development
As an example, the Land and Forest Allocation programme uses an eight-step participatory land use planning and land allocation process (LUP/LA), as indicated in Figure 7, to be collaboratively implemented by district staff and villagers. While LUP/LA implementation has made much progress in meeting quantitative targets, most agree there are many problems with the quality of results, and thus its impact on upland communities. Most allocated forest land is classed as conservation, protection, or regeneration forest; of some 100 thousand ha of forest allocated during 2000-2001, 91% was under protected categories, while 9% was village production forest; only 5% of all land allocated was for crop and livestock production (MAF 2003b). Moreover, people working in these areas agree that the last two steps of the process – extension and monitoring and evaluation – are rarely included. MAF acknowledges that LUP/LA has been inconsistent and ineffective because the process has been more prescriptive than participatory, and implemented by untrained staff. Problems are seen not so much in the programme per se, but in the way that the process is conducted.

It is very encouraging to see such problems recognised at high government levels, and that progress is being made in finding ways to increase capacity and bring more coherence to planning and implementation. Work in Huaphanh Province under an Asian Development Bank (ADB) supported shifting cultivation stabilisation project, for example, is piloting ways to use the full participatory approach with local staff in specific villages. Their work underscores the importance of a phased approach that puts very substantial effort into local capacity building and participatory zoning of village lands before any household land allocation is considered (Jones 2003).

There are also capacity gaps in the tools and technologies used at different levels. Strategic visions and policies employ notions of natural resources and land use zoning that require comprehension of broad landscapes in provinces and districts. Capacity is emerging in central government units to use tools such as Geographic Information Systems (GIS) to help provinces and districts to more clearly see local distributions of factors that lead to and follow from central policy visions for the future. For example, Figure 8 shows some map images reflecting central policy perceptions generated at NAFRI for Luangprabang Province.
So far, images such as these are primarily used to communicate central policy visions and perceptions to provincial and district levels. However, as provincial capacity to use such tools builds, they can greatly assist multi-directional information flow among levels and sectors. A few pilot projects are beginning to build basic capacity for such work in some provinces.

**Constrained land use and vague livelihood opportunities**

Most policy tools used to induce transformation of land use and livelihood systems in the uplands have centred on control of access to land resources. The central focus of such efforts has been on ‘stabilising’ shifting cultivation, which is linked with forest destruction, watershed deterioration, opium production, and even ‘backwardness’. Whether one agrees with this reasoning or not, it is clear to villagers that serious efforts are underway

<table>
<thead>
<tr>
<th>Program</th>
<th>Central</th>
<th>Province</th>
<th>District</th>
<th>Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty Eradication (NPEP)</td>
<td>Policies &amp; targets</td>
<td>5-year plans &amp; budgets</td>
<td>Planning &amp; budgeting under district 5-year plan, manage, evaluate</td>
<td>Development &amp; revenue plans, collect socio-economic data, implement, monitor impact</td>
</tr>
<tr>
<td>Shifting cultivation</td>
<td>Policies &amp; targets</td>
<td>Meet annual reduction targets</td>
<td>Meet annual reduction targets</td>
<td>Adapt land use practices</td>
</tr>
<tr>
<td>Land &amp; Forest Allocation</td>
<td>Policies &amp; targets</td>
<td>Plans to meet targets</td>
<td>Conduct 8-step participatory land use planning and land allocation processes</td>
<td>Participate in zoning &amp; allocation processes, adapt land use practices</td>
</tr>
<tr>
<td>Opium Elimination</td>
<td>Policies &amp; targets</td>
<td>Planning, coordinate with projects</td>
<td>Help implement</td>
<td>Implement, adapt livelihood where applicable</td>
</tr>
<tr>
<td>Village Consolidation, Relocation</td>
<td>Policies &amp; targets</td>
<td>Identify sites, planning, meet targets</td>
<td>Help identify sites, propose plans, implement, meet targets</td>
<td>Relocate fields &amp; homes as necessary</td>
</tr>
<tr>
<td>Integrated Watershed Management</td>
<td>Policies &amp; targets</td>
<td>Strategies for larger watersheds &amp; priorities for sub-watersheds</td>
<td>Conduct 7-step planning process, include zoning, development interventions, conservation, implement</td>
<td>Participate in all planning and zoning processes, implement</td>
</tr>
<tr>
<td>Agricultural planning &amp; Agro-ecological zoning</td>
<td>Support provincial planning</td>
<td>Provincial agricultural plans for zones, help implement</td>
<td>Help identify farming system zones &amp; plans, implement</td>
<td>Provide information, adapt land use as necessary</td>
</tr>
<tr>
<td>Agricultural Extension and Support</td>
<td>Research &amp; extension support responding to provincial needs</td>
<td>Technical support responding to district needs</td>
<td>General farming system extension interacting regularly with villagers</td>
<td>Village volunteers, farmer groups, interact with extension</td>
</tr>
<tr>
<td>Production Forestry</td>
<td>Field surveys, plans, manage implementation, monitoring</td>
<td>Organize forest management units, implement plans</td>
<td>Village forestry organization, contract with FMU, implement</td>
<td></td>
</tr>
</tbody>
</table>

**8-Step participatory LUP-LA Methodology**

Stage 1: Prepare for land use planning (LUP) and land allocation (LA)
Stage 2: Survey and mapping of village, forest and agricultural land use zone boundaries
Stage 3: Data collection and analysis
Stage 4: Village land use planning and land allocation meetings
Stage 5: Field measurement
Stage 6: Preparing agriculture and forestry agreements and transferring rights to villagers
Stage 7: Land use management extension
Stage 8: Monitoring and Evaluation

**Figure 6: Examples of major duties under decentralising upland programmes**

So far, images such as these are primarily used to communicate central policy visions and perceptions to provincial and district levels. However, as provincial capacity to use such tools builds, they can greatly assist multi-directional information flow among levels and sectors. A few pilot projects are beginning to build basic capacity for such work in some provinces.

**Constrained land use and vague livelihood opportunities**

Most policy tools used to induce transformation of land use and livelihood systems in the uplands have centred on control of access to land resources. The central focus of such efforts has been on ‘stabilising’ shifting cultivation, which is linked with forest destruction, watershed deterioration, opium production, and even ‘backwardness’. Whether one agrees with this reasoning or not, it is clear to villagers that serious efforts are underway

**Figure 7: Land & Forest Allocation Approach**

<table>
<thead>
<tr>
<th>Program</th>
<th>Central</th>
<th>Province</th>
<th>District</th>
<th>Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty Eradication (NPEP)</td>
<td>Policies &amp; targets</td>
<td>5-year plans &amp; budgets</td>
<td>Planning &amp; budgeting under district 5-year plan, manage, evaluate</td>
<td>Development &amp; revenue plans, collect socio-economic data, implement, monitor impact</td>
</tr>
<tr>
<td>Shifting cultivation</td>
<td>Policies &amp; targets</td>
<td>Meet annual reduction targets</td>
<td>Meet annual reduction targets</td>
<td>Adapt land use practices</td>
</tr>
<tr>
<td>Land &amp; Forest Allocation</td>
<td>Policies &amp; targets</td>
<td>Plans to meet targets</td>
<td>Conduct 8-step participatory land use planning and land allocation processes</td>
<td>Participate in zoning &amp; allocation processes, adapt land use practices</td>
</tr>
<tr>
<td>Opium Elimination</td>
<td>Policies &amp; targets</td>
<td>Planning, coordinate with projects</td>
<td>Help implement</td>
<td>Implement, adapt livelihood where applicable</td>
</tr>
<tr>
<td>Village Consolidation, Relocation</td>
<td>Policies &amp; targets</td>
<td>Identify sites, planning, meet targets</td>
<td>Help identify sites, propose plans, implement, meet targets</td>
<td>Relocate fields &amp; homes as necessary</td>
</tr>
<tr>
<td>Integrated Watershed Management</td>
<td>Policies &amp; targets</td>
<td>Strategies for larger watersheds &amp; priorities for sub-watersheds</td>
<td>Conduct 7-step planning process, include zoning, development interventions, conservation, implement</td>
<td>Participate in all planning and zoning processes, implement</td>
</tr>
<tr>
<td>Agricultural planning &amp; Agro-ecological zoning</td>
<td>Support provincial planning</td>
<td>Provincial agricultural plans for zones, help implement</td>
<td>Help identify farming system zones &amp; plans, implement</td>
<td>Provide information, adapt land use as necessary</td>
</tr>
<tr>
<td>Agricultural Extension and Support</td>
<td>Research &amp; extension support responding to provincial needs</td>
<td>Technical support responding to district needs</td>
<td>General farming system extension interacting regularly with villagers</td>
<td>Village volunteers, farmer groups, interact with extension</td>
</tr>
<tr>
<td>Production Forestry</td>
<td>Field surveys, plans, manage implementation, monitoring</td>
<td>Organize forest management units, implement plans</td>
<td>Village forestry organization, contract with FMU, implement</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 6: Examples of major duties under decentralising upland programmes**

So far, images such as these are primarily used to communicate central policy visions and perceptions to provincial and district levels. However, as provincial capacity to use such tools builds, they can greatly assist multi-directional information flow among levels and sectors. A few pilot projects are beginning to build basic capacity for such work in some provinces.

**Constrained land use and vague livelihood opportunities**

Most policy tools used to induce transformation of land use and livelihood systems in the uplands have centred on control of access to land resources. The central focus of such efforts has been on ‘stabilising’ shifting cultivation, which is linked with forest destruction, watershed deterioration, opium production, and even ‘backwardness’. Whether one agrees with this reasoning or not, it is clear to villagers that serious efforts are underway

**8-Step participatory LUP-LA Methodology**

Stage 1: Prepare for land use planning (LUP) and land allocation (LA)
Stage 2: Survey and mapping of village, forest and agricultural land use zone boundaries
Stage 3: Data collection and analysis
Stage 4: Village land use planning and land allocation meetings
Stage 5: Field measurement
Stage 6: Preparing agriculture and forestry agreements and transferring rights to villagers
Stage 7: Land use management extension
Stage 8: Monitoring and Evaluation

**Figure 7: Land & Forest Allocation Approach**
to constrain their ability to continue hai-based land use as in the past. Indeed, a substantial percentage of villagers appear prepared to accept such changes if it will improve their lives. Figure 9 summarises various constraints encountered by farm households in upland zones.

Several of these constraints also focus on changing settlement and land use patterns, and there appears to be increasing movement of populations down from mountain areas to roadside settlements. With very little monitoring to identify or track such movements, and few efforts to prepare receiving sites for this scale of influx, a range of issues and problems are emerging both for previous and new occupants in these areas. The land use planning and land allocation (LUP/LA) process is seen as a key tool for reducing the turbulence and uncertainty associated with new land use constraints and settlement patterns. As we have seen, however, there are still many obstacles to its effective implementation as conceived at policy levels.

While land use constraints are many and increasingly clear, and villagers are expected to make major transformations in their livelihoods within a short period of time, opportunities for new livelihood activities (often in areas to which they are newcomers) remain vague. Livelihood activities identified in the agriculture vision and master plan that would be directly aimed toward increasing (rather than constraining) production in sloping lands are centred on:

- Small-scale irrigation to improve rice stocks and diversify production.
- Agroforestry for subsistence, livestock feed, and/or marketable commodities.
- Expanded livestock production.
- Inland fisheries.
- NTFPs.

Access to commercial markets is an important component of what the government is promising villagers who stop shifting cultivation, relocate to access corridors, participate in land use zoning, and comply with land use practice constraints. The strategy for marketing and agro-processing in the Master Plan (JICA 2001) focuses on:

Figure 8: Policy Perceptions for Land Use Planning in Luangprabang Province
Road access.
- Market information.
- Grading and standards to enhance marketability and product-unseen trading.

Access roads are progressing, and Figure 10 shows major road connections (including new roads being built under projects for the Greater Mekong Subregion (GMS)) and nearby towns in neighbouring countries. Activities under the other two components appear not to have begun yet, and reports of commercial market development are mixed. Anecdotal evidence indicates that some households are becoming assemblers and traders of agricultural or non-timber forest products, or joining trucker groups to service needs along new roads. Overall, however, markets and marketing are still seen as a limitation and 'problem' in most mountain provinces. There is a clear need for substantial action to facilitate development of commercial opportunities for upland areas if the government is to fulfil its promise to villagers whose livelihood systems they seek to transform.

Given the constraints to upland production, livelihoods upon which transformations need to build, and the context Laos faces vis-à-vis neighbouring countries under liberalised trade, recent informal views in MAF see no competitive advantage in large quantities of major field crops. Instead, opportunities are seen for moves into more diversified commercial production. Since Vietnam and Thailand are dominant in global rice markets, competitive advantage for Laos is seen to lie in non-rice niche markets both at regional and international levels. Products of upland livelihood systems that may enjoy competitive advantage in such markets are seen to include:

- NTFPs and agroforestry products
- Organically-farmed produce in border areas.
- Handicrafts
- Livestock.

Overall, such niche items, when properly graded, sorted, packaged and transported to regional markets, are seen to have potential for major impact on household productivity and income.
If these are indeed the types of alternatives offered to upland households, there are important implications regarding how marketing, extension and research activities should proceed. In particular, there is an urgent need for a concerted effort to explore markets for these types of products, and to investigate how market requirements and capacity match with potential production capacities and abilities. Moreover, research and extension service systems need to develop capacity to provide meaningful and timely support appropriate for niche products from diverse ecological, locational, social and cultural contexts in the uplands.

**Impacts on upland communities and their livelihoods**

Recent policy and strategic vision documents embrace holistic views on transforming livelihoods of poor upland villagers. Thus, while policies seek more allocation of household resources to commercial enterprise, there are also concerns about basic food security and the need to build incrementally on what already exists. Household livelihood domains can be seen as centred on their basic resource – household labour, a shorthand term for human resources that includes knowledge, skills, health, etc. Decisions allocating other resources follow from evaluation of overall expected returns to effort.

Household livelihood strategies affect how resources are allocated among available opportunities, which can be land-based or non-land-based, based within the ‘subsistence core’, based in activities centred on commercial production (if available), or based in enterprises managed at household, group, or community levels.

Descriptions of more traditional ‘farming systems’ found in policies, strategic visions and many studies, recognise that resources are allocated across a mix of opportunities, and usually result in a combination of agricultural and forest products. Indeed, shifting cultivation uses forest regeneration to maintain productivity, resulting in much ambiguity about whether products from fallow fields are agricultural or forest in nature.

To help explore existing land-based enterprises (‘farming systems’) Figure 11 depicts major ‘portfolio options’ for core subsistence enterprises. Major options include:

- Upland fields.
- Paddy fields (if available).
- Various types of homegardens.
- Small and large livestock.
- Hunting and fishing.
- NTFPs.
Households allocate their resources (labour, knowledge, land and inputs) among options, depending on access, productivity, risk or other key characteristics associated with each, as well as on their perceived needs, preferences, and opportunity costs. System outputs can meet immediate subsistence needs or go into reserves, and any surplus can be traded or sold (if possible) to help meet subsistence, savings or capital investment needs.

As households, lineages, and communities engage in various component enterprises over the years and through generations, they build a knowledge base about the lands, crops, wild plants, and animals within their management and production domain. This continually evolving familiarity with how plants and animals prosper or suffer under the range of conditions found in local domains is an important input into agroecosystem management practices, and a major resource for further transformations. A few examples are instructive:

- Upland people depend on forests for subsistence and income generation. Benefits from forests include food, wood, fuel, NTFPs, land for crops, shifting cultivation, tree planting or regeneration, and livestock feed and fencing. Associated (often extensive) knowledge of wild species found in local fallows, forests, and waters, and how they can be used for human benefit, complements knowledge of cultivated species, providing a basis for the domestication processes that help livelihoods adapt as conditions and needs fluctuate.

- Since paddy sites are very limited, upland fields (hai) are often the main source of rice, along with other products. The degree to which a household can meet its subsistence rice needs is considered a main indicator of poverty. However, since upland rice cannot be grown in a field continuously without yield decline, traditional technologies use forest regeneration to maintain productivity without chemicals. The many types of such systems are viewed simply as ‘shifting cultivation’, and thus targeted for ‘stabilisation’. The NAFRI socio-economics unit is studying impacts of policy disruption on rice self-sufficiency, and work by Dr. John Raintree and his colleagues is presented in a paper in this volume.

- Livestock provides food or draught power as well as a growing store of wealth that can be mobilised for cash, trade, dowries, etc. Since feed is usually from crop residues, scraps, and/or wild or volunteer plants, livestock crosses household-community land and domesticated-wildland boundaries according to needs, seasons, or opportunities. Barriers to livestock production are often obtaining initial stock and feed sources with reliable continuity, while risks are disease, weather and theft.

- Homegardens are often a rich repository of germplasm, knowledge and familiarity that can be easily underestimated. Homegardens can have a variety of forms and locations that can vary by season and other conditions, and are frequently diverse.

![Figure 11: Household Core Subsistence Portfolio](image-url)
mixes of exotic and domesticated species to meet nutritional, herbal, medicinal and even aesthetic or spiritual needs; they are also an ‘incubator’ for observing and evaluating newly acquired species. Thus, they are a pool of plants, knowledge and experience from which larger specialised commercial plantings can be built, if and when reliable marketing opportunities emerge.

The overall mix of a household enterprise portfolio reflects current livelihood strategies. Whenever there is a disturbance or stress (or new opportunity) that affects one component, the overall system seeks to compensate, adapt, or ‘cope’ by readjusting allocations among the components. Since disturbances by weather, disease and war have come and gone many times in the past, systems have developed mechanisms to make it through hard times - wild or domesticated ‘famine crops’, and social or kinship networks for emergency assistance, are two examples.

Most government policies seek to induce transformation of household portfolios by constraining some components (especially hai cultivation), and opening new opportunities for others (especially road access and government services). This results in major sustained changes in the operating environment, and can challenge the capacity of households and communities to make major adjustments in short periods of time. One study even proposes that such sustained pressures for rapid change be viewed as an ‘ongoing disaster’ for livelihood systems (Brahmi and Poumphone 2002).

Current constraints are affecting household livelihoods through impacts on specific components of their core subsistence enterprise portfolio:

- **Shifting Cultivation Stabilisation.** These policies eliminate the forest fallow option from the upland field component, as in Figure 12, thereby limiting that option to other types of technologies. Fallows are seen as degraded or destroyed forest, rather than as a phase in an agricultural cycle, and since lands ‘abandoned’ for more than three years are reclassified as regeneration forest, there is pressure to not allow forest to regenerate for more than three years. This is cited as evidence of system deterioration, making calls to convert to permanent fields a bit of a self-fulfilling prophecy. While recent policies show more flexibility, it is too late for many.

- **Zoning and allocation.** Land use zoning within village boundaries can affect several components, either positively or negatively. The key determinant of the nature and degree of impact is the way in which the zoning is conducted. Since the participatory poverty assessment indicated upland people associated land allocation with increasing hardship (ADB 2001), these issues are being studied. Early results are that village...
zoning should set the context for identifying why, where and how any household allocation should be done.

- **Relocation.** This changes the whole land context of household enterprise, which could be for better or worse, but will certainly be different. Where new conditions are substantially different from the old, there can also be an impact on the relevance of local knowledge related to land resources, as well as the likely viability of plant and production system options. Major change in social capital is likely, including relationships among households and villages at the new site. New opportunities may also emerge, so there could be a net gain in household well-being, which is, of course, what the government hopes will happen.

Government strategies for opening new opportunities and addressing major issues of land use transformation centre on access to government support services, new production technologies, and commercial markets. The remaining sections briefly review these three areas.

### Building support services for agriculture and forestry

Access to agricultural support services is another component of promises to people who transform their livelihoods according to government policies. Officers at provincial, and especially district levels, are key in this process. Policies recognise the urgent need to build staff capacity to properly implement programmes, as well as the need for responsive and timely inputs or assistance from central institutions. This section briefly reviews the development of institutions for agricultural technology generation and extension services. Services such as micro-finance, education, health and others, are also important, but beyond the scope of this paper.

### Problem-solving adaptive research

There is a modern myth in many development organisations that somewhere there is a repository of ‘proven’ (and often ‘simple’) agricultural technologies that can just be taken ‘off the shelf’ for implementation. This is at best a partial-truth, and in most cases simply not true, especially for livelihoods in ecologically and ethnically diverse upland areas. Ad hoc projects promote production of one crop or another using lowland or imported technology, and may see ‘success’ with project support, but few results can survive beyond the end of a project. As John Raintree notes (paper in this volume), complex problems require integrated solutions.

Recognising these issues in its strategic vision for agriculture, the Lao government reorganised the Ministry of Agriculture and Forestry (Figure 2) to ‘harmonise’ efforts to develop and adapt agricultural research and extension systems to better support the livelihood transformations it seeks to induce in rural, and especially upland areas. As a result, the National Agriculture and Forestry Research Institute (NAFRI) was established in 1999 to consolidate, systematise, and coordinate a more coherent and problem-solving approach to adaptive research within MAF. While it is still a very young institution, composed largely of research centres formerly under sub-sector oriented line agencies (Figure 13), it is the largest single unit within the Ministry, and it is making strong efforts to achieve its mandates.
Building on the agriculture vision (MAF 1999), NAFRI articulated its research strategy for 2001-2005 and vision to 2010 (NAFRI 2001), with emphasis on problems limiting production and causing resource degradation in agro-ecological zones. A farming systems research (FSR) approach is to coordinate activities of its research centres, integrated at the conceptual level with a watershed perspective in the physical landscape, and a livelihood focus in human dimensions. NAFRI seeks to develop leadership and capacity to provide responsive support to DAFO and PAFO needs through five programme areas that strengthen and support work by its constituent research centres:

1. Farming systems research/extension (Gibbon 2002; NAFRI 2003c) to develop an approach to integrate complementary lines of technology to improve rural livelihoods, including links with the extension system.

2. Socio-economic analysis of key issues related to livelihood change, increased income, agricultural intensification in agro-ecological zones, commercial market opportunities and constraints, village group learning and collective action, etc. (NAFRI 2002).

3. Forestry, and especially agroforestry, NTFPs, joint forest management, forest regeneration in protected areas, and other key emerging issues (MAF 2003b).

4. Land management, with focus on land classification and zoning, including procedures, methods and tools for participatory land use planning and land allocation.

5. Information, focused on increased quality and quantity of information flow related to adaptation and dissemination of agricultural and forestry technologies (NAFRI 2003b).

NAFRI collaborates with the Consultative Group on International Agricultural Research (CGIAR) and other international research centres and advanced research institutes. The Lao-Swedish Upland Agriculture and Forestry Research Project (LSUAFRP) is assisting NAFRI to implement its strategy (LSUAFRP 2001).

NAFRI, MAF, and the Lao government generally recognise that, except for lowland rice and livestock health, there has not yet been a large flow of practical information on agricultural technology from central institutions to provinces, districts, and villages. How-
ever, they are building capacity (NAFRI 2003a), and anticipate future increased flow and quality.

**Demand-Driven Agricultural Extension**

Government and NGO experience indicates that participatory approaches are needed to seek localised agricultural solutions appropriate for environmentally and ethnically complex upland conditions. Under decentralisation policies, villages, districts and provinces urgently need support to meet goals with the quality envisioned in policies. A “demand-driven” extension system is seen as an essential core component of these efforts.

The National Agriculture and Forestry Extension Service (NAFES) was established in 2001 as the extension counterpart to NAFRI. DAFES and PAFES staff in DAFOs and PAFOs are to be upgraded, and NAFRI, NAFES and farmers will jointly develop options consistent with local opportunities and market signals. Two projects will help develop the system:

- The **Laos Extension for Agriculture Project (LEAP)**, based at the Central Extension and Training Development Unit (CETDU) and funded by the Swiss agency for Development and Cooperation (SDC), is developing extension methods, delivery systems and training and coaching activities, with pilot sites in Luangprabang, Champasack and Saravane provinces.

- The **Lao-Swedish Upland Development and Poverty Alleviation Programme (UDPAP)** was designed as a pilot project for two districts in each of two northern provinces (Luangprabang and Oudomxay), to refine the full set of processes from village to national level for further application around the country.

Although approval by the Swedish Development Agency (Sida) of UDPAP has been delayed, its proposed structure (NAFES 2002) helps clarify efforts to build a demand-driven extension system. Key components are:

- **Village development** based on an annual village development cycle, using participatory methods to identify, implement, and monitor development activities with farmers.

- **District response** to support village plans, with DAFES coordinating with other district agencies, and seeking provincial and central support and assistance as needed.

- **Provincial support** based in PAFES to provide technical support using subject matter specialists from PAFO sections, and facilitate central assistance as needed.

- **Central Support** from NAFES using methods, processes, and procedures developed in cooperation with key sectors. NAFES works with NAFRI to screen indigenous and exogenous technologies as well as to produce extension materials for farmers and all staff.

- **Market support** will include a market information service, inclusion of marketing in all extension programmes, assistance for periodic markets, and training for villagers and staff.

LEAP is seeking consensus and direction for the system by assessing existing methods used in Laos by NGOs and projects (LEAP 2002a, 2002b, 2002c); and through workshops to help clarify current status and future directions of the system, as well as where projects can go to obtain assistance that is currently available (Gerner 2003). Extension process development under LEAP so far includes:
Development and testing of a training needs assessment tool for district extension agents to use with villagers in their area (LEAP 2003).

Three rounds of training for ‘master trainers’ and provincial and district staff in pilot areas.

Application of a coaching tool to help identify successes, gaps, failures, and where to go next (Gerner 2003).

Financing of agricultural extension is also under study (LEAP 2002d).

**Potential improved livelihood component technologies**

Recent informal views in MAF indicate agricultural technology development should target components of upland livelihoods, and that first priority should be on rice intensification, followed by livestock, agroforestry and cash crops, NTFPs and community natural resource management. This paper will now take a brief look at technologies for each of these priority areas.

**Rice intensification for household safety nets**

From a villager’s or the national point of view, rice production is the most important aspect of food security. The Lao-IRRI Rice Research and Training Project (LIRRTP) has supported development of the Lao National Rice Research Program (NRRP) since 1991, with funding from the Swiss SDC. NRRP has become the most advanced agricultural research and development programme in the country, and has helped Laos achieve national level rice self-sufficiency. It has developed considerable research and training capacity, made extensive collection of rice genetic material including a major contribution to global rice gene banks (Rao et al. 2001), and developed a number of new cultivars both in and for Laos (Schiller, Rao et al. 2001). A resource book on soil fertility management in lowland rice is available for work with lowland farmers (Linquist and Sengxua 2001). The NRRP has advanced to the point where a new phase of LIRRTP will phase out IRRI resident international staff in Laos (LIRRTP 2003). The emphasis of this work has been on lowland paddy rice, for which cultivars, methods, trainers, and training materials are now available. Production and distribution of improved paddy rice seed is now seen as being an available technology with potential for high return, quick yielding development activities (JICA 2001).

Although it has received a much lower priority, there has also been research on upland rice in mountain areas, particularly in Luangprabang (Schiller, Linquist et al. 2001). Early work by Walter Roder (2001) and Lao colleagues made major contributions to understanding traditional and transitional upland rice shifting cultivation systems in MMSEA. Roder and Keith Fahrney made observations regarding upland rice research (Roder 2001) that include:

- As long as rice production for home consumption remains the main objective, slash-and-burn farmers in Laos will have only limited options for changing their land-use practices.
- Widespread problems include access to resources and markets, challenges in changing from slash-and-burn to mulching and integrating livestock and fallow/fodder species.
- Improvements to rice-based systems such as increased rice yield and labour productivity will accrue by incorporating other components (especially forage/livestock rotations).
Nevertheless, IRRI is seeking support for a project to identify improvements in rice production in both small pockets of paddy and upland rice systems in Laos and Vietnam.

**Livestock**

Another area of relative strength in the Lao research and development system is in livestock health programmes, making this the second area with potential for high return-quick yielding development activities (JICA 2001). A European Union (EU) funded project is helping establish an animal health information system and a diagnostic laboratory as well as improving vaccine production and extension services. Livestock nutrition and selection/breeding programmes are complementary lines of work that are also mandated for research under NAFRI.

Livestock have long been important in upland agroecosystems, and much analysis has explored their role and potential pathways for development. The Australian Centre for International Agricultural Research (ACIAR) published a collection of useful materials from a major workshop in Vientiane shortly before NAFRI was established (Chapman et al. 1998). All strategy documents place high priority on livestock and forages in the uplands, especially integrated livestock-agroforestry systems (NAFRI 2001). The Forages for Smallholders Project (FSP) managed by CIAT focuses on improved fallows (Fahrney et al. 1998) and other niches (Horne 1998) for forages in upland landscapes of northern Laos. They are developing forage technologies in partnership with farmers in upland areas as well as building on a network of farmers, researchers and development workers across Southeast Asia. Two booklets have been published in Lao language (Horne and Stur 1999, 2003).

**Agroforestry and cash crops**

Recent-era collaborative research on upland agroecosystems involving MAF and international researchers emerged and grew during the nineties (SUAN 1991, Chazee 1991, Fujisaka 1991, Ireson 1991, Roder 2001, LSFP 2001). Based on such research and growing international contacts, interest grew in how agroforestry might be useful in upland areas of Laos. Trials were built into various projects, mostly 'alley-cropping' inter-plantings of crops and trees, and often oriented along contours as a form of 'conservation farming'.

Agroforestry concepts continued to evolve (Thomas 2001), recognising traditional and new forms of ‘sequential agroforestry’, ‘complex agroforests’, and ‘landscape agroforestry’, with impacts on both livelihoods and environmental services at larger spatial scales. A shift from multi-purpose tree species to tree domestication is bringing more and new challenges. Related scientific tools are emerging to help explore local knowledge, simulate complex ecological processes, and analyse landscape interactions using Geographical Information Systems (GIS), as well as to understand how policy, economic, institutional and social conditions can support, restrict, or influence directions of system development. The conceptual ‘arena’ of agroforestry is expanding rapidly, and associated training materials are emerging (ICRAF 2004). While notions of ‘improved fallows’ in shifting cultivation systems are now of considerable interest, concepts of agroforests and landscape agroforestry are just beginning in Laos (although many examples exist). These categories may help encourage work on livelihood-oriented agroforestry:

1) **Improved Fallows and live fences.** This type of agroforestry focuses on the use of perennials to:
Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR

31

- intensify fallow fields in order to improve upland rice production still necessary in some areas;
- provide fodder for livestock.

Projects have experimented with various plants that provide marketable products, livestock fodder, or live fences. It can be argued that once a farmer begins to make such investments, these are really no longer ‘fallow’ fields’. Thus, it would probably be more appropriate (and accurate) to call them crop rotations, which might help reduce the negative views of fallow fields due to their links with shifting cultivation.

2) Conservation Farming. Conservation farming agroforestry focuses on planting perennials or natural vegetative strips along contours in fields on steeply sloping lands where crops are grown. They help control soil erosion, and hedgerows can be sources of livestock feed. Natural vegetative strips can be a low-cost way to help form small terraces, and trees yielding various types of crops, fodder or other products can later be planted into the strips.

3) Tree Gardens. Tree gardens are areas where perennial plants are grown on a long-term basis. They may be simple or complex in species diversity, stand structure or age class, and may yield one, a few, or many types of products. Horticultural research in Laos is limited (except for coffee) and NAFRI’s new Horticultural Research centre needs time to produce practical new information. Research on forest species falls under the Forest Research Centre (FRC). For the near term, small farmer-operated tree nurseries linked with demonstration plantings are a useful approach for stimulating innovation in developing tree garden options:

- Fruit trees. Homegardens can be good examples of diverse plantings of fruit trees that help household nutrition and can generate surplus for trade or sale. Improvements can build on local knowledge and have a rapid (for trees) impact on household food supply. Experience with more extensive and less diverse commercial orchards is building in highland opium crop substitution projects. Commercial ventures need technical inputs, care, quality control and time to develop into mature, profitable operations.

- Plantation crop trees. Examples in Laos include para rubber near the border with China as well as coffee and tea in the south. While research on plantation crops is planned, strategic visions indicate large plantation crop areas are not a priority for upland programs.

- Domesticated NTFPs. Examples now include paper mulberry, rattan, and cardamom, but there is obvious scope for great expansion of this menu. NTFPs can have production options under domesticated, semi-domesticated or managed natural forest conditions.

- Timber trees. Small-scale teak plantings in northern provinces are one example of a ‘forestry’ timber farming system component seen as having prospects for producing wood for processing into products for domestic and international markets. This may be an area for expansion, if market and processing chains emerge (MAF 2003b).

4) Organic Produce Gardens. These are specialised plantings of annual and/or tree crops grown for sale to chemical-free produce markets. Promising examples are seen with vegetables, dried bananas, peanuts, sesame and animal feed in border areas. Major questions include:
• Where are the ‘green’ markets for organic produce, and what are their prices, capacities and quality requirements? While urban consumers are willing to pay ‘a bit’ more, they expect no blemishes or imperfections, which can be difficult to achieve without chemicals.

• Professional organic farming needs technologies for plant protection and producing large amounts of high-quality compost or mulch, etc. suitable for use in Laos.

• Consumers (or retailers) must believe they get what they are paying for. How can quality assurance or certification mechanisms be developed and effectively implemented?

5) Other crops. While NAFRI sees the need for improving field crops (especially maize, legumes, cassava, tubers) and industrial crops (cotton, sugarcane, tobacco) (NAFRI 2001), MAF appears to prefer diversified production targeting ‘niche markets’. There is still a role for upland maize for animal feed, legumes in improved fallows and conservation farming, as well as perhaps tubers or other crops in suitable niches of markets and agroforestry landscape niches.

**Non-timber Forest Products (NTFPs)**

Policies mandate land use zoning processes within village boundaries. This is an exercise in ‘landscape agroforestry’ that seeks spatial patterns of agricultural, agroforestry and forestry landscape components that both improve livelihoods and maintain environmental services. Uplands are zoned for protection or regeneration forest to stop shifting cultivation in order to maintain watershed services for downstream society. How can these areas also yield sufficient livelihood benefits to provide incentives for the local people responsible for their maintenance?

NTFPs are seen as a key means for addressing this issue. While some interesting work has been conducted, systematic efforts need to address questions such as:

• Where are the markets for products suitable for the production zones in question?

• What NTFPs do villagers believe are most productive and/or profitable?

• Are there ways to group or ‘bundle’ NTFPs for development?

• Are there bottlenecks in NTFP production that could be addressed by ‘generic’ research facilities (such as propagation)?

• Might particular forest types or niches be managed in a way to provide a ‘suite’ of NTFPs?

The draft forestry strategy (MAF 2003b) notes that promising trends are:

• Increasing interest in NTFP development through domestication in agroforests and home gardens.

• More effective community NTFP management.

• Supportive new policies.

• Private investment in small-scale processing.
Threats to NTFP production include:

- Deforestation, logging, fire and other disturbances.
- Increased market access and demand without clear rules for allocation, tenure and management.
- Local knowledge lost through relocation and changing lifestyles.
- Knowledge on domestication, management technology, and market requirements is limited.

**Community-based natural resource management**

Policy strategies emphasise upland land use planning based on farming systems and agro-ecological zones. Provinces are to take the lead, based on policies and research findings. The question arises of how do we know whether land use zoning and agroforestry landscape management are achieving their stated goals? For impacts on local livelihoods, the NAFRI socio-economics unit is developing diagnostic methods to assess local conditions and the impact of policy on local livelihoods (LSUAFRP 2003a, 2003b). For impacts on environmental services, methods are being developed in neighbouring countries for community-based monitoring of stream flow and water quality to clarify agroforestry landscape performance. Analytical tools and modelling can help ‘fine tune’ zoning and land use restrictions within each zone. At some point, such tools may be useful for improving watershed management in Laos.

The need to maintain environmental services places many constraints on land use by upland communities. Many benefits of these services go to lowland areas that are also benefiting more quickly from development. The need for more equity in lowland-upland relations is recognised. NPEP is helping compensate with investments in infrastructure and services. Might there also be longer-term mechanisms that could help improve equity by rewarding upland households’ and communities’ efforts to maintain these services?

A Southeast Asia project on 'Rewarding the Upland Poor for Environmental Services they Provide' (RUPES) is conducted through a regional consortium coordinated by the International Centre for Research in Agroforestry (ICRAF). The project seeks to explore and test approaches through which upland communities, who are asked to bear many costs of providing environmental services (water, biodiversity, carbon stocks) that benefit larger societies (downstream, national, global), can receive a more equitable share in the benefits provided. Might the Lao PDR be interested in participating?

**Agro-processing and micro-enterprise**

Micro-enterprise, especially if based on processing materials from local land use systems, is seen to have great potential for improving incomes in upland areas. Simple forms are household assembly, trading and/or transport of local agricultural and forest products (already beginning in some areas) or use of specialised skills to provide local services such as local plant nurseries. With more skill and investment, processing of agricultural or forestry products can help local people expand to new markets, capture added value, and transform products into forms more easily stored and transported. Micro-enterprise can expand beyond the household level in various ways, thus providing jobs and markets for local agricultural and forest products.
Production for commercial markets

Policies view commercial enterprise as an essential element of upland development, and livelihood options are expected to flourish following road improvements. Current visions place particular emphasis on production of ‘niche products’ derived from various components of ecologically and ethnically diverse upland landscapes. However, if there is to be serious development of commercial production, agro-processing, micro-enterprise, and production and marketing chains, various issues need further thought and consideration, such as:

- Survey and analysis of potential marketing opportunities is needed early in the process of considering commercial production or micro-enterprise. While nearby and national markets are important, their currently limited capacity and value for many products may make at least regional markets worth consideration. Indeed, it may be useful to couple exploration of markets for agricultural commodities with markets for processed products.

- Product identity is important for capturing added value and competing in higher value markets. If a range of ‘niche products’ is desired, it may be useful to formulate product lines marketable under a single identity. In developing product identities in Laos, one might survey local and nearby areas for sources of widespread notoriety; some areas may already have reputations for traditional products that may serve as a base. Places of historical significance, such as the Luangprabang World Heritage site, could also help shape integrated tourism and product lines with complementary images and markets.

- If areas aspire to produce a diverse line of such ‘niche’ products, there may be marketing chain infrastructure and technologies that can be developed in a ‘generic’ manner capable of producing, processing and marketing a range of products, rather than a single commodity or product. The Royal Project Foundation in Thailand provides an example.

- Quality control standards and processes are essential, especially in premium markets, and even in more general markets where competition is substantial and consumers have rising incomes and expectations. A market identity can backfire if it becomes associated with poor quality. Some related national projects are being proposed to donors.

- Investment costs for developing commercial production, processing, or other micro-enterprises are a recognised bottleneck. While it may be too early to assess their viability, projects are developing and testing financial mechanisms and institutions (BOL 2002).

- Although research and development of technologies and management systems is still in the early stages in Laos, relevant experiences, technologies and equipment are available in China, Thailand and Vietnam. These can be used as a source of ideas for adaptation to conditions in Laos. The question of how to help develop local entrepreneurial skills is an urgent and important challenge.

**Challenge for the Workshop**

While the challenges are many, a broad range of experienced and motivated people participated in this workshop. The author of this paper sincerely hopes that the range of promising alternative upland livelihood opportunities can be expanded, and that further
efforts under NPEP for development in upland communities can be improved and accelerated as a result of discussions at this workshop, and the subsequent actions they can inspire and help organise.

**Acknowledgement**

This paper summarises major findings from an ICRAF report to the International Fund for Agricultural Development (IFAD) (Thomas *et al.* 2003). More details and references can be found in that report.

**Author**

Dr. David Thomas is the Senior Policy Analyst, World Agroforestry Centre (ICRAF), ICRAF Chiang Mai, P.O. Box 267, CMU Post Office, Chiang Mai 50202, Thailand, Email: D.Thomas@cgiar.org

**Bibliography**


LEAP. 2002b. *Existing Extension Approaches in Lao PDR. Survey September to November 2002*. Laos Extension for Agriculture Project (LEAP), Central Extension Training and Development Unit (CETDU), NAFES, MAF


LEAP. 2002d. *Financing Agricultural Extension in Lao PDR*. Mission report with key findings and possible models for CETU and NAFES. Laos Extension for Agriculture Project (LEAP), Central Extension Training and Development Unit (CETDU), NAFES, MAF


**How Do We Know an Upland Solution When We See One?**

John Raintree

**Abstract**

If the NAFRI workshop in Luangprabang was about identifying solutions to upland problems, then this paper is about a search frame to aid us in recognising a solution when we see one. There are three main sources of ideas for upland solutions: 1) Diagnosis of local problems, 2) Inventory of local solutions, 3) Historical pathways of development in comparable systems.

In the diagnostic approach, the search for solutions begins with an analysis of the problems. A clear view of the problem is often all that is needed to suggest the nature of the required solution. Many of the papers in this volume have used this approach, either explicitly or implicitly. The starting point is usually some kind of participatory analysis of problems and opportunities with the local community. Causal diagramming is a useful tool for obtaining clarity about problems, causes, and intervention points within the system where solutions can be applied. There is never only one problem or one solution, but rather an interrelated set of causes and effects, and a range of possible solutions at different levels of the system. Diagnostically relevant solution types identified by papers in this workshop include: cropping systems solutions; livestock management solutions; NTFP and forest management solutions; land use planning, land allocation and relocation solutions; other policy-related diagnostic and planning solutions; institutional solutions and implementing mechanisms.

Inventory of indigenous solutions already being experimented with by local innovators is another powerful and even more relevant source of solutions. ‘Home grown’ solutions identified in this way tend to have the advantage of being rooted in indigenous knowledge, compatible with local culture, and pre-adapted for effectiveness under local biological and socio-economic constraints. The view that livelihood solutions have to be given to rural communities displays a profound ignorance of the realities of rural life, where innovation in the face of adversity has always been a condition of continued survival. Several of the papers in this volume discuss locally originated solutions and one paper in particular reports on a systematic inventory of indigenous agroforestry innovations.

Knowledge of common pathways of historical development in comparable systems is another source of insights into proven solutions to contemporary challenges. We know from the global experience that there are only a certain number of proven directions for the transformation of shifting cultivation. Historically, they have usually involved the adoption of one or more of the following core elements: rice paddies and fish ponds; home gardens and tree crop plantations; mixed farming systems with draught animals and managed feed sources; extensive agro-pastoral systems in dry or mountainous areas; mulch/green manure/cover crop farming in humid areas. What all these have in common is that they are ecologically sustainable and more productive than degraded shifting cultivation.

Success with these approaches may require the ability to solve two development riddles. Riddle No.1: When is a solution not a solution? Answer: 1) When it generates more problems than it solves, 2) When it is not adopted by the intended beneficiaries. Examples are given in the final section of the
paper. Riddle No.2: When is a problem not a problem? Answer: When it is part of a solution. Example: Traditional, long-fallow shifting cultivation with enriched fallow crops and NTFPs - a proven, highly productive and sustainable system at low population densities.

Following a brief outline of an information management system for keeping track of upland solutions, the paper concludes with a review of the current inventory of solutions and some critical gaps that remain to be filled.

**Introduction**

In an orientation meeting when I first came to work at NAFRI, some four years ago, the then Director General of NAFRI, Dr. Ty Pommasack, said, “You know, John, here in Laos we have had twenty years of research, but so far very few technologies have resulted that could be taken up by farmers.” What Laos needs, he said, is practical adaptive research to generate technologies that can be adopted by upland farmers. He also said that we should aim to produce such technologies within five years.

Well, time is almost up, but I am hopeful that this workshop will go a long way toward answering Dr. Ty’s concern. Judging from the abstracts submitted, the workshop will show that we do have a lot of solutions for the uplands. However, fifteen years might be a more realistic timeframe for widespread development in the uplands. For this to occur, the vision of what constitutes a sustainable upland mix will need to be revised. One thing that should be clear is that it is not just technologies that are needed, but also other kinds of solutions: institutional solutions, market and infrastructure solutions, and policy and planning solutions are all needed. While many of these are addressed by the broad range of papers in this volume, it might be useful to first consider how we can recognise an upland solution.

**How do we recognise an upland solution?**

How do we look for solutions? Where do we look for them? I would like to suggest that there are three main sources of solutions and ideas about solutions for the uplands:

1. Diagnosis of problems.
2. Inventory of local solutions.
3. Historical pathways of development in comparable systems.

Let us briefly consider each of these in turn.

**The diagnostic approach**

“The ability to find a solution begins with the ability to define what the problem is.” Those are the words of Howard Steppler, the Director General of The World Centre for Agroforestry (ICRAF) when I first came to work with the organisation twenty years ago. At that time the diagnostic approach in Farming Systems Research was just gaining momentum and we were responding to the challenge of developing a diagnostic approach for the broader range of concerns involved in agroforestry.
The diagnostic approach, in one form or another, is now pretty much standard practice in all international research and development projects. The abstracts of many of the papers here testify to this fact by giving explicit recognition to the *problematique* being addressed by the solutions proposed. For other papers the diagnostic rationale is less explicit but nevertheless still discernible. Only for a few papers is it still missing. “Problem? What problem?”

The basic idea behind the diagnostic approach is the search for solutions begins with an analysis of the problems. This is very productive because *a clear view of the problem is often all that is needed to suggest the nature of the required solution.* The starting point is normally some kind of participatory problem analysis carried out with the concerned community. Methods vary concerning the level of detail they go into and what kind of analytics are used, but they all eventually end up with a better understanding of what is a *relevant solution* to the problems and opportunities of the local livelihood system.

Sometimes there is an argument about what is *the* problem and what is *the* solution. Such arguments are fruitless. There is never only one problem and never only one solution even for a single problem. The reality is always a complex network of interrelated causes and effects, and every cause is a possible entry point for a solution. Causal analysis is a useful tool for bringing clarity into the analysis of the most important cause-effect complexes within the diagnostic picture. On the basis of such an analysis it is relatively easy to identify “entry points” and general “functional specifications” for critical interventions within the system where specific solutions might have a significant impact on the causes of problems. The following sequence shows the evolution of a generalised causal diagram based on upland people’s own analysis of the causes of their poverty, as uncovered by the *Participatory Poverty Analysis*, supplemented by additional findings from NAFRI’s diagnostic research in northern Laos (LSUAFRP 2002a-d, 2003a-b). The basic problem, which is the starting point for this analysis, is insufficiency of rice for household consumption. This is caused by two factors: low household rice production and low cash income, which makes it difficult to buy enough rice for household needs.

The most direct cause of low rice production among shifting cultivators is the . . .
The next part of the diagram brings in the additional factors of insufficient paddy land and shortage of animal power, and indicates the main . . .

Adding the labour factor, we have a more complete picture of the . . .

Each of these ovals represents an entry point for a possible solution to the problem at that point.

There is never only one problem.
Never only one solution.
But this is not yet the whole story. Turning to the problem of low cash income, the other side of the total *problematique* is revealed:

**A complex of interrelated problems requiring integrated solutions**
Not all of these problems are apparent in every upland location and some locations may have problems not shown on this diagram. Nevertheless, it does seem to represent most of the major upland problems. By examining the causal network we see numerous opportunities for interventions aimed at solving or mitigating these interrelated problems:

This is very general. Each of the problem complexes could have its own more detailed causal diagram to highlight opportunities for more specific solutions. We will not go into that level of detail here because that is the province of the individual papers. Our purpose here is only to illustrate the diagnostic approach in a general way, as it applies to the uplands of Laos. Problems exist at many levels and many different kinds of solutions are needed. It is helpful to try to identify the level of problem being addressed within the hierarchy of causes and effects and the logic of the solution. When we understand the logic of the solution, we can often then see alternative ways of accomplishing the intended effects. Our thinking about solutions opens up and becomes more creative and more effective. Some of the different strategies for tackling problematic cropping systems might be as follows (see next page):
The main difficulty we may encounter when trying to apply a diagnostic approach is in harmonising our thinking about solutions with the local people's own problem-solving strategies. The general experience is that it is not so difficult to come to agreement with farmers about the diagnosis of problems, but it can be very difficult to anticipate which of several alternative solutions are most likely to succeed with the local people. That is why it is always good to combine a diagnostic survey with an . . .

**Inventory of local solutions**

The best solutions are those that are closely related to the local people's own attempts at problem solving. Why? Because they are rooted in the indigenous knowledge of the people and are, for this reason, far more likely to spread quickly to other potential users. Moreover, these home grown solutions are already pre-adapted to local constraints. Maybe
the adaptation is not yet complete, but when you find an indigenous innovation being practised you at least know that it works for someone in the local community. Also, local farmers are much more relevant as models for other farmers than outsiders. For all these reasons, it is always wise to focus a major part of your effort on supporting development and spread of local innovations that build upon the local technological tradition. The same applies to institutional solutions.

How do you recognise local solutions when you look for them in this way? It is simple - they are related to local problems. The two approaches are not unrelated. In fact, a good diagnostic understanding of local problems is usually a prerequisite for a systematic inventory of local solutions. Otherwise, how would you recognise a solution when you found it? How would you even begin to tell people what you are looking for?

The view that villagers have to be ‘given’ livelihood solutions could not be further from the truth. This viewpoint demonstrates a profound ignorance of the realities of village life. In all communities there are some farmers who are innovators. Through these individuals, rural populations are constantly experimenting with new solutions to survival problems. If these populations did not have innovators, they would have ceased to exist long ago. All you have to do is to look for the innovations. We have a number of papers that focus on local solutions and we have one in particular that reports on a systematic inventory of indigenous agroforestry innovations (Forshed and Sodarak 2004). The above pictures illustrate just a few of the innovations found in NAFRI’s research area.

**Known pathways of historical development in comparable systems**

The other major source of good ideas about local solutions is to find out what other communities have done in similar situations in the past. The problems of shifting cultiva-
tion under population pressure are not new. This has happened many times before in all parts of the world. How did people respond? In fact, the patterns of response are very clear and regular. We know from the global experience there are only a certain number of proven directions for the transformation of shifting cultivation. Historically, the transformation of shifting cultivation has usually involved the adoption of one or more of the following core technologies:

- Rice paddies.
- Fish ponds.
- Home gardens.
- Tree crop plantations.
- Mixed farming systems with draught animals and managed feed sources.
- Agro-pastoral systems in dry or mountainous areas.
- Mulch farming systems.

What these all have in common is that they are sedentary, sustainable and more productive than degraded shifting cultivation.

Communities within the same cultural geographical region tend to follow similar pathways of development. African shifting cultivators tend to gravitate towards tree crops and mixed farming systems. Rice paddies and fish ponds are typical of Asia. Home gardens are ubiquitous, and reach high levels of complexity and productivity in Asia, Africa and Latin America.

The fact that there are known patterns of historical development in a given region does not mean that farmers must follow these pathways, only that it is highly likely that they will do so. In this there is good news for Laos, because the Asian tradition is full of highly productive systems that exist, as yet, only in rudimentary forms in the rural areas of Laos.
There is vast potential in Laos for productivity increases through intensification of classical Asian forms of:

- Home gardens (e.g. mixed subsistence/commercial like the market home gardens of Thailand).
- Rice paddies (highland valleys, terracing and multiple cropping have only begun to be developed).
- Fish ponds (especially integrated agro-forestry-fishpond complexes like those of southern China).
- Tree crop plantations (especially mixed agroforestry suan, e.g. the “spice gardens” of Indonesia, Sri Lanka, the multi-species market gardens of Thailand, agroforestry intercropping systems for commercial crops like tea and rubber, pineapple under teak, etc.).
- Mixed farming (like the buffalo-based plough farming systems of the Philippines).
- Agro-pastoral systems (it is harder to find mid-elevation Asian parallels comparable to the potential in Laos; if we have to look outside the agro-ecological zone perhaps the Swiss model would be appropriate, where people live in villages in the valleys and herd under collective management in the highlands).

The global experience on transformation of shifting cultivation is that forced measures are less likely to succeed than voluntary attractions. A common approach to facilitating transformation has been to encourage sedentarisation through creation of economic magnets that attract farmers and make them want to stay near these new sources of wealth (e.g. tree crop plantations, rice paddies, fish ponds, market access opportunities, etc.).

**Market signals**

Villagers are already receiving and responding to market signals - with or without public sector assistance. Market-oriented development is happening already, perhaps not as rapidly as it could if public sector support were more coordinated, but probably more rapidly than the public sector realises.

For an example of an area where market signals are having a major impact we can point to the border provinces of Oudomxay and Luangnamtha, where the influence of the Chinese market is most dramatically felt.

In how many places in the Lao PDR can you find farmers practising contour ridging or mini-terracing of hillsides, as Namor District where there are sugar cane fields next to the new road to China? The reason for adopting this conservation practice is that it was part of the deal the farmers made with a sugar cane factory in return for a “turnkey” extension package that enabled them to rapidly adopt sugar cane growing.

The package, brought to them by a contracted extension agent of the sugar cane factory in Mengla, Xishuangbanna, also included the planting material, fencing, a cash loan for hiring labour, technical training on sugar cane growing and a ready market for the cane crop. Part of the proceeds from the sale of the first crops is used to repay the loan of cash and materials needed to get started. This illustrates the power of an integrated extension approach, as sometimes found in the private sector.
Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR

There has been a lot of discussion in development circles in Laos about whether sugar cane is really a good crop for Lao farmers, but the discussion remains academic in Namor because no one in Laos is offering the farmers any comparable opportunities. There does, however, appear to be a serious issue concerning the sustainability of sugar cane growing. Over the long term, the soil will suffer from exhaustion of fertility, as has already happened on the Chinese side of the border where cane can now only be grown with heavy fertiliser inputs. The officers of the sugar cane factory in Mengla freely admit that the relative fertility of the forest covered slopes along the new roads close to the border is what makes sugar growing such an attractive proposition on the Lao side (LSUAFRP 2003c). Perhaps the public sector has an important role to play in complementing the private sector extension success by undertaking research to develop sustainable cropping systems for sugar cane, incorporating rotations of fertility restoring crops in conjunction with moderate fertiliser use. Market sustainability does not appear to be an issue. South-western China seems to want to have its own sugar supply and the factory in Mengla is operating at only about 50% of capacity. The entire sugar crop that it receives from Oudomxay and Luangnamtha can only keep the factory busy for two days.

Rubber for the Chinese market is also that is taking the northern border provinces by storm. The rubber story is another example of the speed with which market driven developments can occur, with or without public sector support. Rubber was introduced into Luangnamtha by Chinese entrepreneurs. Hmong farmers in NAFRI’s Namor research area mentioned their interest in rubber growing, based on the positive experience of relatives in Luangnamtha, to the farming systems researchers in 2003. In late 2003 provincial officials in Oudomxay asked NAFRI to provide advice about the advisability of rubber growing in that province. Within a month the Socio-economics Unit sent a market research team, accompanied by staff from the Namor DAFO office, into the established rubber growing area of Luangnamtha to assess farmers’ experience with rubber and to interview district and provincial officials about their views on rubber. The team then followed the market chain into China, where it interviewed a number of small rubber processing units. Within a couple weeks of this mission’s final briefing to the Namor DAFO, the Socio-economics Unit issued a report on the findings of the mission. Then, when members of the Socio-economics Unit returned to Namor two weeks later, they were surprised to discover that the Chinese promoters had already established a one million seedling rubber nursery in Namor! So much for careful deliberation of options before deciding what to do about rubber.

The issues brought to light in the SEU report (LSUAFRP 2003c), and which Lao government officials should consider before rushing headlong into rubber production are:

- Why is China getting out of rubber production?
- Is rubber production really an economically viable option for Laos?
- And if so, what kind of rubber plantation system would give the most development benefit with least risk to participating farmers?

The answers, in brief, appear to be:

- Rubber production in Xishuangbanna, even of the special northern adapted variety, has been judged to be an economically marginal activity in the Chinese context. The country’s real interest is in rubber manufacturing rather than raw rubber production. Xishuangbanna has been advised to get out of rubber production, and is apparently
responding to that by promoting the transfer of production to Laos.

- With low production costs and two markets for rubber, the Chinese to the north and the Thai-Malaysian-Indonesian rubber cartel to the south, rubber production might well constitute a viable economic opportunity for Laos.

- However, tea-rubber agroforestry gardens might be far more beneficial than conventional monoculture plantations, not only for biological reasons as the following chart suggests, but also for economic diversification of the smallholders’ livelihood system (Source of data: in Roland Cheo, *An Evaluation of the Impact of Rubber Trees in China on the Rural Economy with Specific Focus on Xishaungbanna, Yunnan and Hainan Island*. http://natureproducts.net/Ecology/Rubber/Rubber.htm).

![Rubber Yield (kg/ha)](chart.png)

What both of these examples show is that while market signals, especially when received from a powerful market force like China, can generate a development impetus that public sector development programmes in Laos are powerless to duplicate, the public sector may still have a critical role to play in protecting Lao farmers from uncontrolled manipulation and in ensuring that the best options are chosen from the range of possible development responses to these signals. In any case, while market signals are a powerful source of solutions for the uplands, these solutions themselves may bring new problems and challenges for Laos.

**Solution types presented in the workshop papers**

The on-going review of the four major sources of solutions for the uplands may be regarded as a kind of prolegomenon to the papers presented in this volume, which richly represent and exemplify all four sources. A review of the abstracts of the papers available before the workshop indicates the following solution types:

- Cropping systems solutions (nine papers).
- Livestock management solutions (two).
- NTFP and forest management solutions (four).
- Land use planning, land allocation and relocation solutions (four).
- Other policy-related diagnostic and planning solutions (nine).
- Institutional solutions and implementing mechanisms (six).
A diagnostically oriented synopsis of the kinds of solutions presented in the papers is given in the following table.

This table represents the kind of simple and robust diagnostic key to solutions that could be used as the logic for a full-blown database that keeps track of upland solutions, preferably with a database architecture allowing flexible key word searches in unstructured text fields, for maximum flexibility and fidelity to the perverse, structure-defying nature of real world situations.

Success with any of these approaches to the search for solutions may require the ability to deal with certain . . .

<table>
<thead>
<tr>
<th>Paper</th>
<th>Solutions</th>
<th>Problems addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cropping Systems</strong></td>
<td><strong>Solutions</strong></td>
<td><strong>Problems addressed</strong></td>
</tr>
<tr>
<td>Cropping systems (IUARP) Linquist et al.</td>
<td>18-27% increase in yield under shifting cultivation from rice variety selections resulting from participatory selection procedures; improved rotational cropping systems addressing problems of weeds, soil fertility and declining yields (for farmers practicing rotational cropping); intensive continuous cropping systems with dry season fallows (for permanent field farmers); a multi-faceted, participatory and adaptive research approach</td>
<td>Increased poverty and lower productivity due to declining yields, decreased soil fertility, increased weed pressure and labour requirements resulting from shortened fallows due to increasing population pressure; and slow adoption of sustainable upland technologies due to lack of site-specific recommendations due to difficulties in addressing the high biological, economic and cultural diversity of the Lao uplands</td>
</tr>
<tr>
<td>Paddy rice in uplands (Lao - IRRI) Pandey et al</td>
<td>Development and productivity improvement of highland paddy rice in valley floors and terraced fields, providing higher yields and increased food security with lower labour inputs per unit of output than upland rice</td>
<td>Vicious cycle of low productivity, environmental degradation and poverty in upland rice farming - resulting from intensification under population pressure</td>
</tr>
<tr>
<td>Farming system Technologies (LSUAFRP) Chanpensay, Calub &amp; Overgoor</td>
<td>Lowland and upland annual crops, sloping land integrated fruit tree systems, small and large livestock feeding systems, integrated pig-fish pond systems, frog production, and wet season vegetable cultivation</td>
<td>Low household income and food insecurity associated with diagnosed production constraints, and variable adoption of solutions by households with different conditions</td>
</tr>
<tr>
<td>Direct seeding, Agro-ecology (CIRAD/NAFRI) Tivet et al.</td>
<td>Zero-tillage direct seeding on crop residues (reduced erosion, increased yield, reduced chemical use, reduced labour, reduced capital cost, increased income per man-day)</td>
<td>Effects of agricultural ‘mining’ incl: soil erosion, loss of fertility, decreased yields, chemical pollution, road and paddy field destruction</td>
</tr>
<tr>
<td>Paper</td>
<td>Solution</td>
<td>Problem/Issue</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Generation-extension approach Agro-ecology (CIRAD/NAFRI) Tivet et al.</td>
<td>Agroecological cropping systems developed through the 'generation plus extension' approach (replication of forest systems, non-disturbance and continuous cover of soil, reduced erosion, increased organic matter, improved soil physical structure, recycling of nutrients, weed control)</td>
<td>Problems of soil &amp; water conservation, environmental damage, food safety, high cost associated with conventional agriculture</td>
</tr>
<tr>
<td>Cropping systems (RDMA/Bokeo) Chansom</td>
<td>Modification of SALT designs to include leguminous cover crops with direct economic benefits (e.g. rice bean, lab-lab bean, black bean, mungbean, stylosanthes)</td>
<td>Non-adoption of SALT techniques by farmers</td>
</tr>
<tr>
<td>Fruit trees (IUARP) Lai et al</td>
<td>Integrated fruit trees systems with a continuous income stream from annual crops, medium-term fruits (pineapple, banana) &amp; long-term fruit trees planted in contour hedgerows</td>
<td>Declining rice yields and limited opportunity for income generation</td>
</tr>
<tr>
<td>Rice cropping and fallow (IWM/NAFRI) de Rouw</td>
<td>Farmer experimentation with adaptive changes in land use through a four-step process of intensification, leading in the final stage to the ending of upland rice cultivation</td>
<td>Population pressure on rotational shifting cultivation and labour shortage for weeding</td>
</tr>
<tr>
<td>Indigenous agroforestry (LSUAFRP) Sodarack et al.</td>
<td>Systematic survey and description of indigenous agroforestry practices resulting in the cataloging of 24 distinct agroforestry systems found in 17 villages, including home gardens, rotational and intercropping systems, NTFP plantations, improved fallow practices, fishpond systems and livestock grazing practices</td>
<td>Lack of knowledge about alternative indigenous agroforestry production systems in shifting cultivation areas</td>
</tr>
</tbody>
</table>

Livestock Management Solution

<p>| Livestock Intensification (CIAT) Phimphachanhvongsod et al | Systematic survey and description of indigenous agroforestry practices resulting in the cataloging of 24 distinct agroforestry systems found in 17 villages, including home gardens, rotational and intercropping systems, NTFP plantations, improved fallow practices, fishpond systems and livestock grazing practices | Limitations on livestock production due to epidemic diseases and feed shortages; high labour demand for intensification of shifting cultivation on steep slopes |
| Livestock Technologies (CIAT) Phengsavanh et al | Intensification of livestock production through farmer managed feed resources in combination with strategic use of veterinary medicines | Problems associated with unsustainable shifting cultivation |</p>
<table>
<thead>
<tr>
<th>Paper</th>
<th>Solution</th>
<th>Problem/Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NTFP and Forest Management Solutions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role of NTFPs (SNV/FRC/NAFRI) Foppes &amp; Ketphanh</td>
<td>Long-cycle NTFP production systems</td>
<td>Food insecurity, lack of cash income, instability of shifting cultivation, watershed deterioration, loss of biodiversity of wild and cultivated plants and animals</td>
</tr>
<tr>
<td>Wildlife hunting (WCS) Johnson, et al</td>
<td>Recommendations for developing village models of sustainable wildlife use for subsistence</td>
<td>Unsustainability of harvest rates of wildlife for subsistence consumption</td>
</tr>
<tr>
<td>Aquilaria crassna (NAFRI/KVL) Jensen</td>
<td>Possibilities for achieving effective ex-situ conservation and high income from various activities in the current planting boom (forest domestication, single-tree planting, agroforestry, wood lots, and plantation establishment)</td>
<td>Entry of Aquilaria crassna ('wood of the gods') on the critically endangered species list due to excessive and indiscriminate harvesting</td>
</tr>
<tr>
<td>Community forestry woodlot species (LTSP/NAFRI) Pathammavong</td>
<td>Aquilaria crassna, Tectona grandis, Eucalyptus camaldulensis and Acacia mangium</td>
<td>Need to identify priority tree species that match planting sites</td>
</tr>
<tr>
<td><strong>Land use planning, land allocation and relocation solutions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resettlement (ACF) Laurent Romagny</td>
<td>Alternative sustainable livelihood strategies that do not require displacement of population</td>
<td>Difficulties associated with displacement of population as a development strategy (health and sanitation, doubling of mortality, insufficient paddy land and access to basic services)</td>
</tr>
<tr>
<td>Participatory land use plan (GTZ-RMDA/Luang namtha) Lundgren</td>
<td>Various recommendations for improvement of Participatory Land Use Planning (PLUP) procedures</td>
<td>Need for improvement of implementation procedures for land use planning and land allocation</td>
</tr>
<tr>
<td>Landuse &amp; livelihood issues (LSUAFRP) Jones et al</td>
<td>Village level planning options to mitigate adverse consequences of relocation and improve the effectiveness of well-intentioned poverty alleviation programmes and policies</td>
<td>Village level planning options to mitigate adverse consequences of relocation and improve the effectiveness of well-intentioned poverty alleviation programmes and policies</td>
</tr>
<tr>
<td>Land use approaches (SCSPP) Ladouangphanh &amp; Phetsomphang</td>
<td>Forest protection and containment of upland cultivation within agreed agricultural zones through land use zoning, village land use agreements and inter-village networking and monitoring</td>
<td>Conservation and livelihood problems arising from land use planning procedures that do not give enough time to villages to adapt to land use zoning before carrying out land allocation</td>
</tr>
<tr>
<td>Paper</td>
<td>Solution</td>
<td>Problem/Issue</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Shifting cultivation</td>
<td>Understanding of how farmers optimize family labour use and reduce risk through shifting cultivation</td>
<td>Policies and development interventions which increase poverty and risk through over-simplification of traditional farming systems</td>
</tr>
<tr>
<td>Ducourtieux</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardamom (PDDP)</td>
<td>Lessons about development prerequisites (economic issues, market risks, compatibility of new crops with farming systems, and suitability for different classes of farmers)</td>
<td>Failure of attempts to promote conversion of shifting cultivation into cash-crop based agriculture</td>
</tr>
<tr>
<td>Rossard and Visonnavong</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes at Houay Cha (GAA)</td>
<td>Sustainable stationary upland farming and integrated farming techniques, improved livestock production and management of NTFPs</td>
<td>Unsustainable shifting cultivation and rice deficiency of 3-6 months</td>
</tr>
<tr>
<td>Kinzelmann et al</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novel approach to upland Development (SCSPP)</td>
<td>Participatory village development planning and livelihood analysis for introducing alternative sedentary technologies and products, water supply and irrigation, systematic NTFP management, community-based drug rehabilitation, primary health care, revolving funds, income generation for women, etc</td>
<td>Poverty and environmental degradation from unsustainable shifting cultivation</td>
</tr>
<tr>
<td>Ladouangphanh &amp; Kulasuriya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balanced approach (UNODC)</td>
<td>A balanced strategy for opium elimination based on alternative development, demand reduction and law enforcement, where the key element is provision of timely and sufficient alternatives</td>
<td>Problems associated with drug addiction and failure to implement national policies and international commitments</td>
</tr>
<tr>
<td>Leik Boonwaat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combining science and local knowledge (SLU/ICRAF/NAFRI &amp; NISF)</td>
<td>Domestication of bamboo production and other interventions guided by a knowledge-based systems approaches; combination of local and scientific knowledge in farmer field schools and participatory watershed management activities involving local and external stakeholders</td>
<td>Land degradation, declining crop yields and food insecurity resulting from forest conversion to intensively cropped farmland</td>
</tr>
<tr>
<td>Forest cover change in Nam Et Phouy Leuy (NUOL/FF)</td>
<td>Detection of cover and land use changes and in-depth interviews with local villagers to understand the causes of these changes and the effects of NBCA delineation on village livelihoods</td>
<td>Loss of forest cover and insufficient understanding of the causes of forest cover and land use change</td>
</tr>
<tr>
<td>Vongvisouk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>Solution</td>
<td>Problem/Issue</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Other policy related diagnosis and solution (continued)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livelihoods in Katu villages, Sekong&lt;br&gt;Alton et al.</td>
<td>Recommendations for improvements in planning methodology for poverty alleviation and emergency response in rural areas</td>
<td>Insufficient understanding of the socio-cultural-economic context of rural poverty and inadequacies in current emergency response capacity and delivery systems</td>
</tr>
<tr>
<td>How do we know a solution&lt;br&gt;(LSUAFRP/NAFRI)&lt;br&gt;Raintree</td>
<td>A systematic approach to the recognition of upland solutions that avoids common pitfalls, defines a search frame for appropriate solutions and provides as basis for an ongoing inventory of upland solutions</td>
<td>Lack of clarity about the current inventory of upland solutions</td>
</tr>
<tr>
<td><strong>Institutional solution and implementing mechanisms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participatory seed source management&lt;br&gt;(LTSP/NAFRI)&lt;br&gt;Moulanai &amp; Ravensbeck</td>
<td>Decentralised seed supply with participation of local people in seed source management, collection and marketing</td>
<td>Lack of seed supply in upland areas</td>
</tr>
<tr>
<td>CBFM Nam Khan Watershed&lt;br&gt;(PAFO/Luang Prabang)&lt;br&gt;Sianouvong</td>
<td>Community-based forestry and agroforestry development (a partnership between villagers, government officials and civic organisations)</td>
<td>Poverty and loss of forest cover</td>
</tr>
<tr>
<td>Fruit trees&lt;br&gt;(UADC)&lt;br&gt;Bubbeldam &amp; Vongvilasai</td>
<td>Extension approaches to promote fruit growing</td>
<td>Need for alternatives to slash-and-burn and marketing constraints on fruit tree growing</td>
</tr>
<tr>
<td>Farmer field school and gender&lt;br&gt;(NAFES/FAO)&lt;br&gt;Sihanath &amp; Baken</td>
<td>Farmer Field School approach focused on multi-disciplinarity, use of group approaches, on-farm technical innovation, assistance in removing critical bottlenecks, and empowerment through training, facilitation and networking</td>
<td>Difficulties of reaching women and dealing with farming systems as a whole in food security programmes</td>
</tr>
<tr>
<td>Sekong Development&lt;br&gt;(SEP-DEV)&lt;br&gt;Mahaxay &amp; Chagnon</td>
<td>New institutional approaches for integrated rural development</td>
<td>Lack of impact and sustainability of externally funded fixed-term projects</td>
</tr>
<tr>
<td>Scaling up&lt;br&gt;(CIAT)&lt;br&gt;Photakhoun et al</td>
<td>Farmer participation in adaptive research with ‘hard technologies’ and market-chain research using an ‘agro-enterprise development’ approach</td>
<td>Need for new approaches to deal with the diversity and complexity of upland farming systems through integrating new technologies into existing farming systems and making markets accessible</td>
</tr>
</tbody>
</table>
Development riddles

Riddle No.1: When is a solution not a solution?

Answer No.1: When it causes more problems than it solves.

Answer No.2: When it is not adopted by the intended beneficiaries.

It is not yet clear whether sugar cane and rubber production are among the examples of Answer No.1, but from the controversy surrounding them, it is fairly clear that following are:

- Relocation of populations and village merging
- Certain Land Use Planning/Land Allocation implementation practices

The many problems that arise when attempting to apply these policy solutions are policy implementation problems. We understand them as such. However, when a policy can be identified as a contributing cause to so many problems, it might be more cost effective to change the policy.

Laos is going to have enough problems coping with spontaneous migration: it does not need to add fuel to the fire.

For examples of Answer No.2, we may cite:

- Some exotic conservation-oriented cropping practices (like certain versions of alley cropping, SALT, mulch farming, etc.) in which the critical conservation feature (e.g. the hedgerow, the ground cover) does not directly produce an economic product.
Any solutions that are too labour-intensive or too information-intensive (i.e. too hard or too complicated) to be easily adopted by the average farmer.

**Riddle No.2: When is a problem not a problem?**

**Answer: When it is part of a solution.**

A first example of this is the misdiagnosis of ‘insufficient’ household rice production when a household has a rice buying strategy. This is basically a problem of inaccurate diagnosis or over-enumeration of problems when interpreting statistically data. For example, here is some data from a household survey.

<table>
<thead>
<tr>
<th>Wealth Category</th>
<th>Average months production insufficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>4</td>
<td>3.0</td>
</tr>
<tr>
<td>5</td>
<td>7.2</td>
</tr>
</tbody>
</table>

It would appear from this summary data that members of wealth category No.1, the richest households in the community, have almost as many months of rice insufficiency as members of wealth category No. 4, the second poorest households in the community.

In fact, a closer look at the data on households in wealth category No.1 reveals that some 14% of these households report that they do not produce enough rice for their family for 12 months of the year! What is going on here? In fact, the data on “Household Livelihood Strategy” reveals that these particular households have no intention of growing their own rice. Their strategy is to purchase all of their household rice supplies with money earned from cash crops, livestock and NTFPs.

In fact, only 38% of the households sampled in this survey try to produce all of their own rice. Most have a mixed strategy of growing some rice and buying the rest. This result cannot be generalised to the rural population as a whole, but it may be fairly indicative of households located near roads with reasonably good access to markets. ‘Insufficiency’ of this type is not a problem because it is part of the household’s total food supply solution, livelihood strategy and household economy.

Most (but not all) households in Laos have the ideal of being able to eat rice every day of the year. Typical household strategies for achieving this objective are:

**Strategy 1 - To grow own rice**
- Grow rice in paddy
- Grow rice in *hai*

**Strategy 2 - To get money to buy rice**
- Collect NTFPs to sell for money to buy rice
- Grow cash crops to sell for money to buy rice
- Raise small livestock to sell for money to buy rice
- Produce cottage industry products to sell for money to buy rice
- Engage in trade to get money to buy rice
Sell family labour for money to buy rice

Strategy 3 - To go into debt to get rice

' Borrow' rice from relatives and neighbours (loose reciprocity)

Receive rice 'loan' that has to be paid back (strict reciprocity)

Strategy 4 - To substitute other staple food (fail safe strategy)

Collect wild foods to eat

Grow other foods to eat (e.g. root crops, *mak duay*, etc.)

Get money to buy other (cheaper) foods to eat

It is not until after you have understood the household's livelihood strategy that you can know whether insufficiency of own-produced rice is a problem or part of a solution. That is why aggregate statistical description is not a substitute for careful diagnostic analysis which distinguishes different kinds of households.

The second example of a 'problem' that is not a problem because it is part of a solution is:

Long-fallow shifting cultivation with enriched fallow crops and NTFPs

Scientific objectivity dictates that we acknowledge that under circumstances of sufficient land for adequate fallow periods, shifting cultivation itself can be a viable solution to the problem of poverty reduction (or avoidance) in the uplands of Laos. There is a reason why shifting cultivation has been the dominant form of cultivation for long periods of time in the early developmental stages of agriculture on nearly every continent on this earth. If one listens objectively to reports from the field, and combines this information with careful analysis of satellite data, one must acknowledge that in Laos today there are places where long-fallow shifting cultivation is still viable: where forest cover is stable, where rice scarcity is unknown, and where real poverty is far less than in many of the overcrowded villages of the lowlands.

Perhaps one should not try to fix something that is not broken. More to the point, there are indications coming from this workshop that wildlife, NTFP's, and agro-biodiversity are most abundant in secondary forest fallows and that there are intelligent ways of managing long fallow rotational cropping systems that are highly productive and, at the same time, highly protective of the natural gifts of the Lao uplands.

Author

Dr. John Raintree is the Senior Socio-economic Adviser for the Lao-Swedish Upland Agriculture and Forestry Research Program (LSUA FRP), PO Box 4298, Vientiane, Lao PDR, email: johnraintree@hotmail.com

Bibliography


LIVELIHOODS AND FOREST RESOURCES IN KATU VILLAGES IN SEKONG

Charles Alton and Houmphanh Rattanavong

Abstract

This paper is extracted from a larger livelihoods study conducted to describe and analyse the existing livelihood systems of eight villages in Sekong Province by inquiring into the resources, opportunities, constraints and challenges of their livelihoods system performance. All these villages were relocated by the authorities at some point in the past.

The extract focuses on the relationship between livelihoods and one dimension of natural resource management: forests. In virtually all locations in rural Laos, families are highly dependent on forests for food, fibres, herbs for traditional medicines, building materials, and cash income from NTFPs. Thus, their relationship with the forest depends upon its great diversity and subsequent productivity. Through decentralisation initiatives, village committees have been given the serious responsibility of managing local forest resources. However, they are often powerless to protect these resources from outside exploitation. This situation has been experienced in Sekong as in all other provinces in the Lao PDR.

Introduction

The southern province of Sekong has an area of 911,100 km^2. It is administratively divided into four districts: Muang Thateng, on the Bolovens Plateau; Lamarm, the valley where the provincial administrative offices are located; Kaleum, located up the Sekong River in the mountains all the way to the Vietnamese border; and Dakcheung, located in the mountains and the high plateau, also on the border. The latter two districts are quite isolated due to poor communications networks and thus are ranked as two of the nation’s forty-seven poorest districts. The livelihoods study examined only the Katu villages in Kaleum and Thateng districts.

In 2002 the province had an ethnically diverse population of about 81,000, with 13 officially designated ethnic groups. All of these groups, except the relatively small Lao Loum communities, are part of the Mon-Khmer (Austro-Asiatic) ethnolinguistic superstock, most being in the Katuic branch and the remaining two or three in the Bahnaric branch.

It is sometimes claimed that rural people are the major cause of deforestation, especially through shifting cultivation. While it is true that some people do undertake activities which are detrimental to the environment and must be rectified, in many cases such behaviour is influenced by external influences. The underlying conditions must be understood if a more sustainable development process is to be facilitated.

A more serious threat to both timber and non-timber resources seems to be the exploitation activities of private companies and influential individuals who are only concerned with short-term gains, and have no real stake in long-term sustainable development. When such outsiders with considerable funds want to exploit these resources, they are virtually given unlimited authority to do so. Seldom, if ever, are villagers consulted about this
exploitation and households depending upon forest resources for their livelihoods are severely affected. The only local involvement is the use of unwitting villagers to identify fruitful areas.

**Katu livelihoods**

Katu traditional livelihood systems are highly diverse, with each component contributing to the overall system performance. Before resettlement, the Katu had longer fallows for their swidden and more abundant forest, so their agro-ecosystems were considerably different to those in the relocated villages. A very large portion of their livelihoods used to be derived from the forest, where they hunted and gathered most of their food, fibres, herbal medicines, household utensils and building materials.

Current Katu agricultural livelihood systems in Kaleum are upland rice-based and primarily supplemented by the cultivation of cassava and taro. They also cultivate sugarcane, corn and fruit trees. In the recent past, roots and tubers were their starchy staple. They like to tap the sugar-palm tree (*mak thaan*) to make a sweet beverage. Both men and women are involved in the making of handicrafts for home use and for supplementary income. The Katu in Thateng also have a rice-based livelihoods system, but with increasingly more paddy rice than in Kaleum. They cultivate coffee and cardamom for cash income and for many households in Thateng, off-farm employment is becoming more and more important for supplementing family income.

The first change in Katu livelihood systems occurred when they arrived in Lower Kaleum towards the end of the Vietnam War. At first the forests were abundant and the fallows long enough to encourage regeneration. As additional migrants arrived however, the pressure on land began to increase. Subsequent land and forest allocation drives further limited available agricultural land. In Kaleum there are not many viable alternatives to upland rice swidden. Villages there still have to practice swidden cultivation, but due to land constraints they rotate their declining number of upland fields with shorter fallows, thus decreasing sustainability. Livelihood system changes have been less dramatic for villagers in Thateng, where the elevation, soils, weather and proximity to markets and government services are different. There also, forest resources were at first abundant but became more scarce with increased in-migration and land allocation.

**Land use and rice self-sufficiency**

Seven of the eight villages complain of not having enough agricultural land (see Table 1). Total agricultural land per village averages 282 ha in Kaleum and about 522 ha in Thateng. Forest land averages 1,462 ha per village in Kaleum with 1,111 ha per village in Thateng (Table 3). The ratio of agricultural land to total (agricultural plus forestry land) land averages 36.1% for Kaleum. In Thateng the agricultural land ratio averages 53.5%, ranging from 11.6% in Thong Kong to 81.7% in Done Saa.

There is very little paddy land in any of the four Kaleum villages, averaging under 5 ha per village (Table 1). Three of the inner villages still complain about the lack of land and villagers feel that, because of this, their villages are only temporary. All four Kaleum villages are forced to cultivate upland rice. The Thateng villages have much more paddy land, but still cultivate upland rice in swidden fields.
Paddy land is insufficient to assure rice self-sufficiency in the villages with declining upland fields. In Kaleum, only 67% of the households averaged 6-12 months of rice self-sufficiency, compared to 71% of households in Thateng. Seven of the eight villages reported rice deficiencies for 2003 with four villages reporting an average of 3.4 months deficit.

All villages cultivate corn and cassava to supplement their starchy staples and for animal feed. Most households have home and riverbank gardens and still have the safety net of their forests to cope with rice shortages, but their forest resources are under threat. The bottom line here for study villages in both districts is that by necessity they must practice shifting cultivation in the uplands.

### Village incomes

The study villages earn cash income from corn, coffee, cardamom, cassava, livestock, NTFPs and off-farm employment (see Table 2). In Kaleum, collection of NTFPs generates about 76% of total income and raising livestock accounts for around 16%. The environment in Thateng is much more conducive to cash crops and total average income in the district is almost six times that of the Kaleum villages. Peanuts, coffee and cardamom generate about 160 million Kip or 52% of the Thateng villages’ total annual income. NTFPs are also a significant income earner, averaging about 132 million Kip (43.3%).

The figures in Table 2 illustrate just how important the forest is to village livelihoods. In Thateng the forest provides as much income as the cultivation of both coffee and cardamom, while for the people of Kaleum the forest is even more significant.
Deforestation

There are many forces jeopardising villagers’ forest resources in Sekong, including seemingly unabated logging in village areas, land and forest allocation, and population growth. In Kaleum there has been massive logging along the road from Sekong: the study team counted 4,574 logs along the roadside on 10 November 2003. Logging trucks had noticeably damaged the road, and the companies responsible had made little or no effort to repair or maintain the highways. When this issue was raised with district officials they expressed a great deal of frustration over their lack of authority to deal with it.

Loggers had been active in three of the study village areas in Kaleum. An example is Tham Deng, one of the most beautifully primitive study villages, where one wakes up in the morning to the calls of gibbons. In 2002 a company came without notice with a myriad of seemingly official documents and started cutting pine trees (mai paek). The logging company removed 300 of 380 logs before the villagers asked for 15,000 Kip per log. The company never agreed and paid nothing, so the village did not allow them to remove the remaining 80 logs. Then about 200 loggers came in to cut Aquilaria trees (mai heuang), taking out almost 200 sacks of woodchips, for which they paid the villagers nothing. In 1999-2000, rattan in the village area was cut almost to the point of complete destruction and again the villagers received nothing.

Four Thateng villages (two of the four were study villages) are still being heavily logged. Between 1997 and 2003 it is estimated that about 52,550 m$^3$ of logs were removed. According to their records these villages received a fee (or tax) of about 387.3 million Kip (US$38,725) at 5,000/m$^3$ Kip for fallen logs and 10,000/m$^3$ Kip for standing timber. The provincial and local governments reportedly received 2.1 billion Kip or about US$ 210,200 at 20,000 Kip or US$ 2 each per cubic metre.

At an estimated average timber value of US$ 175/m$^3$, a total of about US$ 9.2 million of wood was extracted. The villages received 0.42% of the total value of this wood while the combined provincial and district government revenue was 2.3%. During the fieldwork in November 2003, trucks were hauling out the previous year’s residual logs. It was estimated that 564 logs (493 m$^3$ – worth US$ 83,351) lay along the road near Nong Kan and Done Saa and in two yards near Nong Kan. The logs had been probably cut in 2003 but not removed at that time for unspecified reasons.

Villagers complained that they did not know what their rights were when these loggers came in. They related that the outsiders brought official-looking documents with signa-

---

1. It took nine and a half hours for our team to drive 66 kilometres. We were pulled out of chest-deep ruts over ten times by a large truck.

2. A local person said that this was likely a ploy of the timber company to take out so-called ‘downed logs’ this year, as they may have been over quota for last year.
Table 3: Land Use in Study Villages in Sekong

<table>
<thead>
<tr>
<th>Village Name</th>
<th>Paddy</th>
<th>Upland Coffee &amp; Corn</th>
<th>Cassava</th>
<th>Home Garden</th>
<th>River Total</th>
<th>Cons Prod</th>
<th>Regen De.</th>
<th>Existing Plant Forest</th>
<th>Total Forest</th>
<th>Total Calculated Agriculture to total Land</th>
<th>Ratio</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tham Dang</td>
<td>8</td>
<td>108</td>
<td></td>
<td></td>
<td></td>
<td>135</td>
<td>125</td>
<td>210</td>
<td>0</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Khay Tai</td>
<td>2</td>
<td>172</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Tong Kong</td>
<td>6</td>
<td>62</td>
<td></td>
<td></td>
<td></td>
<td>161</td>
<td>152</td>
<td>21</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Xay</td>
<td>1</td>
<td>77</td>
<td></td>
<td></td>
<td></td>
<td>54</td>
<td>54</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Se</td>
<td>3</td>
<td>220</td>
<td></td>
<td></td>
<td></td>
<td>876</td>
<td>876</td>
<td>31</td>
<td>8</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Dou</td>
<td>2</td>
<td>275</td>
<td></td>
<td></td>
<td></td>
<td>307</td>
<td>307</td>
<td>31</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Mou</td>
<td>3</td>
<td>280</td>
<td></td>
<td></td>
<td></td>
<td>281</td>
<td>281</td>
<td>31</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Sa</td>
<td>1</td>
<td>386</td>
<td></td>
<td></td>
<td></td>
<td>318</td>
<td>318</td>
<td>31</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Mou</td>
<td>8</td>
<td>736</td>
<td></td>
<td></td>
<td></td>
<td>3200</td>
<td>3200</td>
<td>32</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Mou</td>
<td>108</td>
<td>1010</td>
<td></td>
<td></td>
<td></td>
<td>3480</td>
<td>3480</td>
<td>34</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Don Mou</td>
<td>26</td>
<td>1260</td>
<td></td>
<td></td>
<td></td>
<td>693</td>
<td>693</td>
<td>69</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The table details land use in hectares (ha) for each category in the study villages of Sekong district, including paddy, upland coffee & corn, cassava, home garden, river total, conservation production, regeneration, existing plantation, and total forest. The final column calculates the ratio of agriculture to total land area, expressed as a percentage (%).
Wang and stamps, and they did not know how to react to these people. They were perturbed by the fact that these people wanted to cut in the conservation forest (*paa sanguan*).

### Conclusion

This is a situation facing many communities in the rural uplands where there still are considerable timber resources. The villagers depend on the forests for a substantial portion of their livelihoods, both for subsistence and commercial uses, but these livelihoods are increasingly being put into jeopardy. The communities have been given the onerous responsibility of being the guardians of the forest. Yet it is difficult for them to police these dwindling resources among their own people, let alone protect them from outsiders who are seemingly armed with official authority to extract timber from forbidden areas.

The villagers try to cope with these outsiders as best possible, but without assistance they are overwhelmed by outsiders who are more adept at manipulating officials and misusing procedures. The government has made some efforts to assist them in becoming more acquainted with their rights and responsibilities, however, much more needs to be done to truly empower village committees. They should be given more power in decision-making, in the approval process, in policing forests, and perhaps even be involved in the adjudication process of natural resources management.

### Note

The observations in this paper were made by the study team under the auspices of the National Economics Research Institute (NERI) under the Committee for Planning and Co-operation (CPC) in Sekong while undertaking the UNDP/ECHO funded Service Delivery and Resettlement: Options for Development Planning, commonly referred to as the Livelihoods Study.

---

3In February one of the team members was again in the area of Done Saa and reported that the loggers were back in full force cutting more timber. There were about a half dozen logging camps set up for the Vietnamese labourers. The roads past Nong Kan and Done Saa were lined with new logs, so the logging continues unabated.
Authors

Houmphan Rattanavong is a former director of the National Cultural Research Institute and is a member of the Lao National Science Council.

Dr. Charles Alton has lived and worked in Laos for more than three decades, email: alton97@loxinfo.co.th
SHIFTING CULTIVATION AND POVERTY ERADICATION: A COMPLEX ISSUE *

By Olivier Ducourtieux

Abstract

Shifting cultivation is often described as 'traditional', inflexible and outdated, in contrast with 'modern', mechanised and chemical agriculture. That belief overlooks farmer know-how, accumulated over generations to exploit natural resources while adapting itself to the mutations of the physical, social and economic environment.

Research conducted in Phongsaly provides an idea of how complex and consistent a slash-and-burn farming system can be, and how farmers optimise family labour but also limit their risks.

External interventions - policies, projects, etc. - are aimed at improving farmers’ livelihoods by converting their farming practices. When those interventions overlook how diversified slash-and-burn agriculture is, they often lead to oversimplification of farming systems, thereby impoverishing people and exposing them to natural and economic risks. The actions are then counterproductive. To improve them, the role of local services should be rethought, from the underlying policies/projects through to an active interface that adapts each intervention to local conditions and farmers.

Introduction: shifting cultivation, an important agricultural practice discredited in the Lao PDR

Shifting cultivation plays an important role in the Lao economy and society. In a country where 80% of the surface area is hilly or mountainous, shifting cultivation or 'slash-and-burn' crops provide jobs to over 250,000 families (MAF 1999), i.e. 35% of the country’s population. These people are among the poorest in the country and mostly belong to ethnic minorities from the remote uplands in the northern, eastern and southeastern regions of the country.

Slash-and-burn farmers are often accused of destroying the forest and many authors hold them responsible for deforestation in Laos (NAFRI and CIRAD 2003; UNDP 1995; Vorakhoun 2003; Watershed 2000): in 50 years, the country’s forest cover has reportedly fallen from 70% to 51% (MAF 2000). For a resident of the lowlands, culturally used to distinguishing permanent farm areas (rice fields, gardens) from forest areas (protected or exploited forest), images of slash-and-burn in uplands are traumatising (figure 1). As a result, it can seem obvious and natural to call on political powers to make such destructive practices stop (Aubertin 2001).

However, some authors have put forward convincing arguments saying that this is a culturally conditioned position, rather than a rational judgement (Mellac and Rossi 1999; Menzis 2002). This paper contributes to the debate through a study, conducted in Phongsaly.

* This paper will also be appearing in a special issue of the journal “Moussons”, dealing with the recent transformations in Lao agriculture. The paper will appear under the title “Is the diversity of shifting cultivation held in high enough esteem?” You can find out more about this special issue of “Moussons” by going to: http://www.edisud.com/edisud/site/affichecollection.asp?IdCollection=52
on a shifting cultivation farming system that demonstrates how farmers use reasoned and complex management of their human and natural resources to maximise the efficiency of both. For lack of study on and esteem for this farmer know-how, interventions by administrative services and projects have often led to results contrary to the political aims of environment preservation and poverty alleviation.

**Complex and coherent management of environmental resources in a shifting cultivation farming system**

**Economic study of a small region: Phongsaly**

**Study methodology**

Within the framework of the assessment of the PDDP\(^1\), in late 2002 we began characterising agricultural development in Phongsaly district to place the project in a historical perspective. The methodology selected relies on the theory of differentiating agrarian systems (Dufumier 1995; Mazoyer and Roudart 1997), already applied in many regions of Laos\(^2\). The study dealt with 40 rural villages in the southwestern part of the district, where 1,850 families live (47% of the district’s population), for the most part from the Phunoy\(^3\) ethnic group, but also from the Akha ethnic group.

In each of the 40 villages, interviews with elderly farmers made it possible to reconstruct the historical evolution of the village in the demographic, technical, economic and social domains, while farm surveys made it possible to characterise current agricultural

---

\(^1\) Rural Development Project of Phongsaly District (Ducourtieux, Visonnavong \textit{et al.} 2004).

\(^2\) In particular in Phongsaly (Alexandre and Eberhardt 1998; Baudran 2000; Laffort and Jouanneau 1998), Xayabury (Laffort 1998; Pasquet 2002), Vientiane (Sackloham 2003; Sackloham and Degoul 1999), Luangprabang (Kousonsavath and Lematre, 1999) and on the Bolovens (Babin 1999; Ducourtieux, 1994; Grimeaud and Meaux, 1999; Pelliard, 1998).

\(^3\) 34 out of the 40 villages studied are Phunoy (89% of the study zone population), compared to five Ahka villages (9%) and one Laoseng village (2%).
practices and the differences between villages and families. That initial phase brought to light a dual zoning of the region: the situation of farm families and their practices differs depending on how far they are from Phongsaly, the region's administrative and economic capital. In the first zone, villages along the roadside or in the immediate vicinity of the city do substantial commercial trade with city dwellers and benefit from sustained attention from administrative services; that is the case for 16 out of 40 villages\(^4\). On the other hand, in the second zone, over a two-hour walk into forested land, trade with Phongsaly is progressively lower and public intervention is less forthcoming for the 24 villages concerned\(^5\) (Cf. figure 2).

To round out the study, one village per zone was selected for an in-depth economic interview with all families. The interview surveyed the family, farming practices and their results over the past five years, as well as other economic activities: gathering, fishing, hunting, handicrafts, trade, etc. The second phase has just been completed (Nov. 2003), with processing of the surveys conducted in the villages of Samlang (forest zone) and Yapong (roadside).

**Phongsaly District: a landlocked, mountainous forest Region**

The terrain throughout the whole district is hilly and uneven, culminating at 1,948 metres, with some twenty peaks over 1,500 metres high. The valleys, under 500 metres in altitude, are very steep-sided; their V-shapes limit the potential for agricultural hydraulic projects. The schist or sandstone substrates create fairly deep, acid, clayey or silty-clay soils, which are rather fertile but very heterogeneous (Zhou, Yao *et al.*, 1999).

---

\(^4\) 966 families, i.e. 52% of the study zone population and 25% of Phongsaly's rural population.

\(^5\) 890 families, i.e. 48% of the study zone population and 23% of Phongsaly's rural population.
The region, like all of the Lao PDR, is subject to a tropical climate marked by the monsoon system. Nevertheless, the altitude and latitude temper the tropical influences here, providing a cool dry season and a milder rainy season, during which on average 75% of the annual rainfall (1,560 mm) occurs. The very high inter-annual variability in rainfall (980-1,860 mm) strongly conditions how successful farming activities are.

The zone’s climax ecosystem is a tropical evergreen mountainous rain forest at altitudes over 800 m, and tropical rain forest at lower elevations. The very productive forests are characterised by their rarely equalled range of biodiversity, with over fifteen times more ligneous species than in a temperate forest (De Koninck 1997), and still widely unknown endemic vegetal or animal species (Chaze 1990a and 1990b).

**Phounoy shifting cultivation: Complex and coherent management of the environment and workforce**

This chapter describes the production system of the forest zone villages (Cf. figure 2). That system is a result of experience handed down from one generation of farmers to the next, and will serve as a reference. The technical and economic findings are from families in the village of Samlang over the past three years.

**A zoned agricultural production system**

In a traditional Lao village, agriculture production is usually based on three distinct zones: family gardens, in and around the village, the agroforest crown, around and slightly above the village, and the slash-and-burn zone, which constitutes the main part of the village land - planted fields and forest regrowth, or fallow land (Laffort and Jouanneau 1998):

- **Village gardens**: near the main dwelling families cultivate a small vegetable garden, with tubers and fruit trees, for household consumption. The village proper is also used for animal raising, with poultry that wander among the houses, looking for consumable waste and rice bran.

- **Agroforest crown**: the village, generally located near hilltops, is surrounded by an agroforest crown, which plays an essential role as a water reservoir. Trees from the remaining primary forest and plantations provide part of the village’s timber and firewood, as well as fruit. Free-range pigs raised there forage for their food, and are also given supplements gathered on the fallow land.

- **Slash-and-burn zone**: swidden farming occupies most of the village land, with a low proportion recently cleared and planted - 6% to 40% of the surface area depending on the length of the rotation - and the rest left fallow - 60% to 94% - in landscapes ranging from grassland to secondary forest, and including all possible forms of shrubby thickets.

**Slash-and-burn fields**

Following the clearing and burning of one strip of forest, the plots are planted for one year, sometimes two. In the first year, glutinous rice dominates, with many associated crops (maize, tubers and roots, cucurbits, cruciferae, peppers, sunflower and groundnut). In Samlang, all the work requires an average of 130 days of work per active worker, i.e.

---

6 Sources: Meteorology Department, Phongsaly Forest and Agriculture Service (2002).
320 days per family, for a production of 500-700 kg of paddy rice, 30 kg of maize, 130 kg of tubers and 420 kg of various vegetables per active worker. In the second possible crop year, rice is sown alone; the farmer simplifies his crop complex in order to preserve his priority crop, rice.

The bottleneck in this crop system is weeding, an activity requiring substantial manpower (75 days per active worker per year). It must be done according to a specific, restrictive schedule, or else weeds will put a strain on the yields of rice and associated crops. For example, weeding done too late lets the weeds sprout and spread their seeds, complicating the management of grass cover during subsequent weeding periods. In June, July and August, weeding monopolises the entire workforce.

After the second crop year, the plot is freed for forest regrowth, with a 13-year long fallow period. Those long periods allow for the reconstitution of dense secondary formations, a biomass source of fertility for the next slash-and-burn crop cycle (Ramakrishnan 1992). The fallow land is the pasture area for large cattle; cows are limited to grazing grassy fallow whereas water buffalo can graze year round on shrubby, tree-covered and grassy fallow.

Figure 3: Weeding of a slash-and-burn field in Phongsaly

Photo by O. Ducourtieux

7 Namely a yield in paddy rice of 1,310 kg/ha on average between 2000 and 2002 (minimum of 450 kg/ha and maximum of 3,550 kg/ha depending on the years and families, for a sample of 28 families), with 260 days of work/ha.

8 Seven to fifteen years for villages in the forest zone studied (Cf. figure 2).
Due to the low population density⁹, the bottleneck of farm production is the workforce. There are more potentially farmable areas than areas actually farmed. Weeding is the major constraint limiting work productivity, representing 60% of the annual labour by an active worker in swidden cultivation¹⁰. The maximum surface area farmable per active worker is approximately 0.8 ha; even if a family could clear more in January or sow more in April, limits are observed due to the labour overload of weeding in the middle of the rainy season, July - August.

The limits on production that are due to fertility problems are harder to assess. The direct comparison of rice yields in lowlands and swidden fields - 1.7 tonnes/ha in the Vientiane rainfed paddy fields (Sacklokham 2003) and 1.3 tonnes/ha in the Samlang swidden fields - is misleading, as it does not take into account the other crops associated with the swidden crop¹¹.

The importance of the fallow period to yield is itself the interaction of a large number of cumulative and synergetic factors, for which it is hard to isolate the respective contributions. Traditionally, fertility is presented as proportionate to the fallow period (Ramakrishnan 1992). While progressive build-up of biomass resulting from photosynthesis on the fallow land has been proven¹², yields are not directly proportionate to the fallow period (Foppes, Phongsavath et al. 1994; Roder et al. 1995; Van Keer 2003). In addition to the build-up of biomass for mineral fertility and soil structure, there is pest control. The density of harmful insects and

---

⁹ On average nine inhabitants/km² in Phongsaly district.

¹⁰ Namely 20-25% of the annual work of an active worker, all activities combined.

¹¹ Although it is not possible to add up the disparate quantities, the value of crops grown can be calculated: one hectare of wet paddy field produces an average of 2,550,000 Kip (US$ 245) of added value on the Vientiane plain, whereas a slash-and-burn field in Phongsaly reaches 3,320,000 Kip (US$ 320) of added value per hectare.

¹² After a three-year fallow period, the biomass is over 20 tonnes/ha, then 30 t/ha after 7 years, 70 t/ha after 10 years and 80 t/ha after 18 years (Van Keer 2003).
weeds in a slash-and-burn field rapidly decreases, the longer the fallow period lasts before clearing (Van Keer 2003). Furthermore, rapid rotations amplify erosion, limiting future productive potential (De Rouw, Baranger et al. 2002; Moa, Valentin et al. 2002).

Recent research conducted by Van Keer (2003) for an agronomic diagnosis of shifting cultivation systems in northern Thailand shows that soil fertility is not the factor limiting how the genetic potential of local cultivars is expressed. The author established that the constraints concerning yield are, in order of importance, the number of successive crop years, climatic hazards, the topographical position of the plot, weeds and predators (Van Keer 2003). In Laos, farmers draw up a comparable list (Roder, Phengchan et al. 1997), ranking weeds, rodents and inadequate rainfall at the top of constraints affecting their slash-and-burn crop. Samlang farmers rank drought - once every three years - as the main problem, followed by parasite attacks on roots, and rodents.

A crop is stopped after one or two years due to fertility and weeding problems. The increased workload required, beyond a family's potential, for countering the invasion by weeds and the drop in fertility contribute to reasons for abandoning a plot. Given current knowledge of the region's agriculture, it is not possible to systematically come to a conclusion about the preponderance of one factor in relation to another (George, Magbanua et al. 2002).

**Extensive animal raising**

Technically, the association of livestock and crops is limited in the Phongsaly farming system; however, livestock plays an important role in the family economy by strongly increasing work productivity and income, but especially as a saving and capitalisation process (Alexandre and Eberhardt 1998; Baudran 2000; Laffort 1997).

Water buffalo are raised on fallow land where they graze freely year round. In order to limit animal losses, regular regroupings and monitoring are organised at the village level. Raising of cows has been historically limited due to food restrictions: cows only graze on grass, whereas a water buffalo grazes indiscriminately on grassy and shrubby fallow. Nevertheless, an administration incentive policy and strong urban markets, in Vientiane and Bangkok, have favoured the emergence of cow raising in the easiest-to-reach villages.

Animal husbandry is of extensive character while vegetation resources are plentiful in these upland humid tropical zones. Food and genetics are not therefore factors limiting livestock development. On the other hand, the economics of animal raising are hazardous particularly because of excessive mortality problems. Smaller species are affected by recurrent epidemics, often devastating all the head in a village: Newcastle disease and cholera among poultry, swine fever (hog cholera) among pigs. For cow raising, there are fewer health problems, and the diseases present remain circumscribed and secondary. However, acciden-

---

13 The combination of climatic factors and topography expresses the sensitivity to drought, the main cause of a drop in yield in swidden cultivation (Van Keer 2003).

14 The main parasite identified by Van Keer (2003) is a root aphid (Tetraneura nigrigibabdominalis) and, secondarily, birds and rodents. The other pests only have an anecdotal impact in the farming environment (Van Keer 2003).

15 Weeds are only a secondary limiting factor of the yield for Van Keer (2003), due to their control by farmer weeding. If that control fails, weeds do indeed have a drastic effect on the crop, hence they are ranked as the number one constraint by farmers.
Cattle mortality is high. In Samlang, 60% of young cattle born between 2000 and 2003 died, with predators\textsuperscript{16} accounting for 75% of those losses.

**Very secure traditional family tenure**

In the southwestern part of the district, agricultural production is a nuclear family activity although clearing is regulated at the village level. Every year, the active workers slash a single strip on the village land. In that strip, each family farms its own plot, of which it is the owner: the field is always planted by the same farmer and the plot is inherited by the children. Each family owns a plot in each strip of the annual clearing.

With demographic growth, there is a trend towards splitting up plots from one generation to the next. Regulating this trend of lowering the surface area per active worker is complex, based on four successive mechanisms: loan of land between families, possible lengthening of crop period from one to two years, departure of part of the population, acceleration of rotations as a last resort (Laffort and Jouanneau 1998).

The inflexibility of this land system tends to slow down the decrease in the fallow period, a characteristic response to demographic growth in many other slash-and-burn farming systems (Dufumier 1996; Foppes, Phongsavath \textit{et al.} 1994). This management system favours the maintenance of fertility and satisfactory production levels, at the cost of expulsing a fraction of the village population, essentially the younger generation, towards other zones. The growth rate in the district was 1.9\% a year between 1985 and 1995, compared to nearly 2.6\% for the whole country (Sisouphanthong and Taillard 2000). This land tenure system, comparable to private property farmed by the owner, is unique in shifting forest agriculture. It confers high degree of land access security to each family, particularly in the long term. Farmers can plan on investing in their plots so as to increase productivity. With its social control, Phongsaly’s traditional land system allows farmers (Ducourtieux, Visonnavong \textit{et al.} 2004) to:

- **Invest in their land:** Despite limited water resources and rough topography, nearly 12\% of the families have developed terraced rice fields. The substantial and long-term investment of labour and capital required to achieve this is fairly unique for forest agriculture with a low population density. The farmers also grow market gardens and plantations of cash crops, such as cardamom or teak (in the valleys). Those investments demonstrate the trust the farmers have in their access to land. \textit{The traditional land system contributes to tenure security.}

- **Maintain long fallow periods:** For shifting cultivation, rotation varies from eight to sixteen years in villages where traditional land management endures. \textit{The traditional land system contributes to forest and soil protection, as well as biodiversity maintenance.}

- **Finance the development of other economic sectors through the transfer of capital from agriculture:** Even if the Phongsaly agrarian system seems fairly unproductive and poor, it exports manpower and capital to other regions and other activity sectors on a regular basis. \textit{The traditional land system contributes to the general economic development of Laos.}

\textsuperscript{16} These were mainly felids on cows and canids on water buffalo.
Adaptation to environmental variations and uncertainties

Like any agricultural activity, swidden farming in Phongsaly is not a practice that follows a set standard. On the contrary, each family is constantly adapting its actions based on the natural (climate) and socio-economic (manpower, tools, markets, consumer needs, etc.) environment. During the crop cycle farmers elaborate a unique technical itinerary, which differs from that used the previous year and from the other families’ methods (S billotte 1990).

Shifting cultivation has evolved as a function of the historical context. Cotton and tobacco have vanished from the fields at the end of the 1960s, when low-cost manufactured products from China arrived on the local market. Poppy has also progressively disappeared under the government’s pressure. On the other hand, some villages have developed maize or white rice farming as a raw material for the distillation and trade of alcoholic spirits in Phongsaly.

At the beginning of each year, farmers decide on the surface area to be cleared and sowed. Their decision is based on consideration of factors such as the surface area available based on the land system (in effect, the topography of the plot\textsuperscript{17}), the previous year’s harvest and perspectives of stock or shortages, how far away the new plot is from the village, its potential fertility - evaluated based on past crops during previous rotations and recent observations such as the soil texture or colour.

For example, the remoteness of a field is not an important factor for clearing or sowing, but does represent a certain constraint for gathering firewood and transporting the harvest. Furthermore, every hour spent walking during the rainy season is an hour’s lost weeding. Added to the marginal production gained by fallow periods over ten years (Van Keer 2003), the constraint of distance explains why villagers choose not to include in rotations the forest land that is within their domain but furthest away from the village.

\textsuperscript{17} A sloped, rocky plot located on a mountain top only offers a family low income prospects, whereas a fairly flat field located down below with deep soil is very hopeful. The family will be able to limit risk by multiplying plots in complementary conditions.
Out of the 24 forest villages in the study zone (Cf. figure 2), 20 have unofficial forest reserves.

After calculating the ideal dimensions, farmers elaborate the sowing plan, choosing the varieties and their distribution on the plot. Each of the 40 villages studied has a sample group of four to twenty varieties, enabling precise adaptation of the crop to the farmer’s strategy; the choice of varieties is based on the length of the cycle\(^{18}\), risk limitation by multiplying the number of cultivars, adaptation to the soil and altitude, crop technique\(^{19}\), rice required\(^{20}\), and so on. Biodiversity is wide, with nearly 550 sticky rice varieties identified for shifting cultivation in northern Laos (Roder, Keoboulapha et al. 1996) and Laos contributing nearly 50% of the germplasms in the IRRI’s rice germplasm bank (Douangsavanh, Bouahom et al. 2002).

On a plot, sowing is neither standardised nor random. The farmer decides how to do it based on his experience in using all the environment’s resources, on a very precise scale for each square metre. For example, the sowing density will depend on the slope, with tubers being planted preferably in large heaps of ashes, while maize does best in the wettest part. On a larger scale, this well thought-out choice of land use can be observed in the development of terraced rice fields in the scarce irrigable zones or in the use of shady, damp plots that are not too high in altitude for growing cardamom (Ducourtieux, Visonnavong et al. 2004).

After sowing, farmers decide how family labour is to be used. When the village clears several zones, in particular if there are two consecutive years of crops, each family first allocates its workforce to the plot considered potentially the most fertile. It is usually the plot cleared that same year, but the choice is not systematic: seed quantities vary every year and with each plot. Furthermore, the initial distribution of labour can evolve over the year, depending on the problems encountered. If a plot is substantially damaged, for example by

\(^{18}\)Particularly important for limiting the rice shortage period the year after a poor harvest.

\(^{19}\)Sowing in hills with a hoe or cast sowing.

\(^{20}\)Basic food, cakes for festivals, alcohol distillation, etc.
drought or rodents, the family will reduce the amount of work there and transfer labour to other plots to limit the risks of a drop in production. There are other rescue strategies, such as sowing a plot again if growth is deficient due to lack of rain in April-May, or, when problems arise too late, sowing sesame as a main crop to replace the rice.

Associated crops in a slash-and-burn field maximises work productivity and income per area but, above all, limits the risks for the farmer. Crop failure arising from a particular situation does not jeopardise the family’s survival if they can count on the farm’s other harvests and activities. Dynamic and evolving allocation of the workforce and diversification of activities are two aspects of the strategy used for limiting risks and maximising family income. Resources that are limited, such as workforce, or fragile, like soil, forest, water and biodiversity, are individually managed by each family so as to be integrated into a sustainable and synergistic strategy.

**Solid economic performance in a hard context**

The average family income in Samlang is over 15.6 million Kip (US$ 1,490) per year, including the market value (replacement value) of self-consumed produce. Monetary income, at 2.1 million Kip (US$ 200), is only 13% of the total income: the family’s farming system is focused on fulfilling its direct needs.

Families conduct many activities to reach that income. Swidden farming only ranks second, behind collecting (hunting, fishing, and gathering), which procures over 40% of the family income in forest villages (Cf. figure 6). This is in line with the country average (Douangsavanh, Bouahom et al. 2002; UNDP 2002).

The breakdown of income into multiple activities quantitatively expresses the farmer strategy of diversification to optimise the use of labour and maximise income while limiting risks. Furthermore, the wide range of products in a self-consumption economy contributes to the balance of family nutrition.

*In brief*, *shifting cultivation no longer appears to be an archaic and rudimentary practice but a complex economic activity managed by farmers who adapt to changing conditions. They optimise the use of resources with practices that are based on neither chance nor inflexible norm, but on the know-how and experience acquired from one generation to the next. This precise and detailed use of resources leads to a generally forested landscape, dotted with small areas of crops.*

**Eliminating shifting cultivation to protect the environment and eradicate poverty**

**Eradicating poverty has become a national cause in Lao PDR**

In 1986, the Lao Revolutionary Party (LRP) committed the country to a socialist market economy via the New Economic Mechanism policy. Private ownership of production means and free enterprise became new principles for prosperous development. In 1996, the 6th LRP Congress set the government aim of removing Laos from the list of ‘least-developed

---

21 This is no longer a crop for self-consumption; the sesame is marketed for buying rice.

22 i.e. US$ 0.7/day/person or 17,000 Kip/day/active worker (US$ 1.6).
countries’ by 2020. In 2001, the 7th Congress reinforced that position with quantified objectives and based the policy for eradicating poverty on three pillars: economic growth, socio-cultural development and environmental protection (GOL 2003).

The government is committed to reaching its goals by implementing the national programme for the eradication of poverty (NPEP), supported by a decentralisation policy. Rural development plays a central role in that policy. The NPEP promotes development based on community demand. Improving access to the poorest landlocked districts is also a priority (GOL 2003). The Ministry of Agriculture and Forestry is enacting a complementary programme in which the country’s development includes modern, permanent and intensive agriculture. It is charged with generating sufficient raw materials to supply the domestic and growing export markets, and for the emergence of a national agro-industrial fabric (MAF 1999).

Not all the country’s regions have the same potential to meet such intensification. Government policy differentiates between the productive lowlands, vectors of the country’s economic development, and the uplands, where environmental protection must prevail (MAF 1999). Although the economic role of the rice-growing plains in the Mekong Valley is undeniable, limiting the problematic upland issue to the single dimension of protecting nature is simplistic: slopes cover 80% of the country’s surface area and 250,000 families - nearly a third of the country’s total population - live there (MAF 1999). These rough figures convey the social and economic importance of upland agriculture in the Lao PDR.

Shifting cultivation: the source of all evil

During the 7th Congress in 2001, the LRP took up a twofold fight against poverty: elimination of opium production by 2005, and progressive phasing-out of shifting cultivation by 2010 (Lao PDR 2003).

Those strategic measures confirmed earlier positions, in which slash-and-burn agriculture was presented as outmoded and destructive by the colonial administration (Mellac and Rossi 1999), then by development institutions (UNDP 1995). In 1994, the government decided to eliminate shifting cultivation by the year 2000 (Keonuchan 2000); in 2000, the objective was postponed until 2020 (MAF 2000), before being brought back down to 2010 (GOL 2003). The policy of banning slash-and-burn agriculture falls into a historical and regional, logic: it can be observed in Thailand, Vietnam, Malaysia, China and Indonesia (Durand 1997; De Koninck 1998; Rossi 1998; Zaifu 1998; Mellac and Rossi 1999).

The goal of eliminating shifting cultivation is motivated by the reasoning that it is one of the main causes of rural poverty. Demographic growth in swidden agricultural regions tends to accelerate rotation and reduce forest areas, which leads to a reduction of income among the families involved while burdening the country’s future development through the destruction of natural resources. Furthermore, the poverty of families who practice

---

23 Reduce poverty by half by 2005 and eradicate it by 2010
24 Prime Minister Decree PM/01 dated March 11, 2000.
25 Prime Minister’s Decree 010/PM defines poverty as “the lack of ability to fulfil basic human needs such as not having enough food, lacking adequate clothing, not having permanent housing and lacking access to health, education and transportation services”. That same decree specifies the criteria for measuring poverty in households, villages and districts; 47 districts were acknowledged as priority targets out of the 72 villages identified as poor (GOL 2003).
Shifting cultivation drives them to grow opium, a source of addiction and therefore increased poverty (UNDCP 1999; GOL 2003). The vicious circle is complete and poverty is self-maintained (Dasgupta, Deichmann et al. 2003).

Based on this observation, the solution seems obvious: converting farmers who practice slash-and-burn to permanent crops or non-agricultural activities would make it possible to interrupt the process and therefore eliminate poverty (UNDP 2002). Is it that easy?

**Outside interventions are often counterproductive**

*State intervention based on accessibility to villages*

In Phongsaly, converting from shifting cultivation has been on the administration’s agenda since the end of the 1960s. From 1968 to 1969, over 400 families were displaced to the Boonneua and Boontai lowlands during the ‘paddy rice field movement’.

More recently, local authorities have implemented three programmes to apply the national policy:

1. Resettlement of forest mountain zone villages to the roadside.
3. Land allocation.

In Phongsaly District, eight villages (300 families) have been instructed to move since 1987. Five of them (200 families) were settled on an abrupt ridge along the road from Phongsaly to Boonneua. Seven other villages have been eliminated by the authorities since 1990; the 200 families concerned joined neighbouring villages along the roadside, or migrated to towns (Phongsaly, Oudomxay, Luangnamtha, and Vientiane).

At the same time as this restructuring, the DAFO introduced cash crops to replace swidden agriculture. Between 1996 and 1998, the first experience with sugar cane concerned four villages along the roadside and ended in failure for the 275 families, who were obliged to farm a minimal surface area per active worker (Ducourtieux 2000).

Since then, the tea crop has taken over. There are plans for the town of Phongsaly (1,100 families) and 14 rural villages (880 families) to plant 500 ha between now and 2005, at a minimum mandatory rate of 0.3 ha per active worker. In those villages, clearing is being progressively banned: the three rural villages closest to Phongsaly are not allowed to clear land for the next crop season (2003-2004), and the ban will be extended to seven more villages for the following season (2004-2005). In other villages, the mandatory tea crop is rounded out by fruit trees (three villages, 100 families) and by galanga (Zingiberaceae, 17 villages, 980 families). In the 40 villages studied, 45% of the families are involved in the tea programme, 13% in the galanga one and 5% in the fruit trees plan.

Since 1998, the local administrative services have been carrying out the land allocation programme, the central component of national land reform (Ducourtieux, Laffort et al. 2004). At the end of 2003, 22 rural villages had a new land use map in the district.

---

26 Due to a contractual ambiguity concerning the responsibility for transportation costs between Phongsaly and Mengla, China, it was not possible to find buyers for more than 3/4 of the crop in 1998.

27 19 villages out of the 40 in the study zone.
meaning 47% of their village domain has been placed under forest protection.

Due to lack of human resources, the Phongsaly DAFO focuses on land allocation and cash crop promotion only in easy-to-reach villages, along roads and tracks or on the Nam Ou river banks (Cf. figure 2). Villages in the forest zone are, for the time being, fairly unaffected by these programmes. Because of insufficient financial means, support to farmers for implementing the programmes is limited to very basic technical training and planning. Farmers are accumulating debts with the Agricultural Promotion Bank or private merchants in order to buy the mandatory crop seedlings that they have to plant.

**Drastically reduced economic performance in reconfigured villages**

To assess the recent changes in Phongsaly district agriculture, we compared the technical and economic performance over the past three years in two drastically different villages in the study zone.

Twenty-eight families were surveyed in the village of Samlang, an old and archetypal Phunoy village in the forest zone, with swidden cultivation fairly unaffected by recent

<table>
<thead>
<tr>
<th>Units</th>
<th>Yapong</th>
<th>Samlang</th>
<th>Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield&lt;sup&gt;28&lt;/sup&gt;</td>
<td>kg paddy rice /ha</td>
<td>602</td>
<td>1,308</td>
</tr>
<tr>
<td>Surface per active worker</td>
<td>ha/active worker</td>
<td>1.1</td>
<td>0.5</td>
</tr>
<tr>
<td>Herbicides</td>
<td>kg/tonne of rice produced</td>
<td>2.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Work Productivity</td>
<td>Kip/workday</td>
<td>6,300</td>
<td>14,000</td>
</tr>
<tr>
<td>Rice Deficit (gap)</td>
<td>month/year/family</td>
<td>3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

<sup>28</sup> First-year slash-and-burn field, 2000-2003 average for all the village families.
reforms. The results were compared with a survey of 48 families from Yapong, a Phounoy village on the roadside, six kilometres away from Phongsaly.

Like all the villages along that road, the Yapong families have been successively resettled (1996), grown sugar cane (1997-1998), participated in village land allocation (1999) and, since the year 2000, been developing tea plantations.

For the two villages, data collected during a two-hour interview with each of the families allowed us to model the various income components\(^{29}\) and relate them to the work supplied and the family structure (number of members and number of active workers).

**Public intervention reduces shifting cultivation performance**

Land allocation has had a direct impact on swidden cultivation in Yapong. Fifty-eight percent of the village land was classified as forest. As clearing is now forbidden in the forest reserves, these areas are taken out of rotation. The surface area of fallow land available for swidden cultivation has diminished, thereby inducing a quicker return to the fallow strip to be cleared each year. The fallow period dropped from ten to three years.

Yield is limited to 600 kg/ha of paddy rice on the plot cleared each year, compared to 1,300 kg/ha for the village of Samlang, in the forest zone. This represents a 54% reduction (Cf. figure 7).

In an attempt to maintain rice production, Yapong families developed a strategy of increasing surface areas within the limits of the land allocation, with two to three successive years of cultivation, compared to one year in Samlang.

To extend their farmed surface area, families have to face the crucial problem of weed control. Due to a lack of resources, farmers cannot devote more time to weeding: 78 days/year/active worker in Yapong compared to 75 days/year/active worker in Samlang. The Yapong families compensate for the saturation of the available workforce with new and massive use of herbicides: the consumption of weed-killer per tonne of rice produced

---

\(^{29}\) Swidden cultivation, rice fields, tea, gardens, cardamom for vegetal crops; water buffalo, cows, pigs, goats and poultry raising; hunting (snares, traps), fishing (nets, hoop nets, dams), gathering (bamboo sprouts, ‘peuak meua’ lines, mushrooms, banana tree flowers and trunks, firewood, etc.); crafts (alcohol distillation, basketry, weaving, dyeing, metalwork) and services (husking, video screenings, grocery trade, transport, firewood trade, etc.); possible double-activity (teachers and other civil servants, salaried farm or forest workers).
is 20 times higher in Yapong than in Samlang. The product, of Chinese origin, is poorly identified and used, and doubtlessly poses public health and environmental problems.

With rising work, a falling yield and production costs that are increasing, work productivity for roadside village farmers has dropped drastically. In Samlang a workday brings in the equivalent of 14,000 Kip, but in Yapong the figure is less than half this at 6,300 Kip per workday (Cf. figure 12).

Furthermore, the family workforce is a limited resource. Production per family is dropping, thus increasing shortage problems. Rice shortage is still rare in Samlang at an average of two weeks of shortage/family/year over the past three years, affecting 20% of families. It is however becoming the norm in Yapong, with three months of shortage per year on average, and 60% of families affected every year (Cf. figure 9). It should be noted that the National Poverty Assessment (NPA) states that poverty is closely correlated to food availability in terms of rice (CPC 2000; ADB 2001; UNDP 2002; Lao PDR 2003).
The drastic drop in the technical and economic performance of swidden cultivation, as caused by land allocation, is not intrinsically a problem. It could even be a method of urging farmers to convert to alternative crops which can provide income.

**Other activities also affected**

Unfortunately, the performance of other economic activities does not meet the needs of the families either. All the components of family income in Yapong are on average lower than those in Samlang (Cf. figure 10).

Income from livestock is decreasing substantially (-72%) due to decapitalisation: to buy rice, families sell their animals, including reproductive females. They can no longer capi-

![Figure 12: Comparison of work productivity for different rural activities](image1)

**Figure 12: Comparison of work productivity for different rural activities**

The drastic drop in the technical and economic performance of swidden cultivation, as caused by land allocation, is not intrinsically a problem. It could even be a method of urging farmers to convert to alternative crops which can provide income.

**Other activities also affected**

Unfortunately, the performance of other economic activities does not meet the needs of the families either. All the components of family income in Yapong are on average lower than those in Samlang (Cf. figure 10).

Income from livestock is decreasing substantially (-72%) due to decapitalisation: to buy rice, families sell their animals, including reproductive females. They can no longer capi-

![Figure 13: Comparison of total income per person](image2)

**Figure 13: Comparison of total income per person**
nalise in livestock. There were 110 head of cattle in Yapong in 1996, but only 85 left in 2003. Animal raising brings in less than one million kip per year to 73% of the Yapong families, whereas 80% of the Samlang families have a livestock income over a million kip per year (Cf. figure 11).

Tea, the cash crop promoted as an alternative to slash-and-burn, is characterised by low income - 515,000 Kip/family/year (US$ 50) - and substantial work - 70 days/active worker/year. As labour is the limiting factor for agriculture in the region, farmers give priority to products that optimise employment, or in other words, give high productivity. As tea farming in fact offers the lowest income level of all the farm activities (Cf. figure 12), it cannot be a credible alternative to swidden cultivation in reaching the political aim of poverty eradication.

The introduction of cash crops such as tea is based on the presupposition that it is possible for farmers to sell cash crops and that the monetary income procured will make it possible to buy rice instead of producing it in the family slash-and-burn fields (Ducourtieux, Visonnavong et al. 2004).

The family monetary income is on average 2.3 million Kip (US$ 215) in Yapong. It is slightly higher than in Samlang\(^{30}\) (+7%), but that difference only enables a family to buy 100 kg of rice\(^{31}\), less than 10% of its annual needs.

**Poverty is rapidly increasing**

The average annual total income for a Yapong family is 7.1 million Kip (US$ 680) compared to 15.6 million Kip (US$ 1,490) in Samlang, i.e. a 54% difference. Taking into account the difference in family size between the two villages\(^{32}\), the income gap is great: 1.7 million Kip (US$ 160) per person in Yapong compared to 3.1 million Kip (US$ 300) in Samlang. The average income in roadside villages is half that in forest villages (Cf. figure 13).

\(^{30}\) Average of 2.1 million Kip (US$ 200) per family and per year.

\(^{31}\) That is to say a third of the average yearly shortage in rice for a family in Yapong (Cf. figure 8).

\(^{32}\) 3.7 people per household in Yapong compared to 5.1 in Samlang.
This drop in income does not affect all the families. Although a large fraction of the population is impoverished (Cf. figure 14), a few families have taken advantage of the resettlement towards the road and Phongsaly to get involved in transport and trade\textsuperscript{33}. At the time of the move, those families had slightly more capital than the others - in particular, more animals - which enabled them to limit the effect of decapitalisation for buying rice, as well as invest in profitable services. This has led to increased socio-economic differentiation in the village.

**Discussion of findings and conclusion**

The comparison of the economic findings in the villages of Samlang and Yapong is striking. However, are these two villages representative of their respective zones, namely, on the one hand forest villages practising traditional shifting cultivation, and on the other, easy-to-reach villages involved in the local administration’s development programmes?

Survey work conducted in 40 villages over six months, including interviews with more than 200 families, made it possible to establish this zoning and establish Samlang as the reasoned choice for an archetypal forest village. For the easy-to-reach zone, the first village selected as a model could not be surveyed, as the farmers did not have time to accommodate us during the three-week period needed for interviews with all the families. As a result Yapong was selected, as it like the first choice, participates in all the activities developed by the DAFO and is therefore characteristic of the easy-to-reach zone. All the families in the village were surveyed.

Although the findings of the comparison are clear, there are many cumulative causes behind the situation. The effect of some factors, like land allocation for swidden cultivation, is easy to identify and quantify. For many farmer activities though, there may be multiple and combined causes for the differences between the villages. The villages are

\textsuperscript{33} Trade and transport of firewood and banana trunks between the village and Phongsaly, using moto-cultivators.
neighbours and are located in comparable natural environments: soil and climatic effects
do not explain the differences. However, the farming systems in the forest zone are not
permanently set, and the easy-to-reach zones are subject to pressures other than those
applied by the local administration. The relative and progressive opening up of the land-
locked region\textsuperscript{34}, the increase in both cross-border exchanges with China and Vietnam and
cooperation projects in the region, all also contribute to the varying evolution of farming
systems. For example, the number of animals per active worker is comparable in Samlang
and Yapong for both water buffalo and cows, but an active worker in Samlang raises three
times more pigs than an active worker in Yapong (Cf. figure 15). The existence in Samlang
of a credit scheme belonging to the microfinance network developed by the Phongsaly
District Rural Development Project (PDDP) explains that difference, given that pig raising
accounts for 77\% of the credit granted from the network funds\textsuperscript{35}.

Nevertheless, despite the wide range of differentiating factors, the sheer size of the gaps
points to the conclusion that the Phongsaly programmes are counterproductive. Instead of
contributing to the eradication of poverty, they drastically increase it. The aim set during the
7\textsuperscript{th} Lao Revolutionary Party Congress to cut poverty in half by 2005 (Lao PDR 2003) will not
be reached in Phongsaly; it is more likely that it will have doubled.

\textit{Rethinking public intervention to reach political aims}

The impoverishment of the farmer community observed in Phongsaly is not an iso-
lated phenomenon. Studies in other mountainous regions in northern Laos obtained simi-
lar findings in Luangprabang, Luangnamtha, Oudomxay (Keonuchan 2000) and Huaphan
(Aubertin 2003). The NPA\textsuperscript{36} conducted by the Planning and Cooperation Committee shows
that poverty in rural mountain zones is a contemporary phenomenon, widely triggered by
development programmes, with land allocation ranking first as a cause (CPC 2000). These
conclusions are reported in recent official publications by the government (GOL 2003) and
international development agencies (ADB 2001; UNDP 2002). Many development pro-
grammes conducted in the field are counterproductive to the main political goal of pov-
erty eradication.

The official statistics highlight this problem, without necessarily identifying and ana-
lysing it. As a result, the preliminary findings of the latest household consumer survey\textsuperscript{37}
announced an overall reduction in poverty in Laos - in 2003, 30\% of the population were
living under the poverty threshold compared to 39\% in 1998 and 45\% in 1993. However, it
also indicated that the increase in wealth is unequally distributed between the uplands
and lowlands, between rural and urban zones and between different groups of the popu-
lation; in some northern provinces, poverty has increased (GOL 2003).

To reach the goals set by the political authorities - cut poverty in half by 2005 and
eradicate it by 2010 - the reform of development programmes in upland regions is of
utmost urgency. That reform must be founded on the principle that the farmers are the
solution to and not the cause of the poverty problems; on that account, farmers should be
involved in choices concerning the direction to be taken and in the definition of develop-

\textsuperscript{34} Opening of the Phongsaly–Oudomxay road in 1996, opening of the Phongsaly–Vientiane air link in
2003, etc.

\textsuperscript{35} Source: Phongsaly District Rural Development Project (PDDP).

\textsuperscript{36} NPA: National Poverty Assessment, 2000.

\textsuperscript{37} Lao Expenditure and Consumption Survey III (LECS III), forthcoming.
ment actions, so that the programmes take into account their elaborate environmental management know-how. That experience, acquired over many generations, enables them to use natural resources sustainably, whereas underestimating that know-how generally has the opposite effect to what is desired.

In order to be effective and pertinent, public interventions must be rethought. Decentralisation entrusts the provinces and districts with new responsibilities. To reach the national policy goals, those services must be capable of defining development programmes with the farmers. They must be called on to rapidly become an active interface that can adapt public intervention to local conditions.

Author

Olivier Ducourtieux is a Doctoral candidate at the Paris-Grignon National Institute of Agronomics (INA P-G). His e-mail address is: olivier.ducourtieux@laposte.net.

Bibliography


Menzies, N. K. 2002. “Nice view up there: Discordant visions and unequal relations between the mountains and the lowlands.” in Mountain Mainland South East Asia conference III (MMSEA III), Lijiang. Yunnan (China), Yunnan Science and Technology Press.


Zaifu, X. 1998. *From shifting cultivation to agroforestry in the mountain areas of Yunnan tropics.* Ottawa, IDRC.

THE BALANCED APPROACH TO OPIUM ELIMINATION IN THE LAO PDR

Leik Boonwaat

Abstract

Laos is presently the third largest producer of illicit opium in the world. Committed to its obligation to national policies, as well as international conventions, the Government of the Lao PDR is committed to eliminating illicit opium poppy cultivation in the country and has set a target of doing this by 2006. Opium as part of the shifting cultivation system is largely grown by ethnic minorities in some of the most remote, poorest, and least accessible regions of northern Laos. The national programme strategy to eliminate opium balances three key components: alternative development, demand reduction and law enforcement. Elimination of opium poppy cultivation, shifting cultivation and poverty are ranked as national priorities. To achieve these, a complementary and synergistic development partnership must be formed.

Introduction

In the colonial era, opium monopolies were responsible for a major part of administrative revenues in Laos. After independence, poppy fields were used to fund various paramilitary activities. Cropping expanded until the border areas of Laos, Myanmar (Burma) and Thailand achieved notoriety as the ‘Golden Triangle’ in the early 1970s. In 2000, the Lao PDR was the third largest producer of illicit opium after Afghanistan and Myanmar. In 2001, after the Taliban banned opium poppy cultivation in Afghanistan, the Golden Triangle was responsible for producing some 76% of the world’s illicit opium and accounted for 83% of the total area under illicit poppy cultivation. In 2002, after the fall of the Taliban, Afghanistan regained its position as the number one producer of illicit opium followed by Myanmar and Laos (UNODC 2003b).

In 1949, China had an estimated 1.34 million ha of opium poppy and some 20 million addicts, but it had virtually eliminated both cultivation and addiction by 1952 (Zhou 1997). Major illicit opium producing countries in the east Asian region, such as Laos, Myanmar, Thailand and Vietnam, have enacted legislation against the production and consumption of illicit drugs and have policies and set goals for the elimination of production. During the United Nations General Assembly 20th special session in 1998, member countries agreed to work towards eliminating or significantly reducing cultivation of illicit drug crops, including opium poppy, by 2008. Committed to its obligation to national policies as well as international conventions, the Government of the Lao PDR (GoL) has set a target of eliminating illicit opium poppy cultivation in the country by 2006.

In Laos, opium is mostly produced by ethnic minorities as their main cash crop. The product is a way of life, providing cash to buy rice and other basic essentials, and also being used as a medicine. In the absence of health services it provides relief from aches and pain as well as respiratory ailments. It is also used for recreational and traditional ceremonial purposes, but in many cases frequent use leads to addiction. Laos has the second highest opiate consumption rate worldwide. Opium addiction is closely associ-
ated with household social and economic problems and increasing household and village poverty. High rates of addiction deprive highland communities of otherwise productive members.

Opium poppy - as part of the shifting cultivation upland farming system - is cultivated in some of the most remote, isolated and least accessible regions of northern Laos. These regions have some of the highest levels of poverty in the country, and in some areas may have sensitive conditions that could affect national security and stability. These upland mountainous areas lack the socio-economic and physical infrastructure that is a prerequisite for development. Many problems are associated with such areas: villages often have no roads and reaching them requires days of walking; there is a lack of access to health, education, and water; many ethnic group families have a poor understanding of the Lao language, while women especially have heavy workloads; families can be rice deficient for up to four months of the year and livestock also suffer from poor health and nutrition. Since 1997, Amphetamine Type Stimulants (ATS) abuse and trafficking have been posing new dangers to society in the Lao PDR.

To address this situation, there is a need to develop opportunities for income generation, credit and marketing. Efforts are required to strengthen local extension capability to develop and provide access to proven technologies that can improve household livelihood strategies. First of all though, there is a need to address the severe shortfalls in funding for interventions.

The National Drug Control Programme, launched in 1994, calls for a gradual balanced approach to eliminating opium poppy cultivation with an emphasis on Alternative Development (AD). The National Programme Strategy “The Balanced Approach to Opium Elimination in the Lao PDR” was prepared in 1999 in response to an agreement between the GoL and UNODC to eliminate opium in six years through an accelerated rural development programme in major opium producing districts (UNODC 2000). The GoL and UNODC-supported Palaveck project, which commenced in 1989, demonstrated that strong supportive clan leadership and successful community participation in AD interventions can reduce opium without need for punitive measures or forced eradication. This led to further assistance, including the Nonghed AD project, which was able to reduce opium from 332 ha in 1999 to 26.7 ha in 2002. In 2003 UNODC supported four alternative development projects in Boonnuea, Nhot ou and Phongsaly districts of Phongsaly Province, Nonghed district in Xiengkhuang Province, Xamneua district in Huaphanh Province and Long district in Luangnamtha Province. The national programme strategy is to eliminate the causes of opium production and balances three key components: alternative development, demand reduction and law enforcement. Alternative development is to replace the socio-economic incentive behind opium production, demand reduction is to eliminate the opium need of addicts, and law enforcement is to stop trafficking to internal and external markets.

In 1998 some 26,837 hectares was under opium poppy cultivation in the Lao PDR. By 2003, mostly due to the committed efforts of the GoL, opium poppy cultivation had been reduced to 11,973 hectares and the government reported that of this, only 7,847 hectares was actually harvested. This represents a reduction of some 70% in six years, which is very commendable. However it is important to ensure that opium elimination efforts do not outpace the provision of sufficient alternative development and demand reduction interventions to all needy areas.
The United Nations General Assembly Special Session (UNGASS) on the World Drug Problem in 1998 defined AD as "a process to prevent and eliminate the illicit cultivation of drug crops through rural development measures in the context of sustained national economic development in countries taking action against drugs, recognizing the particular socio-cultural characteristics of the target communities and groups". The International Conference on “The Role of Alternative Development (AD) in Drug Control and Development Cooperation”, held at Feldafing in Germany during 2002, states in its final declaration that, "as regards a balanced approach between AD and law enforcement, AD should neither be made conditional to a prior elimination of drug crops nor should a reduction be enforced until licit components of livelihood strategies have been sufficiently strengthened”. In the Lao context, AD is evolving to mean providing long-term support to sustaining the elimination of opium. The annual national opium poppy cultivation survey of 2003 estimates that the average opium farmer earned 46%, or US$ 92, of his/her annual income (about US$ 205) from opium poppy cultivation (UNODC 2003). This is roughly equivalent to the income that could be generated from the sale of a cow or a small buffalo, one tonne of rice, a couple of pigs, five goats, fifty chickens or two pieces of woven silk (Boonwaat 2003).

**Lessons learned**

Considering the diverse and complex socio-economic, cultural and environmental conditions found in upland opium growing areas, there is no ‘one solution fits all’ approach to AD. Alternative Development project strategies have evolved to include a matrix of approaches and an integrated mix of interventions based on a holistic vision of development, including community strengthening, use of appropriate technology, income generation, financial services, socio-economic and physical infrastructure, natural resource management, and good governance.

The matrix of interactions between government policy, science and technology, investment and finance must be understood and used in an integrated manner to augment what locals already do well and the assets to which they have access. Thus, it is important to work both through livelihood systems at the micro level and through the policies that affect them at the macro level.

Regarding indicators, one has to consider the concept of sustainable human development, outlining a process of enlarging people’s choices. The most critical of these are: to lead a healthy life, to be educated, and to enjoy a decent standard of living with freedom, self respect and respect of others.

National poverty indicators for poor villages include those related to lack of access to education, health, safe water and access roads - conditions common in most opium poppy cultivating villages. Of the 47 poorest districts identified under the National Poverty Eradication Programme, more than two-thirds (32) grow opium poppy. Of the 72 poor districts, 45 grow opium poppy. Of the ten priority districts, seven grow opium poppy. Huaphanh province had the highest absolute number of poor villages and the highest opium production in 2003 and Phongsaly province had the highest percentage of poor villages and the third highest opium production (Committee for Planning and Cooperation 2003). As such the criteria for success of opium elimination should include indicators not only for opium elimination but also for poverty reduction, as well as for those related to sustainable human development.
Lessons learned from AD projects show that interventions which are identified, planned, implemented and monitored utilising a community-based, participatory approach have a higher rate of community ownership, success and sustainability. These should build on community strengths and assets (Boonwaat 2003).

In the Lao context it is crucial to balance all three components of the balanced approach. When eliminating opium it is especially important that the provision of alternative development is geared with the treatment and rehabilitation of opium addicts and the enforcement of community laws and rules.

Experience and lessons from other illicit crop producing countries have shown the crucial need for special alternative development programmes targeting remote isolated opium producing areas. These special development programmes are provided until these areas have reached a certain level of development, before they can be reintegrated into the normal national socio-economic development planning processes.

Gender mainstreaming is an important part of the village participatory approach of AD projects. Women, as the mainstay of their households, do the majority of household work and generate up to 80% of household cash income by working in the fields, especially in the labour-intensive aspects of opium production. Most highland ethnic groups, however, award women little status or opportunity. The education of girls is given low priority and the decision-making role of women outside the household is severely limited. As part of the UN system, UNODC is required to promote gender mainstreaming under its mandated function as the coordinator and centre of expertise in drug control (Bazalgette et al. 2000).

Lessons learned include the benefits of setting up and working with activity interest groups, rather than focusing on individual households: promoting the use of group extension and training methods ensures women's participation. It was found that women might feel shy at an individual level, with predominantly male project staff, but have no problem in working together as a group (Boonwaat 2003). Another important lesson involves the need to mobilise and involve the masses in drug control and prevention. Six districts were declared opium free in 2003, including Beng District in Oudomxay Province. UNODC operated an AD project in this district from 1999-2001 and it was found that upland farmers' coping strategies to counter the loss of opium income included increasing rice and maize production, and using their project-learned skills for disease prevention and livestock husbandry to increase pig production. The pigs were then sold to traders that visited the villages using newly constructed access roads. Farmers reported that the income received was comparable with that received from opium (Boonwaat et al. 2003).

Extension approaches have evolved to include a flexible combination that includes study and dialogue to create awareness and interest, followed by participatory strengths and assets assessment, and building on indigenous skills and knowledge to improve household livelihood strategies. Identification, planning and implementation of interventions are carried out by Village Development Committees, with the formation of activity interest groups. Training is provided through the intensification of appropriate technical support which leads to action utilising community-selected pilot families within the same activity groups. Participatory monitoring and evaluation of lessons learned is carried out at all stages and followed by networking and expansion of best practices. Consolidation of activity groups is carried out to manage supply inputs and sales, thereby ensuring continued development of technology and exchange.
Various appropriate approaches and technologies have been developed to improve socio-economic infrastructure. These include community construction of access roads, educational and health facilities, village water supply etc. An important lesson learned is to ensure community contribution to and ownership of the various schemes. More success is achieved by improving existing livelihoods rather than introducing new ones. Appropriate technologies have been developed to improve income and this work needs to be continued. An example is adding value through agro-processing: the difference in price between coffee beans and a finished cup of coffee ranges from US$ 2 for a kilo of green beans, to US$ 10 for roasted beans, to US$ 20 for roasted retail beans, to US$ 100 for a cup of prepared coffee (Diskul 2003). The global coffee industry is estimated at some US$ 65 billion of which only US$ 6 billion, goes to farmers.

The importance of a market-driven approach instead of a product-driven one is a lesson sometimes learned the hard way. Some projects have promoted trials to produce crops and commodities and only then started to look for markets, rather than conducting market studies first and involving the private sector in efforts to increase village income opportunities.

AD projects have tried to introduce and provide access to micro-credit, some with more success than others. Village revolving funds that are managed by the community and are not cash based, but have interest paid back in kind, have been more successful in remote areas. These includes village rice banks and livestock banks.

**Conclusion**

Opium poppy cultivation has been reduced significantly in the Lao PDR during the last six years. It is important to ensure that indicators for success in eliminating opium include not only reductions in area cultivated, but also relate to ensuring food security and improvements to sustainable livelihoods and sustainable human development. The issues related to opium, stabilisation of shifting cultivation and poverty elimination must be addressed together. This requires a long-term approach that should continue even after most farmers have stopped opium poppy cultivation.

It is estimated that some 70,000 households have cultivated opium poppy in the Lao PDR. Women are the mainstay of these households. Although women do most of the work involved in producing opium, it is usually men who control the proceeds. Given a choice, nearly all women would give up opium cultivation voluntarily. This makes them key players in the success of opium elimination and emphasises the need for gender mainstreaming.

Elimination of opium poppy cultivation, shifting cultivation and poverty are ranked as national policy priorities for the Government of the Lao PDR. To eliminate opium, issues related to poverty reduction as well as stabilisation of shifting cultivation must be addressed, as they are synonymous in the opium poppy growing areas. To achieve this a complementary and synergistic development partnership must be formed between all relevant parties.

UNODC's operational priority is to identify and promote best practices for expansion and replication on a national scale, with the aim of mainstreaming drug control issues into national development priorities, policies, strategies and programmes. These include the National Poverty Reduction Programme, which is targeting the 47 poorest districts.
with ten priority districts, the National Stabilisation of Shifting Cultivation Programme, the Forest and Land Allocation Programme and the policy for decentralisation.

There is no one-step answer. A variety of economic options and programmes should be promoted, some of which will work better than others. To achieve success will take time, commitment and money and will require a long-term approach that focuses on building up local capacity, based on self help, and is aimed at the sustained elimination of opium production and consumption.

**Author**

Leik Boonwaat is the Alternative Development Adviser at the Programme Facilitation Unit of the United Nations Office for Drugs and Crime and the Lao National Commission for Drug Control and Supervision. P.O. Box 6559, Km 3, Thadeua Road, Vientiane. Lao PDR. E-mail: leik.boonwaat@unodc.org

**Bibliography**


**Implementation of the Land Allocation Policy in the Lao PDR: Origins, Problems, Adjustments and Local Alternatives.**

Bernard Moizo

**Abstract**

This paper briefly outlines the origins and contents of land tenure reforms in Southeast Asia before turning to the Lao land titling programme and examining its origins, development, main goals and objectives. The implementation process of the land titling programme contains various pitfalls, as pointed out in several national reports on the issue. The paper details major local problems encountered since the programme began and proposes some possible adjustments to improve livelihoods, understanding of local perceptions of space, and use of natural resources. The second part of the paper draws from examples in several villages in the Luangprabang area where farmers have developed alternatives directly or indirectly prompted by the land allocation policy. The main conclusion is that the strong relationships which previously existed between swidden farmers and their land (including sacred preserved forest) are now directly threatened by the way this policy is currently being implemented. The result is a further and deeper environmental and social crisis that needs to be addressed urgently.

**Introduction**

In Southeast Asia, agriculture remains a crucial sector in the majority of countries. There are several countries where over 80% of the population is rural, such as Cambodia, Laos and Vietnam. Overall, nearly 70% of Southeast Asia's workforce still depends on agriculture as a main source of income. When focusing on challenging issues such as reducing and eliminating poverty, it must be kept in mind that the majority of the region's poor still live and work in rural areas. In some of these countries, however, considerable tracts of potentially productive land are now included in protected forests and natural reserves. Consequently, access to land is becoming an issue of conflict. More importantly, land distribution is highly unequal across the entire region.

Over the past 20 years, land reforms have proved central to the Southeast Asian growth experience. While land reforms were vital to the experience of rapid growth in some countries, the failure to readjust land systems in later years has proved to be extremely problematic. Recent land reforms have been more difficult to implement since they often necessitate the adaptation of property rights, which are at the institutional core of a state. Each part of land reform legislation has to some extent legitimised active state intervention in shaping, challenging and transforming property rights inherited from the past (Putzel 2000).

The purpose and aims of land reform differs from one country to another according to the extent of landlessness, the importance of agriculture and rural livelihoods as a source of employment and income, densities of the rural population and so on. It has been observed in many countries that most land reforms seek to detach land rights from their
social context, separating rights and duties associated with land from the political and social status of land holders (Aubertin 2003). But if land reforms and allocation are badly needed in urban and upland areas they have so far met with unequal success and have triggered resistance from farmers (Sikor 2002).

In the past, land reforms were pursued by governments in Asia because of the driving force of people's organisations, working on the ground with the potential beneficiaries of reform to pursue the beneficiaries' rights and improve their livelihoods (Putzel 2000). Still, mapping land ownership is a formidable task and can not be accomplished without a serious commitment from government agencies at the central and local levels, together with appropriate skills acquired through training and financial support. Newly implemented land reforms are not only needed by rural people, who are often supportive of such reforms, but could also be beneficial to the country economy, as pointed out by Putzel.

The new land legislation throughout the Mekong region also entitled the state to collect taxes on allocated land. Often, land allocation is described as the vehicle for establishing state territorial control over lesser-controlled areas within the national territory (Vandergeest and Peluso 1995). Recent land reforms in Southeast Asia can be summed up as follows: they are a direct outcome of development policies and they seek to reorganise space in the uplands (with forests reserves for conservation or logging) as opposed to in the lowlands (which are dedicated to the development of stabilised agriculture); initially most of these laws are implemented to regulate shifting cultivation and to protect forested areas.

In the Lao PDR, despite new forestry and land laws, foreign aid and resettlement policies, forest today covers between 36 and 38% of the country, as compared to the 1997 figure of 42% - though even that figure was challenged by some researchers as being optimistic (Aubertin 2002). The point is that the deforestation process still goes on. In the meantime farmers are confronted with land shortage and a severe deterioration of livelihoods (Ducourtieux 2004). However, as stated in a UNDP report, “in national percentage terms, the Lao PDR remains one of the most heavily forested countries of Asia and one of the region’s richest countries in terms of biodiversity” (UNDP 2001).

After initial unconditional support for land reforms, international bodies such as the World Bank have largely revised their views. Now, land tenure reforms are considered to have an inherent potential for displacement, which can even be caused by development activities that are actually trying to oppose causes of displacement. Such activities include improvement of access to land for poor farmers, and ways of facilitating security of tenure and productive investments through clarification of property rights (World Bank 2001).

It is now internationally acknowledged and scientifically well documented that swidden agriculture is suitable if long fallow periods are associated with rotational cycles. Moreover, despite various pressures, swidden farmers throughout Southeast Asia have over the years developed efficient and sophisticated ways of preserving forested areas (Poffenberger 1990; Moizo 1994). All types of swidden agriculture are characterised by the particular practices of the ethnic groups using them. This is equally true in Laos and in neighbouring countries like Thailand (Kundstater et al. 1978; McKinnon & Bhrusasri 1986). Though they have low environmental impact and have proved to be sustainable in many countries, pioneer systems such as those practised by the Hmong became the main target, first of former development policies and then of land reforms.
Swidden agriculture is a very complex and extremely well articulated system that relies on strong social cohesiveness, in-depth knowledge of territorial resources, and strong complementariness between various ethnic groups. Relationships between ethnic groups are largely dependent upon a specific relation to the land and upon management of resources in response to growing pressures upon land tenure. In the Lao PDR, for example, the social relationship to the land is interwoven within inter-ethnic relationships and exchanges (Evrard 2002). In the past they were very few conflicts over land and territorial issues since the system was quite flexible.

There was a tendency throughout the 1980s to associate shifting cultivation not only with environmental degradation, but also with poverty. It is now widely acknowledged though that when it is conducted appropriately, swidden farming provides farmers with sufficient yield and an appropriate and diversified diet: “Although it is true that the majority of the poor in Laos are swidden cultivators, this should not be construed to imply that swidden causes poverty... It is also necessary to distinguish between the two types of swidden: rotational and pioneering. Traditionally, only the latter type has been responsible for environmental degradation” (ABD 2001).

Livelihood systems in Laos can be summed up by Chamberlain’s definition (ABD 2001), which describes a very complex and intimately related set of various elements: 1) cultural beliefs (rituals, ceremonies, and myths); 2) land (territory, arable land, forests and sacred spots); 3) rice cultivation (dry rice and paddy fields); 4) livestock, (cows, buffalo); 5) corn, tubers and vegetables crops (usually grown in both upland fields and home gardens); 6) natural resources (fish, wildlife and other forest products). All these elements are organised into a continuum of activities and production based on a fragile but nonetheless operational balance between human groups and their territories (ABD, ibid).

The Lao land titling programme

The Lao land titling programme was developed in the mid 1990s. It was modelled on the Thai programme and on a similar project in Vietnam, and was supported and implemented by and through the World Bank. Initially only urban and peri-urban areas were targeted but the final objective, through the Land and Forest Allocation Programme (LFAP), is to cover the entire country. It is based on ideas and results after empirical research conducted in Thailand, said to have demonstrated that “secure and clear land rights will induce cultivators to make productive investments in their lands” (World Bank 2001). However, as pointed out by Vandergeest, other interpretations came out of the same research showing that land reforms and titling had no effects on increasing productivity and or food security (Vandergeest 2003) and were sometimes directly connected to impoverishment of rural farmers. Examples of similar effects in Phongsaly and other remote provinces of the Lao PDR have been suggested by Chamberlain (ABD 2001) and Rigg (2001).

The Land Law was initially implemented in 1997 to provide a primary legal basis for the LFAP. The major objectives were: 1) to promote sustainable management and use of natural resources; 2) to prompt reduction and gradual elimination of shifting cultivation; 3) to enhance the promotion of commercial production (ADB 2001). In 2001, as a result of the shifting goals of the World Bank, a new approach was selected to incorporate improving food security and ideas such as customary land tenure and inheritance in the allocation programme (Vandergeest 2003). The change in direction encompassed some innovative
steps such as using property and common property rights to achieve the new objectives. Unfortunately, for various reasons this shift was not as beneficial as expected for local communities.

The goals and objectives of the LFAP were numerous and stated in many government and foreign agency reports. In short, the LFAP was originally meant to prevent illegal logging by giving ownership of forest land and resources to villages through a process of participatory land use planning. The government’s intention was good and seemed to be a useful step towards the decentralisation process and the long-term management of resources in the Lao PDR. However, the programme was run in association with specific development goals aimed at eradicating shifting cultivation, and was combined with the rural development ‘focal site’ approach of bringing villages nearer to services (relocation and village consolidation). As a result the initial objectives were rapidly diluted into something far less beneficial to the local communities.

Unfortunately the concept of permanent agriculture was based on lowland notions and uses of space. Paddy cultivation, gardens, orchards and plantations were acknowledged as the only land uses that deserve titling (Lao Consulting Group 2002). Swidden techniques, foraging activities, hunting and gathering and cattle grazing were either underestimated or simply ignored. This is crucial to bear in mind since “the Land-Allocation Programme issues temporary land use certificates (TLUC) to upland farms only if they meet the ‘permanent’ criteria of land uses” (ADB 2001). In other words, upland swidden farmers had no choice but to comply with the reforms and change their entire livelihood system if they wished to be granted TLUCs.

At the beginning there was nothing wrong really with the land allocation policy nor with its goals, but implementation at the district levels caused numerous disjunctures with the process. These need to be identified and rectified in order to avoid non-reversible side effects from both environmental and social perspectives.

**The process and overall pitfalls**

It is reasonable to question how a programme that is apparently people and community oriented, with strong participation, can have such negative side effects. Often, with new land reforms or agricultural policies, the initial ideas are rather good but the implementation process is very poor (Putzel 2000). This is precisely the case with land and forest allocation in the Lao PDR. The focal site strategy had all the ingredients to be successful: it advocated a decentralised, very participatory, area-based development and aimed to promote the empowerment of local communities. But as pointed out in many reports, success was rarely achieved and pitfalls were numerous. One quotation says it all:

"However, repeated evidence indicates that as currently practised, land allocation may aggravate poverty" (UNDP 2001).

The main criticisms of land titling can be outlined as follows: with poor implementation, such a policy may lead to loss of local control of land, generate growing class inequalities (in many instances small farmers were forced to sell), and prompt displacements (Evrard, 2002). It has been pointed out that non-uniform practices by district and provincial agriculture officials during the implementation process led to lowlanders taking advantages of the system. Some upland areas were cleared just so lowland people could title
to them. Meanwhile, in order to grow enough rice, many villagers were forced to travel to remote areas or old village sites to practice swidden farming in old abandoned fallows or forested areas that remained unnoticed by or inaccessible to officials. Such poor implementation was not in accord with policy objectives and has induced severe hardship for the affected swidden farmers. For example, fallow periods were reduced to three or four years at the best, leading to insufficient rejuvenation of soils and a lack of biomass for forest regeneration. Various social, technical and natural factors combined, and overall it has been recorded that in most of the cases yields fell by 50% (ADB 2001).

The most negative effects were the creation of a new land sale market (Aubertin 2002), and the ways in which the reforms redefined the meaning and control of space, sometimes forcing local people to be displaced.

“The displacement impacts of the new land tenure reform policies are largely due to the way in which the policies reinforce this reorganisation of space” (Vandergeest 2003).

There was great confusion among farmers, for example regarding the various types of forest under the newly applied classifications (see Aubertin 2002 & 2003 for details). Their former classification of space came into direct conflict with the new definitions of the land reforms and this generated mutual discontent.

It is true that land titling brings some clarification and protection of individual property rights within bounded mapped space through cadastral mapping, but so far there is still no provision for protection of common property resources outside boundaries. Thus inter-village conflict over access to resources may arise or re-emerge, especially for highly valued NTFPs or significant and symbolic spots.

In many ways the land reform is a programme that incorporates various grassroots developments and community-based management ideas through improved tenure security and formal recognition of village forests. However, most case studies conducted so far have shown that it has led to displacement and impoverishment to a degree far beyond what could be expected from simple conflicting claims over resources and land (Thomas 2003; Ducourtieux 2004; Romagny 2004; Jones 2004; Alton 2004). Overall, it has been observed that the programme has induced substantial loss of available arable land and access to resources and has generated significant out-migration movements (Goudineau 1997). Very often, the demarcation of village boundaries during the zoning phase was either hurried or not achieved through mutual consent. Thus, former conflicts over resources were not solved but often reactivated and sometimes amplified (Chaze 1999).

Several government reports from various ministries indicated real concerns over the direct and side effects of the LFAP. For example the State Planning Committee (2000) singled out the shortening of fallow periods, resulting in soil depletion and decreased rice yields for same labour inputs, as the main outcome of the land allocation programme. As a result, “For many ethnic minorities then, the land and forest allocation process provided them not with tenure security but with new insecurities as their agricultural practices were rendered illegal” (Vandergeest 2003).
Major local problems

The implementation of the land reform associated with forest zoning led to a change in the territorial perception of most villagers. Their new perception is of two mutually exclusive categories of space - where swidden is authorised and where it is not. According to their former space classification and beliefs, if swidden is not permitted on an area, then to them it is not forest, and consequently it does not require any specific protection from the community since it no longer belongs to them. It is similar with conservation campaigns that ban hunting activities: they are well perceived locally only if they have direct effects on increasing wildlife resources for future hunting purposes. According to farmers, forests are defined according to their uses: wood and timber stock, reserve of future arable land, protection of spring for paddy field, wildlife reserve, and sacred or ceremonial purposes. If decision-makers want to encourage communities to take forest preservation into their own hands, these traditional uses of forests lands cannot be just ignored, as has been the case so far.

Numerous conflicts between traditional land tenure and government land law have arisen as a direct result of changes in village territory perception, especially regarding rattan gardens, cardamom, benzoin, and grazing lands (Aubertin 2000). One of the new law's objectives is forest conservation, but in fact the forest is currently under growing threats: opening of new swidden fields is common, sales of land are recorded in many provinces, illegal logging is still flourishing, and shortage of arable lands is generating food insecurity and forcing people to rely more on forest products for their survival. Overall it can be said that so far the policy is a political failure, since deforestation is still increasing as a result of a direct confrontation between perceptions and uses. There are many potential benefits to land reform, but pitfalls have occurred almost everywhere it was implemented, with dramatic consequences for people and environment alike.

In the delimitation process of village territories, the local dynamics of resource management and use were not taken into account. The new village definition of territory is rather different from the former: management of forest and land for conservation has created a weakness in conservation purposes both institutionally and organisationally, especially in new migrant areas where forest management was not efficient or community controlled (Fujita 2003). In many provinces, new waves of migrants have been recorded subsequent to either village relocation or the implementation of land reform (Évrard 2004; Romagny & Daviau 2003; Jones 2004).

Adequate 'permanent' livelihood substitutes have not been successful because many families were given unsuitable paddy land (poor soil or lack of water) and there was a lack of technical support. This failure to develop upland permanent cropping or paddy fields has resulted in further deforestation and increased cases of encroachment, and some cases of people fleeing the areas (ADB 2001). The increased deterioration and degeneration of forest resources and wildlife is a direct result of rice shortage, to the point that some species and NTFPs have been eliminated through over harvesting (Foppes 2000). In some areas, NTFP harvest grew to represent 40 to 60% of household income, rising up to 80% at certain times of the year (UNDP 2001).

For the villagers there is a direct equation between land allocation and poverty since the former is accompanied by ecological changes, together with epidemics of pests, and results in the latter. Land allocation has emerged as the main cause of poverty in Phongsaly province and in remote districts of neighbouring provinces. “In general villagers in the
study felt that land allocation is unfair, and it thus emerges from the analysis as one of the main causes of poverty” (ADB 2001).

The land reform has also generated inequalities in land repartition and allocation. As the head of one surveyed village expressed:

“After the land allocation was carried out, we began to be short of rice to eat. If they allocated us some of the paddy given to the Hmong that would have been better, because they have more than they need” (Kw n villager in Bokeo, quoted in ADB, ibid).

The majority of poor villages trace their plight to a result of combined and sometimes directly related elements (relocation + land allocation + pests + natural disaster). Villagers claim that prior to land reform, their rice yields and agricultural production were sufficient. At that time, costs for health, education, and consumer goods were either low or non existent, but now farmers find themselves facing lower yields and higher needs. “To make up for rice deficiencies and to cover the costs of new costs, poor villages are more and more having to exploit new means of supplementing livelihoods” (ADB 2001).

There is a willingness to find alternative policies but examples are few. For example, the Lao Swedish Programme on Forestry challenged the way that reform was implemented but the adjustments and new goals it made were still aimed at the stabilisation of swidden and the separation of zones between agricultural and forest areas (Leuangkhamma, Sysomvang & Jones 2001). Policies are loosened when required to by people pressure, but are not intrinsically adjusted as they should be. There are also examples of local adjustment, such as relaxing enforcement of swidden restrictions by local authorities if there is sufficient land for rotation systems to be maintained.

Another field in which this reform has caused drastic changes is gender issues. The impacts of poverty and land allocation are more severe on women. Their workload has increased while the fruits of their labours are declining. Land problems rank high among the processes alienating and marginalising Lao women in the uplands and lowlands alike (ADB 2001). For example, with limitations on swidden rotations and the associated soil depletion, fallows consist mainly of grass, and cutting grass is traditionally women’s work. As a result, women must work longer and harder at clearing fallows for lesser yields. They also need to engage in further activities such as raising small livestock to compensate for the lower incomes that result from reduced yields. Here again they work harder, since they have to deal with more animal diseases. Of course, this comes on the top of their daily activities within the households and outside the villages. Girls are getting involved in various activities at younger and younger ages. This has an impact on their education, with most of them not attending school at all. Moreover, land allocation often neglects or ignores the importance of women in access to land as well as their role in the land tenure and inheritance process.

Coping strategies

As always when facing a new situation created by outside forces, either from natural disasters or the interference of other people upon their livelihoods, farmers in the Lao PDR have come up with various coping strategies as a direct answer to the implementation of the land reforms and its immediate aftermath. These strategies are treated in detail in several reports (ADB 2001; Evrard 2004; Jones 2004; Lao Consulting Group 2002;
Thomas 2003; UNDP 2001) and are listed below, followed by a case study from Luangprabang province.

These strategies vary depending upon the location, local opportunities, periods of the year, significance of change, and ethnic group. They can be placed in the following categories, which are not mutually exclusive: increased reliance on natural resources, either for auto consumption or sales; labour for rice and wages either within the village or outside; sale of produce, livestock and handicrafts; borrowing rice; sale and exchange of NTFPs; forest food resource; sale and exchange of poultry and pigs; cutting trees for timber (sale); changing eating habits; migrations. These strategies are often conducted on an individual basis and with short-term objectives. They are very damaging, both socially and environmentally, but are employed because they are badly needed and unavoidable. The immediate causes and impacts of these strategies must be listed and analysed before the situation deteriorates further and slips out of control.

**Situation in Lak Sip (Luangprabang Province)**

Lak Sip village is located on the main road to Vientiane, 10 km outside Luangprabang town. It is a predominantly Khmou village, whose inhabitants came originally from several villages in the area and beyond and were grouped here gradually over time. For more than 15 years it has been a pilot site for several development projects and is currently one of the sites for an MSEC multi-disciplinary research programme involving IRD and NAFRI researchers.

While Lak Sip village has not yet been subjected to the LFAP, it is under the Land use Planning/Land Allocation (LUP/LA). Therefore there are already numerous restrictions and rules regarding land management, but no official titling has yet been performed with individual households or at the village level. The situation as observed throughout 2002 and 2003 is briefly outlined in the following paragraphs. Since field research is still under progress, more comprehensive results should be made available in the coming months. Published materials on some other aspects of the village are already available (de Rouw, Kadsachac and Gay 2003).

**Most negative impacts**

Growing impoverishment amongst villagers has been identified, with symptoms including:

- Lack of suitable agricultural lands as a result of inaccurate zoning.
- Internal conflicts emerging over land demarcation and access to resources.
- Village leadership challenged both within and outside the community.
- Growing insecurity is noticeable with theft and house breaking reported.
- Environmental degradation is increasing in an area already under heavy pressure from human activities.
- Social cohesiveness is loosening, leading to further discontent.
- Land and territorial spirit rituals have been neglected since the land zoning was done: people from other ethnic groups are hired to clear forest or old fallow and they take the blame for any problems that arise.
Conflict over land zoning and uses

The LUP/LAP survey was conducted with village leaders only and not all agricultural land was taken into account, since some villagers did not declare old fallows. Arable land within the village zone was allocated in one contiguous block, which does not reflect the reality, while many forest uses were not taken into account when forest delimitation was performed. Land claim by villagers who had temporarily left the area was either ignored or underestimated, and several infringements by neighbouring communities have been noted in recent years (access to land is no longer controlled by village leaders as a result of lack of cohesiveness and challenge to leadership).

Inequalities in land repartition and allocation

The better off families were given more land, while the land of those leaving the village was either sold or taken. Newcomers are given poor land or parcels located too far away. Many areas of the territory are no longer under village control (having been sold to urban people to obtain the cash needed to compensate for lower yields). The flexibility of the former land use system and the emergence of inter-village conflict has been noted over access to and uses of land, especially for degraded forest or old fallows located far away from the village. There is now a complete lack of recognition of the spiritually significant and symbolic areas within the territory (traditionally protected on behalf of the territory and village spirits), and this leads to a lack of self esteem.

On gender issues

Women are marginalised in their access to land, and there has been a recent development in prostitution (on the main road and in local shops). Women have to face more and more work in the fields and on necessary alternative activities, while weaving, for example, is now neglected due to lack of time. Young girls become involved in agriculture activities earlier and thus miss out on school. The new village leader is a woman, but overall, women seem to be further marginalised in the decision-making process. Many women have taken up wage labour at the nearby brick factory, on top of their household tasks, to compensate for falling yields.

Coping strategies

Selling of plots of land, plantations and timber was recorded in increasing numbers. Wage labour is sought on rich people’s fields, in town or at the nearby brick factory. Several farmers have cleared old fallow in remote areas and if they are fined they interpret it as the ‘price to pay’ to get access to land. Some villagers started raising poultry on a larger scale than before, but this led to an increase in both poultry diseases and theft. Serious disputes between families followed and various households moved out of the village and established hamlets in more isolated locations. Despite the shortage of land, some farmers have hired out their fallow fields to people from neighbouring villages, in order to generate the cash required to pay land taxes. The development of small enterprises (e.g. tuk tuks, shops) is noticeable, and out migration has increased greatly in recent years: job seeking in nearby towns is common practice amongst young villagers and results in a shortage of labour. Sale of NTFPs and wildlife is booming, as is the raising of small livestock, despite many thefts and diseases.
Adjustments needed and some possible alternatives

The main objective of the reform, i.e. elimination of swidden and the reorganisation of space into two categories, should be reconsidered. As stated by Vandergeest, "It is quite possible to imagine a land allocation process that does not try to reorganise space into mutually exclusive agricultural and forest spaces, and works with swidden as a viable and sustainable land use practice" (Vandergeest 2003). Furthermore, very few land reforms have been successful when they induce conflicting views, both in perception and uses, between people’s and government’s definitions of space.

It has been noted in many case studies that the delineation of forest boundaries has been conducted without consideration of customary resource management practice. Thus, "special attention is required to understand the communal resource management practices between neighbouring villages that vary in agricultural land use conditions and dependence on forest resources" (Fujita 2003). Common resources and properties should be included and sometimes given priority in the land zoning survey when appropriate.

Another priority should be to focus on human and social capital in social sciences. It is well known that planners cannot plan adequately using only knowledge of the physical sciences. An alternative programme is required, such as the Land Use Zoning suggested by UNDP (2001): "Land Use Zoning is the delineation of zones of forests and agricultural land within the villages boundaries, which creates a framework in which villagers themselves work out rules for the utilisation and management of natural resources within these zones" (UNDP 2001).

This should be seen as a necessary step prior to any implementation of land allocation. One of the major changes required is that the allocated zone is not necessarily a contiguous block of land. Rather, it should reflect villagers’ perceptions and use of space more accurately and include sacred and symbolic areas.

The delimitation of all land and resources to satisfy and fulfil village livelihoods should use multiple levels of analysis, whereby each level demonstrates a certain degree of internal articulation, has a unique set of agents, operates according to its own dynamic, and provides new insights concerning the relationship between human groups and their environments.

First of all, it is necessary to re-adjust objectives from stopping swidden to improving people’s livelihoods by finding and promoting alternative ways to generate income or revenues. Another necessity is allowing fallow periods to last longer than the three years currently the case in many places. The delimitation of village territorial boundaries is a fine tool that secures villages limits, but within villages the territory distribution between households should be made at the village level, with the complete and real involvement of all stakeholders. The programme should allocate large areas to individual households to allow possible subdivision amongst children in some cases or to encourage intensification if appropriate. The programme should also concentrate on environmentally sensitive areas, in areas close to towns where there is a potential for land speculation, and on areas where necessary preconditions are available such as reasonable roads and market access (UNDP 2001).

To achieve this, the government needs to identify a way of utilising the strength of the nation’s ethnic diversity, to ‘capitalise on ethnic diversity’. Each group has strengths and weaknesses in forest and land management. Many research results and agency reports are
available on this topic, and it has now become a priority to rehabilitate some of the villager’s practices and uses of resources in order to restore self esteem and to get them to support a land reform, with appropriate adjustments, that will make more sense to them than that currently imposed from above. Continuing gender research is also a priority. Ongoing change and increasing poverty are placing more and more stress on the cultural systems of hill tribes, especially on women, who also happen to be the most innovative and future-oriented group concerned.

Two other areas require special attention as they offer promising alternatives for the future: livestock and NTFPs. The latter have real potential for improving both diet and revenue as well as preserving biodiversity. “They also provide a basis for food security and poverty alleviation, give strong incentives for biodiversity conservation and contain potential for the development of a strong and sustainable forest-based industrial and trade sector” (Foppes and Ketphan 2001, quoted in UNDP 2001).

Similarly, it is prudent to take into account traditional uses and perception of space within and outside the village territory. What is often described as ‘tradition’ is actually dynamic, since it evolves over the years. This aspect is too often ignored, whereas it could prove a useful lever for implementing land reform (Moizo 1997).

**Conclusion**

It can be said that so far the land allocation reforms have generated more disagreements and tensions than improvements to farmers’ livelihoods. It has not been a participatory process as expected, because of lack of training (staff in charge of land zoning for example), and mapping that was often conducted over too short a period of time. The availability of farmers for consultation was another pitfall that triggered bad feelings on both sides. The reform caused relocation of many villagers, directly or indirectly, and those relocated people did not have sufficient time to acquire a good knowledge of their new environment. This has increased pressures upon natural resources. Land allocation induced land shortage, shortening of fallow and lower yields and is often identified as one of the main causes of impoverishment. While land allocation is adequately designed for individual titling, it takes little account of common property.

Following are some suggestions which could help to improve the overall process of mapping and zoning village territories. Mapping should use local names (allowing for the importance of toponomy) and be conducted with farmers and, when appropriate, by farmers so that they can give some information on their own perception of places, space and resources. The history of land used for agriculture should be traced up to 15 years, and displacements recorded with causes and dates. The location of territorial and village spirit locations as well as areas of symbolic significance should be registered along with the appropriate rules (myths, persons in charge, rituals and taboos). An exhaustive list of all collected forest products should be made for each village and the main location for each activity recorded on the territory map, once again using local or vernacular language. All sites of significance and their purposes or uses need to be recorded and mapped. Concerning forested areas, a clear distinction has to be made between what is a ‘forest’ and what is old fallow, according to people’s views. These are often wrongly classified during the zoning process. It is suggested that planning start with Land Use Zoning, with possible revision once or twice over a five-year period before any TLUCs are issued.
More reports and case studies are needed on changes observed upon land uses and ownership. These dynamics need to be taken into account for future adjustments, as do resistance, failures and successes associated with similar policies from neighbouring countries (Vietnam, Thailand and Cambodia).

Finally, the author strongly believes that any change in the essential relationships between human groups and nature, as codified in native cultural practices, technology, supporting beliefs and knowledge systems, sends winds of change that turn into waves and sometimes chaos throughout social order. In many countries, over the past 30 years, land issues have prompted ethnic identity revival movements (Canada, the USA, Australia, Indonesia, Thailand and Vietnam) and sometimes direct confrontation between the nation states and minorities. It is to be hoped this will not happen in the Lao PDR.

Author

Dr. Bernard Moizo works for the Institute of Research for Development, France and is currently working at the Faculty of Social Sciences, National University of Laos. PO Box 5992. Vientiane, Lao PDR E-mail: bmoizo@laopdr.com

Bibliography


Resettlement: An Alternative for Upland Development?

Laurent Romagny

Abstract

The national response to the question of how to integrate upland isolated populations into the development plan has been to move certain of these villages from upland areas down to the plains. This leads to the identification of resettlement being an ideal strategy for development and rural planning.

In order to investigate the effect of resettlement on mortality rates of relocated populations, Action Contre la Faim (ACF) carried out a case study in Long District, Luangnamtha Province. The study estimates mortality rates in the district between 1998 and 2003, and evaluates the evolution of mortality following resettlement of upland villages to the lowlands. The study’s hypothesis is that “The resettlement of upland villages down to the plains leads to increased mortality during the first five years following settlement of the new villages”.

Results show that in the case study area, populations moved down from the uplands to the plains experience great difficulties during resettlement in their new habitat. Sanitary conditions are severely affected resulting in the doubling of the resettled population's mortality rate. For certain villages in the study, the mortality rate reached up to 20% mortality during the first year of relocation. In addition, the study highlights other difficulties such as access to paddy land and basic services.

This paper recognises that the national objectives set up by the Government show its willingness to implement a sustainable development policy. However, it is important that the strategies implemented to reach these objectives fully take into account the populations whom they are aiming at assisting.

Sustainable livelihoods development policies, particularly those concerning upland areas, should be explored and promoted. These development strategies would provide alternatives to the option of resettlement, thereby avoiding the negative consequences that are currently occurring for upland ethnic minorities facing resettlement in the Lao PDR.

Introduction

Rural development is one of the key national priorities for the government of the Lao People’s Democratic Republic (Lao PDR). Since the beginning of the nineties, this has been characterised by the implementation of a regional development plan. This plan centres on the construction and improvement of roads in order to open up remote areas. However, the majority (80%) of the country is mountainous and many villages remain very isolated. To integrate them into the regional development plan, certain of these villages are being moved from upland areas down to the plains. In this way the villagers are brought closer to cities and communication links. This action could be summarised by saying:

“If development cannot be brought to people, bring the people towards development.”
These displacements have been marked by a split from the old way of life for the population that has been moved. The displaced people are ethnic minorities with a subsistence economy, based on the practices of: slash-and-burn cultivation, collection of Non-Timber Forest Products (NTFPs), hunting and fishing. When moved, these people have to quickly adapt to a new environment, a different climate, new agricultural practices, as well as a new economic system that is more geared towards a market economy. For these ethnic minorities, such changes can lead to a true cultural upheaval.

In view of the difficulties faced by upland villagers of adapting to such new environments, this initiative of resettlement has been greatly debated (Goudineau 1997). Displacement is characterised by an increase in precariousness for such people rather than being a vector for their economic and social development.

Since 2001, a new national development policy entitled “Lao Revolutionary Party’s Socio-economic Strategy for Poverty Reduction” has been in place. This includes the general Five Year National Rural Development Plan. The objectives of which are to:

- Eradicate opium production by 2005.
- Eradicate slash-and-burn cultivation by 2010, with a decrease of 50% by 2005.
- Reduce poverty by 2010, with a decrease of 50% by 2005.
- Provide education for everyone by 2015.

Although there is a noticeable lack of means with which to achieve these goals, the policy has given a new impetus to the strategy of resettling upland populations down in the plains. In order to investigate the effect of resettlement on mortality rates of relocated populations, Action Contre la Faim (ACF) carried out a case study in Long District, Luangnamtha Province. The study estimates mortality rates in the district between 1998 and 2003, and evaluates the evolution of mortality following resettlement of upland villages to the lowlands. The study’s hypothesis is that “The resettlement of upland villages down to the plains leads to increased mortality during the first five years following settlement of the new villages”.

**Case Study of Long District, Luangnamtha Province**

**Background information**

Long District is located in the northwestern part of Luangnamtha Province, bordering with Burma to the west, China to the north and Viengpoukha District and Bokoe Province to the South. As such, it is located firmly in the legendary *Golden Triangle*. The road to Luangnamtha provincial capital has only been accessible since 1996. The overall population of the district is approximately 25,000 with most of the villages located in the uplands. Villagers rely mainly on slash-and-burn cultivation; the growing of poppies is also widespread.

---

1 NGPES: Ensure that by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling
**Government objectives**

According to the district authorities, the resettlement plan is part of a strategy to achieve the National Development Objectives, and the Provincial Activity Plan 2001-2006. Part of this strategy prescribes a reduction in area under shifting cultivation in Luangnamtha Province from an alleged 11,827 ha in 2001 to 2,849 ha by the year 2006, as well as eliminating all poppy cultivation by the year 2005.

**Selection criteria for resettlement**

Villages to be relocated are selected according to development criteria (e.g. size of population, presence of health/educational infrastructure, etc.). Authorities consider that for a village to be suitable for development, it needs to have:

- Thirty or more families to optimise the cost of infrastructure giving access to the basic needs of water, education and health.
- A communication link to facilitate access and trade.
- Sufficient potential to develop agriculture with alternative methods to slash-and-burn cultivation.

Villages fitting these criteria can be allowed to remain at their original locations.

**Initial figures and evaluation**

In order to meet the district strategy objectives (outlined above), the Long District authorities in Luangnamtha Province planned to resettle around 50% of the approximately 130 villages existing in the district by the year 2005. This relocation programme targets villages located in the mountains of which more than half of their inhabitants, approximately 6,000 persons, will be displaced during the next few years. Such planning is not unique to Long District and is similar in other districts of Luangnamtha Province as well as other districts in the Lao PDR.

In 2003, dialogue with the district authorities resulted in interventions to the resettlement initially planned by the district. At this stage, the District Authorities had already encouraged 11 out of the initially selected 65 villages to resettle. Results from a study of the villages allowed for the original listing to be reviewed and changed as follows:

- A further 22 villages should be resettled between 2004 and 2005.
- 16 villages are allowed to stay at their original site.

In summary, at least 28 % of Long District’s villages will have been resettled over the three-year period 2002-2005. For a number of other villages, representing 13 % of the total number of villages in Long District (based on a figure of 130 villages in total), the future remains uncertain as far as resettlement is concerned.

**Rationale for resettlement**

The theory that resettlement is the way in which to achieve the objectives of the National Strategy Plan leads to the identification of resettlement as an ideal strategy for development and rural planning. However, there are reservations about the implementation of this resettlement plan, namely that it requires high inputs but also that alternative solutions are available.
Resettlement from the villagers’ point of view

It is difficult to generalise as each village which is supposed to move, has its own history, situation, wishes, opinions, potential for in situ development and alternative placements, etc.

Most of the villages in the upland areas of Long District are presently endowed with large village areas and rich natural resources for upland agriculture, hunting and collection of NTFPs. Some of these villages are quite wealthy in terms of tangible assets with good houses, food sufficiency and savings. However, their remoteness is the main reason for all of them to have quite simple standards of living. None of the villages observed can be considered to be in a state of abject poverty or to be miserably poor.

Villagers are generally happy with their lives and their occupations, which does not mean that they would not grasp the opportunity to change their lives for the better. Generally, however, they lack ideas or opportunities for pursuing occupations other than their present ones of slash-and-burn cultivators, hunters and gatherers.

Dissemination of information about resettlement plans has generally been poor and each of the villages has different stories to tell:

- One village has not yet received any notification at all.
- In other villages, information was mainly in the form of an official order with no or inconsistent directions about where to move to.
- Some villages were told that if they moved they would receive support from an International Organisation.

This sort of variable information creates confusion among people.

Generally when asking villagers in areas targeted by resettlement plans, a great number of people do not want to leave their existing villages. Their opposition to displacement is based on the fact they already meet the government criteria for remaining where they are. At the same time, villagers who are ready to be resettled are conditioning their displacement with the guarantee of seeing improvements in their standard of living. Such conditions include access to roads, education, clean water and paddy land.

Positive aspects of village resettlement

Some positive aspects in terms of integration into newly resettled villages are seen:

- **Language and education**: Increasing numbers of people who claim to speak Lao.
  Higher school attendance.
- **Health**: Better dissemination of advisory information and improved access to medicines and vaccinations.
- **Economics**: Rapid integration into a market economy and increased possession of domestic goods (manufactured).

Negative aspects of the implementation of village resettlement

Significant means are needed in order to guarantee an improvement in living conditions for resettled populations. The first few years following resettlement are generally characterised by:
Brutal degradation of living conditions of the population involved.

Increased shortages of food and rice.

High incidences of diarrhoea, malaria, respiratory diseases, and psychological disorders.

Social and cultural breakdowns.

Loss of assets, both financial and symbolical with traditional functions often becoming obsolete in the process.

Specific groups or small hamlets are the most vulnerable in the resettlement process.

**Mortality rates**

**Objectives of the study**

The case study that was carried out by ACF had the objectives to:

- Estimate the mortality rates in Long District over the last 5 years (from 1998 – 2003).
- Evaluate the evolution of mortality after resettlement of upland villages to lowlands.

The survey also aimed to verify the following hypothesis:

“The resettlement of upland villages in the plains leads to increased mortality during the first five years following settlement of the new villages.”

This hypothesis is an accepted fact by different actors within the district including the health department, international organisations and the population. This study tests it using a random sample of villages representing three different geographical types of village identified in Long District. Sampling includes:

- Five lowland villages (representing 25% of the total number of lowland villages in the district).
- Seventeen upland villages (22% of the total number of upland villages in the district).
- Fifteen resettled villages (48% of the total number of resettled villages in the district).

**General data on mortality rates in Southeast Asia.**

According to table one, the Lao PDR has the second worst mortality rate in Southeast Asia (1.4%) after East Timor (1.6%) and the highest birth rate in the region (3.9%).

**Table 1: Mortality rates in Southeast Asia**

<table>
<thead>
<tr>
<th>Country</th>
<th>Death rate / 100 people / year</th>
<th>Birth rate/ 100 people/ year</th>
<th>Life expectancy (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lao PDR</td>
<td>1.4</td>
<td>3.9</td>
<td>52</td>
</tr>
<tr>
<td>Myanmar</td>
<td>1.2</td>
<td>2.8</td>
<td>55</td>
</tr>
<tr>
<td>Cambodia</td>
<td>1.1</td>
<td>2.8</td>
<td>56</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.6</td>
<td>1.4</td>
<td>73</td>
</tr>
<tr>
<td>Singapore</td>
<td>0.5</td>
<td>1.4</td>
<td>78</td>
</tr>
<tr>
<td>East Timor</td>
<td>1.6</td>
<td>3.3</td>
<td>49</td>
</tr>
</tbody>
</table>

*Source: INED (Institute National d'Etudes D'ographiques) 2001*
**Methodology**

Villages in Long District are classified into three categories:

- Lowland villages (traditional lowland villages or villages that have been settled for more than ten years).
- Mountain villages.
- Resettled villages (settled for less than ten years).

There are a total of 130 villages in the district, with 20 lowland villages, 79 upland villages and 31 resettled villages.

After grouping the villages according to their geographical location, they were then further classified according to the degree of mortality in each village. In order to do this, a number of key people in the district (District Authorities, Project Staff – both from ACF as well as from other relevant projects) gave a ‘mortality grade’ of 1 to 4 to each village as follows:

- 1: normal mortality.
- 2: medium mortality.
- 3: serious mortality.
- 4: alarming mortality.

A total of 37 villages were selected for the survey by randomly and proportionately sampling from within the combined grouping of village typology and mortality grade. The 37 villages include 5 lowland villages, 17 upland villages, and 15 resettled villages.

A team of three people (an ACF expatriate and two translators, one for Lao language and one for the relevant ethnic language) surveyed each selected village. The team gathered data on population and mortality covering a five-year period (1998 - 2003) from key people in the villages.

The small size and close-knit nature of the communities surveyed made it easy to access the data required. Furthermore, the survey was carried out using semi-structured group interviews, which allowed immediate validation of the data collected.

**Villages selected**

Table 2 shows the villages selected for the study.

<table>
<thead>
<tr>
<th>Mortality grade</th>
<th>Lowland Villages</th>
<th>Resettled villages</th>
<th>Upland villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>1</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Alarming</td>
<td></td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Serious</td>
<td></td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Total number of villages</td>
<td>5 (25% of lowland villages)</td>
<td>15 (48% of resettled villages)</td>
<td>17(22% of upland villages)</td>
</tr>
</tbody>
</table>

Table 2: sample of villages used in the study
**Information collected.**

Information regarding the five-year period of 1998 – 2003 was collected from the above villages as follows:

- Population and the annual mortality rate.
- Key dates where major changes in village life occurred.
- Mortality rates for the following age groups: under one, one to five years old, five to 50 years old and the over 50's.
- Disease nomenclature.
- Causes of death.

**Problems encountered**

A number of problems were encountered during data collection:

- **Time measurement:** The villagers follow a type of Chinese calendar and are unfamiliar with either the Buddhist or western calendar (e.g. the Year of the Goat instead of 2547 or 2003). In addition to the Chinese calendar, people often refer to time in terms of the relevant agricultural season (e.g. during the last rice planting).
- **Lack of written data:** This meant that villagers needed to think and count the number of deaths in previous years. This is not a pleasant experience as it involves recalling times of sadness and re-awakens memories of the dead.
- **Underestimation of deaths:** In some cases deaths could have been forgotten, leading to an underestimation of results (in such cases). However, no deaths were invented.

**Results:**

The results gained from the sample are compared with:

- The national mortality rate (1.4% per year);
- “Serious” mortality rate (3.5% per year);
- “Alarming” mortality rate (7% per year).

*Source: Action Contre la Faim 2001*

![Average annual mortality rate during the five-year period (1998 – 2003) for each category of village](image)

Figure 1: Average annual mortality rate during the five-year period (1998 – 2003) for each category of village
**Average mortality rate**

Figure one shows that:

- The average mortality rate for lowland villages remains low, i.e. two times less than the national average.
- The average mortality rate for upland villages is much higher than the national mortality rate but remains under the “serious” mortality rate.
- The average mortality rate of about 4% per year for resettled villages is higher than the level of “serious” mortality rate.

**Highest mortality rate obtained by village and by category**

This parameter aims at highlighting the worst episode of mortality faced by the villages. Figure two shows the percentage of villages per category of mortality rate for each type of village (lowland, upland and resettled). The mortality rates take into consideration the highest mortality rate obtained by the villages over the period observed.

Figure two shows that:

- In the **lowland villages**, the mortality rate is kept in check. Episodes of high mortality are rather rare with 40% of villages having mortality rates contained between 1.4 and 3.5%.
- For **upland villages**, there are a lot of differences between villages. For example:
  - 17.5% of villages have low mortality rates (average 0.44% never exceeding 1.4%);
  - 29.5% of the villages have moderate mortality rates (average 1.2% but with episodes of “serious” mortality not exceeding 3.5%);
  - 23.5% of the villages have high mortality rates (average 2.34% with episodes of “serious” mortality of between 3.5 and 7%);
  - 29.5% of the villages have “serious” mortality rates (average 4.54% with episodes of “alarming” mortality of over 7%).
- For **resettled villages**, the distribution within each mortality class is as follows:
  - 13% of the villages have an average mortality rate (1.37%) close to the national average but face episodes of mortality of between 1.4 and 3.5%;
  - 39% of the villages have a “serious” mortality rate (3.13%) with episodes of mortality located between 3.5% and 7%;
48% of the villages have an “alarming” mortality rate (5.49%) with “alarming” episodes of mortality over 7%.

**Distribution of the number of years per class of mortality and village typology**

The distribution of the number of years per mortality category and per village typology allows us to measure the frequency of episodes of high mortality over the five-year study period. Figure three shows that:

- **Lowland villages** experienced less than 1.4% mortality for 80% of the years, with mortality rates of between 1.4 and 3.5% only occurring in 20% of the years.

- For **upland villages** it is important to note that 49% of the years have a mortality rate of less than 1.4% and that for 33% of the years mortality fluctuated from 1.4 to 3.5%. Serious mortality rates (>3.5%) were only experienced in 12% of the years and alarming mortality rates (>7%) in 6% of the years. The upland villages studied have serious to alarming mortality rates for nearly one year in five.

- **Resettled villages** experienced mortality rates of over 3.5% in 44% of the years (among which the mortality rate of >7% was experienced in 16% of the years). In resettled villages, one year out of two is characterized by an alarming mortality rate.

**Analysis of mortality rate**

An increased mortality rate is one of the most acknowledged and widely reported negative consequences of resettlement. Through case studies of certain villages, it is now officially recognized that numerous epidemics have decimated important portions of resettled communities.

Although the situation regarding mortality is rather well contained in lowland villages that is not the case in upland and resettled villages.

In upland villages, even if some results seem very positive, and generally “serious” and “alarming” episodes of mortality only occur during one year in five, the situation remains precarious and the average mortality rate is still too high.

In resettled villages, the results are extremely bad and the average mortality rate is over the “serious” level of 3.5%. Almost every two years the situation reaches the “alarming” level of mortality. This category of village shows the highest mortality rate and the highest number of deaths between 1998 and 2003.

![Figure 3: Distribution of years per class of mortality and village typology](image_url)
When comparing mortality rates between upland settlements and new settlements in the lowlands, the mortality rate increases by about 70% in the first five years. Even if health and sanitation in the uplands is not very good (2.3% mortality rate compared with 1.4% at the national level and 0.78% for lowland villages), the mortality rate remains less alarming than in resettled villages (3.99%). In these resettled villages, violent episodes of mortality are frequent resulting in deaths equal to between 5 and 20% of the village population annually. The highest number of deaths recorded in one year was in 2002 in Tapai village with 40 deaths, or 20% of the entire village population.

Regarding the causes of death, in cases where mortality is average, deaths occur among newborns and elderly people.

In the case of high, serious and alarming mortality rates, death strikes all age groups and is due to malaria and dysentery in resettled areas and dysentery, cholera, typhoid and measles in upland areas.

The transition from the uplands to the lowlands definitely seems to be extremely perilous, bringing about a 70% increase in mortality in resettled villages (from 2.32% to 4% per year) over at least the first five years of resettlement.

Other negative aspects of village resettlement

Land use conflict

Economic development often remains a false hope because the areas to be settled are often inadequate and the efforts needed to establish a new village and valorise new lands, without any assistance, are enormous. Resettlement increases pressure on the land and land use conflicts emerge as a new reality. Resources are scarce and competition for land use takes place between newcomers and first-comers or long-term established communities. The availability of land suitable for paddy rice cultivation remains a crucial issue. Lack of previous experience, technical expertise, draught animals, control of water, paddy rice seedlings, etc. constitute the main obstacles for the transition process from shifting to paddy cultivation.

Loss of financial capital

Resettlement is generally costly and drastically reduces household financial capital. Costs of transportation, rebuilding, agricultural transition, lack of experience in the lowlands, loss of traditional potentialities of forested land in terms of diet, medicine and income, all contribute to increase household poverty.

Proletarian class

Shifting cultivators are experiencing the transition from subsistence livelihood to the market economy, wage labour and commodity production. Unable to reconstitute viable and prosperous systems of production (some households are landless), resettled populations often turn to low-paid wage labour, earning less than one dollar per day.
**High-risk areas**

New settlements that are isolated and without any access and services, such as the Mengla irrigated settlement area in Chongka sub-district, remain the most vulnerable areas and present high risks for the populations that will be resettled there.

**Conclusion**

Resettlement generally leads to extremely poor sanitary conditions. In the plains, resettled villages meet with a different environment that is less favourable than the one in their previous villages situated in mountainous areas, particularly in terms of higher prevalence of malaria and water born diseases. This results in the doubling of mortality rates among the resettled populations, with certain villages reaching mortality rates of up to 20% in their first year of resettlement. This situation is accentuated by the difficult conditions of resettlement, as populations do not always easily find the means for development, such as paddy land and access to basic services.

Once a village is resettled in a lowland area, its sanitary conditions tend to improve progressively over time. However the population faces difficulties in adapting to such an abrupt change in the way of life. Most of the displaced people have to sell their labour at a cheap price in order to supplement dwindling resources. This results in their conversion into a new rural proletariat, quite far from the development scheme and the improvement of their living conditions.

The loss of human life and poor sanitary conditions that resettled populations suffer from, are similar to situations that Action Contre la Faim (ACF) usually observes with internally displaced populations in conflict areas. That is to say in cases of sudden and non-organised displacements.

The national objectives set up by the government show its willingness to implement a sustainable development policy. Nevertheless, the strategies undertaken to reach these objectives have to take into account the populations whom they are aiming at assisting, and for whom the strategy should be implemented. Their needs should form the core of the strategy, which must be reflected in the indicators used to measure success.

Furthermore, feasibility studies made by different organisations are showing other development alternatives. These should be explored as they may be less economically and socially expensive than the systematic displacement of upland villagers down to the plains, especially in a country that is predominantly mountainous.
Recommendations

‘Stabilisation of shifting cultivation and eradication of poppy cultivation’ does not intrinsically mean extinction of cultivation by prohibition or/and resettlement.

‘Village consolidation and services delivery’ does not necessarily mean resettlement.

Sustainable livelihood development policies, particularly ones concerning upland areas, should be explored and promoted. These development strategies would constitute alternatives to the option that leads to resettlement, thereby preventing all the associated negative consequences experienced by ethnic minorities inhabiting upland areas in the Lao PDR.

A national surveillance unit concerning resettlement, comprising different actors (Government institutions, International Organisations, Non-Government Organisations, Experts, etc.) should be created and given appropriate means. Such a unit would have the mandate to propose and promote alternatives to resettlement, where feasible.

Where resettlement is unavoidable, the surveillance unit should then ensure that:

- The appropriate means necessary to ensure respect for the population’s well being before, during and after displacement are mobilised and provided.
- All commitments to the population to be resettled are undertaken prior to the displacement of the village (including allocation of paddy land, building of infrastructure giving access to basic needs, health education, etc.).
- The resettled population is provided with support for their transition and integration into their new livelihoods as well as assistance during their first year of installation.

A government policy aiming at protecting the health and livelihoods of the populations concerned should be adopted.

Author

Laurent Romagny is the Head of Mission, Action Contre la Faim Laos, Email: acflaos@laopdr.com and acf-laurent.romagny@libertysurf.fr

Bibliography


**LIVESTOCK INTENSIFICATION: A PATHWAY OUT OF POVERTY IN THE UPLANDS**

Viengsavanh Phimphachanhvongsod, Peter Horne, Rod Lefroy and Phonepaseuth Phengsavanh

**Abstract**

Increasingly, smallholder farmers in the uplands of the Lao PDR are becoming dependent on livestock to ensure their livelihood security. The main issues limiting livestock production are (i) epidemic diseases and (ii) feed shortages. There are no ‘magic bullet’ solutions to these problems. A combination of better feeding and animal management, combined with strategic use of veterinary medicines, is likely to be far more effective, achievable and sustainable. These ‘best practices’ emerge by using (i) the best available livestock technologies and (ii) sound methodologies for encouraging farmers to innovate, adapt the technologies to their own farming systems and then adopt widely.

Having a managed feed resource is the key factor enabling farmers to intensify their livestock systems in the uplands. It allows them to keep animals closer to the village, to provide better care, to collect manure for rice paddies and homegardens, and to fatten animals for market. The main technical and methodological issues that need to be addressed to scale-out these impacts are discussed.

**Introduction**

Shifting cultivation accounts for approximately 40% of the land area of the Lao PDR and is the dominant agricultural system in the northern mountainous provinces. It also is the system in which the most entrenched poverty exists. In Xiengkhuang province for example, where shifting cultivation has been widely practised, upland rice yields are among the lowest in the country (in places less than 1.2 t/ha) and six of the seven districts have net negative food balances (Sisouphanthong and Taillard 2000). These low and variable rice yields are largely due to declining soil fertility and increasing weed problems resulting from the trend towards shorter fallow periods. From 1981-1982, the average fallow period was 12 years. However this had fallen to as low as three to four years in the more densely populated rural areas by 1994 (Chaze 1994). Shifting cultivation has always been a time-consuming agricultural system with an element of risk. However, when crops failed in the past, farmers were able to rely on traditional coping strategies, such as hunting, selling labour, selling opium and selling products from the forest. Many of these strategies are now over-utilised or no longer available due to increased pressure on the land, particularly on forest resources. This process, which depressed the availability of coping strategies, also decreased the quality of soil for cropping, thus exacerbating the loss of coping mechanisms. Increasingly, farmers are relying on their livestock to provide livelihood security.

Livestock production has often been identified as an ideal livelihood activity for Lao farmers who are looking for ways of moving out of shifting cultivation. The many reasons for this have been well presented elsewhere (e.g. Pravongviengkham 1998; Hansen 1998;
Livestock can be sold at any time on a market that has a relatively constant demand and relatively stable prices.

2. Larger livestock (cattle, buffalo and goats) can be walked long distances to market.

3. Livestock provide manure to sustain yields of lowland rice and homegardens.

4. Livestock provide a relatively high return per unit of labour input.

5. Larger livestock use feed resources that cannot be utilised for any other purpose.

6. In many cases, livestock are the only means of capital accumulation available to farmers.

7. Livestock are less susceptible to the climatic cycles of drought and flood and, unlike crops, can be sold to avoid extreme conditions.

In the year 2000, 89% of all farm households surveyed in the national agricultural census reported that they raised one or more livestock types and over 95% of all livestock in the country were being produced by smallholder farmers (Str et al. 2002b). In the northern provinces, especially in remoter areas, livestock commonly contributed more than 50% of household income.

There is, however, another side to this story. In a recent review of the causes of poverty in rural areas, 70% of villagers referred to livestock disease as a major cause of poverty (ADB 2001). In twelve upland villages surveyed in Luangprabang and Xiengkhuang, farmers reported that more than 80% of all chickens die every year from disease and that disease epidemics frequently kill more than 50% of pigs every year (FLSP 2002). Losses to disease are less serious in cattle and buffalo, except for a high mortality among buffalo calves (30-40%) from an internal parasite, *Toxacara vitulorum*. In addition to disease problems, lack of feed resources near villages and the need to protect crops means that large animals (cattle and buffalo) must spend much of the wet season grazing far from the village and are often lost. Farmers who keep pigs spend as much as four hours per day just collecting enough feed for their animals. These disease and feeding issues have made it almost impossible for farmers to move beyond the current extensive, low-input livestock systems with low productivity and opportunistic use or sale. These systems neither help farmers to move out of shifting cultivation nor help overcome poverty.

In 1997, there was optimism that reduction of the impacts of livestock disease through technical interventions could “within the next few years...be reflected in large increases in the numbers of livestock throughout the Lao PDR” (Chapman et al. 1998). That this has not happened is in large part due to the lack of any realistic technical ‘magic bullet’ solutions to the problems of livestock disease. In the extensive livestock systems that typify much of the uplands, with livestock roaming freely, farmers provide few inputs and consequently they receive only intermittent and low returns. Controlling diseases, even in those places where good quality veterinary medicines are available in villages, is extremely difficult. All the livestock to be treated need to be gathered together on the one day. Even if this is successful, within a short period (especially for pigs and poultry) new animals are born that need to be treated. Farmers’ experiences with low benefits from vaccination, combined with the extra costs involved, mean that this approach to disease control is destined to fail. Perhaps the most promising and realistic alternative is to help farmers gradually intensify their livestock production and the key factor that allows them to do this is the development of feed resources closer to their homes.
Livestock intensification – providing more than livelihood security

The term ‘livestock intensification’ conjures up images of feedlots and industrialised livestock production. In the Lao context, we use the term ‘intensification’ to mean a gradual re-orientation of farmers’ attitudes towards their livestock away from an activity that largely provides only livelihood security, to a market-oriented system providing regular income. This is easily said but less easily achieved. To become market-oriented in their production, farmers need to be able to keep their animals closer to home. Consider the example of Mr. Sing in Houay Hia village, Xieng Ngeun district, Luangprabang:

Like all farmers in Houay Hia village, Sing used to allow his cattle to wander in search of feed. The roaming cattle regularly damaged crops and he had to pay fines each year. It used to take two to three days to find the cattle and, being wild, they were difficult to catch. “Our cattle used to wander far from the village and were easier to shoot than catch!” Many were lost in the forest, wasting all his efforts to make money from livestock.

Without feed resources close to home, Sing had little chance of overcoming these problems. Ironically, the time of year when most farmers have these kinds of feed problems is the wet season, when it is easiest to produce feed for livestock from cultivated forages. In 1997, Mr. Sing started testing forage varieties in small plots to see if any of them might allow him to feed his animals closer to home.

He liked the fact that the forages stayed green in the dry season, so year by year he expanded the area. He began to tether his animals close to the house and feed them cut forage. Calves that were fed forages grew more quickly (a ten-month old calf sold for more than his neighbour’s twelve-month old calf). His wife started feeding the legume ‘Stylo’ to her pigs and was able to reduce the fattening time from five to three months.

With one hectare of forages, Sing now spends just 30 minutes collecting grass to feed his expanded herd of five cows, while his wife collects ‘Stylo’ to fatten pigs and goats. He has been able to halve the area of the family’s shifting cultivation and intends to stop altogether once they have enough forages and the livestock system is well established. With the animals kept close to the village, they are now able to provide veterinary inputs and collect manure.

More than 20 households in the village are now developing livestock systems in similar but not identical ways. Two other examples of these kinds of impacts are presented by Connell et al. in these proceedings and other cases are being regularly documented. In Xang village in Xiengkhuang, 17 of the 23 households are developing market-oriented livestock systems following the lead of a few early innovators. Now the forage area in the village has expanded to 4.5 hectares and the shifting cultivation area has fallen from 40 to 18 hectares, largely as a result of improved livestock production and more productive paddy land. These kinds of impacts are significant, are not isolated to one farmer or village, and are not the outputs of model farmers who receive unsustainable levels of outside support. To encourage the emergence of market-oriented livestock systems, this work will expand to more than 100 villages in 20041. The expansion is gaining momen-

---

1 The work described here is from the Lao-CIAT Forages and Livestock Systems Project, funded by AusAID and implemented by NAFRI and CIAT.
tum, with new farmers jumping straight into ‘impact-yielding systems’, rather than small plots, and the number of villages participating is expanding rapidly (Figure 1).

Within these villages, the indications are that about 40% of farmers who have been developing forage systems for at least two years are experiencing significant livelihood impacts. In all cases, the change to a market-oriented livestock system is being enabled by the development of forage resources in the villages.

**Finding the best varieties - forage research Laos**

In the past, the overwhelming evidence that forages can significantly improve smallholder livestock production was not sufficient to convince farmers to make these radical changes to their livestock systems. The reasons for this were mainly that:

1. Research did not often address the real needs and opportunities of farmers.
2. The forage varieties used were not those with the best adaptation for the conditions on smallholder farms.

To overcome both of these problems, the Livestock Research Centre (formerly in DoLF and now in NAFRI) and CIAT started a research programme in 1995 to (i) identify forage varieties with the best potential to deliver impacts to smallholder farmers in the Lao PDR and (ii) develop participatory research and extension methods that would encourage the development of impact-yielding systems based on forages. Prior to the start of this research, about 600 accessions were selected from the germplasm collection at CIAT and pre-tested to screen out those with obvious deficiencies (primarily susceptibility to insects and disease, potential for weediness and poor adaptation to acid soils). About 150 accessions were then tested over two years at five nursery sites throughout the Lao PDR (one in Oudomxay, two in Luangprabang, one in Vientiane and one in Champasack). The most promising accessions were then moved into regional nursery evaluations. These usually involved fewer than ten accessions, selected from the nursery evaluations and sown at many locations to confirm the broad adaptation of the narrowing suite of varieties. The result of this work was a small group of broadly adapted and robust forage varieties.
suited to the environmental conditions of the Lao uplands (for more details, see Str et al. 2000; Str et al. 2002a). The best varieties at this time are Brachiaria brizantha ‘Marandu’, Brachiaria hybrid ‘Mulato’, Panicum maximum ‘Simuang’ and Stylosanthes guianensis ‘Stylo 184’. Other productive varieties but with particular uses or adaptation are the grasses Andropogon gayanus ‘Gamba’, Pasaplum atratum ‘Terenos’ and Setaria sphacelata ‘Solander’ and the legumes Calliandra calothyrsus ‘Besakih’ and Gliricidia sepium ‘Retalhuleu’. These varieties and their management are described in more detail by Phengsavanh et al. (these proceedings), Horne and Str (2000) and Str and Horne (2001). The participatory research methods that confirmed their potential to deliver impacts are described in Phengsavanh et al. (these proceedings) and Horne and Str (2003). The participatory extension methods that are now delivering impact-yielding forage systems are documented by Connell et al. in these proceedings.

**Where to from here?**

The impacts from forages are emerging, increasing and diversifying, both within Lao PDR and across the southeast Asian region (for details see Horne, in press). The Lao government is considering investing in a further expansion of these impacts and other livestock technologies to reach more than 20,000 farmers in the north of country in the near future. What challenges face the intensification of smallholder livestock systems on this scale?

**Focusing on second generation technical problems and opportunities**

Generally, farmers are interested in testing forage varieties to resolve immediate problems, such as the lack of feed in the wet season or the large amount of time needed to collect feeds from the forest for pigs. However, the obvious initial impacts that emerge, for example faster sale of animals because of more-rapid weight gain and reduced area of shifting cultivation releasing labour, are often unrelated to the initial problems. Generally, however, the expansion in forage area is not accompanied by a change in forage management. Small plots of forages supplying cut feed become large areas of forages supplying cut feed. The problem with this is that cutting forages is one of the most efficient ways of removing nutrients (especially nitrogen and potassium) from the soil. Inevitably, after two to three years of regular cutting, forage plots start to exhibit the signs of nutrient deficiency (yellowing of leaves and declining yields). There are many simple ways of dealing with this problem and these are detailed in Phengsavanh et al. (these proceedings). At the same time, once farmers have developed larger areas of forage, new opportunities emerge for more efficiently converting the forage into livestock products and, especially for pigs, for developing other complementary feed resources, such as maize, cassava and sweet potato. These opportunities are also outlined by Phengsavanh et al. (these proceedings).

**Exploring markets, marketing and the private sector**

Substantial increases in demand for livestock products are happening already, both within the Lao PDR and within the southeast Asian region. Within the Lao PDR, the predictions are that the domestic supply of non-ruminant meat products (largely poultry and pigs) will be able to keep pace with demand, but that demand for ruminant meat products (cattle, buffalo and goats) will rapidly outstrip supply (Table 1).
This spiralling demand, especially for ruminant meat products, is also reflected across the region, with demand per capita expected to increase by something like 40–60 percent by 2010 compared with 2000 (Steinfeld 1998; Delgado et al. 1999). While this market demand presents many opportunities for smallholder livestock producers in the Lao PDR, especially for the production and export of ‘grass-fed’ beef, significant market impediments exist that will limit realisation of the potential in the short term. These impediments include patchy market access, poor flow of market information back to producers, lack of quality control and a lack of services to support the development of enterprises (Connell et al. these proceedings). There is an urgent need to address these market impediments.

Apart from local traders and producers, the private sector has contributed very little to the development of the livestock sector in the Lao PDR. On several occasions, private firms have attempted to establish cattle fattening farms, but most have failed because of

---

Table 1: Projected ruminant and non-ruminant meat production and demand (kg/capita) for selected southeast Asian countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Ruminant Meat</th>
<th></th>
<th>Non-Ruminant Meat</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demand 2000</td>
<td>Production</td>
<td>Demand 2010</td>
<td>Production</td>
</tr>
<tr>
<td>Cambodia</td>
<td>3.6–3.9</td>
<td>3.3</td>
<td>5.2–5.9</td>
<td>3.3</td>
</tr>
<tr>
<td>PR China</td>
<td>4.1–5.1</td>
<td>5.4</td>
<td>5.8–7.4</td>
<td>8.5</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3.1–3.6</td>
<td>2.3</td>
<td>4.6–6.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>3.2–3.5</td>
<td>3.0</td>
<td>4.8–5.4</td>
<td>3.0</td>
</tr>
<tr>
<td>Malaysia</td>
<td>4.4–4.9</td>
<td>0.8</td>
<td>6.3–7.9</td>
<td>0.6</td>
</tr>
<tr>
<td>Philippines</td>
<td>3.4–3.6</td>
<td>2.9</td>
<td>4.4–4.9</td>
<td>2.7</td>
</tr>
<tr>
<td>Thailand</td>
<td>6.0–7.4</td>
<td>5.7</td>
<td>10.1–14.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Vietnam</td>
<td>2.7–2.9</td>
<td>2.7</td>
<td>3.6–4.2</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Source: Vercoe et al. 1997

Analysis of these issues has commenced through the Swiss-funded “Small-scale agro-enterprise development for the uplands” (SADU) project implemented by NAFRI and CIAT.
lack of access to (or understanding of) markets, lack of clear land tenure or a lack of long-term commitment to the livestock sector. Given the significant regional market potential, particularly for ‘grass-fed’ beef, and the existence of robust feed and management technologies, the opportunities for private sector investment now seem much brighter. The main obstacles are not technical. They are related to policy, trade and quarantine issues. In particular, the development of a legal live cattle export market will depend strongly on resolution of restrictions for cross-border trade and containment of Foot and Mouth Disease. Given that these issues can be resolved, the private sector could conceivably play an important role in providing an accessible livestock market to smallholder producers. In particular, it is easy to imagine the establishment of private farms for fattening, or conditioning, of livestock on forages, with all of their stock sourced from smallholder producers. The private farms could then be sources of information and planting material for the smallholder producers, in much the same way as Nucleus Estates were established to support the smallholder plantation sector in Indonesia and Malaysia in the 1970s. The private farms could assist the smallholder sector by contracting farmers to grow higher quality forage crops, such as *Stylosanthes guianensis*, during the wet season. These are then dried and fed to stock as a leaf meal supplement during the dry season.

Another example of how the private sector can benefit smallholder livestock producers is being explored by NAFRI, CIAT and a Mexican seed company, Papalotla. Several species of the forage grass genus *Brachiaria* have high potential as a source of feed for livestock production in the Lao PDR, but all of these species have significant limitations. For example, one of the most common varieties, *Brachiaria decumbens*, ‘Basilisk’, grows well in the dry season, but produces very little seed in the Lao PDR. *Brachiaria ruziziensis*, ‘Ruzi’, produces high yields of good quality feed in the wet season, but is poorly adapted to the long dry season and soon dies out. In the mid 1980s, CIAT scientists started a breeding programme to try to combine the best characteristics of different *Brachiaria* species into new hybrids. The first of these was released in 2001 in a public-private partnership between CIAT and Papalotla. This hybrid, known as *Mulato*, combines the best qualities of its parents, *Brachiaria ruziziensis* and *Brachiaria brizantha*, into one plant. That is, it has both good dry season tolerance and produces high quality feed. Most significantly, whilst it is a hybrid, a peculiarity of the reproductive biology of Brachiaria means that the seed collected from this hybrid remains true to the parent hybrid. Thus it is a hybrid that does not lock smallholder farmers into regularly buying seed from large companies.

The significance of this development for smallholder farmers in the Lao PDR is two-fold: (i) *Mulato* appears to be an excellent variety for the environmental conditions of the Lao PDR, although improvements can and are still being made; (ii) there is a potentially large worldwide market for the seed of these hybrid varieties and the sole rights to market *Mulato* are held by Papalotla. There are few localities in southeast Asia where seed production of *Mulato* is technically possible. Northeast Thailand and much of the Lao PDR are an exception because of the higher latitudes compared with countries like Malaysia and Indonesia and the distinct wet-dry climate with a sharp break at the end of the wet season. Furthermore, grass seed production is ideally suited to smallholder methods, with good quality seed coming from hand harvesting. For these reasons, Papalotla have agreed to support expansion of smallholder seed production in both countries for export to Central and South America. In 2003, the first trials were conducted with seven smallholder farmers near Khon Kaen, Thailand. On the strength of the results, Papalotla provided a guaranteed market in 2004 that will allow 4,500 farmers to plant 1,600 hectares,
producing an estimated 200 tonnes of seed for export. Trials are under way in the Lao PDR in 2004 to explore the possibility of a similar market opportunity.

In 2004, the price paid to farmers for *Mulato* seed will be $5/kg with an estimated production of 20 – 25 kg/rai (120 – 150 kg/ha). This translates to a return of 600-750 US dollars per hectare. If we consider that a typical family in the uplands of the Lao PDR might consume 1,500 kg of rice per year and that rice can be bought in the market for about $0.30/kg, then the family could buy all the rice they need for just US$ 500, equivalent to the value of *Mulato* seed expected from three-quarters of a hectare. To produce 1,500 kg of rice, they would need about 1.0 – 1.2 hectares of upland fields and large amounts of labour for land preparation, planting, weeding and harvesting. Not only will a forage seed crop require less land for similar economic returns, but seed production will require significantly less labour than an upland rice crop. Furthermore, the farmers producing forage seed in Thailand are specialising in that crop. The situation in the Lao PDR would be very different. Farmers producing seed would be livestock producers, who can gain the additional economic benefit of using the forage produced by the *Mulato* seed crop through the subsequent dry season.

**Developing better quality forage varieties**

The ‘entry point’ to getting farmers interested in growing forages has been grass varieties. They are robust and provide high yields of feed very quickly. Initially farmers are less interested in the better quality feeds, mainly legumes, which tend to produce lower yields and are slower to establish (see Pengelly *et al.* 2004 for more detailed discussion). Now that some farmers are making the shift towards market-oriented livestock systems, there is a need to develop better quality feed resources for supplementing productive animals, such as pregnant cows and growing piglets.

**Developing forage resources for monogastric animals**

The potential of higher-quality forages for non-ruminant animals, especially pigs, poultry and fish, is just beginning to be understood. These livestock systems are often important in poor villages and among poor people within villages, so there is good potential for positive impacts on poverty through improvements in forages for these livestock.

**A final comment...**

A key lesson from this work is that extension staff do not need ‘finished models’ to promote to farmers. By providing farmers with a range of promising ‘raw technologies’, in this case forage varieties, and key technical information, and then using an extension approach that encourages farmers to innovate, significant and often-unexpected impacts emerge. Some failures also occur but these provide valuable lessons. In the case of forages, the impacts that are emerging are usually not related to the immediate problems that the farmers wanted to solve; they come from farmers intensifying their livestock production systems to take advantage of the opportunities that forages provide.
Authors
Viengsavanh Phimphachanhvongsod works with the Livestock Research Centre/National Agriculture and Forestry Research Institute (NAFRI), PO Box 7071, Vientiane, Lao PDR. E-mail: vieng63@laotel.com

Peter Horne and Rod Lefroy work with the Centro Internacional de Agricultura Tropical (CIAT), PO Box 783, Vientiane, Lao PDR. E-mail: p.horne@cgiar.org and r.lefroy@cgiar.org

Phonepaseuth Phengsavanh works with both NAFRI and CIAT. E-mail: p.phengsavanh@cgiar.org

Bibliography


FLSP. 2002. *Results of the Baseline Study conducted in 8 villages in Xiengkhuang and Luang Prabang in May 2002*. Vientiane. FLSP.


THE ADAPTATION OF UPLAND RICE CROPPING TO EVER-SHORTER FALLOW PERIODS AND ITS LIMIT

Anneke de Rouw, Bounsamay Soulilad, Khambay Phanthavong and Brice Dupin

Abstract

Rotational shifting cultivation in the mountainous land of Northern Laos is responding to population pressure by intensification of land use. In many areas the rotational cycle has been shortened to an unsustainable three to five years. With shorter rotations weed infestation becomes the major constraint in upland rice cultivation, particularly where only manual labour is used. This study is part of the MSEC programme (Managing Soil Erosion Consortium), present in seven countries in southeast Asia since 1998. MSEC deals with soil erosion under land use change. The Lao study site, Houay Pano watershed, is located 10 km from Luangprabang.

The study, conducted between 2001 and 2003, addresses the question of how, in shifting cultivation, cultivation practices have been adapted to shorter fallow periods. Particular attention is paid to the progressive invasion of weeds in fields and the subsequent extra work to clean these fields in order to continue upland rice farming. It also indicates the conditions where upland rice cropping is no longer possible. The study combined interviews with farmers, direct observations in fields, and field experiments.

Four successive stages were identified in the shifting cultivation system. Changes from one stage to the next typically involved a switch in tools, more work lost in weeding, changing priorities in the cropping calendar, and more and more drastic tillage techniques. Weeding and land clearing induce tillage erosion, which is the process of downhill soil movement caused by agricultural tools and gravity. Soil losses due to tillage were assessed experimentally in farmers’ fields. Regression analysis demonstrated increased erosion of between 1 and >5.5 t/ha/year as cropping rotations shortened from over eight years to three years on very steep slopes. In Houay Pano watershed, upland rice cropping is progressively being abandoned and replaced by less labour demanding crops (e.g. Job’s tears). The farmers in the watershed actively experiment with alternative land uses and cropping patterns, with and without the assistance of the MSEC programme.

Introduction

Shifting cultivation has long been a dominant feature in the highlands of southeast Asia and still is in the hills and mountains of Laos, Thailand and Vietnam. Shifting cultivation is largely subsistence-based, providing food, fibre, medicine and a variety of other needs from cropped, fallow and forested land. Over the last forty years a number of changes have affected shifting cultivation systems and the situation now includes the following three important factors: (i) a higher population pressure, mainly due to forced relocation and resettlement as well as spontaneous migration; (ii) the development of markets, together with the opening of roads and other infrastructure; (iii) a lack of suitable conditions for developing sustainable agricultural alternatives. Typical responses to and effects of
this situation have been: (a) the shortening of fallow periods to less than that required to suppress weeds and rebuild soil fertility, leading to productivity decline; (b) an increase in soil erosion and infertility, leading to lower yields and consequently, (c) an even greater pressure on slash-and-burn to produce acceptable yields. In shifting cultivation the shortage of good land, due to an increased ratio of cultivation to fallow, has become a crisis. However, it should be noted that shifting cultivation, whatever the rotational area, is a system where labour is the limiting factor. A study on shifting cultivation should therefore include estimates both of the productivity of the land and of the required labour.

Weed pressure has rapidly increased due to the shortening of the fallow period and farmers now consider weeding to be the most difficult task for upland rice (Roder et al. 1997). On steep slopes, these operations can induce tillage erosion, which is the process of downhill soil movement caused by the force applied by agricultural tools and gravity. The limited attention paid to tillage erosion probably originates from its slow and inconspicuous nature compared to the more spectacular gullies and rills resulting from overland water flow. In northern Laos, soil losses due to runoff, as measured at the plot scale under traditional farmer practices, are 5.7 t/ha/year mean over five years (Phonmasack et al. 2001). However, soil losses due to tillage remain largely unknown - hence the urgent need to quantify soil losses for each operation disturbing the topsoil surface. This is all the more pressing because shifting cultivation has developed from an essentially no-till system under long term fallowing into systems that depend heavily on tillage to control weeds.

This study is part of MSEC (Management of Soil Erosion Consortium), which is a scientific research programme based on a participatory, interdisciplinary approach and works at the watershed scale. The MSEC programme has been active in six Asian countries since 1998.

The aim of the study was to retrace all major changes in the shifting cultivation system in one area, starting from a period with no apparent land shortage and ending with a period in which shifting cultivation is progressively abandoned because the land becomes unsuitable for upland rice cropping. Secondly, this study estimates on-farm, and on the prevailing steep slopes, the quantity of tillage erosion induced by intensification of the shifting cultivation cycle.

**The study site**

The study site, Houay Pano watershed, comprises 73 ha and is located near the village of Lak Sip, about 10 km south of Luangprabang town along national road No.13. The population density in the village territory is 55 persons per km², which is quite high when compared to the mean density of 23 persons per km² in Luangprabang Province (NSC 1998). However, this density does not reflect the actual availability of land. Due to the land allocation and forest classification scheme introduced into Lak Sip village in 1995, only 136 ha or 31% of the village territory can be used for rotational cropping. With only this area of rotational land, the population density is then 98 persons per km² of arable land. The entire Houay Pano watershed falls within the category of rotational land and thus the study area reflects the real pressure on available cropland in the region. Farmers in the village practice upland rice-based cultivation in rotations of one to three years of bush fallow, and one year of rice or Job’s tears (*Coix lacryma-jobi* L.). The average house-
hold is comprised of five people and has three hectares of rotational land at its disposal. Most of the farmers cultivating the watershed also have fields and fallow plots outside the watershed. Khmou constitute 92% of the village population and 97% of household heads are engaged in farming as their major source of livelihood and income. Because of more intense cropping and reduced fallow period, farmers reported that crop yields have declined, leading to recurrent rice shortages. To compensate for these rice shortages, farmers resort to the sale of secondary crops, livestock, firewood and non-timber forest products.

The cultivated soils in the catchment are of medium fertility. Alfisols cover 71% of the catchment, with Entisols and Ultisols at 14% and 12% respectively (MSEC 1999).

From April 2001 onwards, a team of Lao and European students and staff stayed permanently in the village conducting studies in agronomy, soil science, hydrology and socio-economy. Senior scientists supported and monitored all the field team activities through extended stays in the village at monthly intervals.

**Study of cultivation practices: methods**

Three sources of information were combined: 1. interviews with farmers; 2. observations and experiments in farmers’ fields; 3. publications, including maps.

Instead of group interviews in the village, farmers were questioned individually in the field. Interviews with farmers were conducted frequently and can be considered as a continuous process over the years 2001-2003.

Field observations were carried out each year at regular intervals in 30-60 permanent plots of 9 m², in order to follow crop performance, weed development and vegetation regrowth. Within the watershed, where rotations are short, the monitored plots covered the range of upland crops (rice, Job’s tears, maize), soil types, topographic position and fallow length. Outside the watershed, examples of rice cropping under long-term fallowing were studied in a similar way (10-20 years of fallow). In addition, the cropping calendar, labour input and use of hand tools were determined. The extensive biophysical and socio-economic inventories produced in the MSEC programme were also used, i.e. annual land use maps, topographic, soil, and land tenure maps (MSEC 1999-2003).

**Changes in cultivation practices: results**

With fallow length diminishing gradually and the number of rotations increasing one by one, upland rice cultivation has become more labour intensive and difficult. Confronted with these problems, farmers have been forced to adapt their practices in a stepwise manner. Combining field observations and interviews, four successive stages of adaptation were identified in upland rice cultivation, as summarised in Table 1.

**Stage 1:** In the hilly country of northern Laos, on soils of moderate fertility, the development of fallow vegetation is such that after eight years or more of undisturbed growth the standing forest has to be cleared with an axe. The burning of the debris is sufficiently intense to produce a clean seedbed where rice can be sown with the first substantial rains. One or two weeding rounds are carried out, both with a small curved hoe. The weed cover is composed of a relatively few large individual weeds. These are pulled out and, where this is not possible, stems are cut off with the sharp edge of the curved hoe. Farmers avoid disturbing the soil, as they are aware that tillage triggers the germination of new seeds
and thus increases the weed pressure. The technique of sowing the rice, by dibbling the seeds in holes, is also an operation which reduces soil disturbance to a minimum.

**Stage 2:** In fallow vegetation less than seven to eight years old, the machete replaces the axe as a tool for land clearing. The quantity of slashed material is still large enough to provide an overall burn and a clean seedbed, allowing timely rice sowing. The distinguishing feature of stage 2 is the introduction of some tillage. Just after sowing, the weeds that appear are so numerous and so small that they cannot be pulled out individually or cut off. The first weeding operation - superficially scraping the soil with the curved hoe to uproot the weeds - disturbs the soil. The second weeding generally does not require tillage: the larger weeds are pulled out or the stems are cut off above the soil surface.

**Table 1: Characteristics of the four stages in shifting cultivation, Luangprabang**

*In bold, the distinguishing feature best remembered by farmers.*

<table>
<thead>
<tr>
<th>Operation</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field preparation</td>
<td>Clearing with axe</td>
<td>Clearing w/ machete</td>
<td>Clearing w/ machete</td>
<td>Clearing w/ machete</td>
</tr>
<tr>
<td>Burning</td>
<td>One burn</td>
<td>One burn</td>
<td>Burn, piling, re-burn</td>
<td>Piling, burn</td>
</tr>
<tr>
<td>Second clearing before sowing</td>
<td>None</td>
<td>None</td>
<td>Tillage with small curved hoe</td>
<td>Tillage with medium-sized hand hoe, this causes delay in sowing</td>
</tr>
<tr>
<td>1st weeding</td>
<td>Hand pulling and chopping with machete</td>
<td>Tillage with small curved hoe</td>
<td>Tillage with small curved hoe</td>
<td>Tillage with small curved hoe</td>
</tr>
<tr>
<td>2nd weeding</td>
<td>Hand pulling and chopping with machete</td>
<td>Hand pulling and chopping with machete</td>
<td>Tillage with small curved hoe</td>
<td>Tillage with small curved hoe</td>
</tr>
<tr>
<td>3rd weeding</td>
<td>None</td>
<td>Hand pulling and chopping with machete</td>
<td>Hand pulling and chopping with machete</td>
<td>Hand pulling and chopping with machete</td>
</tr>
<tr>
<td>4th weeding</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Hand pulling and chopping with machete</td>
</tr>
</tbody>
</table>

**Stage 1.** Rice cultivation without major constraints due to fallow periods >8 years and rapid forest cover after cultivation.

**Stage 2.** The massive germination of weeds requires a superficial scraping of the soil - this becomes necessary after two successive cycles of moderate duration (4-8 years).

**Stage 3.** Tillage prior to sowing becomes a necessity after three to four cycles of moderate duration (4-8 years) or short duration (<4 years).

**Stage 4.** Deeper tillage is needed to extract the rhizomes of grasses. Rice cultivation stops as weeds are impossible to control without the use of herbicide after five to nine cycles of short duration (<4 years).

(Note: cycle duration and number of cycles depend on soil conditions and topographic position).
smallest weeds are left undisturbed because they are considered harmless to the now well-developed rice crop.

**Stage 3:** With shorter fallow times the standing biomass of natural fallow vegetation becomes reduced, and so the burning phase of the process produces only scanty fires. Subsequently patches of soil surface remain unburned. Unburned patches, combined with the progressive invasion of weeds, create the need for additional clearing prior to sowing. Farmers are well conscious of this change because a new and heavier tool, the medium-sized hand hoe, had to be introduced into the system. This situation occurs after a succession of short rotations of about three to four years. Once this stage is reached, two or three weeding rounds are necessary after sowing. Only the last round does not involve tillage with the curved hoe.

**Stage 4:** After slashing the vegetation, the material does not cover the ground sufficiently to produce a burn. Instead, the debris is gathered and burned in heaps, and only these burned areas are weed free. The entire remaining field surface has to be tilled with a hoe before the rice sowing can start. More and deeper tillage is required to remove the rootstocks of perennial grasses that tend to invade the field. As farmers have to perform this preparatory cultivation, sometimes twice, they are naturally late with planting. Weeding after sowing is quasi-continuous, requiring up to four rounds. The last weeding round does not disturb the soil.

Most of the fields in the study site have been cultivated five to eight times with rice over the last 40 years. Over the same interval, average fallow periods have gradually reduced from about eight years to three. Most of the land has presently reached stage 4 of adaptive practice or has gone even beyond this, meaning that farmers are no longer cropping upland rice but are producing less labour-demanding crops instead.

**The study of tillage erosion: methods**

Tillage erosion under on-farm conditions was assessed in Houay Pano watershed during the cultivation seasons of 2001 and 2003. Soil losses were estimated, with three replications for different tools (clearing tools versus weeding tools), as well as for nine slope gradients ranging from 30 to 85%. For each measurement, 100 aggregates of 1-2 cm were taken from the soil surface, dried, painted and used as tracers. They were placed along a contour line marked by a string. A clearing or weeding operation was then performed and the distance between each displaced aggregate and this benchmark line was measured, enabling both the calculation of the soil flux caused by the tillage pass, and of the annual erosion rate per hectare (Dupin *et al.* 2002; Turkelboom *et al.* 1997).

**Tillage erosion: results**

Regression analysis of the experimental data produced the following conclusions and graph. In Figure 1, the results of tillage erosion under stage 4 of adaptation are presented. Firstly, soil losses increased exponentially with the slope, whatever the tool used. Secondly, tillage erosion depended on the type of operation: clearing with the medium-sized hand hoe works the soil down to 1-2 cm and generates more soil loss than weeding with the small curved hoe, which scrapes the topsoil to a depth of only 1-2 mm. Thirdly, soil losses due to tillage depended on the moment in the growing season. The more the rainy season advances, the more the soil is covered by the rice crop. Hence the chance of de-
tached soil aggregates ‘meeting’ a rice plant and subsequently getting trapped increases. These obstacles limit tillage erosion later in the season.

Apart from the above-mentioned interaction between crop and soil aggregates, there is also interaction between weeds and soil particles. The calculation of tillage erosion distinguishes two aspects: the quantity of soil detached, which depends on the tool (e.g. the hand hoe works deeper than the curved hoe); and the distance the soil particles travel down the slope, which depends on steepness and on roughness and cover of the soil surface. In the case of the first weeding round (in stage 4), plants are too small to be picked up individually. Instead, thousands of seedlings get uprooted and mixed with the topsoil, forming loose mulch. This mulch stops the downward movement of aggregates and hence limits soil losses (Figure 1). In contrast, during the second and the third weeding, individual weeds are mostly gathered in the hand and put down periodically, producing a rather bare soil that is less rough. Hence, soil losses increase (Figure 1). The fourth weeding generally does not include tillage.

**Tillage erosion and changes in shifting cultivation**

Soil losses due to tillage were evaluated in relation to the four stages in shifting cultivation identified above (Table 1). In Figure 2, soil losses are presented for the various slope classes and the four stages of shifting cultivation adaptation. Erosion increased with each stage, because new tools are introduced and the number of weeding rounds including tillage also increased. Figure 2 demonstrates that the combination of steep slopes and tillage is extremely degrading. At the watershed scale, tillage erosion has increased markedly because steeper slopes are nowadays cultivated more frequently than before. It should be noted that erosion events under stage 1 occurred every eight years at most, whereas erosion events under stage 4 occur every three years.

Figure 1: Tillage erosion due to hoeing during clearing and weeding, as influenced by slope gradient. Shifting cultivation in Houay Pano watershed, Luangprabang.
Houay Pano watershed, with its very high pressure on arable land, is approaching the limit of upland rice cropping without external inputs. Weed infestation prior to sowing seriously threatens the timely sowing of rice. Farmers are aware that late sowing of the crop directly affects its yield potential. In addition, the massive presence of weeds shortly after sowing threatens the acceptable development of the rice crop. In respect to these problems, the study site is ahead of most areas in Luangprabang province. Looking for alternatives, the farmers in the study site experiment with other upland crops as well as mixtures of crops. All of these can limit the work lost in weeding, and most of them also provide better ground cover over the rainy season (de Rouw et al. 2002).

Besides these spontaneous efforts of the Houay Pano farmers, since 2002 the MSEC programme has also been experimenting with improved fallows and alternative land uses to slash-and-burn, in close collaboration with other programmes (Lao-IRRI, IUARP, CIRAD). A preliminary analysis over one year demonstrated that erosion was substantially reduced under these alternative systems, though yields suffered (de Rouw et al. 2003).

**Authors**

Anneke de Rouw, Agronomist, IRD, MSEC Programme at NAFRI, c/o Ambassade de France, PO Box 06, Vientiane, Lao PDR  E-mail: derouwird@laopdr.com

Bounsamay Soulilad, Agronomist, MSEC Programme, Ban Lak Sip, Luangprabang province

Khambay Phanthavong, Hydrologist, MSEC Programme, Ban Lak Sip.

Brice Dupin, student from ISTOM, Clergy-Pontoise, France.

Figure 2: Tillage erosion under the various stages of shifting cultivation and as influenced by slope gradient
Bibliography


Village Land Use and Livelihoods Issues Associated with Shifting Cultivation, Village Relocation and Village Merging Programmes in the Uplands of Phonxay District, Luangprabang Province

Peter Jones, Somsak Sysomvang, Hongthong Amphaychith and Sukhan Bounthabandith

Abstract

The Land Management component of the Lao-Swedish Upland Agriculture and Forestry Research Programme (LSUAFRP) is undertaking action research on land use issues in project target villages in the uplands of Phonxay and Namor Districts. The villages are located in lower-lying areas where land use is affected by the relocation of people from more isolated highland villages. This relocation is a consequence of district plans to eliminate/reduce shifting cultivation and opium production. The districts have introduced programmes to consolidate or merge villages to provide better infrastructure and government services.

Research in study villages to date has indicated that the merging of Hmong families into the original Khmou settlements, while having some desirable outcomes, is giving rise to a range of land use, social and livelihood problems. This paper explains the type of action research that is being conducted in close cooperation with district authorities to identify problems that have arisen in study villages. It also provides quantitative and qualitative information on the consequences of village relocation, and makes suggestions on actions relating to land use planning that might be taken at district and village levels to ameliorate adverse consequences of the relocation programme. It puts forward some suggestions that could be considered by senior decision makers to ensure that well-intended livelihood improvement and poverty alleviation programmes are not adversely affected by ineffective land use planning procedures and activities.

Introduction

The Land Management component of the Lao-Swedish Upland Agriculture and Forestry Research Programme (LSUAFRP) is undertaking action research on land use issues in project target villages in the uplands of Phonxay and Namor Districts. The study villages are located in lower-lying areas where land use is affected by the relocation of people from more isolated highland villages. This relocation is a consequence of district plans to eliminate/reduce shifting cultivation and opium production. The districts have introduced programmes to consolidate or merge villages in order to facilitate the provision of better infrastructure and government services. These include road access, commodity markets, village water, schools, health posts, and agricultural extension services that can provide alternatives to existing production systems in the highlands.
Action research has been undertaken by the Land Management component staff in close cooperation with the relevant district agencies and development committees in each province, in particular the District Governor's office and associated units, and the District Agricultural and Forestry Office (DAFO). This approach helps to provide understanding of the difficulties facing both the communities and the district authorities as a consequence of village relocation to more accessible locations.

This case study focuses on a small group of target villages in Phonxay District, namely the ‘host’ village of Huay Maha (Khmou), and the ‘relocating’ villages of Ban Pha Toup, and Ban Phou Soong Noy (Hmong) and Phou Cha Norm.

**Background information**

**Relevant government policy and rural development programmes**

A number of village level development programmes arising from government policies are relevant to and influence village relocation and village merging activity plans at district level. These include:

- **The Focal Site Strategy and Village Consolidation Programme**: this is the cornerstone of the government’s rural development policy. It is officially viewed as a necessary means to reduce shifting cultivation. It specifies that a village unit may comprise no fewer than 50 families, which often results in the relocation of small settlements.

- **Opium Cultivation Elimination Programme**: the emphasis of this programme is on *in situ* alternative development rather than relocation of villages from opium producing areas. However, differing interpretations and application of the policy at district level sometimes results in the relocation of opium producing villages.

- **Shifting Cultivation Reduction and Alternate Occupations Programme**: the programme objectives are to stabilise shifting cultivation, stop indiscriminate logging, regenerate forests, and improve the living standard of upland people through the adoption of permanent land use systems.

- **Land and Forest Allocation Programme**: MAF Instruction No. 822/1996 set general principles, specific targets and implementation procedures. Land allocation is often viewed at district level as a mechanism for reducing shifting cultivation and in some cases has resulted in the allocation of insufficient land to families.

**Brief description of study villages**

**Ethnic composition**

The village of Huay Maha is a Khmou roadside settlement comprising two village groups, Huay Maha and Phoung Pao, which were amalgamated when land and forest allocation (LFA) was undertaken in 1997.

The villages of Pha Toup, Phou Soong Noy and Pha Cha Norm are inhabited by ethnic Hmong who used to reside in the high country in the hinterland of Huay Maha. They started to migrate to Huay Maha in the year 2000 as a consequence of the district relocation plan. Since then families have continued to settle at the new Huay Maha site and the old Poung Pao village site nearby.
**Village livelihood systems**

The Khmou group wish to retain a secure livelihood at their present location based on upland agricultural production and supplemented by handicrafts, some commercial tree crops (teak), non-timber forest products (NTFPs) and the raising of small animals and harvesting of stream fish. They have a future interest in large animals such as cows and buffalo but have few animals at present.

The Hmong villagers aim to attain a secure livelihood at their resettled location in Huay Maha, mainly from upland agricultural cropping close to the road, and in suitable areas within their old village boundary. They are experienced cattle raisers and wish to continue that activity on lands within their old village area, and/or in areas zoned for cattle production within the Huay Maha village area. They also wish to improve the education levels of their children so they can seek outside employment. Their plans include the phasing out of opium production, but the villagers emphasise the importance of retaining land for cattle grazing to provide livelihood security while they adopt other commercial production activities.

**Relocation and village merging plans in Phonxay District**

The Governor’s Office indicated that the plan for relocation and village merging in Phonxay District aims to reduce the total number of 72 villages to 41 villages by the year 2005.

<table>
<thead>
<tr>
<th>Year</th>
<th>Families</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001/2002</td>
<td>293</td>
<td>2,029</td>
</tr>
<tr>
<td>2002/2003</td>
<td>1,113</td>
<td>7,459</td>
</tr>
<tr>
<td>2003/2004</td>
<td>319</td>
<td>1,984</td>
</tr>
<tr>
<td>Total</td>
<td>1,725</td>
<td>11,472</td>
</tr>
</tbody>
</table>

An examination of the District Relocation and Village Merging Plan - Phonxay District 2001-2005, indicates that this would entail the movement of the following populations between the year 2001 and the year 2004.

Relocation may be justified and undertaken for any one of the following reasons:

- Villagers live in sensitive or critical watersheds.
- Villagers grow opium in mountainous areas.
- Provision of extension and development activities is difficult.
- Settlements have less than 50 families.
- Villages are located outside of ‘focal sites’ or ‘growth centres’.

The plan is not supported by any livelihood or land use analysis and leaves much of the responsibility for relocation with the communities themselves, as indicated by an extract from the plan presented in table 1.
Research activities

The action research activities followed the following procedures.

Research methodology

Field research was based on assessing the carrying capacity of available land to the existing and projected population, both in the ‘host village’ of Huay Maha and in the villages being relocated - Ban Pha Toup, Phou Cha Norm and Phou Soong Noy - in order to assess the consequences of relocation, and, in consultation with district authorities, formulate possible solutions to identified problems. The process is summarised below:

Activity 1: Gathering secondary data from district authorities and target villages.

Activity 2: Verification of current village populations and projection of population trends in villages in which relocation is occurring.

Activity 3: Verification and mapping of existing boundaries of project target villages and adjoining villages with DAFO staff and villagers.

Activity 4: Calculation of agricultural land available in ‘host’ and ‘neighbouring’ villages.

Table 1: Extract from the District Relocation and Village Merging Plan - Phonxay District 2001-2005

<table>
<thead>
<tr>
<th>No.</th>
<th>Villages</th>
<th>HHs</th>
<th>Pop</th>
<th>Year for Resettlement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Huay PianSun</td>
<td>60</td>
<td>382</td>
<td>02/03</td>
<td>Two villages find one location and form one village</td>
</tr>
<tr>
<td>2</td>
<td>Gang</td>
<td>36</td>
<td>235</td>
<td>02/03</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mok Chong</td>
<td>37</td>
<td>243</td>
<td>01/02</td>
<td>Four villages move to the Nambak area and form one village</td>
</tr>
<tr>
<td>4</td>
<td>Huay LonKiew</td>
<td>47</td>
<td>303</td>
<td>01/02</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>YaNong</td>
<td>33</td>
<td>215</td>
<td>01/02</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Khan</td>
<td>58</td>
<td>431</td>
<td>01/02</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Huay Port</td>
<td>37</td>
<td>218</td>
<td>02/03</td>
<td>Five villages find a location to form one village. The idea is they move to Sop Gia area, but this is not yet certain</td>
</tr>
<tr>
<td>8</td>
<td>Huay Xiua</td>
<td>35</td>
<td>209</td>
<td>02/03</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Phan Ta Long</td>
<td>32</td>
<td>255</td>
<td>02/03</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mok La Hang</td>
<td>51</td>
<td>314</td>
<td>02/03</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Huay Soy</td>
<td>54</td>
<td>300</td>
<td>02/03</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Pha Toup Tai</td>
<td>100</td>
<td>671</td>
<td>02/03</td>
<td>Five villages find a location and settle as one village (Huay Maha). Some are now moving to Pak Xeng Districts. Most have moved already to Long Ngat and Long Sa Ao</td>
</tr>
<tr>
<td>13</td>
<td>Phou Soong Noy</td>
<td>63</td>
<td>412</td>
<td>03/04</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Phou Cha Norm</td>
<td>66</td>
<td>478</td>
<td>03/04</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Long Yom Yai</td>
<td>52</td>
<td>377</td>
<td>02/03</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Long Yom Noy</td>
<td>41</td>
<td>343</td>
<td>02/03</td>
<td></td>
</tr>
</tbody>
</table>

Note: The plan includes the relocation of a total of 180 Hmong families from Pha Toup Tai, Phou Soong Noy and Pha Cha Norm to Huay Maha.
Activity 5: Approximation of carrying capacity of the available land in both the host village and neighbouring villages.

Activity 6: Livelihood discussions with representative farmers from each of the villages concerned to identify future farmer livelihoods and land use strategies.

Activity 7: Assessment of land requirements based on projected populations and livelihood strategies.

Activity 8: Adjustment and demarcation of host village boundary to incorporate adequate land from neighbouring villages to support the projected population.

Activity 9: Land and forest zoning using appropriate land use zoning criteria.

Activity 10: Land management and use agreements for the expanded host village management area.

Benefits derived by villagers

Representatives of the Hmong new settlers indicated they would derive the following benefits from moving to Huay Maha:

- Access to roads and transportation.
- Access to markets to buy and sell commodities.
- Improved access to health services, better educational opportunities.
- Access to better domestic water supplies.

Issues identified

Meetings with district authorities and the villagers identified the following issues and problems associated with the relocation programme in general and also with merging the Hmong and Khmou populations at Huay Maha.

Main issues

- The district authorities acknowledged that the district lacks adequate staff resources and budget to provide the infrastructure required for relocation on the scale outlined in the plan.

- Relocation and land allocation programmes are managed and implemented by different district agencies. This creates land allocation confusion when large numbers of new settlers occupy land in a host village.

- There is limited dialogue between concerned agencies and with village authorities when preparing the relocation plan.

- The land use strategies of the Hmong settlers and the district authorities appeared to be similar. However, the livelihood options expressed by the district (vegetables and coffee) were not comparable with the strategies of the villagers (cattle raising, rice, maize and Job's tears production).

- While some families accept relocation, others wish to remain in their old village sites because they have economic assets there such as grazing land and cattle.
Population increase has been rapid. In 1997/98, Huay Maha/Poung Pao comprised 58 families and a population of 337 persons. By the end of 2002, the number of families had risen to 92 and the population to 647.

New settlers are using a variety of ways to access agricultural land, including borrowing fallow or ‘spare’ land and paying the land tax instead of the original owner (then trying to claim title), renting land, and purchasing land from families migrating out of the village.

Land carrying capacity within Huay Maha village was inadequate for the number of Khmou and Hmong families supposed to be relocated there.

It would be necessary to expand village land areas beyond the boundaries of Huay Maha to enable the allocation of adequate arable land to new settlers.

Transportation of produce from remote fields to the road head would need to be considered in the district strategy. Villagers stated they were ready to work with the district authorities to build an access road for small vehicles.

Identification of village management areas (village boundaries) in both the host village of Huay Maha and the resettling villages would be necessary to facilitate appropriate land use zoning.

### Specific land use and social problems being encountered by villagers

- Most Khmou families have fewer plots of agricultural land to use; in the past they normally farmed four or more plots in rotation.
- Some of the recent arrivals do not have parcels of land, i.e. they have not been able to claim land in their new location.
- Less quality agricultural land is available for some families, forcing them to choose less fertile land.
- The established rotational land cycle by families with four parcels or more has been disrupted or reduced because new settlers have acquired numerous parcels.
- New settlers borrow land and pay the land tax to the Lands Office instead of the original owner, with the aim of establishing claim to the land.
- Farmers have adopted practices such as the sub-division of parcels, and crop rotations as an alternative to plot rotations. Villagers referred to this as *prayat din* (saving land). The new land use practices on the one plot of land may involve continuous cropping for three years before returning the land to fallow.
- *Imperata cylindrica* grass has started infested cropping fields.
- Significant numbers of land parcels allocated to Khmou residents by DAFO in 1997/98 have been vacated. This will necessitate a redistribution of land parcels.
- The mortality rate of Hmong settlers in Huay Maha, particularly children, has increased beyond normal levels since they moved from higher elevations, with nine deaths in the last two years.
The Khmou families who moved from Poung Pao to new Huay Maha have encountered several difficulties, including being further away from farming lands, having to vacate their houses in the old village and build new houses, and abandoning the permanent water supply at the old site for an incomplete supply at the new site. Hmong settlers are occupying land in the village area vacated by the Khmou.

There have been eight cattle mortalities because Hmong cattle owners had to move and secure livestock in a small fenced enclosure at Huay Maha, where there is very little grazing land. The animal losses were valued at 6,400,000 Kip.

The influx of Hmong families is associated with the original Khmou residents vacating allocated land. To date 121 hectares of allocated land has been vacated by 26 families who have migrated out. About half of the land has been acquired by Hmong families.

Villager proposals for resolving land shortage in Huay Maha

The villagers proposed the following solutions to overcome land shortages:

- Expanding the village boundary of Huay Maha to include land in the village areas from which they are migrating.
- Allocating land so that families have some plots in the area adjacent to the road and other plots in the management areas of their old villages. A system of exchanging land (laek plian din) between the villagers of Huay Maha, Ban Pha Toup, Phou Soong Noy and Phou Cha Norm was suggested.
- Planting crops such as upland rice, maize and Job’s tears in the old village areas where soils and climatic conditions were more favourable.
- Pooling labour to improve the walking track to the highland areas so that the transportation of cereal crops by horses and farm tractors to the main road and markets was made easier.
- Raising goats, cows and buffalo in areas further away from the road (‘far fields’).
- Constructing fish ponds and undertaking fish pond and frog culture in the areas near the road (‘near fields’).

Conclusions arising from action research

<table>
<thead>
<tr>
<th>Subject</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>District Development Strategy</td>
<td>The District Development Strategy (<em>pan utasart</em>), based on the policies of shifting cultivation reduction, opium reduction, and increasing forest cover, results in the concentration of populations in more accessible areas. The Plan to Arrange Watersheds and Relocate Villages (<em>pan ngarn jut san prum nam le tau hom ban</em>) contributes significantly to this population concentration and to land use confusion between the two ethnic groups.</td>
</tr>
<tr>
<td>Subject</td>
<td>Conclusions</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>District Rural Development Planning</td>
<td>District planning timeframes are oriented towards achieving policy and programmes targets by 2005/06, which results in a lack of focus on securing sustainable livelihood systems for villagers. This limits the effectiveness of programmes in addressing and alleviating poverty. The decentralisation of responsibility to the local levels is severely straining the institutional capacity of district agencies, including in rural development planning.</td>
</tr>
<tr>
<td>Land Management at District Level</td>
<td>It is observed that inter-agency dialogue and planning on the district programmes is limited, e.g. the village relocation programme and the land use planning and land allocation programmes are managed and implemented by different district agencies and are not very well integrated.</td>
</tr>
<tr>
<td>The Village Merging or Consolidation Programme</td>
<td>The relocation plan is too large and too rapid for the district to manage effectively with its limited resources. The plan is to move of 35 villages, 1,725 families and a population of 11,472 by 2003/04. The villagers have strategies for coping with relocation, similar in some ways to the district administration's strategies. However, their livelihood options are different.</td>
</tr>
<tr>
<td>Effects of Relocation in Huay Maha Village</td>
<td>Confusion exists over land occupancy and use (see above). Villagers have identified several problems and proposed solutions which, if addressed by district authorities, would ameliorate the situation.</td>
</tr>
<tr>
<td>Population Growth, Land Availability and Land Demand in Huay Maha Village</td>
<td>The demand for land for upland cropping could be between 1,920 and 2,400 hectares by the year 2010, and between 2,400 and 3,000 hectares by the year 2020 if the relocation of families follows the proposed plan. The area of arable land in Huay Maha is only about 1,225 hectares.</td>
</tr>
<tr>
<td>Village Livelihood Considerations</td>
<td>Consideration of village livelihood systems does not feature in the planning of relocation programmes. Villagers have strategies and coping mechanisms which would improve village merging programmes and should be considered by government staff.</td>
</tr>
<tr>
<td>Land Zoning and Land Allocation</td>
<td>Land rezoning and redistribution or reallocation will require quite detailed planning with Hmong and Khmou villagers because of the confused land use situation created by the relocation of Hmong villagers to Huay Maha.</td>
</tr>
<tr>
<td>Village Land Use Agreements and Inter-Village Networking</td>
<td>Village land use agreements and land use maps will be essential tools in developing inter-village natural resource management networks, based on appropriate groupings of villages within the small watershed of Huay Maha.</td>
</tr>
</tbody>
</table>
Recommendations

**District development strategy**

- The strategy would be greatly improved if it was not bound by policy and development targets, and if it was reoriented to match the limited availability of staff resources and funds. The resources available to implement a strategy should be a prime consideration in developing long-term development plans.

- Access to production land within reasonable distance of village sites should become a primary consideration in village consolidation programmes. Without a secure food-based livelihood system, the villagers will gain limited benefit from relocation if services promised are not delivered by the district authorities, as is the case in Huay Maha.

**District rural development planning**

- Villager participation in future planning needs to be increased to ensure that village livelihood objectives and strategies are incorporated by district staff in village land use and development planning.

- On-site community planning and alternate development approaches to reduce village opium cultivation, as practised by UNODC-supported projects, should be considered in the planning process at district level.

**Land management at district level**

- In future, inter-agency involvement in land management research should be strengthened to facilitate a bridging between the concerned district agencies implementing land management and land use programmes.

- Improved planning capability at district level should be addressed by:
  - developing and implementing improved land use planning procedures with district staff and villagers;
  - formulating possible solutions with the district authorities to address the potential negative consequences of the district relocation plan;
  - demonstrating improved ‘livelihood friendly’ methods of land use planning in selected sites, for evaluation by district and provincial authorities.

**The village merging and relocation programme**

- A rethink of the relocation targets should be considered, as well as provision for larger village production areas so that the growing populations have access to adequate land in the future.

- Alternatives to relocation should be considered, including the construction, with villager assistance, of access tracks and small rural roads to enable villagers to retain production areas near old village sites. The provision of land tenure entitlements in agreed production areas, and the development of forest and land management agreements would need to be integrated with access road construction.

- In circumstances where relocation is obviously desirable or unavoidable, the planning, costing and funding of infrastructure development, and the provision of services at roadside locations, should be undertaken prior to relocation.
**Population growth and land demand**

- Population growth projections and arable land area availability calculations should be incorporated in planning for village consolidation, because the present criteria for merging small settlements to achieve 50 families per village near roadsides isolates villagers from production areas, creates land shortages in the more accessible areas, and restricts production and livelihood potential and opportunities in the hinterlands.

**Land zoning and land allocation**

- Responsibility for ‘land redistribution’ and ‘land reallocation’ should be worked out by villagers, both Hmong and Khmou, with guidance from staff, to ensure that host village families are not losing their allocated land to new settlers, and that new settlers receive fair allocations, using land rezoning approaches (see below).

- Where village merging is undertaken, land and forest zoning and land allocation should focus on securing sustainable livelihoods within an ‘integrated village management area’. In the case of Huay Maha, for example, the integrated village management area could include suitable lands in Huay Maha, Pha Toup Tai and Phou Soong Noy.

**Village Land Use Agreements and inter-village networking**

- In relocation villages, Village Land Use Agreements should be prepared with villagers after land redistribution and rezoning is completed in order to encourage inter-village cooperation in forest and agricultural land management and use.

**Authors**

Peter Jones is the Land Use Adviser, Lao Swedish Upland Agriculture and Forestry Research Programme, National Agriculture and Forestry Research Institute, Lao PDR. E-mail: prjones@laotel.com

Somsak Sysomvang is the Head, Land Use Planning Unit, Forestry Inventory and Planning Division, Department of Forestry, Lao PDR

Hongthong Ampanychith is the Technical Officer, Land Use Planning Unit, Forestry Inventory and Planning Division, Department of Forestry, Lao PDR

Sukhan Bounthabandith is the Technical Officer, Land Use Planning Unit, Forestry Inventory and Planning Division, Department of Forestry, Lao PDR
Bibliography


LAND USE PLANNING: AN APPROACH TO POVERTY REDUCTION AND STABILISATION OF SHIFTING CULTIVATION IN THE LAO UPLANDS TO IMPROVE UPLAND LIVELIHOODS

Jens Kallabinski and Doris Lundgreen

Abstract

In 1995 the national Land Use Planning and Land Allocation (LUP/LA) programme was started in order to revise land use in villages in Luangnamtha Province. The GTZ. Integrated Rural Development Programme in Mountainous Areas (RDMA) has been working to improve this process, to secure and upgrade the upland livelihoods of villagers in the mountainous areas of Sing District. The predominant hilltribe in the district are the Akha people, who used to practice slash-and-burn cultivation in the uplands until it became restricted. It was found that in most villages people did not understand the reasons for the LUP/LA process and that in some cases the land that was allocated to them was not sufficient. Therefore GTZ looked to improve the process by supporting and training governmental staff. More participatory elements were brought into the process, which has been renamed Participatory Land Use Planning (PLUP). This new approach was evaluated in August 2003, and a variety of recommendations have been made on how to further improve the process in the future.

Introduction

The economy of the Lao PDR is facing a lot of challenges. While 80% of the population derive their livelihood from agriculture, including the usage of forest resources, Laos is confronted with a dramatic degradation and destruction of forests, leaving only 41% of originally forested areas still intact in 2003 (Xayvongsa 2003).

In the northern provinces, particularly in mountainous areas, on average just 60% of people are rice sufficient, with ethnic minorities the worst affected. These people still use non-timber forest products (NTFPs) extensively, and are also highly reliant on fishing and hunting to compensate for their rice shortage. The traditional shifting cultivation generally practised to farm this mountainous topography was sustainable as long as large forest areas were available in relationship to the density of the population. Some Hmong groups have been identified as an exception to this though, because of their destruction of forested mountainous areas (ADB 2001).

However, these traditional slash-and-burn methods have come under pressure due to population increase, transformation of forest areas into other productive land (e.g. rubber plantations), and logging activities (Rock 2003a). In order to face these challenges the Lao Government set up a comprehensive programme. Started in 1996, the programme consisted of various essential laws, policy statements, strategies, decrees, concepts and ac-
tion plans to create a framework for Land Use Planning (LUP) as an approach to improving the social and economic aspects of life in the Lao uplands.

To find out about the effectiveness of LUP and its implications for the daily lives of villagers, GTZ performed an impact assessment which included an evaluation of the LUP process itself. The following chapters briefly outline the main aims of LUP and explain the methodology applied for the impact assessment. The results of the evaluation are presented, followed by the LUP methodology. Recommendations for an improvement of the LUP process are then listed and are followed by general conclusions.

The aim of LUP

Land Use Planning and Land Allocation (LUP/LA) were started in 1996 in order to promote decentralised and community-based management of natural resources. The aim was to achieve the following national development goals:

- Social goals: poverty reduction, food security, village consolidation.
- Economic goals: stabilisation of shifting cultivation, increasing agricultural productivity combined with sustainability to secure long-term income, opium eradication, and community-based natural resource management to improve and protect forest areas and their biodiversity by transferring the responsibility to village level.

The national LUP/LA programme has since covered 95% of villages in Bokeo and 40% of villages in Sing and Nalae and is to be finished by 2005.

LUP impact assessment

Aim

In order to fully understand the impact of LUP/LA at village level, GTZ conducted an assessment of LUP that focused on the following points:

LUP process
- Did the villagers understand the purpose of LUP?
- Is there a noticeable difference between the shorter methodology which was previously applied, and the improved methodological approaches enacted by GTZ?

Socio-economic changes
- How does LUP contribute to poverty reduction?
- What are the implications and impacts on daily livelihoods?
- What changes are the villagers confronted with after LUP?
- What effects does the LUP have on environmental issues?

The impact assessment was carried out between November 2003 and January 2004 by Udo Pawlowski, a student from Germany working in Sing District, Doris Lundgreen, a GTZ consultant from Germany in Sing and Nalae Districts and Jan Seven, DED staff, in Bokeo Province. Additionally, several villages were assessed by Florian Rock, a consultant on
Natural Resource Management (NRM) and Rural Development, within an evaluation assessment of LUP. These results have also been analysed and used (for more details see Rock 2000b). A further two villages in Sing District were assessed in September 2003 by Benjamin Mohr, a student from Germany. These villages experienced a revised GTZ LUP/LA approach in May 2003.

The assessment was supported by DAFO project staff: Mr. Bounthan, Mr. Sommy and Mr. Bounthien for Sing District and Mr. Kuab for Nalae District.

The impact assessments were carried out in seven villages of Sing District and four villages in Nalae. Two villages in Bokeo Province were covered by the assessment of Florian Rock.

**Methodology**

The impact assessment is based on two questionnaires: a structured questionnaire developed by the Lao-Swedish Forestry Project (LSFP) in 1999 and a semi-structured questionnaire by Florian Rock in 2003.

The actual questionnaire used for the assessment was a mixture of semi-structured and structured interviews designed for interviewers with little training in interviewing. It

<table>
<thead>
<tr>
<th>Village</th>
<th>LUP/LA Carried out</th>
<th>Protection and Conservation Forest</th>
<th>Production and Use Forest</th>
<th>Agricultural Land Use Area (including paddy)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sing District</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.Seanane</td>
<td>2003</td>
<td>430 ha (55%)</td>
<td>200 ha (26%)</td>
<td>149 ha (19%)</td>
</tr>
<tr>
<td>B.Nanoy</td>
<td>2003</td>
<td>1328 ha (39%)</td>
<td>1367 ha (40%)</td>
<td>690 ha (20%)</td>
</tr>
<tr>
<td>B.Lo Meu</td>
<td>2003</td>
<td>356 ha (52%)</td>
<td>37 ha (5%)</td>
<td>286 ha (42%)</td>
</tr>
<tr>
<td>B.Yan Luang</td>
<td>2000</td>
<td>220 ha (63%)</td>
<td>31 ha (10%)</td>
<td>97 ha (28%)*</td>
</tr>
<tr>
<td>B.Sopeemay</td>
<td>1999</td>
<td>180 ha (23%)</td>
<td>123 ha (16%)</td>
<td>381 ha (48%)</td>
</tr>
<tr>
<td>B.Tinthat</td>
<td>2001</td>
<td>71 ha (22%)</td>
<td>51 ha (16%)</td>
<td>195 ha (61%)</td>
</tr>
<tr>
<td>B.Namlek</td>
<td>2001</td>
<td>156 ha (39%)</td>
<td>35 ha (9%)</td>
<td>206 ha (52%)</td>
</tr>
<tr>
<td>B.Laokhao</td>
<td>2001</td>
<td>478 ha (52%)</td>
<td>113 ha (12%)</td>
<td>324 ha (35%)*</td>
</tr>
<tr>
<td>Houayna Kang</td>
<td>2001</td>
<td>1005 ha (79%)</td>
<td>156 ha (11%)</td>
<td>148 ha (10%)</td>
</tr>
<tr>
<td><strong>Nalae District</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Lao</td>
<td>1998</td>
<td>129.5 ha (13%)</td>
<td>60.5 ha (6.5%)</td>
<td>471 ha (47%)</td>
</tr>
<tr>
<td>B. Hadlooi</td>
<td>1999</td>
<td>214 ha (43%)</td>
<td>12 ha (2%)</td>
<td>266 ha (54%)</td>
</tr>
<tr>
<td>B. Hadchome</td>
<td>2001</td>
<td>818 ha (62%)</td>
<td>345 ha (26%)</td>
<td>129 ha (10%)</td>
</tr>
<tr>
<td>B. Puchalae</td>
<td>1998</td>
<td>535 ha (72%)</td>
<td>21.5 ha (3%)</td>
<td>187 ha (25%)</td>
</tr>
<tr>
<td><strong>Bokeo Province</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Namai</td>
<td>1999</td>
<td>535 ha (72%)</td>
<td>21.5 ha (3%)</td>
<td>187 ha (25%)</td>
</tr>
<tr>
<td>B. Thongkang</td>
<td>1996</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* without paddy
was translated into Lao language to minimise misunderstandings due to language differences and to facilitate the process of questioning the villagers.

However, the importance of training the interviewers should be emphasised. When staff do not fully comprehend the purpose of a questionnaire, the results of interviews might not reflect the whole truth.

While conducting the interviews the following constraints were met:

- Valuable information was lost during the translation process.
- Time available for interviews was restricted, meaning that it was impossible to do any actual field study (e.g. checking plots or crops).
- The presence of a DAFO official might have influenced the validity of the answers (e.g. through a fear of voicing criticism).
- Some difficulties were encountered when trying to locate legal documents (either within the village or at the DAFO).

**Results of the LUP impact assessment**

Even though the villages which were surveyed differed greatly in their economic status and history (e.g. date of settlement), the results of the assessment showed some similarities which can be summarised as follows.

Positive aspects:

- All villages seemed to highly approve of the clear village boundaries, which reduce quarrels with adjacent villages.
- Most villages mentioned a considerable improvement in forest regeneration.
- Some villages claimed that their living condition has generally improved.

Negative aspects:

- Land zoning within the village boundary was drawn arbitrarily, neglecting actual topography, soil conditions, etc.
- A high percentage of land within the village boundary was designated for conservation and protection purposes, leaving only small areas for agriculture and production forest. Very often this does not amount to enough land to cover the village’s daily needs.
- Sometimes pressure has also increased on NTFPs, leading to a noticeable decrease in certain NTFPs (e.g. green bamboo).
- LUP induces a higher pressure on arable land by excluding plots which were used as fallow land for shifting cultivation.
- Increasing pressure on agriculture leads to less yield and thus to more poverty. Some families are trying to improve their livelihoods by opening up land which has not been allocated and often lies within protected and conservation forest areas.

**LUP/LA methodology**

The initial results of LUP/LA seemed not to be meeting the goals set by the government. In recognition of the importance that villagers’ knowledge be integrated into the
LUP process in order to achieve sustainable land use, in 2002 GTZ started to support a revised LUP/LA approach in Sing District. To improve livelihoods in the longer term, GTZ worked on strengthening villagers’ participation in land use planning. To do this it was important to spend more time in the villages gathering data, making a needs assessment, and understanding the problems of the villagers (including both sexes).

In 2003, GTZ technical advisor Mr. Bounyong Thongmalayvong trained three LUP/LA teams to conduct LUP in this more participatory fashion. Two villages in Sing District where the revised LUP has since taken place have been assessed to try and provide a comparison with the old LUP process. However, it is difficult to express any conclusions yet since the time span since the LUP is too short for any noticeable impact on livelihoods to have occurred.

**Recommendations for the improvement of LUP**

The results of LUP/LA impact monitoring showed that some adaptations and improvements are still needed if the LUP/LA approach is to achieve the aim of sustainability and improved livelihoods in the uplands.

---

### Table 2: Overview of LUP/LA procedures

<table>
<thead>
<tr>
<th>Stages</th>
<th>Main Activities</th>
<th>Modified eight-stage procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Preparation for implementation of LUP and LA activities (training of staff, preparation of materials, villager consultations)</td>
<td>LUP and LA preparation</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Village boundary survey, land use zoning, forest surveys and land use mapping</td>
<td>Introduction to LUP, gender exercise, PARM²</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Data collection and analysis concerning land tenure, socio-economic conditions and needs</td>
<td>Village boundary delineation and agreement</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Village land use planning and land allocation meeting</td>
<td>Land Use and forest survey, village profile</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Agricultural field measurements</td>
<td>Village zoning. Forest and agricultural land allocation decisions.</td>
</tr>
<tr>
<td>Stage 6</td>
<td>Preparation of forest and agricultural agreements and transferring rights to villagers</td>
<td>Signing of contracts and land tenure</td>
</tr>
<tr>
<td>Stage 7</td>
<td>Land use management extension.</td>
<td>Promotion, extension, support</td>
</tr>
<tr>
<td>Stage 8</td>
<td>Monitoring and evaluation</td>
<td>Monitoring and evaluation</td>
</tr>
</tbody>
</table>

¹ Land Use Planning and Land Allocation Procedures and Method (GTZ 2003)
² PARM: Participatory Analytic Resource Map
The following points are suggested guidelines for methodological adaptations to the LUP/LA process:

**Law, policies, regulations**
- To facilitate comprehension of the legal policy, it would be advisable to prepare a summary of the relevant law documents, including a brief explanatory handout in Lao.
- Village regulations should be drafted by the villagers themselves (and also include their traditional rules).

**Data collection and storage**
- Improve cooperation between community development workers and other teams in order to avoid double data collection.
- Focus only on land and natural resource issues.
- Analyse the collected data more clearly for use in the LUP process.

**Boundary Agreement and Land Use**
- In order to define boundaries, aerial photography can be used to specify zones and land use.
- Boundary agreements should be standardised and need to be signed by neighbouring villages to achieve full consent.
- Villages which depend upon shifting cultivation need agricultural use areas that allow a sustainable rotational cultivation system (including fallow periods).
- Extra time should be spent identifying additional potential paddy land, which could be set aside as reserve land for future land allocation.
- In case future resettlement of villages is required, enlarged topographic maps can be used to identify potential areas for new settlements (including new paddy fields, water supply, topography etc.).

**Land Allocation**
- Ideally all land within the village boundary should be allocated for permanent crops only.
- It is advisable that criteria for new land be developed together with villagers. This might help to minimise social conflicts among villagers and improve the livelihoods of the poorest villagers.
- Migrating families should be integrated into the process.
- LUP needs to be reviewed in the cases of relocated householders who migrated to the new village after LUP had taken place.

**Extension**
- In order to offer villagers alternatives to their traditional land use (shifting cultivation and opium) it is important to give them technical advice. Therefore land capability and development potential need to be analysed in parallel with the LUP process.
To prevent a new form of land-misuse/exploitation, it is essential that neutral advice be provided to villagers.

Consultancy and project staff attendance are necessary on a long-term basis in order to teach villagers new agricultural methods.

Financial support is needed to help poor villages start new crops.

**Monitoring, evaluation and future prospects**

- The LUP/LA process should be regularly followed up through assessment visits, impact monitoring and evaluation of the understanding of LUP. In this way, new problems and conflicts that arise can be identified at an early stage and managed more quickly. It is recommended that visits initially start on a monthly basis and gradually decrease over time.

- A successful LUP/LA process is the starting point for the development of an improved community-based mechanism for NRM such as NTFP, firewood and timber production. Simple management plans need to be adopted for the future usage of forests, including the protection of land, water supply etc. (for more detailed information see Rock 2003b).

The suggested improvements could be implemented on a step-by-step basis that also makes use of existing cooperation with national or NGO partners. This would ensure a bottom-up approach, which helps villagers to understand the LUP process. Participation will lead to higher satisfaction with and improved acceptance of LUP. Most important however, is that the daily needs and requirements of villagers are satisfied, thus making LUP more beneficial for villagers.

**Conclusion**

LUP is one step towards poverty reduction and stabilisation of shifting cultivation in the uplands of the Lao PDR. The overall opinions gathered in the survey indicated the benefits of clearly defined boundaries, which minimise conflicts among villages.

However, the impact assessment also showed some weak points, which need to be improved in order to achieve a successful and sustainable LUP for the villagers.

GTZ is trying to improve the process of LUP by providing training for CD staff and by working closely together with the DAFO. Joint financing between GTZ and DAFO could lead to a successful LUP/LA in the future that will improve the livelihoods of villagers.

**Authors**

Dr. Jens Kallabinski and Ms. Doris Lundgreen work with the Lao-German Rural Development Programme in Luangnamtha, PO Box 100 Muang Sing, Luangnamtha Province, Lao PDR. E-mail: rdnamtha@laotel.com
Bibliography


Land Use Planning Approaches to Involve Villagers in Land Use Management and Forest Protection

Amphay Ladouangphanh, Phetsay Phetsomphang and Peter Jones

Abstract

Land use planning (LUP) is a key activity in the Institutional Strengthening Capacity Building Component of the Shifting Cultivation Stabilisation Pilot Project (SCSPP) and has the task of “investigating and developing new and/or modified approaches and options to land allocation in upland areas”. Since the end of 2000, LUP activities have focused on piloting approaches to land use planning at the village level that are appropriate to the topographic and socio-economic conditions prevailing in Xamneua District, and manageable under the resource constraints faced by the district and provincial agencies working with the project.

This paper describes the modified approaches to LUP that are being developed by the project in cooperation with the relevant PAFO/PAFES and DAFO. To help determine the particular LUP activities that are most applicable, village specific conditions are taken into account. For example, more isolated villages with little access to markets receive minimum LUP inputs, while for those villages with more potential for sedentary farming systems, land use zoning is implemented and village land use agreements are developed to facilitate inter-village networking aimed at improving village level natural resource management. This paper elaborates on how land use zoning, village land use agreements, inter-village networking and monitoring activities may be used to contain upland cultivation within agreed agricultural zones, while protecting forest areas.

A phased approach to LUP is applied. The reasons for deferring land allocation to a later stage in the LUP process are explained. Time is allowed for the village boundaries and land use zones to be mapped and digitised, and clusters of villages to be 'formed' into 'networks' to facilitate villager understanding and cooperation regarding management and use of resources before land allocation is attempted. Approaches to land allocation are being reviewed and pilot activities will commence in 2004. Preliminary views on land allocation methods are presented, along with proposals for securing villager land use rights, starting with the issue of Temporary Land Use Certificates and progressing to land registration.

Introduction

The Shifting Cultivation Stabilisation Pilot Project (SCSPP) started field operations in 2000 in two zones in Xamneua District, Huaphanh Province. Land use planning (LUP) is a key activity in the Institutional Strengthening Capacity Building Component of the SCSPP. This component has the task of “investigating and developing new and/or modified approaches and options to land allocation in upland areas”.

Since the end of 2000 LUP activities have focused on piloting approaches to land use planning at village level that are both appropriate to the topographic and socio-economic
conditions prevailing in Xamneua District, as well as manageable under the resource con-
straints faced by the district and provincial agencies working with the project. The ap-
proaches being developed aim at containing shifting cultivation within agreed agricultural
land use zones while providing villagers with agricultural and forest land use entitlements
and benefits.

Background Information

Land Use Planning (LUP) activities commenced in the project in November 2002 with
initial orientation training for relevant provincial and district personnel, followed by an
assessment of current LUP and Land Allocation (LA) approaches in the project area. Pilot
testing of modified approaches was undertaken in early 2001 in two target villages after
which discussions with relevant project, provincial and district officials led to an agree-
ment on the approaches that would be further piloted and applied in the project area.
Provincial, district and project staff members have jointly worked in the project villages
to learn and implement the approaches. The project has provided technical training, field
equipment and materials to the provincial and district forestry offices to facilitate their
participation in the LUP activity.

The programme has now completed village boundary delineation and/or land zoning
in 52 villages. Currently, under an agreement with the GIS Unit at the National Agriculture
and Forestry Research Institute (NAFRI), a series of digitised maps of the project area,
village network areas, and village land use zones are being prepared. Future work will
focus on developing improved methods of providing agricultural land tenure entitlements,
inter-village networking, and monitoring of the LUP and LA activities.

Land Use Planning approaches

Characteristics of the approach

- **Efficient:** workable with limited staff resources.
- **Cost effective:** achievable with limited funds.
- **Relatively simple:** achievable by staff with limited technical skills.
- **Flexible:** suitable for steep upland terrain as well as lowland situations.
- **Adaptable:** recognises the variety of land uses and farming systems in villages.
- **Gradual:** progresses through phases to increase villager understanding of the process.
- **Responsive to policy:** contributes to shifting cultivation stabilisation.
- **Participatory:** incorporates inter-village networking to manage natural resources.

The initial focus is on LUP and not land allocation. To promote inter-village coopera-
tion, LUP work is first undertaken in ‘clusters’ of villages occupying the same small waters-
shed area. These ‘village clusters’ are later formalised into ‘networks’ to encourage
sustainable village management and use of village production land areas and village pro-
tected forest areas. LA is deferred until after villagers adopt the zoning and networking
activities. This provides villagers with an opportunity to take responsibility for distrib-
uting farming land to families, using agreed guidelines, at a later time.
Options within the approach

The approach is an adaptation of the process adopted by the Government of the Lao P.D.R., commonly referred to as the “eight-nine step procedure”, as shown in table 1.

Table 1: The “eight-nine step procedure”

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LUP and LA Preparation</td>
</tr>
<tr>
<td>2</td>
<td>Village Boundary Delineation and Land Use Zoning</td>
</tr>
<tr>
<td>3</td>
<td>Data Collection and Analysis</td>
</tr>
<tr>
<td>4</td>
<td>Preparation of Village Land Use Plans</td>
</tr>
<tr>
<td>5</td>
<td>Forest and Land Allocation Decisions</td>
</tr>
<tr>
<td>6</td>
<td>Field Measurement of Agricultural Land</td>
</tr>
<tr>
<td>7</td>
<td>Forestry-land Agreements and Transfer of Rights to Villagers</td>
</tr>
<tr>
<td>8</td>
<td>LUP and LA Information Storage and Agricultural Land Allocation Records</td>
</tr>
<tr>
<td>9</td>
<td>Monitoring and Evaluation</td>
</tr>
</tbody>
</table>

This procedure is reorganised into three options:

1. **Village boundary approach**: Village boundary delineation (table 2).
2. **Land use zoning approach**: Village forest and land use zoning (table 3).
3. **Land allocation approach**: Agricultural land allocation (table 4).

Table 2: Village Boundary Delineation

<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LUP and LA Preparation - Staff and Villager Orientation</td>
</tr>
<tr>
<td>2</td>
<td>Establishment of Village LUP/LA Committee</td>
</tr>
<tr>
<td>3</td>
<td>Village Boundary Delineation (and, if possible, some preliminary zoning)</td>
</tr>
</tbody>
</table>

Table 3: Village Forest and Agricultural Land Use Zoning

<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LUP and LA Preparation - Staff and Villager Orientation</td>
</tr>
<tr>
<td>2</td>
<td>Establishment of Village LUP/LA Committee</td>
</tr>
<tr>
<td>3</td>
<td>Village Boundary Delineation</td>
</tr>
<tr>
<td>4</td>
<td>Forest and Land Use Zoning</td>
</tr>
<tr>
<td>5</td>
<td>Preliminary Village Forest and Agricultural Land Management Agreements</td>
</tr>
<tr>
<td>6</td>
<td>Establishment of Village Land Use Networks</td>
</tr>
</tbody>
</table>
Table 5: Appropriate Situations for the Three Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Situation or Criteria</th>
<th>Staff Required</th>
<th>Approx. Cost per Village (Lao Kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boundary Approach</strong></td>
<td>Resources are very limited (staff, budget, equipment)</td>
<td>3-5 staff for 5-7 days = 15 to 35 person days</td>
<td>600,000 to one million</td>
</tr>
<tr>
<td></td>
<td>Isolated villages with difficult access and terrain</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sparsely populated areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas where there is a very low demand for land</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Villages where shifting cultivation is indiscriminate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Little or no paddy land available</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some benefit from funds expended</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Land Use Zoning Approach</strong></td>
<td>Resources are very limited (staff, budget, equipment)</td>
<td>5-7 staff for 7-10 days = 35 to 70 person days</td>
<td>1.5 to 2.5 million</td>
</tr>
<tr>
<td></td>
<td>Areas with reasonable access</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas with medium population densities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas where there is a low demand for land</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas where upland farming systems dominate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some paddy land available</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good benefits from reasonably low expenditure</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Land Allocation Approach</strong></td>
<td>Sufficient resources available (staff, budget, equipment)</td>
<td>12 + staff for 30 + days = 360 + person</td>
<td>6 – 8 million</td>
</tr>
<tr>
<td></td>
<td>Areas with good access and less difficult terrain</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas with higher population densities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas where there is a higher demand for land</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Villages where land values are higher (paddy, tree crops)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher potential for land disputes within the village</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential for extension programs to work effectively</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential benefits from funds expended relatively high</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The advantage of having these three options is that they can be used as separate options for specific situations and/or they can be used sequentially in a process over a period of years.

Implementing the three options

The programme applied some simple criteria to determine in which situations, or under what conditions, the different options would be most appropriate. This enabled village selection in which each of the options would be implemented. The criteria for classifying villages into three categories are summarised in table 6.

Having villages classified in this way enables staff to:

- Set priorities for LUP/LA implementation
- Plan and budget more accurately
- Use available staff and budget resources more efficiently

Village types and village networks

In the Nam Vene Zone, one of two zones in the project area, villages are classified and grouped into clusters or networks as indicated in table 7.

<table>
<thead>
<tr>
<th>Village</th>
<th>Type</th>
<th>Network 1</th>
<th>Village</th>
<th>Type</th>
<th>Network 2</th>
<th>Village</th>
<th>Type</th>
<th>Network 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pieng Di</td>
<td>2</td>
<td></td>
<td>Ban Pieng</td>
<td>3</td>
<td></td>
<td>Ban Khong</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Houa Phou</td>
<td>2</td>
<td></td>
<td>Na Tang</td>
<td>2</td>
<td></td>
<td>Ban Na</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Muang Vene</td>
<td>3</td>
<td></td>
<td>Na Loui</td>
<td>2</td>
<td></td>
<td>Ban Him</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Huay Man/</td>
<td>1</td>
<td></td>
<td>Yeun Thong</td>
<td>1</td>
<td></td>
<td>Ban Teum</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Cheekeng</td>
<td></td>
<td></td>
<td>(Huay Yeun)</td>
<td></td>
<td></td>
<td>Sombong</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Na Houay</td>
<td>2</td>
<td></td>
<td>Na Douang</td>
<td>2</td>
<td></td>
<td>Hauy Sarm (Huay Long)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Na Kao</td>
<td>2</td>
<td></td>
<td>Huay Beuan</td>
<td>2</td>
<td></td>
<td>Huay Yen/Tong Ching</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Na Phai</td>
<td>2</td>
<td></td>
<td>Huay Yap</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Na Khoun</td>
<td>2</td>
<td></td>
<td>Huay Harn</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 villages</td>
<td></td>
<td></td>
<td>8 villages</td>
<td></td>
<td></td>
<td>7 villages</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Progress with land use planning implementation**

Progress was very slow in 2001 when approaches were being developed and agreed on. At this time, orientation training was undertaken with provincial and district staff. In 2002, field implementation accelerated and in the 2002-2003 period, work was completed in 50 villages, as indicated in Table 8.

**Relevance to containing shifting cultivation**

Land allocation has been widely viewed as the mechanism for reducing shifting cultivation as indicated by the emphasis placed on it at district levels. The SCSPP approach is based on the understanding that shifting cultivation of the 'pioneer type' (where undisturbed forest land is felled for cultivation) is unacceptable, and that cultivation of land for agriculture using forest fallow rotations in agreed agricultural zones, is acceptable, MAF (2001). Available information suggests that the impact of land allocation on shifting cultivation reduction may be minimal:

- Assessments by the Forestry Inventory and Planning Division of the Department of Forestry (DoF) during the period 1992 to 2002 suggest that areas of shifting cultivation countrywide remain approximately unchanged (MAF 2003).
- Studies, including the Participatory Poverty Assessment (ADB 2001), have also indicated that villagers regard land allocation as a cause of poverty, particularly in upland areas because it reduces areas of farming land available to farmers.

### Table 8: Land use planning implementation from February 2001 – December 2003

<table>
<thead>
<tr>
<th>Period</th>
<th>Zone</th>
<th>No. of Villages</th>
<th>Villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2001</td>
<td>Nam Ham</td>
<td>2</td>
<td>Ham Tai, Na Muang</td>
</tr>
<tr>
<td>March 2002</td>
<td>Nam Ham</td>
<td>4</td>
<td>Ham Neua, Na Chong, Ban Yat, Huay Sone</td>
</tr>
<tr>
<td>July-September 2002</td>
<td>Nam Ham</td>
<td>11</td>
<td>Phou Piet, Huay Paek, Lak 12, Keo Khuang, Na Pieng, Huay Sarn, Ban Bun, Hadkok, Na Kao, Na Khoun, Na Phai</td>
</tr>
<tr>
<td>October-December 2002</td>
<td>Nam Ham</td>
<td>6</td>
<td>Saleuy, Na Sala, Phonexay, Ban Done, Na Nong, Ban Bang</td>
</tr>
<tr>
<td>January-March 2003</td>
<td>Nam Ham</td>
<td>9</td>
<td>Na Kar, Na Kham, Kor Hai, Sang Kham, Huay Harn, Ban Sombong, Huay Yen / Tong Ching, Huay Sarm, Na Huay</td>
</tr>
<tr>
<td>April-June 2003</td>
<td>Nam Vene</td>
<td>6</td>
<td>Ban Teum, Ban Na, Ban Khong, Ban Him, Ban Na Tang, Ban Na Loui</td>
</tr>
<tr>
<td>July-November 2003</td>
<td>Nam Vene</td>
<td>9</td>
<td>Huay Beuan, Ban Pieng, Ban Na Douang, Ban Yeun Thong, Lak Sao, Huay Khong, Muang Yong, Huay Sart/ Poung Din, Tabong</td>
</tr>
<tr>
<td>December 2003</td>
<td>Nam Vene</td>
<td>5</td>
<td>Haua Phou, Muang Vene, Huay Man/ Cheekeng, Yeun Thong/Huay Yeun, Huay Yap</td>
</tr>
</tbody>
</table>

**Total No of villages** 52
A discussion paper “Land Allocation or Land Use Zoning: What is the Priority” prepared by the Lao Swedish Forestry Program, proposed that more emphasis should be placed on land use zoning aspects (LSFP 2000).

These findings and proposals, just a few among others that have been documented, suggest that revised village-level land management approaches to ameliorate or contain shifting cultivation, need to be examined.

Three aspects of the SCSPP LUP/LA approach are briefly discussed below to contribute to dialogue on this issue. These are: land use zoning, village forest and agricultural land use agreements, and inter-village networking.

**Land use zoning**

Land use zoning is a participatory activity with villagers that enables LUP staff to understand village views on demarcating production and protection zones within an agreed village boundary. At the same time it provides an environment that enables villagers to understand government policies and programmes regarding land use allocation and entitlements. The aim of the activity is to zone forest and land use categories that contribute to a satisfactory village livelihood system, while offering potential for retaining current forest cover levels. The premise adopted is that the activity contain the expansion of shifting cultivation by demarcating an appropriate area, or areas, of agricultural land within which villagers undertake cultivation using forest fallow rotations. Villagers manage the distribution of land to families within the agricultural zone or zones and develop land use agreements to manage agricultural land as well as production and protection forest areas. Land allocation is phased in at a time when villagers are comfortable with managing the land use zones.

**Village forest and agricultural land use agreements**

These agreements elaborate the management, land use arrangements and conditions for each of the land use categories. They are developed with villagers at the time when land use zoning is undertaken, and are officially acknowledged by the district authorities. The implementation of the agreements is facilitated and strengthened by village land use maps and village signboards. The Village Authority (VA) works with the appointed LUP and LA committee and the Village Development Committee (VDC), which represent men and women, to implement and enforce the conditions and rules of the agreement. Land use staff members assist the VAs to resolve difficult land use issues that arise, thereby ensuring that the integrity of the Agreement is protected. Agreements should provide for flexibility in the use of land and include agreements and conditions for the use of forests and land in neighbouring villages, as well as exchange of land between villages.

**Inter-village networking and monitoring**

Inter-village networking commences from the time neighbouring villages come together to discuss and agree on village boundaries. Networking is progressively strengthened by the preparation of Inter-village Boundary Agreements, and by awareness activities that facilitate an understanding of the Village Forest and Agricultural Land Use Agreements of neighbouring villages. Clusters of villages with common boundaries are formally organised into ‘networks’, representatives of which meet regularly to discuss and resolve land use issues and conflicts, and to progressively develop understanding on natural resource
management and use at the network level. LUP staff members assist with organising networking activities, and use the network’s meetings to monitor the implementation of VAs as well as to develop and document Network Agreements. In view of the limited district resources available for monitoring, and to ensure that communities are managing the land use zones as intended, monitoring focuses at the ‘zone level’ and not the ‘parcel level’.

These approaches are being implemented by the SCSPP with the aim of monitoring and evaluating their effectiveness in rationalising and improving forest and agricultural land use practices at the village level. It is too early to evaluate either their impact on village livelihoods, or their effect on containing shifting cultivation and maintaining forest cover. However, to facilitate monitoring and evaluation, village management area and land use zoning records have been created and a series of land use maps are being developed in a GIS system that can be used by land use planning staff members during village networking and monitoring.

**Phasing land allocation into the land management process**

Land allocation is a complex and expensive activity and its implementation needs to be considered very carefully. In the approach proposed by the SCSPP, land use rights to agricultural land would be initially managed by the Village Authority (VA) who would distribute parcels of land to families within the agricultural zone or zones. Record sheets of land claimed and used by families would be maintained by the VA to facilitate land allocation which would be phased in at a time when villagers were comfortable with managing the land use zones, and had rationalised the ‘ownership’ of land parcels among the various families. Preference would be given to Type Three villages (as per earlier description), where the expense of surveying and allocating land is justifiable. For convenience, land allocation could follow the village network groupings as this would then facilitate the allocation of land parcels in adjacent villages within the network.

**Proposed land allocation approaches**

It is envisaged that groups of villagers (units or nouay) with a history of land use in various parts of the agricultural zone would be responsible for sub-zones, within which they would work out equitable distribution of land to families. The VA and VDC would initially provide ‘group guarantees’ to families that they would have continued access to various parcels of land to cultivate crops of their choice, both for subsistence and cash purposes. Land Use Certificates would be issued for parcels of land on which families demonstrate that they are making progress with stabilising agricultural practices. In other words, land allocation would be a gradual process not a ‘one-off’ exercise. Land Use Contracts would not be issued because they:

- Are not necessary in the process of land registration.
- Unnecessarily restrict farmers’ land use/cropping choices and flexibility to respond to market opportunities.
- Require that farmers pay fines for so-called “inappropriate uses” which damages relations between farmers and extension staff.
- Are very difficult for limited numbers of staff to monitor and enforce.
Authors

Amphay Ladouangphanh is the National Project Director of the Shifting Cultivation Stabilisation Pilot Project, P.O.Box 129, Xam Neua District, Houaphanh Province. E-mail: pioscspp@laotel.com

Phetsay Phetsomphang works with the Shifting Cultivation Stabilisation Pilot Project, PO Box P.O.Box 129, Xam Neua District, Houaphanh Province. E-mail: pioscspp@laotel.com

Peter Jones is the land management adviser for the Shifting Cultivation Stabilisation Pilot Project. E-mail: prjones@laotel.com

Bibliography


MAF, 2001. Address to the National Assembly by the Deputy Minister of MAF, October 2001. Section regarding “clarification on the definition of shifting cultivation”.


SCSPP Lao PDR and ADB. 1999. Appendix 1, Background Information and Terms of Reference.
Non-Timber Forest Products for Poverty Reduction and Shifting Cultivation Stabilisation in the Uplands of the Lao PDR

Joost Foppes and Sounthone Ketphanh

Abstract

Gathering of Non-Timber Forest Products (NTFPs) is as important for human livelihoods in the uplands of the Lao PDR as agricultural and livestock production. NTFPs provide food security and are the main source of cash income for people who live in the uplands. Key trends in NTFP gathering are analysed. NTFPs are promising for the development of forest-based rural micro-enterprises as a strategy for poverty alleviation. NTFPs also provide a good entry point for community based land use planning, land allocation and management. This bears consequences for the way upland development interventions (by Government and donor-supported projects/programmes) should be designed.

Many NTFPs are derived from the mosaic of forests and fallows created by shifting cultivation. A case is made for the development of long-cycle NTFP production systems that are suited to the ecology of the uplands of the Lao PDR, as a strategy to stabilise shifting cultivation, protect watersheds and conserve biodiversity of both wild and cultivated species of plants and animals.

Introduction

In the uplands of the Lao PDR, shifting cultivation systems have predominated livelihoods and land-use systems for centuries. Literature on shifting cultivation tends to emphasize the agricultural component of the system. Fallow vegetation and regenerating forests are described mainly as factors contributing to crop production in terms of soil fertility, weed suppression and erosion prevention. Much less emphasis is given to the role of gathering forest products as a part of upland livelihood systems and the productivity of shifting cultivation systems in terms of forest products.

Over the last ten years, a body of evidence has emerged on the importance of Non-Timber Forest Products (NTFPs) in rural livelihoods in the Lao PDR. NTFPs are especially important for families in the uplands, most of whom practice shifting cultivation. Their 'pre-occupation' with gathering and hunting can be observed from several angles:

- The role of NTFPs in the livelihoods of upland people.
- Time spent on gathering NTFPs, compared to time spent on agriculture.
- The role of NTFPs in local knowledge and belief systems.
- The way in which shifting cultivators create a wide diversity of ecosystems that produce a great genetic variety of NTFPs and upland crops.
Each of these aspects is briefly examined in section 2, leading to the conclusion that there is a need for a different view on shifting cultivation, especially if the benefits of NTFP gathering are added to the equation. Shifting cultivation is not necessarily a bad practice that should be abandoned, but rather an energy-efficient system providing a highly diversified livelihood pattern. Section 3 examines the key trends that are causing changes to shifting cultivation in the uplands of the Lao PDR and their impact on rural livelihoods and the environment. Left unchecked, these trends could lead to a rapid increase in poverty and a loss of natural resources and biodiversity. Section 4 examines how NTFPs can provide a vehicle for sustainable upland development. Shifting cultivation can be modified into long fallow rotational upland production systems. NTFPs are also a good entry point for community based forest management and a good basis for income generation, poverty alleviation and private sector development. Section 5 concludes how these strategies could be applied by extension agencies/projects, researchers and policy makers.

The importance of NTFP gathering versus agriculture in shifting cultivation systems

The role of NTFPs in the upland family economy

The mosaic landscape of the uplands of the Lao PDR results from a long history of shifting cultivation. It consists of a variety of forests and fallows, which produce a great amount of valuable NTFPs, providing a basis for export and cash income for rural families (box 1).

Roughly 70% of Lao people live in the uplands, around half of these are practising shifting cultivation in some form or another, often in combination with other farming systems (UNDP 2002). Table 1 presents estimates for rural family cash income from NTFPs from a number of recent publications. Annual family cash income from NTFPs varies from US$ 69-127, averaging around 45% of family cash income.
However, cash income is only a minor part of total family income. Most of the crops and products collected from nature by Lao families are directly consumed by the family, without entering the cash economy. Table 2 shows some estimates of this subsistence use or non-cash family income. The link between NTFPs and food security deserves special mention (see box 2).

### Table 1: Family cash income from NTFPs per year in four provinces, various sources (values recalculated to US$ equivalent to compensate currency changes of Lao Kip, over time)

<table>
<thead>
<tr>
<th>Location</th>
<th>Khammuane</th>
<th>Xayabouri</th>
<th>Luangprabang</th>
<th>Sekong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of data collection</td>
<td>1997</td>
<td>2001</td>
<td>2001</td>
<td>2003</td>
</tr>
<tr>
<td>No of villages sampled</td>
<td>5</td>
<td>12</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Cash income per family per year</td>
<td>US$ 170</td>
<td>n.a.</td>
<td>US$ 259</td>
<td>US$ 155</td>
</tr>
<tr>
<td>NTFP cash income</td>
<td>US$ 69</td>
<td>n.a.</td>
<td>US$ 127</td>
<td>US$ 12</td>
</tr>
<tr>
<td>NTFP cash income</td>
<td>41%</td>
<td>44%</td>
<td>49%</td>
<td>8%</td>
</tr>
<tr>
<td>Livestock cash income</td>
<td>32%</td>
<td>8%</td>
<td>23%</td>
<td>0%</td>
</tr>
<tr>
<td>Other cash income</td>
<td>27%</td>
<td>46%</td>
<td>18%</td>
<td>92%</td>
</tr>
</tbody>
</table>

*Sources: Khammuane: (Foppes and Ketphanh 2000), Xayabouri: (Foppes et al. 2001) Luangprabang: (Yokoyama 2003) Sekong: (Rosales et al. 2003).*

### Box 2: Forest foods and food security

Food security is the overwhelming concern of most rural families in the Lao PDR. Especially in hilly areas, where people are dependent on upland rice cultivation, most families are unable to produce enough rice to feed their family all year round. The main coping strategies of poor families are:

- Complementing their diet with forest foods.
- Selling NTFPs to buy rice.
- Borrowing rice and paying back in labour.

A study on consumption of forest foods in three villages in Saravane Province showed that:

- Food security is an acute concern of most families in the study area.
- All families in the three villages collect forest foods on a daily basis.
- Villagers consume a great variety of forest foods, both animal and plant products.
- Forest foods are the most important source of food besides rice.

Forest foods provide unique advantages as a coping strategy for poor people:

- Availability and dependability.
- Diversity (e.g. in the Nakai area, 223 of a total of 306 NTFPs were forest foods (Foppes et al. 1997).
- Nutritional values.
- Economic and cultural values.
- Forest foods can substitute rice in times of great hunger.
- Forest foods can be exchanged for money to buy rice and avoid debt.

(Source: Clendon 2001)
It is remarkable that non-cash income contributes as much as 75-84% of total family income, with cash income only 16-25%. NTFPs provide up to half of this non-cash income, with an equivalent value of US$ 269-398 per family per year, even in a place like Sekong, where coffee plantations and not NTFPs are not the main source of income.

NTFPs contribute 39-44% of non-cash household income, equivalent to about US$ 200-359 per family per year. The other main element of subsistence consumption is rice. It is interesting to note that more than half of all household cash income is used to buy rice, as many upland families cannot produce enough rice to feed their families. From the above, it seems reasonable to conclude that:

- NTFPs contribute as much as, if not more than, agricultural and livestock production to family incomes of upland families in the Lao PDR, most of whom are involved in shifting cultivation.
- The large amount of NTFPs used for subsistence indicates a strong link between NTFPs and food security (see also Clendon 2001). NTFPs are also a key coping mechanism for the poorest families in times of need.
Non-cash income or subsistence use plays a much larger role than cash income in the family economy of upland farmers.

**Time spent on gathering NTFPs and on agricultural production**

Several studies have estimated time spent on agricultural production among shifting cultivating families in the Lao PDR. A recent study in Phongsaly cites an average input of 210 man days per family per year (Baudran 1999). There are not many studies available on labour inputs for gathering of NTFPs, which seems to indicate a research gap. A recent study on harvesting of bitter bamboo shoots in Oudomxay quotes an average labour input per family of 195 man days per year (Morris and Ketphanh 2002). The harvesting season for bitter bamboo shoots is only four months, from December to April.

The same families also commercially harvest cardamom, tout tiang bark, red mushrooms and broom grass during other months of the year. For subsistence use, families need to collect palm leaves, bamboos, rattans, etc. to use for house construction and/or tools. Besides that every family has to collect firewood, vegetables, small water animals (fish, frogs, shells, crabs) and other food products for cooking every day. It seems reasonable to conclude that the total amount of time spent on NTFP gathering per family per year must be greater than the time spent on agricultural and livestock production.

**NTFPs, local knowledge systems and genetic diversity**

People who practice shifting cultivation in the uplands of the Lao PDR can easily enumerate the hundreds of NTFPs that they gather from forests, fallows and wetlands (Foppes et al. 2001). These ‘repertoires of knowledge’ are one of the more visible parts of local knowledge systems, developed and maintained by local people over centuries. Other as-

---

**Box 3: Shifting cultivators as producers of genetic diversity**

Researchers at the International Rice Research Institute (IRRI) have recently identified over 13,000 local varieties of rice cultivated in the Lao PDR (Appa Rao 2000). The only other country in the world to have a similar variety of rice is India, which covers a much larger area and has many more ecosystems than the Lao PDR. This makes the Lao PDR the world’s most important rice gene pool in the world.

The vast majority of these local rice varieties in the Lao PDR are glutinous or “sticky” rice varieties, mostly grown as a staple food in uplands under shifting cultivation. These varieties were not produced by sophisticated modern researchers, but by local people of various ethnic groups, practising shifting cultivation in the uplands of the Lao PDR. Among these, women are the main managers and decision makers on rice breeding.

These varieties are now regarded as a valuable genetic resource for the entire world. This raises the question of how these varieties should best be conserved. Specialists in agricultural biodiversity argue that the best way to preserve local varieties is by preserving the agricultural systems and people that produced these varieties (Gemmil 2001).

For the Lao PDR, this would actually mean that to keep this large number of rice varieties intact over time the Lao Government would need to preserve and maintain various ethnic groups living in the uplands, practising shifting cultivation. This poses an interesting new policy perspective, with regards to existing policies towards shifting cultivation.
pects of local knowledge systems are agricultural production and resource management systems, beliefs and rituals as well as modes of thought. There is growing recognition among social scientists that these local knowledge systems are essential for sustainable development. Such scientists advocate that local knowledge systems are a key factor explaining the vast genetic diversity of plants and animals found in the uplands of Southeast Asia (Santasombat 2003).

Shifting cultivation systems are regarded as the most energy-efficient agricultural systems in the world, where 5-50 units of food energy are obtained for each unit of energy expended. In contrast, industrialised agriculture with large fossil fuel energy inputs needs about 5-10 units of fuel energy to produce one energy unit of food (Ramakrishnan 1992).

A good example of genetic diversity created by local knowledge is the recent discovery that the Lao PDR is the world’s leading gene pool for rice (box 3). Local shifting cultivators prove to be the main producers of this wide genetic variety in rice. In this way, one could argue that shifting cultivators have actively maintained a wide variety of wild products in the landscape through their practices of shifting cultivation and NTFP gathering.

Local knowledge systems and local practices such as shifting cultivation, NTFP gathering and preserving the genetic variety of upland rice, should not be regarded negatively. Government, researchers and development agencies need to rethink the role of shifting cultivation and local knowledge systems, as part of the solution for sustainable use of uplands, NTFPs and the preservation of genetic resources.

**How shifting cultivation produces a wide range of NTFPs**

Shifting cultivation produces a landscape consisting of a mosaic of vegetation types, representing fallows and forests in various stages of regeneration (Pollini and Lamxay 1999). Each of these vegetation types produces its own specific set of harvestable products, or NTFPs (see table 3).

Not all NTFPs are collected from mature forests; many NTFPs are also collected from young fallows, grasslands and wetlands. It would seem fair to assume that the variety of NTFPs is greater in a mosaic of vegetation type, as produced by shifting cultivation, than in a landscape covered by only one type of vegetation (crop fields, mature forest).
The dynamics of fallow vegetation, how they depend on fallow length, soil type, slope aspect, previous vegetation etc, are still little documented and poorly understood. In a case study from Luangnamtha, three types of grass fallows can be distinguished, only one of which develops into woody fallows, which become secondary forests over time. As cultivation intensifies, the other two more permanent grass fallows start to become more common (Pollini and Lamxay 1999).

However in another case study in the province of Phongsaly, not far from Luangnamtha, local people report an increase of forest fallows and a reduction of grasslands over the past fifty years (Baudran 1999). This increase of forest land in Phongsaly could well be a result of the settlement of Akha (also known as Ikho or Kho) people. Akha people in neighbouring northern Thailand are reported to follow the practice of regenerating forests for practical and religious purposes (Santasombat 2003).

More research is urgently needed, as it would help us to better understand how to manage upland forest landscapes. For example; collectors of edible bitter bamboo shoots would like to understand better why bitter bamboo forests suddenly spring up in some places after shifting cultivation and why not in others. Such knowledge might make it easier to stimulate the natural generation of these economically lucrative bamboo plots.

**Current trends in NTFP gathering in uplands of Lao PDR**

NTFP gathering in the Lao PDR has changed more rapidly over the last decade (since the early 1990s) than in any other period of Lao history. The main factors causing these changes are:

- Evolving markets for NTFPs.
- Population growth.
- Forest conversion for commercial purposes.
- Government policies directed at upland use.

This section reviews the main impacts of these key factors on NTFP gathering.

**Evolving markets for NTFPs**

Various studies report an increasing trade in NTFPs to neighbouring countries: China, Vietnam and Thailand (Yokoyama 2003; Sayakhoumane and Bott 2002). Exports of NTFPs from the Lao PDR amount up to several million dollars per year. Typical products include:

- Medicinal for the Chinese medicine market: cardamom (Amomum spp.), malva nuts, (Scaphium or Sterculia lychnophora), orchid stems (Dendrobium spp.).
- Aromatic barks and woods for used for the production of incense and perfumes: eaglewood (Aquilaria spp.), barks of Boehmeria malabarica, various Lauraceae species containing saffrol.
- Food products: sugar palm fruits (Thailand), fresh off-season bitter bamboo shoots (China).
- Fibre products: e.g. bamboo and rattan (Vietnam).
Trends in the commercial use of NTFPs are:

- Prices are staying low, as markets are volatile and non-transparent.
- Prices are staying low because most products are sold raw, without any processing or quality control.
- Lack of legislative framework to support sustainable trade in NTFPs. A recent report outlines recommendations how to fill this gap (Sigaty 2003).
- Increased gathering for trade leads to a rapid exhaustion of natural stocks for some NTFPs, e.g. agarwood, Aquilaria sp. or aromatic barks of Lauraceae spp. such as “bong” bark.
- Increased demand for NTFPs starts to result in commercial plantation of economically attractive species, e.g. cardamom (Amomum spp.) and bong bark (Persea kurzii).

**Population growth**

With an estimated population growth of 3.5% per year, the population of the Lao PDR can be expected to double in twenty years (Foppes *et al.* 1993). Without emigration or changes to more intensive land use systems, this population pressure will lead to a shortening of fallow periods, to the extent that shifting cultivation will no longer be possible.

---

**Box 4: Examples of declining NTFP resources due to increased population pressure**

Forest dwelling communities can make good estimates of declines in off-takes of NTFPs. The village of Ban Nong Hin, Champasack, developed management systems varying from rotational harvesting of rattans to prohibited fishing seasons or total hunting bans for certain species of wildlife.

Changes in off-takes per unit of effort for 3 key NTFPs over the last 10 years (1989-1999), assessed by villagers of Ban Nong Hin, Champasack, 17/2/99. (Source: Foppes & Ketphanh 2000).

<table>
<thead>
<tr>
<th>NTFP</th>
<th>10 years ago</th>
<th>Today</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife</td>
<td>Plenty of wildlife: turtles, monitor lizards, deer, snakes, jungle fowl, other birds. You could easily hunt them in your backyard. There was no outside market, no selling. Only our village hunted (9 families only).</td>
<td>Many species disappeared: turtle, deer, jungle fowl, birds. You can walk for 48 hours and still not get anything. Market demand is big, prices are getting higher (1 mouse-deer costs 12,000 kip). Many outsiders come to hunt in our forest. Village has 57 families now.</td>
</tr>
<tr>
<td>Fish</td>
<td>You could catch 4-5 kg within 1 hour. There were only 9 families. No selling, no destructive methods used, only traps and nets.</td>
<td>You can not even get 0.5 kg in 1 hour. There is not enough to feed all our 57 families. Strong outside market (2,500 kip/kg). Destructive methods used by outsiders: explosives, guns, poison. Decline: 90%</td>
</tr>
<tr>
<td>Rattan</td>
<td>In 1 day, you could get 300 stems, or as many as a man can carry. We used to also have big diameter rattan, now only small diameter species.</td>
<td>You can only get 20-30 stems in a day. Harvesting has intensified over the last 2 years. 1 stem sells for 200 Kip. We know there is no quota but we need to sell anyhow. Decline: 90%.</td>
</tr>
</tbody>
</table>
and natural supplies of NTFPs will disappear. Local communities often report declining availability of NTFPs over a time frame of about ten years (box 4).

It is difficult to obtain a clear picture of population dynamics in the uplands. The challenge remains to find out how conservation of upland resources can be combined with such a rapid population increase.

Section 2 presented a case for sustainable management of NTFPs in the wild. This is an essential strategy, aimed at preserving the nation's biological and genetic resources. Yet it is also obvious that the Lao PDR's natural resources alone will not be able to provide enough NTFPs for the needs of tomorrow's population. Additional production of NTFPs will have to be provided from NTFP gardens and plantations. More research, building on existing local knowledge is needed to develop these plantations.

**Deforestation and NTFPs**

Shifting cultivation is often blamed for being the main cause of deforestation. However, several studies have pointed out that commercial logging and conversion of forests for commercial plantations (rubber, coffee) are the main causes of destruction of primary forests in the Lao PDR (Ducortieux 2000; World Bank 2001). Shifting cultivation is often practised on secondary forests. Furthermore, shifting cultivators sometimes produce more forests than they destroy (Santasombat 2003). Our perspective on shifting cultivation vis-à-vis deforestation may need to be redefined. As one author states:

"The inclusion of slash and burn agriculture in the debate on deforestation minimises the role of timber concessions and places the blame on farmers, who cannot defend themselves" (Ducortieux 2000).

Deforestation for commercial use often destroys the NTFP resources that local communities rely on for food security. In view of the volatile nature of the markets for plantation crops such as rubber and coffee, one should ask how the loss of these NTFP resources compares economically to the risks and gains of such plantations. Studies on costs/benefits and environmental/social impacts are urgently needed, for example: in the province of Luangnamtha where thousands of hectares of primary forest were converted to rubber plantations in 2003. The outcome of such studies should be shared with all stakeholders.

**Impact of Government policies on upland NTFP availability**

Impacts of certain Government policies on the livelihoods of upland farmers have been reported elsewhere. The main impact on NTFP harvesting seems to be that policies on land allocation and reduction of shifting cultivation reduce the area of fallow land producing NTFPs. Land allocation policies may need to be revised to allow village communities to practice the long fallow rotational systems that provide them with the maximum range of NTFPs in a sustainable way (NAFRI LSUAFRP 2003).
NTFP-based options for sustainable upland development

The preceding chapters reviewed the role of NTFPs in upland development, as well as the main trends affecting that role. It seems that NTFPs provide a very good starting point for:

- Maintaining a “social safety net” system for poor upland families.
- Community based management of natural resources.
- Private Sector Development based on forest products.
- Plantations of commercial NTFPs for economic development.

Some key strategies for each of these development options are presented here.

Maintaining basic food security for poor families

Strategies for maintaining the food security and coping strategy role of NTFPs for poor rural families include:

- Put NTFP activities as a central part of livelihood based strategies.
- Apply rapid appraisal tools to identify the role of NTFPs in livelihoods and equity.
- Protect access to forest resources for poor families to ensure their food security.
- Promote NTFP agendas as a “must-have” for every rural development programme at province/district/community level.
- Include NTFP use indicators and criteria in livelihood assessment studies.
- Apply economic forest valuation studies to rural development policy development.

Village-based management of wild NTFPs in natural forests

Strategies for NTFP based community land use planning and biodiversity conservation include:

- Find what people are using the forest for and issues regarding this use, then facilitate a process for solving these issues by agreeing on sustainable use rules per product, rather than for the entire forest.
- Use land allocation, not only to focus on demarcation of areas but also to facilitate agreements on the use of specific products inside forest areas.
- Develop frameworks for dealing with the use of one forest block by multiple villages at sub-district level.
- Build on local concerns about exhaustion of NTFPs for income, and engage local communities in using their local knowledge to preserve biodiversity.

NTFPs as a basis for Private Sector Development

Strategies for improving NTFP based private sector trade and industries include:

- Strengthen local communities to organize NTFP production and marketing by organizing producer associations and entrepreneur groups.
- Improve business support services for rural micro enterprises.
Strengthen producers and traders associations at province/national level.  
Develop market and price information systems.  
Improve marketing/quota systems and link them to ecological sustainability criteria/indicators.  
Add value by introducing quality control and product processing techniques.  
Study the potential of standards-based systems, e.g. product certification.  
Link NTFPs to ecotourism (tourists are interested in learning about NTFP use).

**Domestication of NTFPs in gardens**

- Set up systems to record and support the exchange of local knowledge regarding domestication and ecology of wild plants and animals.  
- Identify and protect genetic resources of all NTFP species.  
- Develop nurseries and multiplication systems for key species.  
- Conduct agroforestry trials to identify best practices for production of key species in gardens.  
- Carry out farming systems research to integrate domesticated NTFPs in long rotation hill farming systems.  
- Secure intellectual property rights for Lao NTFPs in the context of conservation of biological/genetic diversity.

**Conclusion**

NTFPs are important for the survival of upland communities, both in terms of cash income as well as subsistence use. Upland farmers spend more time per year on gathering NTFPs than on agricultural production. Shifting cultivation and NTFPs are closely related and both are part of local knowledge systems that should be preserved for sustainable use and conservation of wild and agricultural genetic resources. Long fallow rotational systems creating a mosaic of vegetation types are essential for the maintenance of the genetic variety of upland rice varieties and NTFPs. Community forest management systems need more legal and training support to achieve this. However, these systems will not be able to meet all future requirements for NTFPs by the local population and export markets. Domestication of NTFPs in plantations needs to be accelerated to meet tomorrow's demands. Private sector development needs to be stepped up to add value through better quality control, processing and more efficient marketing of NTFPs for income generation. Marketing analysis systems need to be set up to support these private sector developments effectively.
Authors

Mr. Sounthone Keptanh is the Deputy Director of the Forest Research Centre/NAFRI, Email: sounthone53@yahoo.com

Mr. Joost Foppes is the flexible NTFP adviser for SNV, the Netherlands Development Organisation, based at the Forest Research Centre/NAFRI, Email: jfoppes@csloxinfo.com

Bibliography


Ducortieux, O. 2000. *Agriculture & Deforestation in Laos: the machete, an alibi for the chainsaw?* Vientiane: CCL.


Wildlife Hunting and Use in Luang Namtha Province: Implications for Rural Livelihoods and Biodiversity Conservation in the Uplands of the Lao PDR

Arlyne Johnson, Sarinda Singh, and Malykham Duongdala

Abstract

Policies for poverty alleviation and forest management in the Lao PDR aim to reduce unsustainable rates of wildlife hunting and trade while increasing rural food security. This paper presents household surveys that were conducted in 24 villages, made up of six ethnic groups in Luangnamtha province, to evaluate the harvest, consumption, and trade of 56 species of commonly used mammals, birds, and reptiles. Results were compared with the national policy for achieving sustainable harvest rates of managed species as well as food security. Findings indicated that small mammals and birds are consumed weekly in the majority of households, that the abundance of all reptiles, large mammals and birds available for harvest is declining, and that most families maintained a preference for wild versus domestic meat. Results suggest that wildlife is an important component of the diet in many households and that current harvest rates of most species is probably unsustainable. Recommendations are made for developing village models of sustainable wildlife use for subsistence.

Introduction

In the Lao PDR, hunting of wildlife is an important part of rural livelihoods and nutrition (Foppes et al. 1997; Clendon 2001; Krahn 2003). At the same time, wildlife populations are in serious decline from over-harvesting for subsistence and trade (Duckworth et al. 1999; Nooren and Claridge 2001). In a threat assessment of the Nam Ha National Protected Area (NPA), over-harvest of wildlife was identified by NPA staff as one of the main problems contributing to a decline in many wildlife species (Johnson 2000).

To solve this problem, national regulations aim to manage wildlife for sustainable use in multi-use protected areas so that the subsistence needs of enclave villages are met while viable populations of wildlife are also conserved (Robichaud et al. 2001). Regulations that provide guidelines for wildlife use include Forest Law No. 01/1996 and the Ministry of Agriculture and Forestry (MAF) Regulation No. 0524/2001 on the Management of National Biodiversity Conservation Areas, Aquatic Animals and Wildlife (MAF 2001). MAF 0524 outlines which species can be harvested and where, and identifies seasons and methods of harvest, as well as who has access to hunt in NPAs (Table 1). Article 17 of MAF 0524 states that it is illegal to sell wildlife. To date, there has been no systematic evaluation of how these regulations compare with current village practices.

Successful wildlife management and rural development requires baseline information on wildlife use, as well as, on the status of wildlife populations and habitats. This study examined wildlife hunting and use by villages within and on the border of the Nam Ha
The Nam Ha NPA covers 222,300 hectares of hill evergreen and semi-evergreen forests and broadleaf woodlands in Luangnamtha Province (Figure 1). Core conservation zones were identified by Tizard et al. (1997) as having particular importance as wildlife habitat. Nam Ha NPA is an important component of the Lao protected area system, containing fauna from the northern geographical subdivision of the country (Ling 1999) and from the sub-tropical transition zone of central Indochina (MacKinnon and Mackinnon 1986). The Nam Ha NPA is the fourth largest protected area in the country (Hedemark 2003) and ranked third nationally in importance of mammal and bird species richness and endemism (Ling 1999). Over 288 bird species, at least 37 large mammal species (Tizard et al. 1997) and potentially 22 reptile and amphibian species (Stuart 2002) are found in Nam Ha NPA. Most of the larger species are listed as globally threatened or vulnerable (Duckworth et al. 1999).

Nam Ha has a high human population density relative to other NPAs (Southammakoth and Craig 2001; Tizard et al. 1997). A forest inventory estimated that 67% of Nam Ha NPA has been affected to some degree by human activity (Hedemark 2003). Inside and on the border of the NPA are 41 villages whose principle area of natural resource use is within the protected area boundary. Most villages belong to the Lao Theung and Lao Soung ethnic groups (Ling 1998). Production of hill rice and livestock constitute the major food sources for most villages, although non-timber forest products (NTFPs), including wildlife, are reported to be essential food sources in the event of rice and livestock shortages (Meredith 1997; Phengsopha 2000). Cash incomes are primarily derived from the sale of surplus rice and livestock. However, non-timber forest products are a source of cash income when paddy farming and livestock raising are limited by shortages of suitable land and a high occurrence of livestock disease (deKoning 2000; Hedemark and Vongsak 2003).

Table 1: Regulations for wildlife hunting and use in the Lao PDR (MAF No. 0524/2001)

<table>
<thead>
<tr>
<th>Species</th>
<th>Hunting &amp; Trade²</th>
<th>Where³</th>
<th>Method</th>
<th>When</th>
<th>Amount⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restricted</td>
<td>Hunting</td>
<td></td>
<td>Prohibited</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trade</td>
<td></td>
<td>Prohibited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controlled</td>
<td>Hunting</td>
<td></td>
<td>Prohibited</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trade</td>
<td></td>
<td>Prohibited</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Articles 18 and 19
2 Article 17
3 Article 4; hunting in the NPA Management Zone restricted to previously settled persons
4 Article 10

NPA in Luangnamtha Province. Results are relevant to the design of wildlife management and rural development strategies for improving village livelihoods in the uplands of the Lao PDR.
From January 2002 to March 2003, surveys were conducted in 24 villages inside and near the boundary of the NPA (Figure 1). These were conducted by final-year students from the Faculties of Sciences and Forestry at the National University of Laos. Wildlife Conservation Society (WCS) staff trained and supervised students in collaboration with the Nam Ha Protected Area Management Unit.

Data was collected at two levels, the village and the household, with the emphasis directed towards the latter. The household survey was comprised of 15 multiple-choice, semi-structured and open-ended questions. The questions were organised into three broad topics: wildlife hunting, wildlife use and wildlife populations, with a subset of questions asked in reference to 56 key species, including twenty-nine mammals, eight reptiles, one amphibian and eighteen birds (see Johnson et al. 2003 for details). Animals were selected according to the following criteria: known to occur in the NPA, previously reported as used for subsistence or for sale in the province, having conservation and management importance in the NPA, and ease of identification. The list included 25 restricted and 17 controlled species as defined in articles 18 and 19, MAF 0524. The household survey was conducted with a sample of at least 10% of all households from each village. Surveys were conducted in the Lao language with a local translator, organised by the village headman as necessary.

The main analysis summarised the percentage of households that responded positively to any question or response category as a function of the sample size for each question or animal. The second method for analysis was comparing and ranking animals.
in descending order by the percentage of households responding to a particular question. In order to standardise comparisons across animals with different sample sizes, the total of 320 households was used to derive the percentages used in the ranking. This represents a conservative interpretation of the data, though it may underestimate trends for uncommon animals named by few households. Throughout, the comparison of number of responses regarding use of different animals is taken as a proxy of the relative frequency of use for each animal and also as an indicator of relative abundance.

## Results

The 24 villages surveyed represented 59% (n=41) of villages in and on the border of the NPA. Surveys were conducted in an average of 32% of households per village. The majority of villages surveyed were from the Akha ethnic group (fourteen villages) followed by Khmou (three), Mien (three), Hmong (two), Kui (one) and Tai (one). The predominance of Akha in the survey area is typical of the western section and the more remote villages of the Nam Ha NPA (Ling 1998; Phiapalath 1999).

### Wildlife hunting

Hunting effort for the majority of animals was reported to be greatest from September to February. Frogs were an exception to this pattern, with harvesting occurring largely in May and June at the beginning of the rainy season. Across the year, the results of the ranking indicated that the 15 most frequently hunted animals on a monthly basis were birds, rodents (squirrels and bamboo rats) and frogs less than 2 kg in size (Table 2). Guns

### Table 2: Most frequently used wildlife

<table>
<thead>
<tr>
<th>Wildlife most frequently hunted</th>
<th>Frequently hunted with guns</th>
<th>Frequently hunted with snares</th>
<th>Used as medicine</th>
<th>Frequently sold</th>
<th>Frequently eaten</th>
<th>Status MAF 0524</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Red-cheeked Squirrel</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>2. Pallas’s Squirrel</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>3. Black-crested Bulbul</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4. Hoary Bamboo Rat</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>5. Frogs (H. rugulosus)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6. Bar-backed Partridge</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>7. Spangled Drongo</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>8. Great Barbet</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>9. Thick-billed Green Pigeon</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>10. Silver Pheasant</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>11. Rufous-throated Partridge</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>12. Red Junglefowl</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>13. Grey-peacock Pheasant</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>14. Lesser Oriental Chevrotain</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>C</td>
</tr>
<tr>
<td>15. Greater Coucal</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>R</td>
</tr>
</tbody>
</table>

C: Controlled  R: Restricted
were the most common method reported for capturing most wildlife, followed by snares. Guns accounted for 56% of total responses for hunting methods across all animals, followed by 26% for snares, 14% for other, and <1% for bows. Guns were the most commonly used weapon for capturing arboreal animals and medium-to-large terrestrial wildlife (>2 kg).

Most households responded that they usually hunt near their hill-rice fields (guns are often kept in the fields) and less so in forested areas away from fields. Responses indicated that this was because it was more difficult to access forested areas and not because the animals were not there. When hunting larger animals, hunters reported they would go to forested areas. More hunting was reported near upland fields than paddy fields, which is likely to be due to the larger areas of forest that remain close to upland fields.

It was reported by 40% of households (n=320) reported that outsiders also come to hunt in their village area. Households in villages farther away from a main road reported more outsiders coming to hunt in the village area. One interviewer noted that villages farther from roads are often thought to have more wildlife than more accessible villages. It is possible that new roads to previously inaccessible forests do initially attract more outside hunters.

**Wildlife use**

Across villages, households (n=317) reported eating some type of meat or fish an average of 6.7 times in the week prior to the survey (Figure 2). On average, wildlife was reported eaten 1.9 times in the previous week while fish was eaten 1.95 times. Wildlife and fish made up an average of 66% of occurrences of meat consumed during the week by all ethnic groups other than the Mien, who reported consuming domestic meat relatively more frequently. The quantity of meat consumed was not recorded. Interviewers observed that relatively small amounts of meat were consumed per individual per meal but that meat was often present. It is important to note that this data was collected from January-March and September-October, which were also reported as peak hunting periods. Across ethnic groups, the Akha were unique in that slightly more households reported a preference for wildlife to domestic meat.

The majority (73%) of the 55 animals were reported eaten by at least one household. The ranking of animals most frequently eaten on a monthly basis indicated that a smaller

![Figure 2: Average meat consumption in the week prior to the survey (n=317 households)](image-url)
subset of animals including small songbirds, rodents, frogs, pheasants and partridges made up the bulk of wildlife consumed (Table 2).

Twenty-one (38%) of the animals were reported as used for medicine by at least one household. Eight of these are listed as restricted species in MAF 0524 (Table 3). Animals that were most frequently used as medicine if captured included southern serow, slow loris and pangolin. These are also reported elsewhere as being important for medicinal use (Nooren and Claridge 2001; Tungittiplakorn and Dearden 2002).

![Graph showing suggestions from villagers](image)

**Table 3: Wildlife most frequently used as medicine (n= # respondents, removed species with n<10)**

<table>
<thead>
<tr>
<th>Animal</th>
<th>n</th>
<th>% households</th>
<th>Status MAF 0524</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern Serow</td>
<td>10</td>
<td>90%</td>
<td>R</td>
</tr>
<tr>
<td>Slow Loris</td>
<td>10</td>
<td>30%</td>
<td>C</td>
</tr>
<tr>
<td>Pangolin</td>
<td>15</td>
<td>20%</td>
<td>R</td>
</tr>
<tr>
<td>East Asian Porcupine</td>
<td>65</td>
<td>17%</td>
<td>C</td>
</tr>
<tr>
<td>Pig-tailed Macaque</td>
<td>27</td>
<td>11%</td>
<td>C</td>
</tr>
<tr>
<td>Large Flying Squirrel</td>
<td>50</td>
<td>8%</td>
<td>R</td>
</tr>
<tr>
<td>Large Indian Civet</td>
<td>14</td>
<td>7%</td>
<td>-</td>
</tr>
<tr>
<td>Sambar Deer</td>
<td>14</td>
<td>7%</td>
<td>R</td>
</tr>
<tr>
<td>Wild Pig</td>
<td>57</td>
<td>7%</td>
<td>C</td>
</tr>
<tr>
<td>Crested Serpent Eagle</td>
<td>19</td>
<td>5%</td>
<td>R</td>
</tr>
<tr>
<td>Leopard Cat</td>
<td>22</td>
<td>5%</td>
<td>-</td>
</tr>
<tr>
<td>Silver Pheasant</td>
<td>114</td>
<td>4%</td>
<td>R</td>
</tr>
<tr>
<td>Red Junglefowl</td>
<td>118</td>
<td>3%</td>
<td>C</td>
</tr>
<tr>
<td>Big-headed Turtle</td>
<td>38</td>
<td>3%</td>
<td>-</td>
</tr>
<tr>
<td>Red Muntjac</td>
<td>90</td>
<td>2%</td>
<td>C</td>
</tr>
<tr>
<td>Masked Palm Civet</td>
<td>62</td>
<td>2%</td>
<td>R</td>
</tr>
<tr>
<td>Grey-peacock Pheasant</td>
<td>106</td>
<td>1%</td>
<td>R</td>
</tr>
</tbody>
</table>

(Nooren and Claridge 2001; Tungittiplakorn and Dearden 2002).

Figure 3: Suggestions from villagers of what to do about the problem of wildlife declines (n=280)
Table 4: Wildlife most commonly reported as decreasing in abundance (n=320)

<table>
<thead>
<tr>
<th>Animal</th>
<th>Lao PDR risk category</th>
<th>Global threat status</th>
<th>% households</th>
<th>Status MAF 0524</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reticulated Python</td>
<td>PARL</td>
<td>GNT</td>
<td>13%</td>
<td>R</td>
</tr>
<tr>
<td>Burmese Python</td>
<td>PARL</td>
<td>GT-VU</td>
<td>10%</td>
<td>R</td>
</tr>
<tr>
<td>Asian Softshell Turtle</td>
<td>PARL</td>
<td>GT-VU</td>
<td>10%</td>
<td>R</td>
</tr>
<tr>
<td>Clouded Leopard</td>
<td>ARL</td>
<td>GT-VU</td>
<td>9%</td>
<td>R</td>
</tr>
<tr>
<td>Asian Golden Cat</td>
<td>LKL</td>
<td>GNT</td>
<td>9%</td>
<td>R</td>
</tr>
<tr>
<td>Tiger</td>
<td>ARL</td>
<td>GT-EN</td>
<td>8%</td>
<td>R</td>
</tr>
<tr>
<td>Smooth-coated Otter</td>
<td>ARL</td>
<td>GT-VU</td>
<td>8%</td>
<td>R</td>
</tr>
<tr>
<td>Pig-tailed Macaque</td>
<td>PARL</td>
<td>GT-VU</td>
<td>8%</td>
<td>C</td>
</tr>
<tr>
<td>Water Monitor</td>
<td>PARL</td>
<td></td>
<td>8%</td>
<td>C</td>
</tr>
<tr>
<td>King Cobra</td>
<td>PARL</td>
<td></td>
<td>8%</td>
<td>R</td>
</tr>
<tr>
<td>Oriental Pied Hornbill</td>
<td>ARL</td>
<td>GNT</td>
<td>8%</td>
<td>R</td>
</tr>
<tr>
<td>Pangolin</td>
<td>PARL</td>
<td></td>
<td>8%</td>
<td>C</td>
</tr>
<tr>
<td>Leopard Cat</td>
<td></td>
<td></td>
<td>7%</td>
<td>R</td>
</tr>
<tr>
<td>Hog Badger</td>
<td>LKL</td>
<td></td>
<td>7%</td>
<td>R</td>
</tr>
<tr>
<td>Crested Serpent Eagle</td>
<td></td>
<td></td>
<td>7%</td>
<td>R</td>
</tr>
<tr>
<td>Chinese Pond Heron</td>
<td></td>
<td></td>
<td>6%</td>
<td>R</td>
</tr>
<tr>
<td>Southern Serow</td>
<td>PARL</td>
<td>GT-VU</td>
<td>6%</td>
<td>R</td>
</tr>
<tr>
<td>Indochinese Box Turtle</td>
<td>ARL</td>
<td>GNT</td>
<td>6%</td>
<td>R</td>
</tr>
<tr>
<td>Large Flying Squirrel</td>
<td></td>
<td>GT-VU</td>
<td>6%</td>
<td>R</td>
</tr>
<tr>
<td>Black Giant Squirrel</td>
<td>PARL</td>
<td></td>
<td>6%</td>
<td>C</td>
</tr>
<tr>
<td>Sambar Deer</td>
<td>PARL</td>
<td></td>
<td>5%</td>
<td>C</td>
</tr>
<tr>
<td>East Asian Porcupine</td>
<td>NARL</td>
<td>GT-VU</td>
<td>5%</td>
<td>C</td>
</tr>
<tr>
<td>Bengal Monitor</td>
<td>PARL</td>
<td></td>
<td>5%</td>
<td>C</td>
</tr>
<tr>
<td>Shikra</td>
<td></td>
<td></td>
<td>5%</td>
<td>R</td>
</tr>
<tr>
<td>Mountain Bamboo Partridge</td>
<td></td>
<td></td>
<td>5%</td>
<td>C</td>
</tr>
<tr>
<td>Large Indian Civet</td>
<td></td>
<td></td>
<td>5%</td>
<td>C</td>
</tr>
<tr>
<td>Yellow-legged Buttonquail</td>
<td></td>
<td>GT-VU</td>
<td>4%</td>
<td>R</td>
</tr>
<tr>
<td>Greater Coucal</td>
<td></td>
<td></td>
<td>3%</td>
<td>R</td>
</tr>
<tr>
<td>Masked Palm Civet</td>
<td></td>
<td></td>
<td>3%</td>
<td>C</td>
</tr>
<tr>
<td>Silver Pheasant</td>
<td></td>
<td></td>
<td>3%</td>
<td>C</td>
</tr>
<tr>
<td>Mountain Imperial Pigeon</td>
<td></td>
<td></td>
<td>3%</td>
<td>R</td>
</tr>
<tr>
<td>Grey-peacock Pheasant</td>
<td></td>
<td></td>
<td>3%</td>
<td>R</td>
</tr>
<tr>
<td>Hoary Bamboo Rat</td>
<td></td>
<td></td>
<td>3%</td>
<td>C</td>
</tr>
<tr>
<td>Red Junglefowl</td>
<td></td>
<td></td>
<td>3%</td>
<td>C</td>
</tr>
<tr>
<td>Lesser Oriental Chevrotain</td>
<td></td>
<td></td>
<td>3%</td>
<td>C</td>
</tr>
</tbody>
</table>

*Lao PDR risk status* (ARL = At Risk in Lao PDR; PARL = Potentially at Risk in Lao PDR; LKL = Little Known in Lao PDR; NARL = Not at Risk in Lao and Globally Threatened; GT-EN = Globally Threatened - Endangered; GT-VU = Globally Threatened - Vulnerable; GNT = Globally Near-Threatened; DD = Data Deficient) from Duckworth et al. (1999).
The local sale prices for 42 animals were obtained (76% of the animals on the checklist), indicating that most of these species are sold at some time. Despite this, the majority of households did not contribute information on the frequency of wildlife sale. This is probably because it is known that sale is illegal. Rodents and birds made up 87% of animals most frequently sold on a monthly basis (Table 2). Averaging across all values given in price per individual, the average price for animals used as medicine was higher (62,700K) than the average price for animals not used for medicine (13,000K). Animals used for medicine as well as consumption were generally more expensive than animals used purely for consumption.

Trade in wildlife was directed to sale in the local area, with 97% of reported sales being to people from Luangnamtha Province, and 35% to people in the same village. The total number of responses to this question (n=73) is considerably less than the total sample size (n=320), and may be affected by the sensitivity of the wildlife trade issue. 31% of households reported that outsiders (people who do not live in their village) come to their village to buy wildlife. While it is possible that wildlife may be sold again to form connections with larger wildlife trade routes, the actual contacts for sale from villages in and around the NPA seem to be predominantly local.

**Wildlife populations**

Household assessment of decline in animal numbers was largely consistent with the threat status assigned to animals both nationally and globally. The ranking exercise indicated that animals listed in Duckworth *et al.* (1999) under various categories of risk in the Lao PDR were more commonly reported by households to be decreasing in abundance or were not reported at all in household surveys (Table 4). Likewise, most animals that less than 5% of households reported to be decreasing in number are not identified as being at risk in the Lao PDR or as globally threatened.

The majority of households (65%) identified decreases in animal abundance as a problem. Of those reporting a problem, 41% further explained that wildlife decline was problematic because of impacts on livelihoods (food and income). A majority of households suggested that stricter control of hunting is needed to resolve the problem (Figure 3). Only 32% of responses indicated a problem with wildlife increasing in abundance and causing damage to crops and livestock. In contrast, the majority of households (69%) felt that an increase in animal abundance was not a problem, while 35% of these specifically mentioned the use of these animals for food as the reason why increases were a positive trend.

**Comparison of wildlife hunting and use**

Table 2 compares the relative frequency of wildlife hunting and use across animals. An arbitrary cut-off of the ‘top 15’ animals with the highest percentage of household responses to several survey questions was selected for comparison. Nine of the most frequently hunted animals were also among the top 15 animals most frequently hunted with guns, while 11 were among those reported to be most frequently hunted with snares.

Animals that are most frequently hunted are also primarily those that are reported to be most frequently eaten and most frequently sold. An exception, frogs (*Hoplobatrachus rugulosus*), are frequently eaten but not commonly sold, suggesting that they may be relatively more important as a food item during the wet season, when other animals are not hunted as much.
Few of the commonly hunted animals were reported as being used for medicine. Exceptions were the pheasants, though none of these were reported as being widely used for medicine (i.e. < 10 households reported their use). In general, animals used for medicine were less frequently hunted but among the most valuable for trade.

**Recommendations for rural development and protected area management**

This study provides evidence of the variety of animals that are hunted and used for food and medicine by villages in northern Laos. Hunting is largely opportunistic, occurring in forested areas near upland fields, with the majority of hunting effort coinciding with periods of upland field preparation and harvest. In addition to village use, wildlife is traded from villages and hunted by outsiders, thus contributing to the decline of controlled species that are important for village food, and of restricted species that are already rare and in decline. Of immediate concern to both the maintenance of rural livelihoods and biodiversity conservation is the fact that the most frequently used animals are small-bodied (<2 kg in size) while the majority of large-bodied mammals and birds, and all reptiles, were more frequently reported as decreasing in abundance. The majority of households felt that decline in wildlife abundance is a problem and that more effective controls on hunting are needed. The trend towards consumption of small-bodied animals and decline in larger animals resembles that reported over ten years ago from similar habitats and cultures in neighbouring northern Thailand (Tungittiplakorn and Dearden 2002). Today, several of the larger mammals and birds that were then in decline (e.g. large and medium cats, sambar deer, southern serow, most primates, hornbills) are now extirpated from these northern Thai sites and people report largely eating squirrels and other animals that were previously undesired for consumption. To arrest the decline of larger animals in northern Laos and assure the availability of wild meat for rural livelihoods in the future, several management actions are needed.

**Managing wildlife trade and illegal hunting by outsiders**

**Wildlife trade**

This majority of animals included in this study are traded to some degree. Given the illegality of trade and the reluctance of households to discuss it, what was reported probably represents a very conservative estimate of the real scale and extent of trade. This is a rural livelihoods concern for several reasons. Firstly, wildlife trade directly violates national policies for poverty alleviation by extracting common animals (87% of animals sold in this study) that are designated for sustainable use as food by village residents in management zones. Secondly, it contributes to the decline of animals that are already over harvested, making sustainable use more difficult and unlikely to be achieved. Finally, illegal trade of restricted species reduces animal populations that are already rare and includes unique animals with potentially high long-term economic value as attractions for nature-based tourism (e.g., large mammals and birds such as primates, hornbills, etc.), an important source of revenue for upland villages near provincial and national protected areas.
Recommendations

- Support efforts to block or control access by outside motorised travel (trucks and motorbikes) along existing roads and tracks to the interior of protected areas. Avoid construction of new roads and tracks in these areas.

- Support efforts to make the public aware that trading wildlife anywhere in the uplands is counter to government policies for poverty alleviation and threatens both rural livelihoods and the viability of the nature-based tourism industry. Aim education campaigns at urban populations with disposable income and disseminate information at wildlife markets and at road check points.

- Support efforts to increase the frequency of enforcement in urban markets and road checkpoints to stop sale of all animals. Although the sale of common animals (squirrels, bamboo rats, pheasants, partridges and songbirds) is often thought of as harmless, results from this study suggest that these are most important for village consumption.

**Hunting by outsiders**

Despite village land allocation in management zones and regulations that limit hunting in NPAs to village residents only, a large number of households surveyed (40%) reported hunting by outsiders in their village areas. Hence, the extent of wildlife harvest recorded in the survey represents only a portion of the total wildlife harvest in these areas.

The problems with hunting by outsiders are similar to those already identified in the wildlife trade (see previous section). The data from this study suggests that new roads and tracks pushed into previously inaccessible regions facilitate access for outsiders to hunt (and buy) wildlife. Elsewhere in the Lao PDR, roads are associated with the increased sale and eventual decline of NTFPs, tending to have greater negative impacts on families that are already poor and underprivileged (Chamberlain et al. 2002). Creating more access for motorised traffic invites outside hunting into the final frontiers of protected areas, making it less likely that government staff and villagers will be able to effectively enforce existing regulations to control wildlife harvest.

**Management recommendations**

- Recommendations to control or restrict access to protected areas from the previous section on wildlife trade are also relevant to limiting hunting by outsiders.

- Support efforts to educate the public (through sign posting and mass media) about the location and boundaries of protected areas, as well as on who has rights to legally hunt in management zones.

- Support efforts to strictly enforce the ban on hunting by outsiders in protected areas as stated in MAF 0524.

**Managing hunting by NPA villages**

**Hunting seasons and zones**

Hunting pressure for most animals was reported as being highest from September to March. These months coincide with the period prior to upland rice harvest when food
shortages occur (September-October), months when farmers are in the fields harvesting upland rice (October-December), and a period of free time (December-February) prior to cutting forest (February-March) for new upland rice plots (NAFRI 2003; and data from this study). Hunting in September and October, and for frogs in May and June, is outside of the six-month period (November-April) during which hunting is legally permitted under MAF 0524.

Given the opportunistic nature of hunting and the reported use of wildlife for food and medicine, it is likely to be difficult and unrealistic to stop villages from hunting frequently used controlled and uncontrolled species outside the hunting season, especially during September and October in periods of rice shortages. Even if domestic livestock are available for consumption at this time, villagers will probably elect to hunt wildlife and reserve domestic animals for sale when cash is needed to buy rice or other goods. Given that the majority of the villages surveyed are from the Akha ethnic group, who indicated a slight preference for wild over domestic meat, they will very likely hunt even when domestic animals are available, unless hunting regulations can be enforced by local authorities.

Management recommendations

- Given the potential importance of some common animals (small squirrels, bamboo rats, bulbuls) for food security, it may be more realistic to limit the use of controlled and uncontrolled species by geographic location rather than by season. This would allow for some degree of harvest of common animals by villages in NPA management zones throughout the year, while increasing efforts to strictly enforce bans on hunting of all animals within the demarcated NPA core zone. The hunting ban on restricted species needs to be enforced at all times in all areas.

- The role of wildlife in rural food security in Laos is not well documented or understood. Recent nutritional studies from some villages in Sekong and Saravane provinces (Clendon 2001; Krahn 2003) suggest that wild meat still plays a critical role in providing for balanced rural diets. More detailed information on the type, frequency and quantities of wild meat consumed in villages, relative to other sources of protein, needs to be collected so the results can be used to guide wildlife management strategies in protected areas.

Hunting methods

Despite ongoing gun collections in NPA villages over the years, guns were still reported to be the most common hunting method and were prominent in the capture of larger rare animals often reported as declining. Guns in NPA villages include an array of unregistered homemade muskets as well as semi-automatic AK 47s issued to village militia. As in other locations in Laos, government issued factory-manufactured cartridges for the village militia weapons are altered to change the solid lead bullet to lead shot, and are reloaded and reused (Hansel, manuscript in preparation). In addition to guns, a wide variety of specialised snares are employed for hunting ground birds, terrestrial and volant mammals.

Management recommendations

- Gun collections should be continued and their frequency increased to eliminate the use of firearms in the NPA. Gun control will likely not threaten village food security since the majority of the most frequently eaten animals reported in this study were
also captured with snares or by other methods. Efforts should prioritise villages that are actively selling animals or that report outsiders hunting, as these activities pose the most immediate threats to both rural livelihoods and biodiversity conservation. It is not clear if outsiders bring their own firearms or obtain them in the village. Stronger enforcement efforts should be made to confiscate guns from anyone at any time in protected areas.

The use of village militia weapons for hunting was not investigated by this study but very likely poses a greater threat than muskets, since when reloaded with lead shot they are more effective in the harvest of larger rare animals and the hunting of small animals. Closer management of village militia weapons and ammunition is needed to ensure that they are not used for hunting in protected areas.

The frequency of snares use suggests that gun collections alone will not limit the extent of hunting of many animals (especially of terrestrial birds and mammals). It is possible that use of snares will increase if guns are effectively limited. Therefore, strict delineation and enforcement of the core zone protection areas where hunting is prohibited will be critical to assure effective refuges for animal production.

A concern with snares is that they do not discriminate in prey selection and will inadvertently trap rare and restricted species in the NPA management zone. In order to determine how large a problem this is, hunting with common snares, such as long fence line noose snares (called heo pan) and log drop snares (heo tham), should be evaluated to identify the frequency of types of animals caught. Likewise, types of snares that are permitted for use should be reviewed to determine which pose a threat to restricted species and to species under some degree of risk in the Lao PDR. For example, specialised snares for capturing bears (heo mii) and trip wire spear or gun traps (heo hao) used to kill large mammals should be prohibited. Since the latter can easily injure a human, their use also poses a threat to NPA visitors.

**Use of restricted and controlled species**

No guidelines currently exist to help government staff or villages to know if harvest of controlled species is within the limits of sustainability. To determine sustainability, ongoing information is needed on the actual abundance, harvest and use of controlled as well as other heavily utilised animals. A priority for research and monitoring is information on the status and use of the larger frequently hunted animals in Luangnamtha, including pheasants, partridges, pigeons, civets, and small ungulates. This information should be used to design and adapt village wildlife management plans that will assure population viability and availability of these animals as a food source for the future.

More enforcement is needed in both urban centres and villages around protected areas to stop hunting and use of animals listed as restricted species. These animals are under some degree of risk in the Lao PDR or are globally threatened, and were commonly reported as decreasing in abundance in the survey undertaken by this study.
Authors

Arlyne Johnson is the Co-director of the The Wildlife Conservation Society Country Programme, PO Box 6712, Vientiane, Lao PDR Email: ajohnson@wcs.org

Malaykham Duangdala is a Research Assistant at the Wildlife Conservation Society

Sarinda Singh is a PhD Candidate working with the Wildlife Conservation Society

Bibliography


Hansel, T. Manuscript in preparation. Observations on Subsistence Hunting along the Phu Yai Mountain Range, Xanakham District, Vientiane Province, Lao PDR.


Phiapalath, P. 1999. Protected areas and local people’s participation in natural resource management for sustainable development: a case-study in Nam Ha Protected Area, Lao PDR. Bangkok. School of Environment, Resources and Development, Asian Institute of Technology.


FOREST COVER AND LAND USE CHANGE STUDY
IN NAM ET-PHOU LEUY NATIONAL
BIODIVERSITY CONSERVATION AREA,
HUAPANH PROVINCE

Thoumthone Vongvisouk

Abstract

This study was conducted as part of studies for a Bachelor of Science degree at the Faculty of Forestry, National University of Laos in 2002. Guidance was provided by Sithong Thongmanivong and Khamla Phanvilay from the Department of Watershed Management and Land Use Planning, Faculty of Forestry, and by the Biodiversity Conservation and Community Development Project, supported by IUCN, at Viengthong District, Huaphanh Province.

The study uses interpretation of satellite images from LANDSAT 7 in 1989 and 2000 to focus on forest cover and land use change in Nam Et-Phou Leuy National Biodiversity Conservation Area (NBCA), which was established under Prime Minister’s Decree No.164 in 1993. In addition to the image analysis, in-depth interviews were conducted in four villages in Viengthong District to understand the causes of forest cover and land use change in the villages, and the way the project affects the livelihoods of local villagers around the NBCA.

The study indicates that significant changes occurred in forest cover and land use between 1989 and 2000. Dense forest decreased from 58% to 52% between 1989 and 2000. Secondary forest increased from 23% to 37% between 1989 and 2000. On the other hand, grass land and agricultural land decreased from 6% to 2%, and 13% to 9% respectively (Figure 2). The results suggest that degradation of dense forest is continuing, while some forest is also recovering following delineation of the NBCA boundary.

Introduction

Forest resources are an important part of the national economy in the Lao PDR. A forest survey conducted in 1989 indicates that, through shifting cultivation, forest cover in Laos is declining by about 200,000 hectares per year (MAF 1990). According to Sandewall and Manivong in 1992, forest at that time accounted for 47.1% of total land area in Laos, or 11.2 million hectares.

The current study uses satellite image interpretation and analysis to focus on forest cover change and local resource use in Nam Et-Phou Leuy NBCA in northeast Laos. The study was conducted as part of a Bachelor of Science thesis for the Faculty of Forestry at the National University of Laos. Satellite image interpretation allows assessment of recent changes in forest cover and land use in relatively sizeable tracts of forest. It is thus suited to use for regular assessment of changes in forests for better management of conservation areas as such as NBCAs.
Objective and scope of the study

The main objective of the current research is to compare the forest cover and land use change in Nam Et-Phou Leuy NBCA from 1989 to 2000. Satellite images provide quantitative data, while the use of detailed village interviews aims to understand the reasons for forest changes.

Nam Et-Phou Leuy NBCA was established in 1993 under Prime Minister's Decree 164. It is located between Luangprabang, Huaphanh and Xiengkhuang provinces, covering 4,320 square kilometres of forest. Elevation ranges from between 400 to 2,257 metres above sea level and the topography includes dense forest, secondary forest, grass land and agricultural land.

Given the limitations of time and budget, the current study is limited to areas of the NBCA located in Viengthong District, Huaphanh Province (Figure 1). In particular, ground-truthing and village interviews were conducted in four villages: Namneun Neua, Sanpakha, Longguapa and Sakok.

Method

Satellite image analysis

The current study used LANDSAT 7 images from 1989 and 2000 to assess the forest-cover and land-use change. Images were interpreted using the supervised classification method. The method, which allows clear assessment of existing forest and its use, requires ground-truthing using a GPS (Global Positioning System) handset.

Figure 1: Areas of the Nam Et-Phou Leuy NBCA located in Viengthong District, Huaphanh Province

---

1 All together there are 136 villages located in the NBCA. The majority are located in Huaphanh (101 villages), with 30 villages in Luangprabang and 5 in Xiengkhuang.

2 A method of classifying different types of forest cover and land use with reference to training area.
Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR

Field interviews were conducted at district and village levels to understand how the NBCA is managed and used by local people.

Results

Forest cover change

Using Erdas Imagine software, satellite images from 1989 and 2000 were interpreted to assess forest cover and land use change in Viengthong District. Images were broadly classified into four main categories including dense forest, secondary forest, grass land and agricultural land. Dense forest is defined as an area with more than 70% forest cover. Secondary forest is an area of forest with less than 70% but more than 30% forest cover that was used by local people in the past for swidden cultivation. An area with less than 30% forest cover is defined as grass land in the current study. Finally, areas of paddy field, current swidden, garden and other land were categorised as agricultural land.

As shown in Figure 2, dense forest decreased from 58% to 56% between the two periods. Meanwhile, secondary forest increased from 23% to 37%, grassland decreased from 6% to 2% and agricultural land decreased from 13% to 9%. According to information obtained from village interviews, agricultural land decreased because when Nam Et-Phou Leuy became an NBCA in 1993, local people were not allowed to clear more forest areas within the NBCA for shifting cultivation. Villagers subsequently tried to change from swidden to permanent agriculture (crops, livestock etc).

Socio-economic change

Following the designation of the NBCA, the Provincial Agriculture and Forestry Offices of Huaphanh and Luangprabang, in collaboration with the International Union for the Conservation of Nature (IUCN), initiated a conservation project. This biodiversity conservation and rural development project was first implemented in Nam Et–Phou Leuy NBCA in 1998. The project selected eight villages for development of a model conservation programme. Seven of these villages are located in Viengthong District, Huaphanh, and one is located in Viengkham District of Luangprabang Province. The main emphasis of the programme was to promote sustainable use of agricultural land by introducing livelihood alternatives to the local villagers. For example, the programme encouraged villagers to decrease the area of swidden fields, while encouraging fruit tree plantation and livestock grazing.
Out of the eight villages, four villages in Viengthong District were selected for the current study. These include two Hmong villages (Namneun Neua and Longguapa), one Khmou village (Sakok) and one combined Khmou and Hmong village (Sanpakha). Shifting cultivation is the main agricultural practice in Namneun Neua, Longguapa and Sanpakha villages, while farming in Sakok is based on rice paddy cultivation. In addition to agricultural activities, people in all four villages also collect non-timber forest products including cardamom, *man oon ling*, *khang daeng*, *kaxi*, *mak khaeng*, rattan, *chan daeng*, *dok pheung*, *khi pheung*, sugar palm, *mak kiu*, *mak kha* and so forth, for both household consumption and for sale.

**Conclusion**

While forest cover in Nam Et-Phou Leuy NBCA remains high, the current study conducted in Viengthong District indicates that forest areas have been degraded between 1989 and 2000. As the livelihoods of villagers in the NBCA are traditionally dependent on shifting cultivation, it is essential to develop an alternative livelihood basis to diversify household production means. The conservation and development programme introduced in the eight villages has shown it is possible to reduce areas of swidden while encouraging other livelihood activities such as fruit tree planting and livestock raising.

The result of the satellite image interpretation indicates that dense forest has been declining since 1989 while secondary forest is increasing. This is largely due to continued logging in areas of dense forest.

**Author**

Thoumthone Vongvisouk works at the Faculty of Forestry, National University of Laos PO Box 7322, Vientiane, Lao PDR. E-mail: thvongvisouk@hotmail.com

**Bibliography**


Huaphanh and Luangprabang Provincial Departments of Agriculture and Forestry. 2001. *Biodiversity Conservation and Community Development Project in Nam Et-Phou Leuy NBCA*. Vientiane. Ministry of Agriculture and Forestry and IUCN.
Indigenous Agroforestry Practices in Two Districts in the Northern Part of Lao PDR

Houmchitsavath Sodarak, Chanhpeng Ditsaphon, Vienghad Thammavong, Nonggnao Ounthammasith and Olle Forshed

Abstract

Shifting cultivation is the most common agricultural practice among farmers in the northern uplands of the Lao PDR. Shifting cultivation practices have been widely described in literature and today we know quite a lot about the different types and how they function. Alongside this main cultivation system, other systems have also been traditionally practised for many decades as people have used the forests and forested land to grow different crops. Such practices vary in degrees of intensity ranging from just a few silvicultural treatments in the natural forests to highly advanced and complicated systems consisting of different crops and trees which benefit each other. Few of these kinds of practices (referred to as indigenous agroforestry practices in this paper) have been widely described, either in international or national literature. Today very little is known about the range or spectrum of indigenous practices and how they function. This study is an attempt to find out more about the mentioned practices. The study, which was carried out as a survey of existing indigenous practices in two districts in the northern part of Lao PDR, aims to identify and describe indigenous practices used today. It was carried out in two stages with the first having a broad focus on finding interesting places and people for interviews/data collection while the second concentrated on describing each practice. During the survey a total of 17 villages were visited and around 150 farmers interviewed. It has been difficult to define and decide what an indigenous agroforestry practice really is since many systems and practices are closely linked to each other. However, during the study 24 practices were found and classified as indigenous agroforestry practices or systems. The main directions of such practices found in the districts were home gardens, rotational or intercropping systems, NTFP-plantations, improved fallow practices, fishpond systems and livestock grazing practices.

Introduction

In the north of the Lao PDR people live close to nature and their main activity is growing rice on the sloping hills. Shifting cultivation is the dominating practice and upland rice is the dominating crop. Paddy field cultivation is also common to some extent if there is suitable land available. Crops other than rice, such as corn, Job’s tears and a wide range of vegetables, are also cultivated on upland farming land. These crops are frequently integrated in the traditional rice shifting cultivation practice or are grown more intensively close to rivers where the land is often more fertile. The practice of shifting cultivation in the Lao PDR has been widely described, for example by Roder (2001) and Sodarak (2000), and today there is a lot of knowledge about how it is practised. Shifting cultivation can be seen as an agroforestry practice since it is, if carried out in a good way with long fallows, a combination of agriculture and forestry. Other agroforestry practices have also been carried out side by side with shifting cultivation for decades. Such practices range from simply a few silvicultural treatments in the natural forest to get a desired product (Ankarfjard 1998) to highly advanced systems where trees, animals and plants grow to-
gether so that they can benefit from each other. These systems are not so widely described in literature, either internationally or nationally. To assist further development of rural upland agricultural and forestry practices, it is important to understand both what farmers’ traditional practices are (in terms of techniques, crops, etc.) as well as what has been adopted from projects and outsiders. This study aims to investigate ongoing agroforestry practices in two districts of the Lao PDR and is a step towards finding out more sustainable and acceptable practices for farmers in these areas.

**Objective**

To find out and document more about indigenous agroforestry practices in northern Laos so that good ideas and practices can be shared with other farmers in order to improve their livelihoods.

**Specific objectives**

› Conduct a survey in the form of interviews and observations of ongoing agroforestry practices in two districts in northern Lao PDR.

› Describe and document the findings.

**Definitions**

In this study, the phrase ‘indigenous agroforestry practices’ is defined as follows:

› **Indigenous**: the practice has been developed or adopted by the farmers themselves. It does not include practices or systems that are invented, implemented and run by others (e.g. projects). However, practices that have been adopted by farmers, either partly or, completely in a second phase have been included. The reason for this is that it is very difficult to separate truly indigenous practices from partly indigenous practices. For example, a species or technique introduced by outsiders may have been adopted and transformed into a daily practice and is then accepted by the farmer as part of her/his traditional practice. To summarise, indigenous practices are firstly truly indigenous and secondly accepted and adopted introduced practices. The main point of importance is that the farmer uses and practices the system without any external help.

› **Agroforestry practices**: practices that include the forest in combination with any agricultural use. This includes practices or systems where woody vegetation and plants are making use of each other or growing together as, for example, in an intercropping system with trees.

**Materials and methods**

This study was carried out in two districts (Namor and Phonxay) in the northern uplands of the Lao PDR (figure 1). These two districts are regarded as among the poorest in Laos and they are also the two target research districts for the Lao-Swedish Upland Agriculture and Forestry Research Programme (LSUAFRP) (Anon 2001a).
The method of finding out indigenous agroforestry practices was mainly through interviews with farmers as well as follow-up observations in the field. The study is based upon Raintree and Overgoor's method of identifying indigenous agroforestry practices (Anon. 2001b). A group of five people carried out the fieldwork. This group consisted of two agronomists, two foresters and one livestock specialist, thereby forming a team, which could deal with all aspects of agroforestry. The study was carried out in two steps as follows (see also figure 2):

**Step 1: Identification of interesting sites and farmers**

In this first step the objective was to locate interesting places and farmers for deeper studies to be carried out in step 2. District Agricultural and Forestry Officials (DAFO) were first consulted to see if they knew any agroforestry systems or practices used in the district. They were also asked to identify people or villages that could be of interest to visit concerning agroforestry. Following these discussions with DAFO, the mentioned villages and people were visited for further interviews and observations. Since the survey staff had been working in the districts they also knew a number of farmers and villages practising different systems. These were also consulted as well as, key people (for example, old village men, chiefs etc.) in the districts, known for their insight into the subject. These field visits were very brief and deep interviews were not carried out. After this first stage of fieldwork lists were compiled grading the findings for follow-up visits. Step one took 13 field working days to finish plus some days in the office to finalize the list.

**Step 2: Data collection**

The list from step 1 was followed and relevant people and places were visited. This time deeper interviews were carried out. Forms were prepared for use during the interviews, however ‘improvised’ questions were also asked in order to be able to adapt to the particular practices followed by individual farmers. Information on indigenous agroforestry practices was collected regarding:
Specific methods used.
How systems are discovered.
How old the practices are.
Reasons for following a particular practice.
The main factors or red threads in the system.
The kind of plants or crops that are used.
Whether animals are involved.
Farmers’ knowledge of sustainability of the practice.
Economic importance of the products from the system for the farmer.

**Results**

*Inventory results*

During the inventory twenty villages were covered. Most of them were located relatively close to roads. Villages that were far away from roads were not covered.

The inventory was carried out during the summer period of 2003. Overall it took roughly two months to carry out the field studies with 28 field working days. During this time, although it is difficult to give an exact figure, at least 150 farmers were consulted in some form. For more facts about the inventory result see table 1.

![Schematic flow map](image)

Figure 2: Schematic flow map of the steps followed in the survey
Agroforestry practices identified

During the inventory many cultivation practices were discussed, with most of these being some form of shifting cultivation. These are not described in this report, with a few exceptions. The reason for this is that they appear to be based on the same strategy and are already quite well described. This inventory intends rather to describe practices other than ‘traditional’ shifting cultivation. Shifting cultivation, in various forms, is however the most common system in the districts inventoried. Some of the practices described, e.g. improved fallow practices, are also based on a shifting cultivation system with rice.

It is difficult to label each of the agroforestry practices, other than shifting cultivation, that was found. This is due to the fact that such practices are often integrated into a bigger farming system. Nonetheless, an attempt has been made. In Phonxay eleven practices were found and described and in Namor thirteen. The National Agricultural and Forestry Institute (NAFRI) will soon publish a detailed description of each one of these practices in Lao language. This paper briefly describes only the main directions and most interesting practices, with the intention of giving an overview of what kind of practices are used and accepted by farmers in Phonxay and Namor districts.

Phonxay district, Luangprabang Province

Phonxay District, in Luangprabang Province, is dominated by a mountainous landscape with natural forest only found on the very steep slopes. There are very few roads and access to the district is very limited. To date there is only one road in the district. In this area five main categories or practices were identified:

- Home gardens
- Livestock practices
- Entomoforestry\(^1\)
- Fishponds
- Intercropping and rotational practices

Home gardens

In Phonxay district it appears that home gardens, fruit gardens and orchards are quite well known and widespread. There are many examples of these kinds of gardens and they are found in almost all villages visited. In newly relocated villages with many newcomers, there are fewer home gardens and it is difficult to find gardens where fruit trees play an important role.

---

\(^1\) The author proposes a new term which refers to the raising of insects in homegardens.
In general a home garden in Phonxay district is between 0.25 – 1 ha in size and usually contains fruit trees such as papaya, banana, citrus and jackfruit. Other commonly found crops include different kinds of vegetables and fruits such as eggplants, chilli, cabbage, beans and pineapples. In one home garden in Huay doy, a Hmong/Khamu village high up in the mountains, more than 50 different plants are grown (figure 4). These plants are often mixed with each other or are rotated within the garden. Most home gardens have a living fence of various species (figure 3). Some gardens have fences made of cut bamboo or are a mix of living and cut bamboo. It is common to see chickens and sometimes even pigs inside garden fences. However, farmers do not like this as they claim that the animals destroy the crops and eat the fruits. Various kinds of medicinal plants are also common, especially in the older gardens. The home gardens observed are located in all types of environments ranging from mountain tops down to river valleys. Gardens are mainly situated on relatively flat land close to the village houses.

Some home gardens practice mixed or intercropping with vegetables such as cabbage, chilli and tarot grown together with crops like rice or corn. These gardens are often slightly larger than the ‘traditional’ (<0.5 ha) home garden and do not tend to include the large variety of plants found in the smaller, traditional gardens. In this type of garden fruit trees are common and are often either planted as borders along the contour or scattered throughout the plot. Fences have not been observed.

**Intercropping and rotational practices**

Rotational systems or intercropping permanent systems are closely related to the relatively large home gardens and are usually around one hectare in size. Here the main focus is on grain crops like rice, Job’s tears or corn.

In the rotational systems it is common to rotate crops either during the year or between the years. To provide organic fertiliser, crops such as peanuts are often grown between the different cropping periods or as an intercrop (e.g. with corn). Other vegeta-
bles (e.g. banana, sesame, tarot and chilli) are also found within the gardens. Fences have not been observed around these kinds of fields. In these systems, fruit trees (e.g. jackfruit and papaya) and commonly teak trees are grown either on the border or scattered throughout the field. Teak is mainly grown for home consumption and quality is rather poor with many branches and tops. Such rotational practices are mostly found in valleys quite close to rivers or in moist places with good soils.

Intercropped fields are also found. Here some kind of grain crop is grown mixed with trees or other plants. One example is Job’s tears intercropped with paper mulberry (figure 5). Here the paper mulberry is probably growing naturally and is spreading and regenerating by its roots. It is cut down and harvested every second year. After the paper mulberry is harvested, Job’s tears are planted and harvested during the year. At the same time the paper mulberry continues regrowing and is already around one year old when the Job’s tears are ready for harvest. This system produces crops with apparently sustainable yields every year with no fallow periods. Paper mulberry cultivation is found in rather steep areas far away from river valleys. Other intercropped areas are, however, mainly situated more closely to rivers and streams.

**Livestock practices**

Agricultural practices with animals are common in Phonxay district, and are maybe the most common agroforestry practice. The most widespread of these livestock practices is free grazing of livestock. Chickens and pigs are mainly grazing close to the houses, in the home gardens and other nearby areas. Cows and buffalos are also free grazing around the villages but in a more extensive way. The animals feed on what they can find in the fallows and forests. The management and organisation of the animals with this system is very
unclear and it appears as though they are simply left to roam freely, only sometimes being gathered for reasons such as for slaughtering or going to the market. According to the interviewed farmers, problems with this system are that:

- The animals eat unfenced crops.
- It is difficult to watch over the cattle.
- It is difficult to identify the animals' owners.
- The animals grow quite slowly and are very thin.

The advantage is that it is a very low labour intensive system as nobody herds or looks after the animals. It seems to be quite common for farmers to use the animals as investments - instead of putting money in the bank they buy cattle and raise them using this free grazing system.

Some villages also keep cattle fenced or herded. These systems vary but in general a number of farmers group together and build fences in fallow land where the cattle are then set free. The reason for keeping them fenced is to protect cultivated crops from being eaten by animals. Therefore the livestock are only fenced during cropping seasons (i.e. for approximately 6 months per year) and are free grazing for the remainder of the year. One village can have several fenced areas within the village area, depending on how many cattle and farmers are participating in this, often cooperative, practice. A fenced area is generally in the range of around 200ha in size and holds about 40 animals. Ideally it should contain preferred grasses, e.g. Imperata grass, and a stream for fresh water (figure 6). This way of keeping cattle can be classified as a fallow improvement practice, as the farmers said that after some years the fallow area used for containing the livestock becomes a really good rice production site. If located close to the village such old fenced livestock areas are greatly preferred for growing rice. However, these systems are often practised far away from the villages (possibly close to farmers' previous villages), further up the mountains. According to farmers interviewed, where rice was not replanted, the forest is now growing back. It seems as though this cooperative way of fencing cattle is mainly practised by Hmong farmers and that they brought the idea with them when they
moved down to the new villages along the roads. Khamu farmers have also now copied
this system and either organise their own groups or even join Hmong farmer groups. This
system is also used for raising goats. The main problem with goats is that they eat every-
thing so it is very important that they are fenced during the cropping season. The fact that
goats will eat everything is also considered an advantage by farmers using these systems
as they notice that the goats are still able to graze despite the fenced area being relatively
poor quality grazing.

Livestock is also raised in fenced areas directly in the ‘primary’ forest. This system is
found high up in the mountains in an old village where pressure on land is less than it is
closer to the roads. Here, Hmong farmers are organised into large groups of around 40
people who fence in an area of 1,000ha. Thereby providing permanent grazing for roughly
200 animals. All families have a special earmark to identify their cattle. There are some
problems encountered with wildlife, mainly wild dogs (probably *Cuon alpinus*), attacking
the animals so they have to be guarded or herded within the fenced area. According to the
farmers, advantages with this system are that it protects other crops from being grazed
and that the animals get fatter. It is also much easier to keep them protected from wild
dogs, tigers and other threats. Since the area fenced is so big the farmers said it is not
necessary to vaccinate, unlike when the animals are kept in smaller areas. The farmers
stated that this system was very sustainable and that they have used this area and prac-
tice without any decline in livestock production for a long time already.

**Fishponds**

Fishponds are common in villages in Phonxai, especially in older villages. Ponds are
usually surrounded by different trees (e.g. banana and paper mulberry) which are then
used to feed the fish. Lemon grass is also planted to protect the fish from snakes, which
are perceived as being one of the biggest problems with fishponds. The ponds varied
between very large ones of 50x50m to smaller ones of only 10x10m. Various kinds of fish
are raised in the ponds and clams or mussels can also be found. The clams, which are greatly appreciated by the farmers, are around 10 - 18 cm large with the biggest ponds yielding hundreds of kilos per year. According to farmers the clams were not introduced, they just appeared in the ponds after some time.

The management system of the fishpond is that leaves from the surrounding trees are cut and put into the water to feed the fish. When fish are needed, for local use or for selling, they are harvested using fishing nets. The clams are collected when diving and swimming in the pond. This system seems very sustainable and beneficial as it provides farmers with their daily protein as well as cash income since some farmers sell fish at the markets. The biggest problems with fishponds are the time expense and time it takes to dig the ponds as well as the fact that snakes feed on the fish once the fishpond is established.

**Entomoforestry**

One practice was found that combines trees and insects; raising of stick lac. Stick lacs are raised in older, villages. According to the farmers this practice used to be widespread and common among farmers, but today only a few people know about and practice it. Today, the places where it was mentioned that it can be found are far up in the mountains, a minimum of one day of walking away, close to peoples' old villages. The stick lac was previously used as glue or for colouring cloth and clothes. Today it is mainly used as glue for repairing tools, etc. and it is still considered to be of the best materials for repairing farming tools. It can be grown in two ways, either in natural forest or in small plantation areas. In the natural forest the stick lac insects are introduced on to branches on Mai Faen (*Protium serratum*) trees. Other trees can also be used but Mai Faen is the tree that produces the best quality and quantity of stick lac. To avoid ants, which are one of the biggest problems when raising stick lac, planting spots are preferably at high altitude since there are fewer ants there. Stick lac is introduced onto new trees and branches twice a year and one ‘normal’ tree can produce on average around 100-200kg per year. The tree belongs to the person who infests it. Trees can be re-infested every third year. The other method of raising stick lac is to grow pigeon pea in an open field, e.g. fallow land, and then introduce

<table>
<thead>
<tr>
<th>Practice</th>
<th>Village</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raising Cattle in fallow (fenced) areas</td>
<td>Huay Maha</td>
<td>Livestock</td>
</tr>
<tr>
<td>Raising goats in fallow (fenced) areas</td>
<td>Huay Maha</td>
<td>Livestock</td>
</tr>
<tr>
<td>Farming system with trees and vegetables</td>
<td>Huay Maha</td>
<td>Intercropping practice</td>
</tr>
<tr>
<td>Rotational system with vegetables and trees</td>
<td>Huay Maha</td>
<td>Rotational practice</td>
</tr>
<tr>
<td>Job’s tear and Paper Mulberry</td>
<td>Huay Maha</td>
<td>Intercropping practice</td>
</tr>
<tr>
<td>Rotational farming system</td>
<td>Huay Maha</td>
<td>Intercropping/Rot practice</td>
</tr>
<tr>
<td>Home garden with grain crops</td>
<td>Huay Man</td>
<td>Homegarden</td>
</tr>
<tr>
<td>Home garden</td>
<td>Huay doy</td>
<td>Homegarden</td>
</tr>
<tr>
<td>Raising Cattle in the forest (fenced)</td>
<td>Huay doy</td>
<td>Livestock</td>
</tr>
<tr>
<td>Fishpond with tree products used for feed</td>
<td>Nam bho</td>
<td>Fishpond</td>
</tr>
<tr>
<td>Stick lac raising</td>
<td>Nam bho</td>
<td>Entomoforestry</td>
</tr>
</tbody>
</table>
lac insects onto the branches. According to farmers, pigeon pea is a better host than Mai Faen. However, it is difficult to get seeds and it only provides one harvest per year, compared with two for Mai Faen. Farmers in Phonxai state that nowadays demand for stick lac is low and that planting pigeon pea for stick lac raising is not practised as enough stick lacs can be obtained through forest raising.

**Namor District, Oudomxay Province**

Namor differs from Phonxay in many ways. Geographically it shares a border with China, which provides better market opportunities. The landscape is hilly but not as steep as in Phonxay. There are also differences in terms of infrastructure as there are several roads and it is easier to access the district compared to Phonxay. However, there are also villages that cannot be reached by car. Rather large forests can be found within the district. In Namor thirteen practices have been identified and described. These are organised into six main categories: Livestock practices, Advanced farming systems, Home gardens, Rotational and intercropping practices, Improved fallows and Non-Timber Forest Product (NTFP) plantations.

**Livestock practices**

As in Phonxay, livestock plays an important role in village livelihood systems. The most common system is free grazing whereby animals are left to roam independently.

An interesting livestock practice found is a goat farm where goats are held permanently in a fenced area of around 50ha (figure 7). Within that area approximately 100 goats are fed, however the farmers think that the number can be increased. At first the goats were fenced in on old fallow land but now they are fenced on permanent grazing

![Figure 7: Goat farm in Ban Na Noi of the Ban Huay Kok Fart, Namor District](image)
land. The goats are rotated within the total area so that the land can rest and recover from the pressure of the goats. To ensure that the animals have enough fodder pigeon pea is planted which the goats seem to really like. Today there is mainly short vegetation in the area, however, farmers observe that forest trees are now growing back in the unused areas. In some years time the goats will probably graze in the forest. Today six families work together with this goat farm and they all stopped growing rice a few years ago. They now totally rely on the income from the goats, which they mainly sell at the local markets.

**Home gardens**

In Namor district the tradition of having home gardens is well known and widespread. There is some kind of home garden in almost every village. These gardens are often based on fruit trees, such as citrus, jackfruit, mango and papaya. Within the garden, crops such as tarot, peanuts, ginger and medicinal plants are grown. Some gardens contain up to 20 different species. In one village, Ban Kuang, home gardens are based on planted bitter bamboo (figure 8). Bitter bamboo stems are collected from the surrounding forests and planted in home gardens close to the houses. Between the bamboo stems several other crops are then planted (e.g. pineapple and fruit trees). Within these bamboo home gardens vegetables, medicinal plants and other crops are also grown.

**Advanced farming systems**

Some farmers have developed their home gardens into larger gardens containing several important production factors, these gardens are classified here as advanced farming systems. These relatively advanced farming systems contain:

- Crops such as teak, fruit trees, vegetables, rice, corn and cassava.
- Protein sources such as fishponds, pigs and poultry.

All factors depend on, and make use of, each other to be able to function. In one example from Ban Nathong a fishpond provides the base for the system with other production units supplying the fish with food, (e.g. pigs, bananas, rice husks, corn and cas-

Figure 8: Bitter bamboo home garden, Ban Kuang Namor District
These systems seem very productive and efficient but they are complicated to run and need a lot of investment as well as available land to start up, especially if they contain fishponds.

**Improved fallow**

In Namor district farmers do not actively plan for fallow improvement. Nonetheless, the way in which they manage their land and fallow provides some preferred species. One of the most common examples is the growth of different varieties of cardamom during the fallow period. Green cardamom grows best in fallow areas, as it requires more light. Three years after harvesting rice green cardamom can then be harvested from the fallow area. Harvesting can continue for two years before the land has to be cleared again. If the fallow grows older, the green cardamom disappears, as woody vegetation takes over. The opposite can be seen for red cardamom since it prefers shaded environments. As red cardamom is very valuable, farmers now let fallows grow into forests to create a good growing environment for it. After a ten-year fallow red cardamom can often be harvested and the area is, in one way, transformed to an NTFP plantation. To keep the area for cardamom production, farmers thin the big trees. Where this has already taken place and the areas are at least ten years old the production of cardamom generates more than it would have done if it were still a traditional upland rice field.

**NTFP plantations**

Red cardamom fallow production is one example of an NTFP plantation. Another interesting NTFP that has been successfully transformed to a plantation crop is bitter bamboo.
The knowledge of planting bitter bamboo was mainly found in Ban Kuang village where it is also planted in home gardens. Planting started around 30 years ago at which time bitter bamboo was planted directly in secondary forest. These plantations are still ongoing and, over the years, several new plantations have been established. During the first years of establishment, plantations are often intercropped with pineapple. Today plantations of up to one hectare in size can be found. Other bamboo species are also planted in plantations, often in the form of border plantations between rice fields (figure 9). These bamboo species have several uses such as edible shoot production, handicrafts and construction purposes.

**Rotational and intercropping practices**

In Namor no rotational or intercropping practices without fallow could be found. Nonetheless, knowledge of intercropping and the use of rotational practices with some years of fallow is widespread around the district. These practices can be seen as some form of ‘advanced’ shifting cultivation with the base most often being rice or corn. The other crops are mainly vegetables such as tarot, pumpkin, cucumber, eggplants and chilli. In some places, cotton and tobacco are also planted. Fallow periods vary between villages but it appears in some cases as though they can be shortened without any decline in production. This assumption has to be investigated further before it can be stated as a fact.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Village</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goat farms in fallow and forest</td>
<td>Ban Na noi</td>
<td>Livestock practice</td>
</tr>
<tr>
<td>Farming system with fishpond</td>
<td>Ban Na tong</td>
<td>Advanced farming system</td>
</tr>
<tr>
<td>Improved fallow with green cardamom</td>
<td>Ban Mixay</td>
<td>Improved fallow</td>
</tr>
<tr>
<td>Improved fallow with red cardamom</td>
<td>Ban Mai na taw</td>
<td>Improved fallow/NTFP plantation</td>
</tr>
<tr>
<td>Fruit gardens with cassava</td>
<td>Ban Mixay</td>
<td>Home garden</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>Ban Mai na taw</td>
<td>Rotational crop Practice</td>
</tr>
<tr>
<td>Bitter bamboo plantation</td>
<td>Ban Kuang</td>
<td>NTFP plantation</td>
</tr>
<tr>
<td>Bitter bamboo home garden</td>
<td>Ban Kuang</td>
<td>Home garden</td>
</tr>
<tr>
<td>Bamboo border plantations</td>
<td>Ban Ai</td>
<td>NTFP plantation</td>
</tr>
<tr>
<td>Rice cotton rotation system</td>
<td>Ban Nam tong</td>
<td>Rotational crop Practice</td>
</tr>
<tr>
<td>Shifting cultivation rotational practice</td>
<td>Ban Nam tong</td>
<td>Rotational/Intercropping Practice</td>
</tr>
<tr>
<td>Farming system with vegetables, trees and NTFP</td>
<td>Ban Namor Neua</td>
<td>Intercropping/advanced farming system practice</td>
</tr>
<tr>
<td>Shifting cultivation with long falls</td>
<td>Ban Muu Tuu</td>
<td>Traditional shifting cultivation</td>
</tr>
</tbody>
</table>
Conclusions

To conclude, five points are highlighted:

- **Livestock agroforestry practices.** Livestock raising is common in different forms, both fenced and non-fenced. Not much is known today about indigenous ways of raising cattle and other animals and there is still much for researchers to understand regarding these local systems. It is certain, however, that raising livestock in various forms is accepted and liked by most villagers and farmers. It is likely that sharing indigenous knowledge about livestock between farmers would benefit local production systems. Livestock production seems to have great potential in upland areas if managed properly.

- **Home gardens and advanced farming systems.** Simple home gardens containing vegetables, trees and some other plants are common and are under continuous improvement by the farmers themselves with new species being tested and evaluated as soon as they appear. It seems unnecessary to make further improvements here since the farmers probably know best how to create and manage home gardens. When looking into the more advanced home gardens (advanced farming systems), technologies tend to come from the outside. These practices often need good land and a lot of investment but once established they seem very productive and sustainable.

- **The fishpond system.** In one way this is similar to Advanced Farming System practices and fishponds can also provide the base in such systems. Fishponds seem highly appreciated by farmers since they produce protein for the household as well as income if fish can be sold. However, fishponds are expensive and complicated to build for a farmer. More help and research on new ways to deal with these problems is needed.

- **Knowledge, or lack of it, about intercropping and rotational systems.** These practices are relatively new and undeveloped and there is a need to know more about sustainability and production aspects. Intensive research on identifying crops that can grow together, especially without fallow periods, is essential if practices like this are to be an option for farmers.

- **NTFP plantations.** This seems to be a practice with high potential and one that is necessary if increased NTFP production will continue. Knowledge is currently limited and the practice is not widespread but there are some interesting examples of successful NTFP plantations, which can probably be followed by others. More research on potential NTFPs for plantations could probably generate important upland cropping options for farmers.

Authors

Houmchitsavath Sodarak is the Director of the Northern Agriculture and Forestry Research Centre/NAFRI, Huoay Khot, Luang Prabang Province. Email: frclpb@laotel.com

Chanhpeng Ditsaphon, Vienghad Thammavong and Nonggnao Ounthammasith are researchers based at the Northern Agriculture and Forestry Research Centre/NAFRI

Olle Forsshed is a PhD candidate at the Department of Silviculture, Faculty of Forest Sciences, SLU, Umea, Sweden. Email: olle.forsshed@ssko.slu.se
Bibliography


Anon. 2001b. *Inventory of Indigenous Agroforestry Practices – A Training Course*. Thong Khan Agroforestry Research Station, Forestry Research Centre NAFRI.


COMMUNITY-BASED FOREST MANAGEMENT AND AGROFORESTRY DEVELOPMENT: A CASE STUDY OF THE UPLAND VILLAGE SUPPORT PROJECT IN THE NAM KHANH WATERSHED, XIENG NGEUN DISTRICT, LUANGPRABANG PROVINCE

Sianouvong Sawathvong

Abstract

Forest cover in Luangprabang is continuously decreasing due to shifting cultivation, which is the primary means of food production in rural areas. However, measures to discourage shifting cultivation must provide rural populations with alternative opportunities for income generation, village forestry development and promote intensive upland farming to improve farming systems.

Some upland farms were developed during a participatory afforestation programme through a partnership between officials and communities. With official assistance farmer groups have developed forestry and agroforestry systems, such as the one based around the pilot site of the Village-based Forest Conservation and Afforestation Project (V-FORCAP) in the Nam Khanh watershed, one of the 15 Integrated Rural Development Target Areas of Luangprabang. This project is being implemented jointly by the Provincial Department of Agriculture and Forestry and the Lions Club of Nagoya Johoku, Japan.

The V-FORCAP involves:

- A joint review of village land-use plans by villagers and relevant district officers to identify and delineate forests to be conserved, areas to be afforested, and areas where conservation-oriented farming practices are to be introduced.
- Training of village forest leaders and district officers concerned with forest management and livelihood improvement.
- Establishing and running of community (school and village) nurseries.
- Tree-planting in degraded forests alongside forest conservation work.
- Introducing conservation-oriented farming practices while developing systems for expansion of planting materials.

Since 2001, farmers and officials have tried to develop a more positive partnership by sharing the costs and profits of forestry development in order to improve farmers’ livelihoods. However, communities, officials and private companies need to strongly cooperate for secure future development.

Background

Since 1995 the Luangprabang Provincial Forestry Section, Lao PDR and the Lions Club of Nagoya Johoku (LCNJ), Japan have been working together to implement the Upland Village Support Project in the Nam Khanh Watershed, Xieng ngeun District, Luangprabang
Province, Lao PDR (hereafter referred to as the project). Technical support is provided by the United Nations Centre for Regional Development (UNCRD), Japan.

The primary aim of the project is to enable upland villages in the Nam Khanh watershed to manage their resource base and thereby improve the quality of community life. Project support is mainly connected with the cooperation, operation and maintenance of nine village water supply facilities.

In 2001, as an integral part of the Project, a new scheme to promote village forest conservation and afforestation (hereafter referred to as V-FORCAP) was launched with the aim of enhancing technical capabilities of both village community members and relevant district officers in order to facilitate the transition from slash-and-burn farming to conservation-oriented farming in five selected villages.

**Objectives**

The Objectives of the V-FORCAP are to enable the villages of the Nam Khanh watershed to:

- Undertake forest conservation and afforestation work, particularly in headwater areas, for village community use.
- Introduce conservation-oriented farming practices to improve agricultural productivity and the well-being of village community members.

**Participating Villages**

Five villages in the Nam Khan watershed have been selected, in consultation with local staff, for the project; Ban Huay Chong, Ban Pholsawang, Ban Huay Khang, Ban Pakthor and Ban Pholsaat. The criteria for village selection are:

- Strong leadership in the village community.
- Good performance in managing water supply facilities.
- Village forest conditions requiring urgent action.

**Project Methodology**

Two-day dialogue workshop on ‘Project Benefit-Cost Sharing’ and ‘Seed Source Revolving Funds’ e.g. pineapple sucker banks, banana seedling banks and fruit and forest tree banks. For sustainability, villagers have to return pineapple suckers to the project in the third year after receiving planting materials, banana seedlings in the second year, and fruit tree seedlings in the form of marcotting\(^1\) or air layering system in the fifth year. Two seedlings are returned for each one received. Forest tree seedlings are supplied to villagers free of charge.

Transfer management of the project’s funding system: in the first five years all refunds will be managed by village committees, after which they will be transferred to the relevant

---

\(^1\) A method of propagation where a cut is made in a woody stem and surrounded by damp peat moss held in place by a wrap. When roots form, the stem can be removed and planted.
district authority for development in other villages. Five models were selected for farming systems:

- Model I; terrace with fruit tree planting;
- Model II; teak planting at 2 x 8m spacing where grass can be grown for future cattle raising;
- Model III; using one area of the field for a small scale teak planting area (multi-plots and species diversity);
- Model IV; planting teak as a living fence;
- Model V; encouraging farmers to plant Non-Timber Forest Products (NTFPs) in natural forest undergrowth.

**Project Activities and Results**

Joint review of village land use plans by village representatives and officials with a view to identifying areas:

- To be conserved.
- To be reforested.
- Where conservation-oriented farming practices are to be introduced.

These new areas are dependent on village committees having the rights to manage their natural forest directly.

- **Training village forest leaders and officials in village forest conservation and afforestation:** The two courses organised aimed to enhance skills in applying new technologies for fruit and forest tree propagation and planting into upland fields by teams working on V-FORCAP. The rationale for organising this training course was based on the recognition of the pressing need for a holistic training with regards to community based upland agriculture and watershed development and management. The courses were planned with an emphasis on field visits rather than lectures. The first part of the courses focused on theory, while the second part was practical-based, thereby giving participants direct experiences. Thirdly, participants visited experiment plots of farmers experienced in fruit tree propagation, nursery establishment and management and forest tree plantations. Finally evaluation forms were completed by the participants, the majority of whom rated the courses to be “good”. Feedback from participants and resource persons underscored the high value and relevance of learning in the field as well as the need to provide more time for discussion and practical lessons.

- Establishment of six community nurseries and production of seedlings for agroforestry and afforestation work. This area provides income-generating opportunities for farmers and forms the base of communal work. Furthermore, it provides a good opportunity for farmers and school managers to use a nursery co-management system.

- Extension service by local officials on agroforestry, afforestation and forest management. Table 1 shows participants’ interest in each area of the farming system.
Establishment and improvement of project revolving funds as the basis of ‘self-finance to self-reliance’ systems in the future, even though the starting step is difficult with regards to distribution of income to participating farmers.

**Conclusion**

To optimise village benefits it is necessary to provide “participation benefits”, for example:

- Community nurseries.
- Promoting community plantations.
- Granting rights to individuals for using natural forest undergrowth.
- Encouraging community production and marketing.

**Author**

Sianouvong Sawathvong is the Head of the Forestry Section, Luangprabang Provincial Agriculture and Forestry Office, P.O. Box 530, Luangprabang Province. Email: sianouvong@hotmail.com

<table>
<thead>
<tr>
<th>Name of village</th>
<th>Area (ha)</th>
<th>Farming System and number of interested participants</th>
<th>Planting materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td>Ban Pak Thor</td>
<td>6.8</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Ban Huay Khang</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ban Pholsavaang</td>
<td>10</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Ban Huay Chong</td>
<td>10</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Ban Pholsaat</td>
<td>16</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>54.8</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

Remark: The figures shown above are only statistics from the first year of implementation. In addition, school and village plantations are established for future use.
Domestication of Aquilaria spp. and Rural Poverty – Socio-Economic and Genetic Aspects of the Planting Boom in the “Wood of the Gods”

Anders Jensen

Abstract

Aquilaria spp. or may khedsana has been planted in all parts of the Lao PDR over the past three to four years and is, like other NTFP species, as well as teak and eucalyptus, now a plantation species. The planting boom covers all levels of domestication: 1. forest domestication; 2. single-tree planting; 3. agroforestry; 4. woodlots; and 5. plantation establishment, and is solely fuelled by an increasing trade demand for agarwood, a resinous wood decay found in Aquilaria trees from natural forests. If plantings become successful, i.e. agarwood is formed in plantation-grown trees, this will have a significant socio-economic impact in rural areas. Due to excessive and indiscriminate harvesting over the past 40 years, the main species found, Aquilaria crassna, is critically endangered and is of high conservation priority. This paper briefly describes the process of natural and artificial agarwood formation and discusses the First International Agarwood Conference held from 10 - 15 November 2003 in Ho Chi Minh City, Vietnam.

Introduction

Aquilaria spp. - in Laos known by the vernacular names may khedsana or bo heuang, are unique among trees for their production of a fragrant and resinous wood, internationally traded as agarwood. Agarwood is used as incense, in perfumes and as a component in traditional Chinese medicine and in Buddhist, Islamic and Christian religious beliefs - hence the name 'Wood of the Gods'.

In Laos, agarwood has very limited use as a medicine against stomach ache and small wounds, and is mainly known as being the most valuable and sought after NTFP. Prices paid to collectors range from 0.5 to 1.5 US$/kg for may khi khuan, the lowest quality, to over US$ 7,000 per kg for the best quality, may double super. Main markets for wood from Laos are countries around the Arab Gulf, Japan, Korea and Taiwan, and exports are channelled through the wholesale markets in Bangkok and Singapore.

Aquilaria spp. trees are indiscriminately and excessively harvested within all ecological zones, and Aquilaria crassna is categorised as ‘Critically Endangered’ by IUCN (Hilton-Taylor 2000).

Forms of domestication

The recent planting boom is a response to the increased rarity in natural forests and increasing international prices of agarwood. The first planting of Aquilaria began about
11 years ago in the Palaveck area of Vientiane Province, under a project funded by the United Nations Drug Control Programme (UNDCP). Over the past four to five years, Laos has witnessed a planting boom and it is estimated that approximately 5,000 ha has been planted, with 2,000 ha in 2003 alone. The objective is production of high quality resinous and fragrant wood from young plantation-grown Aquilaria trees. If no such wood is found within the tree, it has very little economic value.

Domestication of Aquilaria takes place in various forms:

- **Forest domestication** occurs when Aquilaria trees are protected in primary and secondary forests or in fallow areas. The objective is protection of trees for a later harvest, and seed and wildlings collection, and resembles the protection and management of older *may yang* (*Dipterocarpus alatus*) trees by local people. It involves no investment other than management and protection and can create some cash income and employment.

- **Single tree planting** around houses and in streets, often through free distribution of seedlings and mainly for ornamental purposes. With the recent interest in Aquilaria, trees are often planted on the National Planting Day and also around government buildings and temples. Such planting has no economic aspect.

- **Agroforestry**, i.e. multi-species planting around houses and/or on farmland either by free distribution of seedlings or exchange of seedlings. This involves only a small investment. Many species, including fruit tree species as well as timber and non-timber species are planted by people whose main occupation is sedentary agriculture. Aquilaria is planted because of its potential economic benefit, alongside other species to reduce the risk of overall failure.

- **Wood lots of 0.5 to 5 ha** are established by private investment or in contractual arrangements with local people. Guaranteed prices are offered, starting from between US$ 30 to US$ 50 and climbing to US$ 1,000 per tree if resinous and fragrant wood is found at time of harvest. These wood lots are established on abandoned agricultural land, fallow areas in shifting cultivation areas, degraded secondary forest, or on productive agricultural land, thus replacing rice cultivation. The latter poses a problem for land use planning and the efficient programming of permanent agriculture.

- **Plantations over 5 ha** are established by businesses as a 100% commercial investment, in some cases involving over US$ 1 million. The objective is a short-term rotation crop, which can be harvested after seven to ten years by cutting trees with indices of resinous and fragrant wood. Local people are often engaged to establish and manage the plantations through paid employment.

Aquilaria trees grow well under optimal conditions and annual growth of over 1 m in height per year is common. For further technical information, reference is made to Species Monograph #12 produced by the Lao Tree Seed Project (Jensen 2002).
Socio-economic aspects

The impact on rural livelihoods from domestication may be analysed through different angles:

**Income:** Does domestication create value, i.e. cash income, as measured by return on investment, internal rate of return (IRR) and net present value (NPV)? What are the short and long-term costs and benefits - is it worth the investment?

Investment costs include those for land preparation, fencing, planting and seedlings, plus annual maintenance fees for weeding and cleaning until a closed canopy is achieved. The total investment cost for 1,100 seedlings planted on an area of 5 ha with a seven-year rotation period is high, at US$ 1,500. This is double the price per ha of other well-known plantation species like teak (*Tectona grandis*) and red gum (*Eucalyptus camaldulensis*). The price of seed is very high, from 600,000 Kip/kg and upwards, as is the price of seedlings, at 5,000 to 10,000 Kip per seedling. Sometimes wildlings are collected in natural forests or in plantations, thus avoiding the expense of seeds, but there is no doubt that substantial capital is required to set up Aquilaria plantations.

**Employment:** Does domestication create either paid employment or self-employment?

There is no question that domestication of Aquilaria, especially during the establishment, harvesting and seed collection of wood lots and plantations, will create employment and enable local people to earn cash income as labourers. Management and guarding may also create cash income.

**Risk:** To what extent can an investor be sure that the expected output is yielded? Will the planting be successful in terms of harvestable products?

From an economics point of view, planting Aquilaria has a completely different risk profile to timber species. Volume growth, stemform, wood quality and a short rotation period are the criteria used to evaluate timber species plantations. For Aquilaria, there is only one criterion: the quality and quantity of resinous and fragrant wood produced in a tree. This wood can develop in any part of the tree: roots, trunk and branches. If there is no resinous wood, the tree has very limited value. However, special conditions are seemingly required for resin production to accumulate within a tree, and most, if not all, plantation-grown trees do not produce agarwood. This is described later in the article.

**Marketing:** Is there a market for the harvestable products?

Unlike with many other Non-Timber Forest Products (NTFPs), marketing agarwood is seemingly not a problem as there is a well-established market and the market chains have a long history. Prices increase year by year and there are no fluctuations - a dream for those involved in sustainable management of NTFPs. However, this is for wood from natural forests, which is of much higher quality than wood from young plantation-grown trees. Although domestication has taken place in other Asian countries over more than 30 years, the bulk supply still comes from the dwindling resources in natural forests, and it is unlikely that plantation trees will ever yield high quality agarwood. Agarwood from plantations - if at all valuable and usable - is for incense and perfume oil production through distillation processes. If any of the various methods for artificial inducement described later in the article are successful, prices will probably slump due to oversupply from the many plantations in other countries.
**Diversification: Portfolio of livelihood activities**

Harvesting *Aquilaria* spp. creates income for local people in the short run, and in some areas of Laos this provides one of the few sources of cash income. If harvesting is no longer possible because tree populations have been wiped out, a source of income has been lost. The question is whether domestication can sustain this income and hence contribute to and support a broader portfolio of livelihood activities. This depends on whether good quality agarwood is produced and if prices remain at acceptable levels, as discussed above.

**Genetic aspects**

Research on artificial inducement of plantation-grown trees provides no conclusive evidence of the exact effects of between pathological techniques such as wounding and other non-pathological processes. Factors such as tree age, differences caused by seasonal variation, environmental variation and genetic variation may also play an important role.

The genetic aspects of plantations are often poorly understood and explained. When the subject is addressed, it is usually at species-level and in discussions on biodiversity conservation rather than commercial forestry.

It is important to conserve genetic resources as they constitute the platform for future domestication and also secure the evolutionary potential of species. The genetic aspects of domestication are key to addressing the issue of conservation at population and sub-population levels, as well as the survival and growth of individual plantings.

The preferred approach to conservation is normally to maintain gene pools in living stands so that they can respond to changing climate or new pests, preferably in their natural ecosystem. This is in-situ conservation. In the case of *Aquilaria*, natural populations and sub-populations are under severe pressure and it is increasingly difficult to conserve populations in-situ. Ex-situ conservation is therefore called for, and small and large-scale plantings may seem a ready solution to conservation problems, provided plantings are genetically diverse.

**Genetic variation**

Genetic variation is important for the long-term adaptation of species. Populations under stress may respond through natural selection, but only if fit genetic variations are present. At the individual tree level, low genetic variation can lead to inbreeding depression, affecting growth, survival and adaptation.

In practical terms, genetic variation is determined by the number of mother-trees. For in-situ conservation purposes, seeds should be collected from 25 to 30 mother-trees and also from trees with indications of agarwood formation. If the objective is ex-situ conservation, the number of mother-trees should be much higher, preferably 200 or more.

No effort is presently being made to collect seeds from a large number of mother-trees of good quality. This holds both for seeds that are imported from Thailand as well as seed collected locally. Instead seeds are collected from only a few mother-trees and from trees with no agarwood inside - had there been agarwood inside they would have been felled already. The results are a narrow genetic base and plantings of probably inferior genetic quality.
**Matching of species to planting site**

In plantation forestry, it is essential to carefully assess the ecological conditions at the planting and to assess whether a potential species will survive and grow. *Aquilaria spp.* is not demanding regarding soil and climatic conditions, occurring naturally in all ecological zones and on a variety of soils. However, many plantings have died back after three to four years of establishment, seemingly due to stagnant water. Planting on sloping lands is therefore recommended.

**Matching of seed source to planting site**

Within the broad ecological and altitude range, from 100 to 1,400 metres above sea level, it is equally important to match the seed source with the planting site. This implies the use of seed from a seed source with similar ecological conditions to the planting site, and the need to avoid the obvious mistake of bringing seeds from high mountains down to the lowland.

**Agarwood formation under natural conditions**

It seems that agarwood formation is a response to wounding and that the tree starts to close the wound by callus formation, i.e. a morphological barrier, a reaction commonly found in most tree species. If this is not successful, a chemical barrier of resinous wood, i.e. agarwood, is formed. The chemical barrier will grow larger and larger year by year if the wound stays open, and hence more agarwood is formed. Fungi are present, and in wood with much resin there is a lot of mycelium. Formation can also take place in sterile wood but a fungal infection can increase resin production by keeping the wound open. Insects are often present too, e.g. termites, wasps and ants, but seem to have no influence on resin production except that they may keep the wound open.

Anatomic and pathological studies show that the whitish wood of Aquilaria trees contains small bands of living cells, including a type of cell called phloem. The inner bands of phloem are connected to the outer phloem in periods of resin production and in this way resin production is spread to other, parenchymatic, cells, sometimes resulting in large resinous areas. If the attacks meet necessary conditions, inner phloem can also produce callus tissue inside the wood.

**Agarwood formation through artificial inducement**

Mechanisms for artificial inducement of the resinous wood are poorly understood. Many people say that they know exactly how to get ‘oil in the tree’ - plantation owners, businessmen and researchers alike often claim to have a ‘secret formula’ for artificial inducement of plantation-grown trees. Five to six different methods were marketed but not exactly revealed at the International Agarwood Conference held in Ho Chi Minh City, Vietnam from 10 to 15 November, 2003, including a method developed by Dr. Blanchette, University of Minnesota, at a cost of US$ 7 per tree.

However, the bulk supply of resinous wood still comes from natural forests, not only in Laos, but also in other countries where Aquilaria is planted. For instance in Assam in northeastern India, where the trade in agarwood began more than a thousand years ago, it

---

1 Based on key note presentation by Dr. Robert Blanchette at the International Agarwood Conference, Department of Plant Pathology, University of Minnesota. [http://forestpathology.coafes.umn.edu/](http://forestpathology.coafes.umn.edu/)
is estimated that 25 million trees have been planted, and many of those are more than 20 years old and ready to be cut. If harvest has begun, the product is wood of low quality, less valuable than *may khi khuan*. Traders and businessmen claim that this wood adds a new category to the existing grading system - at the lower end, and not comparable to *may khi khuan* and other woods.

There are two main categories of methods for artificial inducement: firstly, different kinds of wounding, and secondly, removal of branches. These methods have been tried out with many variations, such as different wound locations on the tree, varying species, ages and sizes of tree, along with changing environmental factors and seasons of treatment. At the International Agarwood Conference four different treatment types were presented:

- Wounding and application of microbes.
- Wounding and application of chemicals.
- Wounding and application of fungi.
- Shoot culture and application of fungi.

The take-home message is that wounded trees can produce resin and that:

- Deep wounds are best.
- Use of aeration tube seems to be successful.
- Wounds that close will stop producing resin.
- No luck in inducement with fungi, i.e. *Fusarium*.

The method of Dr. Blanchette includes the use of aerial tubes as well as stimulation of resin production through application of a 'secret formula' and increased microbial colonisation.

**Discussion**

The First International Agarwood Conference was a good venue for networking and discussions with other researchers. In discussion with an Indian perfumer with economic interest in agarwood research, I posed two questions: “If you were rich and had to invest US$ 500,000 in something, would you invest in agarwood plantations?” and “If you were a poor farmer with only your labour and a little piece of land to invest, would you then invest in agarwood trees?” The answer to both questions was “no”.

This answer can be taken as a conclusion: the economic benefit from plantation-grown trees is likely to be small and it is not worth investing in large plantations. The mechanisms for artificial inducement are so far not 100% successful, and if they become successful in the future, there will be an oversupply of agarwood from plantations in all countries in Southeast Asia and India, and prices will eventually fall.

This is not to say that planting of Aquilaria is not recommended, but one has to be realistic about the economic benefit. Aquilaria plantings could take place as wood lots and in agroforestry systems with a diversified portfolio of many tree species and different agricultural crops. It is also important to follow technical guidelines for establishment and maintenance of plantings and to avoid the mistakes made in earlier planting booms.
Author

Anders Jensen is a PhD student at the Royal Veterinary & Agriculture University (KVL), Copenhagen, Denmark. E-mail: anderslaos@yahoo.co.uk

Bibliography


SEED SOURCE MANAGEMENT AND SEED COLLECTION WITH PARTICIPATION OF LOCAL COMMUNITIES

Martin Greijmans, Khamphone Mounlamai and Lars Ravensbeck

Abstract

This paper is an initial assessment on the progress made in seed source management and seed collection with the participation of local people. The Lao Tree Seed Project promotes and facilitates the use of quality seed for planting activities, while simultaneously supporting the conservation of indigenous species in order to ensure a sustainable supply for future plantings. A decentralised seed supply approach has been adopted and this includes the participation of local people in seed source management and seed collection. Seed sources are selected and established in collaboration with local forest authorities and villagers - an agreement explaining rights and responsibilities is signed by the stakeholders. Both foresters and villagers are interested in the concept and willing to implement its activities. The present target of one hundred seed sources will maintain genetic diversity in species by using a gene-ecological zoning system. Until now efforts have been concentrated in the lowlands, but upland areas will gradually become involved also. The marketing of seed will contribute to poverty alleviation in communities, and at the same time provide an incentive to protect the sources of seeds.

It is premature to draw final conclusions about the approach and its suitability. Future work is needed to strengthen demand for quality tree seed and to build an efficient seed supply system. The model has been introduced at a higher government level, but there is a need for efficiently conducted case studies before the concept can be introduced and accepted at central level.

Introduction

The Lao Tree Seed Project (LTSP) is in the process of promoting a decentralised seed supply system, with the participation of local people in conservation of potential seed sources. An target of 100 seed sources have been set to supply seed for planting programmes, thereby maintaining genetic diversity in species through a gene-ecological zoning system. The seed source approach is to select mother-trees in natural forests. A minimum of 25 good quality mother-trees are selected from each source in order to ensure seed quality as well as genetic variation. The Development of Seed Collection and Seed Source Management in Participation with Villages model, also called the Village Development Project (VDP), involves local people as partners in conservation by allowing them to sell quality tree seed. The partnership model is adapted to the cultural, socio-economic and ecological situation of the Lao PDR. The LTSP assumes that through the active involvement and training of villagers, the quality of seed can be improved and seed sources can be protected.

According to the Forest Law of 1996, the exploitation of forest-derived products, including fruits and seeds, from natural forests is allowed as long it is in agreement with
specific regulations issued by the relevant authorised agencies such as the District Agriculture Forestry Office (DAFO) or the Provincial Agriculture Forestry Office (PAFO). Customary rights are respected as long as these remain within the law. Furthermore, the GoL wishes to improve people's livelihoods by linking them to conservation. In this light, the VDP model perceives the transfer of seed sale and conservation responsibilities to the village level as vital to making a seed supply system work.

**Methodology**

Seed sources in the Lao PDR have not been previously established and their potential lies in the country's abundant natural forests. In addition to the concepts outlined above, the criteria for establishing seed sources are accessibility for management and seed collection by nearby villages, and the presence of the preferred tree species and desired characteristics of potential mother trees. Seed sources are initially identified during surveys and visits to PAFO and DAFO, and nearby villages are selected as contact points.

Each target village is contacted to organise a visit and meeting for a team of LTSP, DAFO and PAFO personnel. In the meetings the representatives of village groups (headman, assistant headmen, village forester, village security man, village women's group, village youth group, etc.) are introduced to the LTSP objectives, and shown how these can be relevant to the objectives of the villagers. Discussions include the use of extension materials to explain the workings of the project model. To increase village involvement, a participatory village forest mapping exercise is carried out to decide, together, where a potential seed source should be selected. In a similar way, potential tree species are listed and those which fit the common objectives are selected. Questionnaires are used to gather information that will affect future seed collection, seed sale, forest management and conservation agreements. Foresters are interviewed to collect information on seed supply, planting programmes and methods of improving seed quality. Finally, a skeleton management agreement is read and explained to the villagers. This agreement outlines responsibilities and rights, which can be discussed and adapted when necessary.

Next, potential seed sources are established using village knowledge and the project requirements. When the seed sources are established, the information on species and mother trees is included in the agreement and prepared for signing by the village headman. After that, DAFO and PAFO are invited to co-sign the agreement. After signing by the project, the agreement is handed back to the co-signers, and one copy will be forwarded to MAF. In addition to the available extension materials for foresters and villagers, a manual has been prepared for use at village level to assist foresters in implementing the model.

**Model implementation**

The assumptions of the model are being tested through a series of pilot villages. To date, 35 villages have been visited and introduced to the concept, and are participating in seed source selection and establishment. A flexible learning by doing method has been used, with each mission carried out according to the situation ascertained. Visits to villages are generally short, and take place when foresters or villagers have the available time - for example not in the rainy season, when villagers are busy planting rice. Depending on the accessibility of the seed source and amount of trees/species to mark, at least one full day is needed to visit a village and establish the seed source.
During visits, villagers are urged to provide feedback on seed source and species selection, but also to ask questions on the model and its concepts. The intensity of discussions depends much on people's level of education and welfare but also on which ethnic group is involved. Lao Loum people tend to express themselves more readily, providing more questions and response to the model than Lao Thueng and Lao Soung groups, who tend to be more passive. With these latter groups, more time is required to explain the concepts. All groups are interested however, as witnessed by their keenness in accepting and signing the proposed agreements.

Much information was collected from village sessions, giving a good picture on what is further needed to make the model work. Some villages have been involved in seed collection before (three villages in Xayabury province, with *Tectona grandis* and *Afzelia xylocarpa* species), making activities easier to conduct, but many villages do not have any experience and asked for assistance. In all areas, villagers are able to make use of the forest all year round, mainly in the collection of non-timber forest products (cardamom, bamboo shoots, rattan, mushrooms, herbs, honey and resin). In all cases, logging is not permitted in these areas, so protecting the seed sources does not place any additional economic burden on villagers.

Work started at the beginning of 2003 with the aim establishing approximately 50 of the total 100 seed sources by the end of the first year. To date 49 seed sources have been established, covering 18 species and 35 villages across ten provinces. Efforts have so far been concentrated in the lowlands, but will gradually involve upland areas also.

Lessons learned and recommendations

The concept of village participation in seed source establishment, seed source management and seed collection, with the objective of improving livelihoods and conservation, is understood and well received at village, DAFO and PAFO levels, and fits GoL policy. The VDP does not aim to solve a directly identified problem at village level, but rather provides a general opportunity for additional income generation. The model facilitates a partnership in which stakeholders can work together more efficiently. The LTSP has few opportunities to maintain regular contact with individual villages, but works mainly at provincial level. From there, PAFOs already have a strong relationship with the districts as do the DAFOs with the villages.

At the national level, a network of seed sources, improved available seed and seed users need to be integrated into an efficient seed supply system. The VDP concept may supply a boost to the network, but this needs to be maintained through links with seed demand. Villagers need support in finding immediate buyers for seed and in marketing seed to a wider audience. At this stage, with seed sources newly established and agreements just signed, no impact can yet be recorded. Information on seed sources and agreements will be centralised and managed in a database to create a seed source register, and for use as promotion material. Additional assistance is needed to further involve villagers and local foresters, so that they are able to overcome problems with seed quality and seed collection techniques. Training will be needed in these areas in the coming years.

The LTSP assists in both building capacity and the seed supply system, including marketing and promotion of seed sources. However, the project cannot involve itself in buying of seed, organising village structures, or carrying out socio-economic studies. Far
reaching and long lasting extension and support will be needed from local forest offices and possibly extension agencies such as NAFES (National Agriculture Forestry Extension Office). Organisations with planting budgets are the main seed customers of the villages involved in the VDP model. Therefore, seed supply needs to have a clear link with reforestation. A thorough study on plantation activities and planting organisations is thus needed.

On the next page, a SWOT analysis of the model is presented, together with recommendations on how to overcome the weaknesses/threats and build on the strengths/opportunities. Weaknesses and threats are more numerous than the strengths/opportunities, meaning that a number of issues have to be dealt with. Fortunately not all problem areas are of high risk. The two most critical short term issues seem to be related to: 1) seed demand and marketing and 2) proper communication or networking between stakeholders. Moreover, in the longer term seed quality (both physiological and genetic quality) and conflicts between stakeholders over potential income could become vital issues. Also in the longer term, illegal cutting is a threat that could bring this development approach to an end. The threat is not considered to be immediate in most areas, but could become serious over time, especially if the approach does not work properly.

In order to address the first critical area, it is suggested that LTSP takes on the challenge of being a national coordinator for marketing and networking, with the main aim of linking seed users/buyers with the seed producers (villagers) and promoting the involvement of the local forest authorities in this process. In the area of seed quality, several measures can be taken: a) villagers can be trained in seed collection and handling techniques; b) samples from village seed collections can be tested to ensure quality level; c) a system can be established for quality control on selected mother trees and certification of origin. This last element will take several years to establish at the national level and it is only possible to obtain a certain level of genetic improvement for this kind of seed source. Conflicts over the potential income might emerge between stakeholders, especially if the model becomes successful. It is difficult to give a standard solution to this kind of situation, but these problems could be mitigated if they are discussed and agreements are signed beforehand.

The potentially important opportunity for reforestation activities has been downplayed in the analysis. This is because there are uncertainties about tree seed demand and to what extent it directs itself towards quality seed. There is a need to formulate and implement policies that promote the use of high quality planting material.

It is premature to draw final conclusions about the approach and its suitability. Future work is needed to address the above mentioned concerns. Also, although the project has been introduced at a higher government level, more field experience and lobbying are needed to convince MAF of its benefits.
Authors

Khamphone Mounlamai is the National Project Manager of the Lao Tree Seed Project Forest Research Centre/NAFRI, Email: kphonemou@hotmail.com

Lars Ravensbeck is the Technical Adviser for the Lao Tree Seed Project. Email: lars_ravensbeck@yahoo.com

Martin Greijmans is a regional consultant for the Lao Tree Seed Project. Email: m.greijmans@yahoo.com
SWOT analysis and recommendations for improving prospects of success

<table>
<thead>
<tr>
<th>SWOT analysis</th>
<th>No.</th>
<th>Description</th>
<th>No.</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
<td>1.1</td>
<td>Stakeholders are interested and the model is supported</td>
<td>A</td>
<td>Keep stakeholders involved and motivated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>Continuation of seed source establishment and agreements with stakeholders</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>Good quality trees in many areas</td>
<td>A</td>
<td>Maintain and possibly expand number of selected, good mother trees</td>
</tr>
<tr>
<td></td>
<td>2.1</td>
<td>Villagers have little knowledge about how to obtain quality seed</td>
<td>A</td>
<td>Training villagers on seed source management, seed collection and seed handling techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>Access to necessary equipment</td>
</tr>
<tr>
<td></td>
<td>2.2</td>
<td>Stakeholders have no financial resources</td>
<td>A</td>
<td>Provide support until the system is functioning</td>
</tr>
<tr>
<td></td>
<td>2.3</td>
<td>Little is known on the actual and potential seed demand</td>
<td>A</td>
<td>Routine of seed demand estimation should be put in practice</td>
</tr>
<tr>
<td></td>
<td>2.4</td>
<td>Little is known about marketing. Seed users are not identified and contacted yet. Knowledge on marketing planning and methodologies very limited</td>
<td>A</td>
<td>Marketing of seed, identification of market segments and potential seed buyers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>Promotion with seed source brochure and National Workshop</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C</td>
<td>Seed testing to proof &quot;quality&quot;</td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td>Lack of village organisation</td>
<td>A</td>
<td>Outside scope of the LTSP, involve NAFES in facilitation/extension/training activities (socio-economic analysis, village organisation)</td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td>Level of active involvement of / communication between stakeholders is limited</td>
<td>A</td>
<td>More networking co-ordinated by LTSP</td>
</tr>
<tr>
<td><strong>Weaknesses</strong></td>
<td>3.1</td>
<td>Build province/district network to improve information sharing and working with villages</td>
<td>A</td>
<td>Additional support from LTSP, through actively networking and keeping stakeholders informed</td>
</tr>
<tr>
<td></td>
<td>3.2</td>
<td>Possible future link with NTFP project at FRC/FAO (Marketing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.3</td>
<td>Model supported by senior government officials from several institutions</td>
<td>A</td>
<td>Continue promotion of the model at the central government</td>
</tr>
<tr>
<td></td>
<td>3.4</td>
<td>(Reforestation activities)</td>
<td>A</td>
<td>Policies that promote demand for good quality planting material</td>
</tr>
<tr>
<td><strong>Opportunities</strong></td>
<td>4.1</td>
<td>A weak demand for quality seed will result in: Objectives not being met and stakeholders loosing interest or confidence</td>
<td>A</td>
<td>Government policies and incentives for the use of quality seed. Active promotion of concepts to seed suppliers (village), seed buyers (GOL, project, NGO) and potential other donors</td>
</tr>
<tr>
<td></td>
<td>4.2</td>
<td>Model is not approved by GOL</td>
<td>A</td>
<td>Promotion of the model at the central government level</td>
</tr>
<tr>
<td></td>
<td>4.3</td>
<td>Awareness of the benefits of quality seed is still low</td>
<td>A</td>
<td>Awareness building must be planned and implemented as a sustained activity</td>
</tr>
<tr>
<td></td>
<td>4.4</td>
<td>Stakeholder conflicts over the potential income may emerge</td>
<td>A</td>
<td>Make detailed agreement beforehand</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>Time span project may not be sufficient to evaluate objectives</td>
<td>A</td>
<td>Models should be continued beyond the current project period</td>
</tr>
<tr>
<td></td>
<td>4.6</td>
<td>Illegal cutting of selected trees</td>
<td>A</td>
<td>Successful implementation of the model</td>
</tr>
</tbody>
</table>
ON-FARM TESTING OF ALTERNATIVE FARMING SYSTEMS TECHNOLOGIES IN SELECTED VILLAGES IN LUANGPRABANG AND OUDOMXAY: OFF-SEASON TOMATOES AND FROG CULTURE

Monthathip Chanpengxay, Phayvanh Siphanhdouang, Vison Phounsavath, Bounhom Thepphavong, Blesilda M. Calub and Paul Overgoor

Abstract

Several farming technologies are being tested on-farm, based on village problem diagnosis, in selected uplands in Phonxay District, Luangprabang Province and Namor District, Oudomxay Province. This study aims to jointly assess with farmers the performance of technologies that can reduce poverty and likewise provide alternatives to shifting cultivation. These include lowland and upland annual crops, sloping land integrated fruit tree systems, small and large livestock feeding systems, integrated pig-fish pond systems, frog culture and wet season vegetable production. In 2002, 72 farmers tested nine technologies while in 2003 this grew to 345 farmers testing 15 technologies. Initial results show that among these technologies, off-season tomato production and frog culture generated the greatest farmer interest and adoption. Income generation was a major factor for technology adoption. In 2002, tomato production provided an additional net income of US$ 469 per 1,000m². In 2003, the income from tomatoes ranged from US$ 21-240 per 1,000m². Frog culture provided farmers with an additional net income range of between US$ 28 per 100 frogs in 2002 and US$ 30-35 per 100 frogs in 2003. Other factors influencing the success or failure of these alternative technologies include farmers’ local knowledge and previous experience, technical support, availability of suitable land, capital and labour, ethnicity and market opportunities. Participatory monitoring and evaluation will look further into farmers’ adoption behaviour and their system of evaluating technology options.

Introduction

The National Agriculture and Forestry Research Institute (NAFRI) through the Lao-Swedish Upland Agriculture and Forestry Research Program (LSUAFRP) is implementing the Farming Systems Research/Extension (FSR/E) approach as one of its primary strategies for carrying out on-farm research relevant to government efforts of stabilising shifting cultivation and eradicating poverty.

Over a two-year period (2002 - 2003), researchers from a number of different technical backgrounds conducted FSR/E research in two districts of northern Laos. On-farm research provided a process where technologies or farming system options are jointly tested and improved under local conditions by farmers, researchers and extension staff. In 2002, 72 participants tested nine technologies with. In 2003, a total of 15 technologies for upland and lowland areas were tested with 345 participating families.
Phonxay District in Luangprabang Province and Namor District in Oudomxay Province are among the 47 priority target districts out of the 72 districts identified as 'poor' under the Lao Government’s National Programme for the Eradication of Poverty (NPEP 2001). Farmers in these areas generally practice traditional slash-and-burn agriculture, also called shifting cultivation. Because of population pressure and shortening of the fallow cycle, this system has led to land degradation and poor agricultural productivity which then contributes to increasing poverty.

On closer inspection, the agricultural livelihood activities of these people do not only focus on shifting cultivation. The farming system also includes management of ‘family gardens’ in and around the village as well as the ‘agroforestry areas’ located along the slopes above the village (Laffort and Jouanneau 1998). If properly managed, these other land uses can be made more productive to complement and perhaps alleviate pressure from the slash-and-burn areas.

The on-farm trials focused on identifying and developing profitable farming systems that can diversify and increase productivity of family gardens, particularly riverbed gardens. Specifically, the objectives of the on-farm trials are to determine the productivity, profitability and farmers’ acceptability of the alternative technologies tested.

On-farm trials for off-season vegetable growing (e.g. tomatoes, cabbage, lettuce, cucumber, onion, dill, pakchoi and coriander) were carried out. Fish and frog culture were tested in areas around households. The most promising technologies tested were off-season tomato growing and frog raising. Therefore this paper focuses on the results and experiences gained from these two activities.

**Methodology**

In collaboration with the Socio-economic Component of LSUAFRP, a diagnostic survey was conducted in the target villages to identify farmers’ problems and opportunities. Research topics were selected based on this diagnosis and were subsequently presented to the target villages in the two districts. This resulted in actual implementation of 11 trial topics by 72 farmers in the nine target villages in July 2002 and 15 technologies by 345 farmers in 2003. These technologies included:

- Lowland and upland rice varietal trials.
- Riverbed off-season vegetables.
- Fish or frog culture.
- Crops and small livestock.
- Forage crops and large livestock.
- Fruit tree agroforestry.
- Sloping land management.
- Improved fallow.
- Cultivation of non-timber forest products.
**Off-Season Tomato Trials**

Participating farmers were given on-the-job training on tomato production during the rainy season from June to September. Training included preparation of raised beds, use of plastic mulch, raising tomato seedlings, transplanting, care and maintenance of the tomato plants (Figure 1). The use of stakes was introduced to prevent tomatoes from sprawling on the ground. Inputs such as Hybrid 382 tomato seeds, black plastic sheets and fertilizers (15-15-15 at 300kg/ha and 46-0-0 at 200kg/ha) were provided by the project. The average size of the experimental plots was 1,000m² per farmer. Both the researcher and the district staff provided technical support.

![Figure 1: Off-season tomato trials using raised beds, plastic mulching and staking.](image)

**Frog Raising Trials**

Participating farmers were taught standard frog raising methods developed by researchers at the Living Aquatic Resources Research Centre (LARReC). The use of earthworms as feed with some commercial concentrate supplementation was recommended. Two stocking rates were tested: $T_1 = 160$ frogs/4m² and $T_2 = 240$ frogs/4m². The researcher and district staff provided close technical support.

**Results and Discussions**

**Study sites**

The off-season tomato trials were conducted with 15 farmers in Ban Nambo, Huaymanh and Thapo Neua in Phonxay District, Luangprabang Province. The frog raising trials were also conducted in the same villages in Phonxay with 15 farmers in 2002 and 22 farmers in 2003. Additional trials were carried out with eight farmers in Ban Namor Neua, Namor District, Oudomxay Province.
Tomato trials: farmer practices

Farmers’ practices of tomato production involve planting in October towards the end of the rainy season. Tomato seeds are directly broadcast onto an area of prepared land together with other vegetable seeds like mustard, cabbage and some legumes. There are no seedbeds and all vegetables grow randomly together (Figure 3). With this practice, seed germination is low. Some seeds are lost in the soil while others are transported elsewhere by ants. Weeding is difficult and many small vegetable plants are trampled during the weeding operation. No mulching or staking is practised. Vegetable harvesting starts around December.

Tomatoes are harvested in January. This coincides with the tomato harvest of many other farmers across Laos, thus there is a seasonal over-supply in the market. Consequently the price of the product is very low.
Table 1: Summary of production and economic returns from off-season tomato trials in 2002 and 2003, Phonxay District.

<table>
<thead>
<tr>
<th>Total area planted to off-season tomatoes</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,600m²</td>
<td></td>
<td>1.2ha</td>
</tr>
<tr>
<td>Off-season tomato yields</td>
<td>1.9 t /1,000m²</td>
<td>0.2 - 1.3 t /1,000m²</td>
</tr>
<tr>
<td>Net income obtained Million Kip/1,000m²</td>
<td>4.69</td>
<td>0.3 - 2.4</td>
</tr>
<tr>
<td>US$ /1,000m²</td>
<td>469</td>
<td>31 - 240</td>
</tr>
</tbody>
</table>

**Productivity, profitability and acceptability**

Table one provides a summary of the production and economic returns from the off-season tomato trials carried out in the project villages in Phonxay District. In 2002, yields of 1.9t/1,000m² were obtained from farmers' small plots aggregating to 1,600m² (LSUAFRP, 2002). The net income obtained was 4.69 million Kip per 1,000m² (equivalent to US$ 469 per 1,000m²). In 2003, there was an increase in the number of participating farmers and therefore a higher total area of 1.2ha was planted to off-season tomatoes. Yields ranged from 0.2 - 1.3t per 1,000m². Net incomes ranged from 0.2 - 2.4 million Kip per 1,000m² (equivalent to US$ 21 - 240 per 1,000m²). The higher incomes obtained in 2002 were due to both the higher selling price of tomatoes and higher yields per unit area. In 2003, some droughts occurred which negatively affected plant growth and subsequent yields. The selling price of tomatoes was also lower than in 2002 and unstable.

Growing off-season tomatoes is well accepted by farmers as they receive a good income from the activity. Despite the high cost of inputs, farmers are able to realize good profits. Because it is an off-season crop, the tomatoes can be sold at a much higher price than during the usual peak season. This is because there is little competition from other farmers in the country. Staking the tomato plants resulted in better quality tomatoes than if the plants were left sprawling on the ground. This better quality again translated to better prices. Plastic mulching made it easy to control the weeds and saved labour for weeding. Some farmers had previous experience in growing tomatoes and so did not hesitate to try out the technology.

In Namor District, however, the off-season tomato trials were set back by late rains, which delayed seedling establishment. When the rains came, the seedlings were destroyed by damping-off. A lack of technical coordination and support between the researcher, DAFO staff and farmers resulted in problems of how to take care of the young seedlings.

**Remaining challenges**

While many farmers were excited enough to try the technology by themselves, there were some farmers who also wanted to do so but couldn't because they did not have land. This brings then the question of whether this technology is helping better-off farmers become better while poorer farmers are being left out. Land is obviously a major requirement for crop production but the reality is that most of the 'poorest of the poor' are landless. This does not imply, however, a simplistic solution of giving land to the poor. There are documented cases where land allocated to the poor was sold to
better-off farmers. A better understanding of the social and cultural factors affecting land ownership or distribution is pertinent.

Other farmers have some land but not sufficient money to buy inputs. There are two options to address this. One could be to provide some credit to enable farmers to purchase inputs. This, however, raises the question of sustainability. Another option is to review the technology and look at ways to make it into a ‘low external input technology’. Some aspects to be further investigated include:

- The use of indigenous, more environmentally friendly materials instead of plastic mulch.
- Development of open-pollinated varieties instead of depending on hybrids.
- Using farmyard manure instead of commercial fertilizers.
- Promotion of Integrated Pest Management (IPM).

Success of a technology is often gauged by its widespread acceptance by farmers. However, when many farmers practice the same technology and produce the same crop, researchers and extension agents should be on the look out for marketing implications. There are many cases of technologies that are good for improving productivity of certain crops but which farmers have stopped adopting because they cannot sell the extra produce.

**Frog culture trials**

Frog culture trials were thought of as an option for generating income without the need for large tracts of land. Frog culture can be done in a limited space in the backyard and it can be done by women and children. Farmers were excited to try it because they saw it as a ready source of food for the family as well as a source of additional income. None of the farmers who joined the trials had previous experience in frog culture. Normally, frogs are merely collected from paddy land and some forested areas.

**Productivity, profitability and acceptability**

Table two provides a summary of the production, survival and economic returns from the frog culture trials in the project villages in Phonxay District. In 2002, the survival
after 4 months was comparable to that in 2003 with the same stocking rate ($T_2$). Average weight per frog was 140g. The net income obtained was 279,200 Kip per 100 frogs or US$ 28 per 100 frogs.

In 2003, the lower stocking rate of 160 frogs/cage ($T_1$) resulted in a higher survival percentage and higher average weight per frog after 4 months than that with the stocking rate of 240 frogs/cage ($T_2$). Higher net incomes of 353,600 Kip per 100 frogs or US$ 35 per 100 frogs were realized with the lower stocking rates. A similar trend was observed (table three) from the on-farm trials in Ban Namor Neua in Namor District.

At the end of the trials, farmers were happy to earn additional income from the sale of frogs and also to have additional food for the family, even if they only have a small amount of land. Others said that it was a good way to spend time and earn extra income during a period when they don't have much work in the fields.

While there are those who favour this technology, many chose not to continue after 2003. Some problems met were:

- Lack of worms to feed the frogs especially during the dry season.
- High labour demand in terms of digging the soil to find worms: As the dry season advances, the worms settle deeper into the ground.
- The alternative commercial feed is expensive. With limited money, farmers would logically rather buy rice for direct consumption than buy feed for frogs.
- Snails, another alternative feed, requires high amounts of labour to collect and process: Processing involves prying out snails from their shells and cutting them into small pieces.
- Hibernation during the cold season: Frogs do not like to eat at this time, which results in slower growth and even death.
- Cannibalism: Big frogs eating the small ones. This was remedied by subdividing the pen to separate the small frogs from the big ones.
- Big frogs escaping by jumping over the fence: Higher bamboo fences and some overhead netting were therefore introduced in the second trials.
- Women and children feel squeamish when handling the worms (LSUAFRP 2003).

<table>
<thead>
<tr>
<th>Table 3: Summary of production, survival and economic returns from frog culture trials in 2003, Namor District.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2003</strong></td>
</tr>
<tr>
<td><strong>$T_1$</strong></td>
</tr>
<tr>
<td><strong>Initial number of frogs</strong></td>
</tr>
<tr>
<td>(number/cage of 4m²)</td>
</tr>
<tr>
<td><strong>Survival after 4 months</strong></td>
</tr>
<tr>
<td><strong>Average weight (g/per frog)</strong></td>
</tr>
<tr>
<td><strong>Net income obtained</strong></td>
</tr>
<tr>
<td>Kip/100 frogs</td>
</tr>
<tr>
<td>$ US/100 frogs</td>
</tr>
</tbody>
</table>
**Remaining challenges**

Frog culture could be a good option especially for farmers with limited land or perhaps no land at all. However, more basic studies need to be made in terms of finding alternative, cheap and easy to find sources of frog food. There is a need to determine strategic periods of the year when frog raising would be most favoured by climate, when there is high availability of worms for feeding and when there would be a good price at the market. At the moment, frog culture trials are being undertaken on-station. At a later stage, when more knowledge and experience has been gained, on-farm trials may again be carried out.

**Conclusions**

Off-season tomato cultivation and frog culture are viable farming system options that can provide both income and food for farmers. However, there is a need to continue further refining these technologies both on-station and on-farm. Farmers’ criteria for evaluating and adopting technologies should be documented. Farmer-to-farmer exchange of results and experiences from the trials can be promoted through cross-farm visits and field days. Scaling-up and its implications for market opportunities and efficiency of extension support services also need to be well studied.

On-farm testing is an effective method where alternative technologies are introduced, tried and evaluated jointly by farmers, researchers and extension agents before they are recommended on a large scale (BAR, 1990). Farmers’ active participation in on-farm trials leads to more refined and relevant alternative technologies that suit the needs both of participating farmers as well as those with similar existing farming systems.

**Authors**

Monthathip Chanpengxay is Deputy Director of NAFRI, e-mail: monthathip.c@nafri.org.la

Mr. Bounhom Thepphavong works in the Research Management Division of NAFRI

Mr. Phayvanh Siphanhdouang and Vison Phounsavath are researchers at the Northern Agriculture and Forestry Research Centre, NAFRI

Dr. Blesilda M. Calub is Farming Systems Adviser for the Lao Swedish Upland Agriculture and Forestry Research Programme (LSUAFRP), e-mail: bmcalub@laguna.net

Mr. Paul Overgoor also worked as an adviser for the Farming Systems Research Component of LSUAFRP, e-mail: paul_overgoor@zonnet.nl

**Bibliography**


ON-FARM EXPERIMENTS OF DIRECT SEEDING 
ON CROP RESIDUES 
SOUTHERN XAYABURY PROVINCE

Florent Tivet, Ho Tran Quoc, Chanthasone Khamxaykhay, Bounsay Chantharath, Patrick Julien, Thammakham Sosomphou and Khamko Panyasiri

Abstract

Since the nineties, traditional farming systems in the southern districts of Xayabury province in the Mekong corridor, have changed through extensive agricultural development based on cash crop production. This development, by way of intensification, depends on local market accessibility, technology transfer from Thailand and financial capacity of local enterprises. Thailand is the source of inputs, heavy mechanization and technical skills and cropping is largely opportunistic following Thai market demand. Land preparation based on burning residues and ploughing on steep slopes has allowed for cultivation of large upland areas. As a result of this present development combined with land allocation and increasing population density, fallow periods are disappearing. Furthermore, this ‘resource-mining’ development generates land erosion, fertility loss, yield decline and chemical pollution as well as destruction of roads and paddy fields. In light of this, the Lao National Agro-ecology Programme has implemented a holistic research approach, in order to propose various systems integrating crops and livestock production to farmers. From a large range of technologies carried out, maize production based on direct seeded grain on former crop residues under no tillage systems has been evaluated. This paper presents results achieved under various conditions with yields obtained close to, and even higher than, those obtained in conventional systems. Labour, costs, soil erosion and increasing income per day are also all observed.

Introduction

Since the nineties, in southern Xayabury, traditional farming systems have changed through extensive agricultural development based on cash crop production. The main dryland crops cultivated are: maize, rice-bean (Vigna umbellata), peanut, Job’s tears, black bean (Vigna unguiculata) and sesame. This development, by way of intensification, depends on local market accessibility, transfer of technologies from Thailand and financial capacity of local enterprises. Inputs, heavy mechanization and technical skills come from Thailand. The cropping system is largely opportunistic related to Thai market demand, no particular crop rotation is followed and usually no fallow period is observed. Land preparation based on burning residues and ploughing on steep slopes has allowed for cultivation of large upland areas every year (Photo 1). As a result of this present development associated with land allocation and increasing population density, fallow periods are disappearing and agricultural systems do not conserve soils and nutrients.

For many years, due to production costs, drudgery of labour for weeding and decreasing soil fertility, farmers have overlooked conventional land preparation and have been shifting from ploughing to herbicides. Spraying before sowing is common and
usually goes together with residue burning in order to decrease, for some weeds, the topsoil seed bank. This practice is widely adopted in many degraded areas in southern Xayabury and emphasises the great reactivity, good or bad, of smallholders who relate their practices according to three main ideas:

- Cash income and increasing the area cultivated.
- Labour optimisation.
- Decreasing the drudgery of labour.

However, residue burning, at the end of the dry season, does not protect the soil against erosion and mineral element losses. Soltner (1999) showed that mineral elements contained in cereal straw represent on average two-fifths of the total elements produced above the soil (straw and seeds) for nitrogen and phosphorus, and more than four-fifths for potassium. Results for maize showed that for 4t/ha of seeds, straw contained 32-68 kg/ha of N, 16-20 kg/ha of P₂O₅ and 40-80 kg/ha of K. Moreover, Findeling (2001) showed that soil erosion is reduced significantly even with a small quantity of straw residue.

Crop residue management can be a first step towards reducing losses of soil and mineral elements as well as saving money. The cost of burning is estimated at US$ 50/ha in terms of mineral fertilizer loss for a yield of 4t/ha. Calculated data does not consider returns to the soil from burning (ash production) or from animals free grazing during the dry season.

The use of pesticides is also one of the major problems of this agricultural intensification. Until recently insecticide was not used for cotton production but more recently, its use has been extended to other cash crops such as sesame and rice-bean. The most common insecticide used by smallholders is Folidol, a parathion methyl with high toxicity (lethal dose (LD) of 14 mg/kg). Some herbicides (for example Gramoxone and Atrazine) are also widely used in southern Xayabury.

Gramoxone, is well know globally because of its high toxicity (LD of 157 mg/kg). Gramoxone is used for land preparation after burning or ploughing and it is common to observe spraying of 10 l/ha. The use of Atrazine is more recent and is linked with maize production in southern Parklai. It is frequent to observe spraying of 3 kg/ha, up to fifty days after post-emergence, in order to control Mimosa invisa. As described by Naylor (1996), lack of knowledge and often misuse of pesticides, particularly in handling have dramatic consequences for human health and the environment. In addition, to widespread herbicide use, large concentrations of pesticides are applied and could pollute rivers and soil. This is in spite of the fact that many products, which can be used as substitutes for the above chemicals are available on the Thai market. Training sessions, as carried out by Prodessa, the Development Project of the four southern districts of Xayabury Province, are crucial in order to improve choice and handling of pesticides by smallholders.

Comparative indicators (MAF 1999) report that the socio-economic paths of the uplands and of the Mekong corridor diverged during 1994-1998 relating to agricultural sector modification and rural economic growth. During 1994-1998, the mean value of household assets represented US$ 471 and US$ 247 for the Mekong corridor and the uplands, respectively, while this value was in the same order of magnitude (US$ 240) in both locations for the period 1986-1993. Some places, like southern Xayabury, experi-
enced important rural growth related to Thai market demand. However, despite very good soils and high potential for agricultural development, natural resources have been rapidly degraded with negative social and economic impacts. Initial assessment of this resource-mining agricultural development showed dramatic land erosion, destruction of roads and paddy fields (Photo 2, 3) and transfer of capital from Kenethao to Parklai district, which is a new zone for cash crop (particularly maize) production. It is obvious that southern Parklai will quickly experience the same situation as Kenethao.

In many countries, due to the issue of soil degradation, smallholders and different stakeholders (extension, research, private sector) develop alternative systems based on green manure, mulching and the use of cover crops to preserve soil potential, stability of the plant-soil system and farmer livelihoods (Flores 1989; da Silva 1999; Richter et al. 2002; Erenstein 2003). Direct seeding mulch based cropping systems (DMC) present a large range of technologies. To be efficient these systems should adhere, as closely as possible, to the natural ecosystem which preserves nutrients, water and soil (Altieri 2002; Derpsch et al. 2003; S guy et al. 2003). The main principles of direct seeding are presented in a previous paper (Tivet et al. 2004). It is clearly difficult to complete all of these principles in a short-term process with smallholders. In order to convert resource-mining production to a stabilising plant-soil system an iterative approach has been implemented to analyse, for each step, the technical and socioeconomic viability of the technologies. The aim of the present work is to compare maize production under direct seeding on crop residues with conventional ploughing systems in southern Xayabury.

**Materials and methods**

Until 2002, activities were conducted at an experimental site with little technological adaptation by smallholders. This changed in 2002 with the implementation of a holistic research approach as presented in a previous paper (Tivet et al. 2004). This programme emphasises generation and adaptation of technologies, focusing on soil conservation, with village communities and groups of smallholders.

**General description of the area**

The study was carried out in southern Xayabury. As presented earlier, the main characteristics of this region are related to its integration with the Thai market and the dominance of maize production. Maize is a key crop in southern Xayabury; 13,000t of grain were produced here in 2000 and the region holds the third place for production after Vientiane Municipality and Oudomxay Province (State Planning Committee 2000). Due to its low labour requirements and high labour productivity this crop is widely sown and production spreads to new areas every year.

As presented in a previous paper (Tivet et al. 2004) quantitative and qualitative household surveys were carried out with targeted farmer groups in order to acquire information on household conditions and farming systems. These surveys were carried out in two villages in Kenethao, one village in Parklai and one village in Botene during the 2003 season. A total of thirty-one households were surveyed.

In 2003, rainfall in southern Kenethao was 1,254mm, however, distribution was very erratic with little rainfall during the two first weeks in May. A short dry season then occurred from the end of June to the beginning of August.
Table 1: Geological and soil characteristics for some sites of southern Xayabury

<table>
<thead>
<tr>
<th>District or zone</th>
<th>Geology</th>
<th>Soil Characteristics</th>
<th>On-farm trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>South of Kenethao</td>
<td>Granite</td>
<td>PH 5.6  OM 3.9  CEC 12  K [Co(NH)₆Cl] 0.2  P Olsen-Dabin 7.0</td>
<td></td>
</tr>
<tr>
<td>West of Kenethao &amp; southwest of Parklai</td>
<td>Clayey schist and green stones</td>
<td>PH 6.4  OM 4.0-4.8  CEC 21-45  K 0.3-0.9  P Olsen-Dabin 5.0-13.0</td>
<td>Nahin, Paktom and Bouamlao</td>
</tr>
<tr>
<td>Botene</td>
<td>Sandstone</td>
<td>PH 6.6  OM 1.4  CEC 5.5  K 0.2  P Olsen-Dabin 5.0</td>
<td></td>
</tr>
</tbody>
</table>

Soil analysis was conducted by Brouwers (1998) and Bourguignon (2001) for 0-10 cm.

Sandstone, green stones and clayey schist are the dominant geological formations in the region (Raunet 1996).

**On-farm experiments**

These experiments were carried out on fields, with and by farmers, on plots of at least of 1,000m². Cropping systems were assessed on large experimental plots, under conditions that matched those found on farms in the region. Moreover, conventional land preparation was replicated on both sides of the direct seeding plots and arranged on landscape slopes in order to take fertility gradients into account (Photo 4). The number of fields differed between the zones with 3, 5, 8, 5 and 3 sites respectively in Kengsao, Bouamlao, Paktom, Nahin and Houay Ihoum. Some geological characteristics of these sites are presented in Table 1.

**Cropping system components**

Two main land management practices were evaluated:

- Conventional (burning and/or ploughing)
- Direct seeding with residue management.

**Conventional (burning and/or ploughing)**

As presented previously, ploughing or pre-sow herbicide used after burning is widespread in southern Xayabury. Conventional practices in Houay Lhoum and Nahin village are based on the use of Gramoxone sprayed with a pump. In these situations, a comparison was carried out between DMC systems on residues and herbicide use after burning.

**Direct seeding with residue management.**

At the beginning of the rainy season, residues of the former crop were preserved and systemic herbicides (3 l/ha of Glyphosate + 1.5 l/ha of 2.4-D) are applied to control
weeds. This broad-spectrum association allows for control of a large number of weeds. Many authors (Nalewaja and Matysiak, 1993a; Thelen et al. 1995) have analysed the efficiency of Glyphosate and reported a strong negative interaction with calcium ions which limits cuticular penetration. Nalewaja and Matysiak (1993a) showed that calcium-sulfate complex can prevent the precipitation of Glyphosate-calcium. As suggested by Nalewaja and Matysiak (1993b), ammonium sulfate showed the greatest efficiency in complexing calcium ions. Because of the lack of ammonium sulfate, sulfuric acid (battery acid), which is very common and cheap but extremely hazardous, has been used at 15 ml per 18l ml with a sprayer; pH of the solution then drops to 3.

Ten days after spraying, crops are sown using a hand-jab planter. With crop residue management, the sowing date may be delayed two weeks. The use of a nonselective herbicide such as Glyphosate requires specific weather conditions and weed physiology. At the beginning of the rainy season the seedling rate is quite low while various weeds in fields have survived through the dry season. Leaves of many weeds have high quantities of cuticular wax in order to decrease water loss by transpiration. This wax is the main obstacle for Glyphosate penetration on leaves (Deschomets 2001). In addition, environmental conditions, specifically temperature and humidity, are not well adapted for spraying.

Three main cultivars are used in this region:

- A maize hybrid from CP1 widely used in southern Parklai.
- Suwan 2.
- A heterogeneous population resulting from breeding between the above cultivars, sown in Kenethao and Botene districts.

Cultivars were sown between April 20 and May 15, 2003 according to the opportunities and constraints of each zone. For the hybrid, the planting density suggested by CP was followed with about 53,333 plants/ha (0.75*0.50m, two seeds per hole, 15 kg/ha). On the other hand planting density for Suwan 2 and the heterogeneous population ranged from 40 to 80 thousand plants/ha according to smallholder's strategies (weed control). After seedling emergence, fluctuations were observed in plant density due to seed quality and rodent damage.

In order to assess the evolution of the systems over time, two levels of mineral fertiliser were applied:

- Conventional system and one direct seeding plot without the use of mineral fertiliser
- Second plot of direct seeding with medium level of mineral fertiliser to compensate for nutrient exportation by grains.

Fertiliser was applied during sowing with the hand-jab seeder as follows:

- 60kg N as ammonium sulphate.
- 60kg P$_2$O$_5$ as triple superphosphate.
- 60kg K as KCl per hectare.

---

1 Chareon Pakpong: Seed producing company based in Thailand.
Due to the chemical characteristics of the soil it is not necessary to apply potassium for the zone on green stones. However, in order to simplify the experiments the formulation of 15-15-15 was applied across all the sites. This cost of production is estimated at US$ 100. Mineral fertilisation is supposed to balance losses of mineral elements due to seed exportation.

**Data collection and economic analysis**

Labour requirements were recorded for all activities (land preparation, sowing, weeding, harvesting). Yield and overall performance was recorded for each treatment. However, the philosophy under which the experiments were carried out allowed for qualitative analysis in order to evaluate the socio-economic viability of these systems. Production costs included ploughing, seeds, sprayer, hand-jab-seeder and hoe. Specifically, one third of the cost of a sprayer (US$ 30) and hand-jab seeder (US$ 15) has been used.

Before sowing, dry matter on the soil was recorded from 4m² samples with 12 replicates per plot. One sub-sample was removed in order to determine the dry weight.

Destructive measurements were carried out at the harvesting stage on plots of 4m² with eighteen replicates per treatment. For each sample, the number of hills, plants and ears, fresh weight of biomass (leaves and stems) and ears were recorded. In order to determine the dry weight of biomass and ears one sub-sample for each treatment (2kg for biomass and 50 ears) was removed. The dry weight of each component was determined after drying for 96 hours at 60°C. The weight of 500 dry seeds was recorded.

**Results and discussion**

**Surveys on cash crop production**

Some results relating to the mean cultivated area, labour requirements per crop, labour productivity per crop and net income, are presented according to location of the experiment.

1. **Parklai District:** Since recently, cropping in southern Parklai (data recorded in Bouamlao) has only shown a low level of diversification. Smallholder maize production is widespread across large areas covering more than 70% of the total cultivated land area (lowland and rainfed). At the same time, maize production represents a net income of at least US$ 200/ha. Labour inputs (lowland and cash crop) represent 83 days per worker and net cash crop income is estimated at US$ 450 per household. During 2003, due to price instability, few areas were sown with Job’s tears.

2. **Botene District:** In contrast with southern Parklai, a combination of multicropping and animal husbandry is observed in Botene, allowing for a balanced distribution of farming activities over space and time. The main dryland crops are maize, peanut, black-bean, rice-bean and sesame. These production strategies aim to reduce climatic and economic risks in a fragile ecosystem. Labour requirements (lowland and cash crop) represent 103 days per worker and net cash crop income is estimated at US$ 175 per household. In this pattern, maize production represents 39% (US$77) of cash crop income. Limiting factors for production of Job’s tears and rice-bean are observed, relating to sandy soil with low water capacity retention at the end of the rainy season.
3. Degraded zones in Kenethao District: present a large array of crops; maize, peanut, rice-bean which can be sown in the same field with maize, Job’s tears and sesame in order to minimize, as in Botene district, climatic and economic risks. Because of these diversified schemes, labour input is higher and represents 137 days per worker. Net cash crop income per household is higher with US$ 491 per household. However, this situation relates to the good price for Job’s tears and rice-bean in 2003 following low production due to erratic rainfall. These surveys show that maize production is minor accounting for less than 11% (US$ 90 per householder) of cash crop income. Regarding soil degradation it is interesting to see that maize productivity (per ha) in Paktom, which has the same geological substratum as Bouamlao, drops greatly with US$ 86/ha and US$ 212/ha respectively. Moreover, labour productivity of maize is lower than upland rice with US$ 1.1 per day. In a few years, land preparation based on ploughing generates heavy soil degradation and depletion of natural resources. Rural stability is based on this natural capital but seasonal migration from Kenethao and Botene is frequently observed due to the rural economy collapsing.

Table 2: Main household characteristics related to cash crop production in southern Xayabury. Surveys conducted in 2003 by students of the Faculty of Agriculture of Nabong

<table>
<thead>
<tr>
<th>Crops</th>
<th>Vilage</th>
<th>Mean area per household</th>
<th>Labour inputs days/ha</th>
<th>Net Income</th>
<th>Labour Productivity USD/day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>household</td>
<td>labour</td>
<td>ha</td>
<td></td>
</tr>
<tr>
<td>Lowland rice</td>
<td>Paktom</td>
<td>0.36</td>
<td>136</td>
<td>133</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Nongpakbong</td>
<td>0.61</td>
<td>124</td>
<td>324</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>Bouamlao</td>
<td>0.89</td>
<td>114</td>
<td>428</td>
<td>151</td>
</tr>
<tr>
<td>Upland rice</td>
<td>Paktom</td>
<td>0.55</td>
<td>154</td>
<td>104</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Nongpakbong</td>
<td>0.11</td>
<td>139</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Bouamlao</td>
<td>0.03</td>
<td>156</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Maize</td>
<td>Paktom</td>
<td>1.05</td>
<td>81</td>
<td>90</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Nongpakbong</td>
<td>0.60</td>
<td>66</td>
<td>77</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Bouamlao</td>
<td>2.27</td>
<td>60</td>
<td>450</td>
<td>159</td>
</tr>
<tr>
<td>Peanut</td>
<td>Paktom</td>
<td>0.22</td>
<td>219</td>
<td>62</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Nongpakbong</td>
<td>0.43</td>
<td>181</td>
<td>64</td>
<td>23</td>
</tr>
<tr>
<td>Job’s tears</td>
<td>Paktom</td>
<td>0.43</td>
<td>81</td>
<td>178</td>
<td>46</td>
</tr>
<tr>
<td>Rice-bean</td>
<td>Paktom</td>
<td>0.23</td>
<td>143</td>
<td>131</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Nongpakbong</td>
<td>0.29</td>
<td>86</td>
<td>28</td>
<td>12</td>
</tr>
<tr>
<td>Maize + rice-bean</td>
<td>Paktom</td>
<td>0.21</td>
<td>82</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>Sesame</td>
<td>Paktom</td>
<td>0.03</td>
<td>82</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Nongpakbong</td>
<td>0.03</td>
<td>81</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>
A layer of mulch, even a thin one, limits soil erosion by decreasing the kinetic energy of raindrops and run-off intensity (Abrahams et al. 1994; Dilshad et al. 1996). Interception of rainfall by residues is proportional to their biomass (Arreola Tostado 1996). Moreover, run-off intensity is decreased because of the sinuous pattern that is generated by residues. This wavy pattern increases the path and decreases the effective slope met by the run-off. Findeling (2001) reported that 4.5 t/ha of biomass can represent a 30% slope reduction and reduce run-off intensity by 20%. Gilley et al. (1986) showed that the micro-channels generated by residues concentrate a large part of run-off and sediments. Furthermore, this protective layer enhances soil surface aggregate stability and permeability (Findeling 2001; Erenstein 2002). In the on-farm experiments described in this paper, dry matter at the beginning of the rainy season ranged from 2.0 to 3.5 t/ha (Table 3), referring mainly to maize, Job's tears and rice-bean residues. However, this data refers only to the large particles of residues and hides the small aggregates of soil and straw, which greatly reduce run-off intensity (Photo 5 and 6).

Job's tears and rice-bean are interesting crops because of their:

- Low residue degradation due to a high lignin content, which enhances soil protection by reducing both evaporation and weed pressure (particularly for rice-bean).
- Low rate of C/N for rice-bean residues which avoids mineral nitrogen competition between the crop and micro-flora at the beginning of the rainy season.
- Low level of animal exportation relating to the low palatability of both species.

Below ground dry matter was not measured but biological improvement of soil structure by rooting systems is crucial. A crop of Job's tears with long duration and strong rooting system is a good companion crop to ensure this function.

### Yield and dry matter

For each treatment grain yield variations for maize, according to site characteristics (landscape, soil units) and cultivars, are important. Such results reflect differences in soil erosion and fertility. For example it is acceptable to consider that Paktom, Nahin and Bouamlao have the same geological substratum, however, large differences in yield are observed.

Southern Parklai (Kengsao and Bouamlao) and along the Heuang river (Houay Ihoum), are recent areas for maize production and hybrid cultivars are widely used. Yields usually reach 5 t/ha (Figure 1). Maize production is generally higher when crop residues are preserved but the difference in yield is not statistically significant. For southern Parklai,
Figure 1 presents a yield increase of 56% with use of fertiliser, which can counterbalance the cost of production. In contrast, the use of fertiliser does not appear to be suitable for fields located along the Nam Heuang River. Low radiation interception, related to surrounding fallows, and alluvium soils could explain this. However, long-term experiments are necessary to confirm this result.

In the most degraded areas in Kenethao (Paktom and Nahin) average yields reach 2.4 t/ha with conventional maize populations. With DMC systems, although yield levels were close to, or even lower than, those obtained in conventional systems (Figure 1) no significant difference was observed. For two on-farm experiments in Paktom a maize
hybrid was used but yield, with conventional land preparation, ranged from 1.5 to 3.2 t/ha. Farmers do not usually sow this cultivar, which is not economically viable under conditions of low soil fertility and high weed pressure. In Nahin, yields were similar between pre-sow herbicide use after burning and residue management (Nahin 2).

Erenstein (2003) reported that short-term yield effects often depend on the mulch, crop and site characteristics; therefore a number of seasons are necessary to stabilise the system. Moreover, with low mulch covering of the soil and poor soil structure, yield is frequently lower with direct seeding technologies. As described in a previous paper (Tivet et al. 2004) and by S guy et al. (1998), soil characteristics must be improved in order to generate a system that conserves water and nutrients with good organic composition to restructure the soil. Moreover, enhancement of soil biological activity is crucial as below ground insect and microbial populations improve soil structure and plant nutrition. Because conventional agriculture has greatly modified the soil, medium and long term processes are required for these main functions to be completed.

In southern Parklai and along the Nam Heuang river maize crops generate high quantities of dry matter which can control weeds and efficiently protect the soil at the beginning of the next season (Crovetto 1996; Scopel et al. 1999). In the experiments, dry matter ranged from 2.5 to 6.4 t/ha with residue management and from 2.5 to 5.4 t/ha with conventional land preparation. Exportation by animals occurred at many sites and obviously this biomass will not be on the soil at the beginning of the next season. No quantitative analyses were recorded to evaluate physical and biological evolution of the soils after two years of crop residue management. Qualitative analysis showed an enhancement of biological activity and aggregate stability in comparison with conventional practices. However, in many areas of Kenethao, production with residue management is quite low (2.5 t/ha) and the biophysical advantages of mulching are largely forfeited.

External inputs such as fertilisers and improved cultivars may present three main advantages:

- Decrease constraints to crop growth.
- Increase labour productivity in good soil.
- Boost yield and dry matter production.

Large variations in dry matter yield ratio were observed. In many situations this ratio ranged from 1.0 to 1.25 but in Nahin this value reached 1.7 misrepresenting a low potential of this cultivar to generate grain. Populations (resulting from breeding between CP 888 and Suwan 2) are heterogeneous in terms of duration, weed competitiveness and yield. As observed in previous work (Soulayakham et al. 2002), a drop in yield of 1 t/ha is observed with the first generation of CP 888. This is linked to less seeds per ear.

**Economic analysis**

**Production cost and net income**

High variations are observed for economic components - such as production costs, net income and labour productivity - mainly related to a few replications and site characteristics (Table 4). One example of analysis of production costs referring to southern Parklai is given in Figure 3. For ploughing, production costs ranged from US$ 40 to 125
Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR

per ha depending on the slope, distance from the main road, stones and/or stumps in fields. In comparison, the cost of herbicide spraying is about US$ 30 per ha.

Except for the on-farm trials conducted in Houay Ihoum and Nahin (2) production costs were reduced by between 31 and 48% with residue management representing a gain of US$ 36 to 72 per ha (Table 4). In southern Parklai (Bouamlao and Kengsao), net income per ha was highly significant with values close to US$ 230 and US$ 135 per ha for direct seeding and conventional system respectively. Only in this zone was a higher net income observed with the use of mineral fertiliser because of good soil fertility and lower weed pressure. However, pre-sow herbicide use after burning (Nahin (2) and Houay Ihoum) presented lower costs of production and higher net income related to low investment for equipment (no hand-jab seeder) and no post-sowing herbicide application.

**Labour requirements and labour productivity**

Crop management is greatly modified with herbicide-based residue mulching. A delay in sowing date and less calendar flexibility have been observed for early crops (peanut and maize), which benefit from rainfall at the beginning of the rainy season. However, no particular adverse effect has been observed in yield and labour inputs.

In all on-farm experiments a mean gain of 17 days/ha was observed with residue mulching (Table 4). This gain is linked to less labour inputs for sowing, weeding and eventually spraying herbicide. Large mechanisation adaptations are necessary; seed distribution by the hand-jab seeder has to be improved specifically for the expensive maize hybrid (US$ 2.2/kg). Using conventional pump spraying, smallholders manipulate a large quantity of water (1,000 l/ha), which can contribute to water and soil pollution. Low volume spraying of 100 l/ha was achieved with a nozzle from Berthoud (BV 30).

Labour inputs for weeding depend greatly on the history of the field and on the nature of the former crop. Rice-bean (*Vigna umbellata*) is an ideal crop to start a direct seeding system on residues. With a long cycle duration (seven months), this species
covers the soil rapidly at the beginning of the rainy season and competes fiercely with weeds.

Little data was recorded in the field but it is common to observe a decreasing number as well as a change of weeds in the second year of direct seeding. In southern Parklai, with residue management, *Ageratum conizodes* became the dominant species and *Mimosa invisa*, which is the major weed associated with ploughing and burning, was significantly reduced. Dominance of this species in the conventional system is mainly related to the fact that burning tends to boost seedling emergence (Lao-IRRI 2000).

Except in one situation (Nahin 2), labour productivity increased with residue management and was highly significant in Bouamlao, Kensao and Houay Lhoum ranging from US$ 3.7 to 4.3 per day (DMC F0). As reported previously, this component is an interesting guide to defining agricultural constraints.

**Socio-economic viability**

Many elements must be taken into consideration to appreciate the complexity of socio-economic viability. In contrast with semi-arid conditions, the level of residue exportation is quite low in sub-humid areas (Erenstein 1999). However, maintaining crop

---

**Table 4: Data SE from on-farm experiments conducted in 2003 in southern Xayabury.**

Mean value, Yield, Production cost, Net income, Labour inputs and Labour productivity are presented for five situations. Data is from three to eight on-farm trials of 1000 m² per treatment.

*Key: DMC: direct seeding with residues management; CV: conventional – ploughing; F0: without mineral fertilizer; F1: 400 kg.ha⁻¹ of 15-15-15.*

<table>
<thead>
<tr>
<th>Components</th>
<th>Treatment</th>
<th>Kensao</th>
<th>Bouamlao</th>
<th>Paktom</th>
<th>Nahin</th>
<th>Houay Lhoum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Replications</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Yield (kg/ha)</td>
<td>DMC F0</td>
<td>5481</td>
<td>167</td>
<td>5044</td>
<td>379</td>
<td>2563</td>
</tr>
<tr>
<td></td>
<td>DMC F1</td>
<td>7542</td>
<td>693</td>
<td>7413</td>
<td>451</td>
<td>3616</td>
</tr>
<tr>
<td></td>
<td>CV F0</td>
<td>4332</td>
<td>691</td>
<td>5073</td>
<td>281</td>
<td>2787</td>
</tr>
<tr>
<td>Production cost (US$/ha)</td>
<td>DMC F0</td>
<td>116</td>
<td>13</td>
<td>93</td>
<td>3</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>DMC F1</td>
<td>220</td>
<td>13</td>
<td>198</td>
<td>3</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td>CV F0</td>
<td>169</td>
<td>39</td>
<td>142</td>
<td>23</td>
<td>88</td>
</tr>
<tr>
<td>Net income (US$/ha)</td>
<td>DMC F0</td>
<td>227</td>
<td>19</td>
<td>222</td>
<td>23</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>DMC F1</td>
<td>252</td>
<td>53</td>
<td>265</td>
<td>27</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>CV F0</td>
<td>102</td>
<td>53</td>
<td>175</td>
<td>39</td>
<td>57</td>
</tr>
<tr>
<td>Labour inputs (days/ha)</td>
<td>DMC F0</td>
<td>62</td>
<td>5</td>
<td>55</td>
<td>9</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>DMC F1</td>
<td>65</td>
<td>2</td>
<td>65</td>
<td>9</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>CV F0</td>
<td>75</td>
<td>7</td>
<td>70</td>
<td>6</td>
<td>74</td>
</tr>
<tr>
<td>Labour productivity (US$/day)</td>
<td>DMC F0</td>
<td>3.7</td>
<td>0.1</td>
<td>4.0</td>
<td>0.8</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>DMC F1</td>
<td>3.9</td>
<td>0.8</td>
<td>4.1</td>
<td>1.4</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>CV F0</td>
<td>1.4</td>
<td>0.7</td>
<td>2.5</td>
<td>0.7</td>
<td>0.8</td>
</tr>
</tbody>
</table>
residues on fields is a difficult process where land management modification during the dry season has to occur. In southern Xayabury, it is common to observe wild-fires during the dry season that are imposed upon farmers by others. This problem relates to mutual land management because it is unrealistic for smallholders, with little available labour, to make firebreaks. Conserving residues has to take place in a setting whereby residue rights are defined and respected by the community. As proposed by the programme and as suggested by Sain and Barreto (1996), one option is to enhance the attractiveness of mulch, linking this component to other technological changes that tend to increase cash income – such as new cultivars or fertiliser use.

Moreover, economic incentives such as provision of credit have to be promoted. As observed in southern Xayabury and reported also by Petersen et al. (1999), one of the major limiting factors to adoption may be that the practice promoted was first perceived as being closely associated with a need to use cash income for equipment and inputs. In southern Xayabury, traders gave ploughing and seed credit at the beginning of the season. For many smallholders, even if higher interest rates (50% over 8 months) are used, this function is overall a positive one as it gives them the opportunity to not have to use any cash.

**Conclusion**

Positive or neutral results of direct seeding systems based on residues were shown in southern Xayabury where growing interest and potential for widespread adoption have been observed with a lot of smallholder requests for technical and financial support. Any increase in fields and number of farmers will be evaluated during the next season.

However, to complete all of the biophysical and economical advantages of DMC systems involves a long process. In order to overcome the constraints of residue management technologies an iterative approach of generating and adapting technologies has to be organised by village communities and groups of smallholders with the support of
research and extension agencies. The amount of residues remaining on fields is relatively low due to low production, biomass weathering and animal exportation. This does not ensure good soil protection and/or weed control. In order to efficiently control weeds (smothering and/or allelopathic effect) and thereby generate systems that are less dependent on herbicides, DMC systems have to be progressively improved with rational crop rotations, relay crops and cover crops (Kegode 1999; Florentin et al. 1991; Petersen et al. 1999). Enhancing attractiveness of residue mulching - cover crops and generating short-term profit (cash or labour) is essential. DMC systems are most likely to be adopted when their uses address specific opportunities (fodder, grain for feeding small animals) and have rapid short-term pay-offs for smallholder (Erenstein 2002).

The impacts of herbicides on environmental and human health have long been addressed by DMC systems. Many authors report that the use of pesticides (herbicides and insecticides) decreases rapidly under DMC systems with appropriate use of mulching and cover crops (Jansen 1999; Scopel 2003). Moreover, DMC systems which exhibit high biological activity (macro fauna and micro flora) actively degrade pesticides (Crovetto 1999). The trapping effect of mulch for Glyphosate was analysed by Jansen (1999) who reported that herbicide concentration in soil (active matter) was estimated at 0.03 mg/kg and 1.29 mg/kg, with DMC systems and conventional spraying on bare soil respectively. However, permanent evaluation of effects on pesticides must be evaluated under different DMC and conventional systems.

Acknowledgements

The authors wish to thank the French Agency for Development (AFD), the French Global Environment Facility (FFEM) and the French Ministry of Foreign Affairs (MAE) for financial support. We gratefully acknowledge Bounmy Rattanatray and Sylvain Pichot from Prodessa for their financial support and help until the end of 2002.

Authors

Florent Tivet, Lucien Seguy, Ho Tran Quoc and Pascal Lienhard work for the Annual Crops Department and Agrosystems Programme, Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD-CA). Email: ciradca@laotel.com

Khamko Panyasiri and Bounsay Chantharath work for the National Agroecology Program based at NAFRI. Email: naep_laos@yahoo.com

Patrick Julien is an Agronomist consultant

Bibliography


Photos


Photo 5: Direct seeding of rice-bean on Job’s tears residues, southern Xayabury, 2004.

LIVESTOCK INTENSIFICATION: FORAGE AND LIVESTOCK TECHNOLOGIES FOR COMPLEX UPLAND SYSTEMS

Phonepaseuth Phengsavanh, Keith Fahrney, Viengsavanh Phimphachanhvongsod and Gavin Varney

Abstract

In the uplands of the Lao PDR, many examples are emerging of farmers moving away from shifting cultivation by intensifying their livestock systems. The door for this opportunity has been opened by combining the best available technologies with a research process that engages farmers to work closely with researchers in evaluating, adapting and integrating the technologies on their farms.

Feed technologies that currently show most promise are particular varieties of forage grasses, herbaceous and tree legumes, and sweet-potatoes. Developing these feed resources in villages allows farmers to provide better housing and animal health management. This paper presents information on the most promising varieties and management practices.

Key research needs are: (i) overcoming nutrient decline in cut-and-carry systems and transition to grazing systems; (ii) extending forage resources into the dry season; (iii) developing forage seed production systems; and (iv) improving feed resources for small livestock.

Introduction

Many people believe that the green mountainous uplands of the Lao PDR are an abundant paradise for grazing livestock, and that it is only necessary to increase the numbers of livestock to bring about major improvements in the livelihoods of upland people. While goats might agree with this view, if buffalos and cattle could talk we would probably hear from them about a green desert. They might grumble about having to wander far and wide in search of enough food and about how hungry they get during the dry season after they have consumed all the upland rice crop residues. Fallow fields and forest understories are usually dominated by inedible weeds such as Chromolaena odorata, Ageratum conyzoides, and Mimosa invisa, and by poor quality grasses (Roder et al. 1997).

Low-input livestock systems result in low outputs for livestock production and limited income generation potential for upland households. In addition to slow growth from inadequate feed, free-ranging livestock are more susceptible to loss and disease. Intensifying livestock production can provide greater benefits to upland farmers (Connell et al. in these proceedings).

This paper describes the participatory process used by NAFRI, DLF and CIAT for developing forage technologies with farmers. Information is presented on the most promising feed resources for livestock and on forage and livestock management practices that can take advantage of these resources to improve productivity.
In order to develop feed resources that can meet the demands for livestock production, forage research and development in the Lao PDR started in 1995 with forage variety evaluation. The evaluations were conducted at five sites in four provinces. The objectives of the evaluations were to: (1) identify varieties that are broadly adapted to environmental conditions in the Lao PDR and (2) help smallholders to integrate promising varieties into their farms. 152 forage varieties (35 grasses and 118 legumes) were introduced to evaluation sites. The evaluations lasted for two years and resulted in identification of about ten varieties that are well adapted to the climate and soils of Laos.

<table>
<thead>
<tr>
<th>Promising varieties</th>
<th>Evaluation sites (Province and District)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ODX</td>
</tr>
<tr>
<td></td>
<td>Muang Xay</td>
</tr>
<tr>
<td>Andropogon gayanus &quot;Gamba&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Brachiaria brizantha &quot;Marandu&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Brachiaria Decumbens &quot;Signal&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Brachiaria humidicola &quot;Tully&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Brachiaria ruziziensis &quot;Ruzi&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Digitaria mikanjiana &quot;Jarra&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Panicum maximum &quot;Sinluang&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Paspalum atratum &quot;Terenos&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Urochloa mosambicensis &quot;Sabi&quot;</td>
<td>X</td>
</tr>
<tr>
<td>Stylosanthes guianensis &quot;CIAT 18&quot;</td>
<td>X</td>
</tr>
</tbody>
</table>

* ODX = Oudomxay Province, LPB = Luanprabang Province, VTE = Vientiane Province, CHS = Champassak Province

**Participatory research on forages in Laos**

Phimphachanhvongsod et al. (these proceedings) discussed the important role of forage and feed technologies and resources as an essential step that enables intensification of livestock production, as natural grassland can only provide low-yield and poor quality feed, which mostly results in low animal production. There was therefore a need to conduct research on forages in order to develop feed resources that can meet the demands for livestock production.

The most recent and comprehensive forage research and development in the Lao PDR started in 1995 with forage variety evaluation. The evaluations were conducted at five sites in four provinces. The objectives of the evaluations were to: (1) identify varieties that are broadly adapted to environmental conditions in the Lao PDR and (2) help smallholders to integrate promising varieties into their farms. 152 forage varieties (35 grasses and 118 legumes) were introduced to evaluation sites. The evaluations lasted for two years and resulted in identification of about ten varieties that are well adapted to the climate and soils of Laos (Table 1).

Evaluation of forage varieties was conducted mainly in large nurseries managed by researchers. Only after the ten most promising varieties were identified were they introduced to farmers in Xiengkhuang and Luangprabang provinces for on-farm evaluation. The process used in testing forage varieties with farmers is shown in Figure 1.
As farming systems in the uplands are complex and farmers in different systems or even within the same system have different farming practices, problems and opportunities, the most important goal for researchers at this stage was to help farmers identify the ‘right’ varieties for their particular conditions and uses. Through this process, farmers identified four varieties as being broadly adapted to the environmental and production conditions of the Lao uplands: *Brachiaria brizantha* ‘Marandu’, *Brachiaria hybrid* ‘Mulato’, *Panicum maximum* ‘Simuang’ and *Stylosanthes guianensis* ‘CIAT 184’. Several other varieties of grasses and shrubby legumes were also identified as being well adapted to particular environmental conditions or specialised uses. Below is a summary of characteristics of these recommended varieties. Horne and Str (2001) provide more detailed information on these and other varieties, including:

- *Brachiaria brizantha* ‘Marandu’ – a tall grass, suitable for cutting, and grows well on moderately fertile, acid soils. It stays green into the dry season and produces more seed than *Brachiaria decumbens*. It should not be fed to goats, sheep, or young cattle.

- *Brachiaria hybrid* ‘Mulato’ – a cross of *B. brizantha* and *B. ruziziensis* that produces fertile seed. It establishes rapidly from tillers, grows well in the dry season, and produces better quality feed than other *Brachiaria* varieties, but it needs at least moderate soil fertility and seed production is low.

- *Panicum maximum* ‘Simuang’ – a tall grass, suitable for cutting, and produces high quality feed. It is generally suited to more fertile soils and must be fertilised regularly to maintain high productivity. It becomes stemmy if not cut frequently and is not suited to long dry seasons.

- *Stylosanthes guianensis* ‘CIAT 184’ – an erect, short-lived (two to three years) perennial legume that will grow on low fertility and acid soils and produces large quantities of good quality feed for cutting. It stays green into the dry season. Leaves can be fed fresh or dried and stored as leaf meal. Stylo needs to be planted by seed and does not tolerate heavy grazing or frequent cutting.

Of the grasses with specialised niches, *Andropogon gayanus* ‘Gamba’ and *Brachiaria decumbens* ‘Basilisk’ tolerate infertile and acid soils and stay green into the dry season.
Both may be cut, but *B. decumbens* is also suitable for grazing. *Paspalum atratum* ‘Terenos’ also grows well on infertile, acid soils but only in wetter areas, without an extended dry season. *Setaria sphacelata* ‘Solander’ grows well in cooler areas but requires soils with good moisture and fertility. *Brachiarias* should not be fed to goats, sheep, or young cattle and *Setaria* should not be fed to horses.

*Gliricidia sepium* ‘Retalhuleu’ and *Calliandra calothyrsus* ‘Besakih’ are shrubby tree legumes that may provide high quality protein supplement to grass-based diets. *Gliricidia* can be planted from stem cuttings and is useful as a living fence. It can grow on moderately acid soils at lower elevations and can be managed to produce leafy forage during the dry season. *Calliandra* can grow on acid soils in cooler areas, but it must be planted by seed and initial growth is slow. Leaf yields are high with properly managed cutting and it provides good firewood. *Gliricidia* is initially not very palatable to cattle, but over time they learn to like it. *Calliandra* leaves are only palatable when freshly cut.

Experience has shown that to be successful in developing forage technologies with farmers, it is essential to offer the best varieties to the farmers - not just any variety of a species. This is important because:

- There can be huge variation between varieties within species (e.g. ‘Cook’ versus ‘CIAT 184’ Stylo).
- There is no magic variety that can grow in all conditions.
- Each variety has special characteristics that suit it to specific environmental conditions and uses.

Once farmers had identified the most promising varieties for their particular conditions and use, the next challenge was to develop functioning forage systems by helping farmers to integrate the most promising varieties onto their farms. Part of the challenge in achieving this involved implementing locally-appropriate forage establishment and management practices that not only allowed farmers to grow forages, but also to maximise the long-term benefits for animal production. These simple establishment and management practices are described in detail by Str and Horne (2001).

By combining the best-adapted varieties with (i) the best establishment and management practices and (ii) extension processes that encouraged farmers to expand their areas and ‘innovate’, significant impacts started to emerge, including:

- Savings in labour for livestock management.
- Sale of forage cuttings.
- Manure for increased crop production.
- Fattening animals for regular sale.
- Reductions in area of shifting cultivation.

These impacts became the basis for further expansion and for the development of new approaches to extension that will encourage a scaling-up of the most promising systems. These processes are described by Connell *et al.* (these proceedings).
New research challenges

Working at the interface between research and extension has provided an understanding of the problems and opportunities facing farmers in the development of livestock-based livelihood systems. As livestock intensification has begun to occur, new research issues have emerged.

Overcoming nutrient decline in cut-and-carry systems

Without adequate recycling of manure or addition of external fertiliser amendments, cut-and-carry forage productivity begins to decline rapidly. There is a need to better understand opportunities and practices for rotating or inter-planting legumes into grass forage plots. Although labour requirements are expected to be less than in cut-and-carry systems, there is still not enough understanding of the range of conditions which favour a shift from cut-and-carry feeding to managed grazing. Exploration is required on management practices for controlling grazing and maintaining productivity on small forage plots.

Extending forage resources into the dry season

Farmers in many upland areas are interested in solving dry season shortages of feed resources. Drought-tolerant varieties, like the *Brachiaria hybrid* ‘mulato’, are one avenue of continuing research. New drought-tolerant varieties will be identified and evaluated with farmers. More research is needed to evaluate production and management of tree legumes in smallholder livestock systems. Methods for drying and preserving forages will be evaluated with farmers.

Developing forage seed production systems

Relatively small amounts of seed will be needed for local expansion of promising varieties. Seed of most varieties can be produced in the Lao PDR if there is adequate research investment to support small-scale seed production technologies. Phimphachanhvongsod *et al.* (these proceedings) described a possible opportunity for developing an agro-enterprise in Laos to produce ‘mulato’ seed for the world market.

Improving small livestock feed systems (pigs, poultry, and fish)

To date, most of our research has focused on feed resources for ruminants, especially cattle and buffalo. Forage grasses can also be fed to some species of fish though, and farmers have found that pigs and chickens like to eat ‘Stylo’ and seem to grow faster when fed a ‘Stylo’ supplement. Work has begun with farmers to evaluate various feed resources for small livestock, such as sweet-potato, cassava, and maize.

Twelve new varieties of sweet-potato, selected for livestock feeding, were introduced from Vietnam and evaluated with farmers in Luangprabang and Xiengkhuang. Farmers identified three varieties (KL5, K51, and 8-84) that are superior in leaf production, palatability, and resistance to disease and insects. More work is needed to evaluate the varieties for animal feeding and to compare them with local dual purpose (food/feed) varieties.

With simple processing (sun drying or fermenting) to eliminate toxic compounds, cassava roots and leaves can be fed to both large and small livestock. Cassava roots are
high in energy, while the leaves are high in protein. A new NAFRI/CIAT project will work with smallholder farmers to develop cassava-based livestock feed systems.

Research in other countries has shown that feeding high lysine varieties of maize to small livestock results in accelerated growth and weight gain. NAFRI and CIAT would like to evaluate the adaptation and productivity of various ‘quality protein’ maize varieties in the uplands of Laos and conduct feeding trials in comparison with ordinary maize varieties.

As a variety of locally-produced feed resources becomes available, it will be important to work with farmers to develop feed rations that are balanced in terms of energy, protein, and mineral requirements for small livestock. Since women are often responsible for preparing feeds and feeding small livestock, they must be key evaluators of new technologies.

**Livestock management options**

Access to adequate, high quality feed and drinking water is essential to good livestock health. Forages provide energy, protein, vitamins, and minerals. Mineral supplements help to ensure adequate nutrition and can serve as useful lures (e.g. salt licks) for attracting animals back to the village or stall. Animals may benefit from protective enclosures and shelter from the elements, but only if pens are kept clean and maintained: good hygiene minimises the presence of disease-causing organisms, while well-nourished and housed animals are generally more resistant to disease.

Timely and appropriate vaccination with quality vaccines that have been properly handled helps to prevent most serious diseases, but vaccination alone will not result in healthy livestock and cannot prevent all disease. Sick and newly-introduced animals should be quarantined at a location that is suitably distant and for sufficient duration to prevent disease transmission. Treatment of internal and external parasites is a cheap and effective way to increase productivity and minimise disease and mortality. For example, *Toxocara vitulorum* is an internal parasite that kills many buffalo calves, but is easily and cheaply prevented with a single dose of oral medication if calves are treated shortly after they are born (Table 2).

Inbreeding can limit livestock productivity. It is important to widen the gene pool by bringing in superior breeding stock from outside the immediate geographic area. Local breeds are generally recommended for intensifying traditional livestock production systems. They are also well adapted to local environmental conditions and feed resources. On the other hand, crossbreeds of local and exotic livestock generally do not thrive on

<table>
<thead>
<tr>
<th>Village</th>
<th>Newborn calves</th>
<th>Treated</th>
<th></th>
<th>Untreated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number treated</td>
<td>Number died</td>
<td>Mortality (%)</td>
</tr>
<tr>
<td>Viengkhouan</td>
<td>58</td>
<td>42</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mouan</td>
<td>35</td>
<td>26</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phak Lak</td>
<td>65</td>
<td>52</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2: Effectiveness of treatment for *Toxocara vitulorum* in three villages in Pek district, Xiengkhuang province (unpublished data, Forages and Livestock Systems Project)
local feed resources, but may be more productive than local breeds if they are given high quality feeds and receive intensive management.

**Conclusions**

We have identified broadly adapted forages (mostly for ruminants). Farmers are integrating new forage technologies into their production systems: small plots of forages are providing large impacts and increasing the range of options for food security and income generation in upland livelihood systems.

Well-adapted varieties are excellent entry points for building trust with farmers and providing early impacts. It is then possible to work with farmers to solve other livestock management problems that limit productivity. Improving feed resources and adopting some relatively simple and inexpensive improvements in management practices can minimise the occurrence and impacts of livestock disease, resulting in greater productivity and benefits to farmers.

In working with farmers to adapt new technologies into their traditional livestock management systems, several new areas for adaptive forage and livestock systems research have emerged. Good technologies are crucial to the intensification of smallholder livestock production systems. Introduction of technologies, in a way that encourages adaptation and innovation by farmers and results in significant benefits to farmers, requires a participatory research and extension approach, with committed, informed, and confident follow-up and a continuing responsiveness to the evolving needs of farmers.

**Authors**

Viengsavanh Phimphachanhvongsod works with the Livestock Research Centre/ National Agriculture and Forestry Research Institute (NAFRI), E-mail: vieng63@laotel.com

Phonepaseuth Phengsavanh works with both NAFRI and CIAT. E-mail: p.phengsavanh@cgiar.org

Keith Fahrney and Gavin Varney: Centro Internacional de Agricultura Tropical (CIAT), PO Box 783, Vientiane, Lao PDR. Email: k.fahrney@cgiar.org; g.varney@cgiar.org

This work is being funded by the Australian Agency for International Development (AusAID) and implemented by the National Agriculture and Forestry Research Institute (NAFRI), the Department of Livestock and Fisheries (DLF) and the International Centre for Tropical Agriculture (CIAT).
Bibliography


THE ROLE OF PADDY RICE IN THE LAO UPLANDS: FOOD SECURITY, FARMER LIVELIHOODS, AND ECONOMICS

Sushil Pandey, Karin Troesch, Lingkham Douangsavang, Khampou Phouynavong and Bruce Linquist

Abstract

The incidence of poverty and food insecurity is high in the uplands of the Lao PDR, with many farmers relying on rice-based cropping systems to meet their food needs. Intensification of land use in response to rising population pressure has reinforced a vicious cycle of low productivity, environmental degradation and poverty. One potential strategy for breaking out of this cycle is to improve the productivity of highland rice paddies or develop such paddies where appropriate conditions exist. Valley floors and terraced fields where rice can be grown under flooded conditions provide a favourable environment for rice production, especially where there are possibilities for local-scale irrigation. Indeed, many villages in northern Laos have small areas of paddy rice and in many cases there is the potential to expand this area. Such a strategy will relieve the intensification pressure on the sloping uplands, help protect the environment, and address food security needs. As food needs become satisfied from these paddies, farmers are likely to adopt diversified land use systems on the sloping uplands, for income generation and for producing goods that satisfy other livelihood needs. Despite the potential roles of highland paddies in improving farmer livelihoods, the economic feasibility of increasing productivity and developing paddy terraces has not yet been adequately investigated.

Based on farm-level data from northern Lao, this paper examines the constraints and opportunities for increasing rice production (through increasing productivity on these highland paddies and through paddy terrace development) and the effects this has on farmer livelihoods. In the north, paddy rice yields (3.4 t/ha) were found to be almost double those of the upland rice (1.7 t/ha). Assuming a three-year upland cropping cycle (one year of rice followed by two fallow years), a hectare of paddy can thus substitute for 5.5 ha of upland fields at the current levels of yield. The extent of household-level food shortage was found to be low for households with more paddy area. Farmers considered the major benefit of paddies to be the lower labour requirement for rice production per unit of output, thus releasing their labour for other income generating activities. A cost-benefit analysis indicated that the cost of converting sloping lands into rice terraces can be recouped in a few years, though in some circumstances this break-even period could be much longer. Farmers considered lack of water, unavailability of suitable area for the development of paddies, and shortage of capital to be the major constraints to paddy development. These results indicate the potential for improving food security in the uplands by raising the productivity of paddy rice through suitable technologies, as well as by promoting further development of terraced paddy fields. The broader implications of these results are interpreted in the context of an overall strategy for addressing food insecurity and improving farmer livelihoods in the uplands of Laos.
Introduction

Rice production is the major agricultural activity in Laos, with rice accounting for over 65% of the gross cropped area (MAF 2002). Rice ecosystems in Laos fall into three major groups: upland, rainfed lowland and irrigated. Upland rice is grown mostly in the northern mountainous region and in the south along the eastern border with Vietnam under a system of shifting/rotational cultivation. The estimated average planted area of upland rice for 2000-2002 was 158,000 ha and this accounts for about 21% of the total rice area of the country. Since upland rice is grown in a shifting/rotational system, the actual area under upland rice systems depends on the length of the fallow. For villages that have undergone land allocation, the fallow period is two to three years (farmers are allocated three to four parcels of land). Hence, the actual area under upland rice systems is three to four times the area of upland rice planted.

In addition to rice production in the sloping uplands using the shifting/rotational cultivation systems, farmers also grow rice in limited areas of ‘paddies’. These include relatively flat areas in the lower slopes, valley bottoms and terraced fields. Due to favourable fertility and hydrological conditions, productivity of rice in these fields is higher than in the sloping uplands. These highland paddies provide an opportunity to increase the food supply and reduce the intensification pressure in fragile sloping uplands.

The objectives of this paper are to analyse the economics of paddy development in the northern mountainous region of Laos, to assess its potential impact on farmer livelihoods and to identify constraints and opportunities for its further expansion. The paper is organised as follows. The first section examines trends in rice growing in northern mountainous areas of Laos, in terms of both area cultivated and ecosystems used. A conceptual model of the nature of upland production systems and the role of paddies is developed in the second section. Some farm-level evidence is subsequently presented on the development of paddies and their roles, based on surveys conducted in Luangprabang and Oudomxay provinces during 2002-03. The fourth section consists of an economic cost-benefit analysis of paddy land development, while a general discussion of the study’s findings and implications is presented in the final section.

Food security, poverty and rice production systems: an overview

Approximately 190,000 ha of rice was grown in northern Laos in 2002 (Table 1). Of this, upland rice accounts for over half the area. Rainfed lowlands (which include flat plains and highland paddies) comprise about 42% of the area, with the proportion of irrigated rice area being only about 3%. The yield of rainfed lowland rice fields (average 3.4 t/ha for 2000-02) is higher than that for upland rice (average 1.7 t/ha for 2000-02), making its share in production also higher at 59%.

The area of upland rice fields has shown a declining trend over time while that of the rainfed lowland has increased in the northern region (Figure 1). The decrease in upland rice area is largely because of government policy discouraging shifting cultivation. The expansion of rainfed lowland rice area is mainly due to the development of paddy lands and the use of previously fallow land, although some expansion can be accounted for by double cropping in favourable areas - those with access to supplemental irrigation in the dry season.
The total area of rainfed lowlands in the northern region was 47,000 ha in 1991. This had grown to nearly 81,000 ha in 2001 – an increase of almost 70%. The average growth rate in the lowland rice area is thus 6% per year, which is much higher than the growth rate across the whole of the country (3.7% per year). The decrease in upland rice area is more or less compensated by the increase in lowland rice, meaning that the total rice area in the northern region has hovered around 200,000 ha.

Within the northern region, lowland rice area expanded rapidly during the 1990s in Bokeo, Huaphanh, Luangnamtha and Xayabury (Table 2). These provinces have relatively large flat areas that have been easy to convert to paddy. The growth in lowland area in other provinces has been somewhat modest. Farm surveys indicate that lowland rice area has expanded rapidly in some villages but not in others (Troesch 2003). Despite the expansion of lowland area, upland rice area is still substantially higher than lowland rice area in all provinces except for Bokeo and Xayabury. Thus upland rice production remains an important activity, although its share in total rice area has decreased somewhat in recent years.

### Table 1: Percentage shares in rice area and production of different ecosystems in the northern region of Lao PDR

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (000 ha)</th>
<th>% Share in area</th>
<th>Production (000 t)</th>
<th>% Share in production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lowland</td>
<td>Upland</td>
<td>Irrigated</td>
<td>Lowland</td>
</tr>
<tr>
<td>1991</td>
<td>215</td>
<td>22</td>
<td>77</td>
<td>1</td>
</tr>
<tr>
<td>1992</td>
<td>170</td>
<td>26</td>
<td>73</td>
<td>1</td>
</tr>
<tr>
<td>1993</td>
<td>180</td>
<td>26</td>
<td>73</td>
<td>1</td>
</tr>
<tr>
<td>1994</td>
<td>211</td>
<td>25</td>
<td>74</td>
<td>1</td>
</tr>
<tr>
<td>1995</td>
<td>203</td>
<td>30</td>
<td>69</td>
<td>1</td>
</tr>
<tr>
<td>1996</td>
<td>193</td>
<td>34</td>
<td>64</td>
<td>1</td>
</tr>
<tr>
<td>1997</td>
<td>179</td>
<td>38</td>
<td>61</td>
<td>1</td>
</tr>
<tr>
<td>1998</td>
<td>176</td>
<td>39</td>
<td>58</td>
<td>3</td>
</tr>
<tr>
<td>1999</td>
<td>194</td>
<td>38</td>
<td>58</td>
<td>4</td>
</tr>
<tr>
<td>2000</td>
<td>190</td>
<td>40</td>
<td>57</td>
<td>3</td>
</tr>
<tr>
<td>2001</td>
<td>202</td>
<td>39</td>
<td>58</td>
<td>3</td>
</tr>
<tr>
<td>2002</td>
<td>190</td>
<td>42</td>
<td>54</td>
<td>3</td>
</tr>
</tbody>
</table>

*Data Source: MAF (2002 and earlier issues)*

The total area of rainfed lowlands in the northern region was 47,000 ha in 1991. This had grown to nearly 81,000 ha in 2001 – an increase of almost 70%. The average growth rate in the lowland rice area is thus 6% per year, which is much higher than the growth rate across the whole of the country (3.7% per year). The decrease in upland rice area is more or less compensated by the increase in lowland rice, meaning that the total rice area in the northern region has hovered around 200,000 ha.

Within the northern region, lowland rice area expanded rapidly during the 1990s in Bokeo, Huaphanh, Luangnamtha and Xayabury (Table 2). These provinces have relatively large flat areas that have been easy to convert to paddy. The growth in lowland area in other provinces has been somewhat modest. Farm surveys indicate that lowland rice area has expanded rapidly in some villages but not in others (Troesch 2003). Despite the expansion of lowland area, upland rice area is still substantially higher than lowland rice area in all provinces except for Bokeo and Xayabury. Thus upland rice production remains an important activity, although its share in total rice area has decreased somewhat in recent years.

![Figure 1: Area of lowland and upland rice in the northern region of the Lao PDR](image-url)
Farmers may develop additional paddy lands by clearing and levelling the existing flat lands or by constructing terraces across the slopes. To encourage such investments, the government exempts land tax for the first three years after construction of terraces. In addition, farmers may avail themselves to some institutional credit from the Agricultural Promotion Bank. These are the two major policy initiatives implemented so far to support the development of paddy lands, but the extent to which they contributed to the rapid expansion of paddy lands during the 1990s is unclear. It is likely that

Table 2: Provincewise lowland and upland rice area (000ha) in the northern region of Lao PDR

<table>
<thead>
<tr>
<th>Year</th>
<th>Bokeo</th>
<th>Phanomheng</th>
<th>Luangprabang</th>
<th>Luangnamtha</th>
<th>Oudomxay</th>
<th>Phongsaly</th>
<th>Xayaby</th>
<th>Northern region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>4.29</td>
<td>6.83</td>
<td>7.97</td>
<td>2.03</td>
<td>12.50</td>
<td>4.85</td>
<td>9.08</td>
<td>47.55</td>
</tr>
<tr>
<td>1992</td>
<td>4.88</td>
<td>7.21</td>
<td>7.73</td>
<td>2.54</td>
<td>5.04</td>
<td>4.75</td>
<td>11.94</td>
<td>44.08</td>
</tr>
<tr>
<td>1993</td>
<td>6.08</td>
<td>6.54</td>
<td>8.64</td>
<td>5.01</td>
<td>6.83</td>
<td>4.85</td>
<td>9.28</td>
<td>47.24</td>
</tr>
<tr>
<td>1994</td>
<td>6.45</td>
<td>7.55</td>
<td>8.77</td>
<td>5.15</td>
<td>7.01</td>
<td>4.69</td>
<td>13.96</td>
<td>53.58</td>
</tr>
<tr>
<td>1995</td>
<td>7.08</td>
<td>8.29</td>
<td>8.21</td>
<td>5.80</td>
<td>7.52</td>
<td>5.31</td>
<td>17.99</td>
<td>60.21</td>
</tr>
<tr>
<td>1997</td>
<td>8.50</td>
<td>10.23</td>
<td>9.37</td>
<td>7.00</td>
<td>8.69</td>
<td>5.70</td>
<td>17.79</td>
<td>67.28</td>
</tr>
<tr>
<td>1998</td>
<td>9.15</td>
<td>9.52</td>
<td>9.53</td>
<td>7.07</td>
<td>7.82</td>
<td>5.72</td>
<td>20.25</td>
<td>69.05</td>
</tr>
<tr>
<td>1999</td>
<td>9.78</td>
<td>11.29</td>
<td>9.68</td>
<td>7.49</td>
<td>8.73</td>
<td>5.75</td>
<td>20.33</td>
<td>73.03</td>
</tr>
<tr>
<td>2000</td>
<td>10.20</td>
<td>11.40</td>
<td>9.80</td>
<td>7.90</td>
<td>9.20</td>
<td>5.40</td>
<td>21.50</td>
<td>75.40</td>
</tr>
<tr>
<td>2001</td>
<td>10.37</td>
<td>11.54</td>
<td>10.26</td>
<td>10.29</td>
<td>9.77</td>
<td>5.79</td>
<td>21.67</td>
<td>79.69</td>
</tr>
<tr>
<td>Upland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>4.20</td>
<td>22.61</td>
<td>54.41</td>
<td>13.22</td>
<td>34.65</td>
<td>26.55</td>
<td>9.07</td>
<td>164.71</td>
</tr>
<tr>
<td>1992</td>
<td>4.22</td>
<td>18.83</td>
<td>41.07</td>
<td>7.46</td>
<td>20.29</td>
<td>19.95</td>
<td>12.20</td>
<td>124.01</td>
</tr>
<tr>
<td>1993</td>
<td>7.55</td>
<td>15.55</td>
<td>38.37</td>
<td>13.96</td>
<td>23.08</td>
<td>20.81</td>
<td>11.16</td>
<td>130.48</td>
</tr>
<tr>
<td>1994</td>
<td>8.85</td>
<td>20.35</td>
<td>55.91</td>
<td>13.53</td>
<td>27.48</td>
<td>18.72</td>
<td>10.86</td>
<td>155.71</td>
</tr>
<tr>
<td>1995</td>
<td>7.18</td>
<td>22.35</td>
<td>37.10</td>
<td>13.37</td>
<td>26.07</td>
<td>20.68</td>
<td>14.03</td>
<td>140.79</td>
</tr>
<tr>
<td>1996</td>
<td>6.78</td>
<td>15.62</td>
<td>35.21</td>
<td>11.82</td>
<td>25.69</td>
<td>17.93</td>
<td>11.44</td>
<td>124.50</td>
</tr>
<tr>
<td>1997</td>
<td>5.77</td>
<td>9.96</td>
<td>34.51</td>
<td>10.94</td>
<td>18.26</td>
<td>16.24</td>
<td>13.06</td>
<td>108.74</td>
</tr>
<tr>
<td>1998</td>
<td>5.09</td>
<td>7.75</td>
<td>32.83</td>
<td>11.10</td>
<td>20.22</td>
<td>16.31</td>
<td>8.74</td>
<td>102.04</td>
</tr>
<tr>
<td>1999</td>
<td>5.28</td>
<td>12.66</td>
<td>32.00</td>
<td>11.20</td>
<td>24.20</td>
<td>15.80</td>
<td>12.22</td>
<td>113.36</td>
</tr>
<tr>
<td>2001</td>
<td>5.28</td>
<td>18.02</td>
<td>30.90</td>
<td>11.30</td>
<td>21.91</td>
<td>12.60</td>
<td>16.77</td>
<td>116.77</td>
</tr>
<tr>
<td>2002</td>
<td>4.78</td>
<td>16.43</td>
<td>27.74</td>
<td>10.08</td>
<td>18.43</td>
<td>9.00</td>
<td>17.03</td>
<td>103.49</td>
</tr>
</tbody>
</table>

Data source: MAF (2002 and earlier issues)
farmers have expanded paddy lands as they see clear economic gains due to higher productivity - the tax and credit incentives have probably not been the major factors in farmers’ decisions.

Livelihood strategies and paddy lands: some farm-level evidence

Highland paddies provide a more favourable environment for rice production than uplands. Accordingly, farmers value highland paddies as an important livelihood asset. To better understand farmers’ views on paddy fields and the effect of paddies on farmer livelihoods, a survey was conducted in 2003 in nine villages in Luangprabang (Park Ou and Phonxay districts) and Oudomxay (Namor district). All the villages selected were in upland areas but all had small areas of paddies. All the farmers with paddies also had upland fields. Farmers indicated that the major benefits of paddies [in comparison with upland rice grown under the shifting cultivation systems] were higher yield, reduced labour requirement, greater stability of yield and the ability to grow rice every year on the same piece of land (Troesch 2003). Regarding the reduced labour requirement for lowland rice, Roder (2001) reported that lowland paddies require 122 person-days/ha compared to 294 person-days/ha for upland rice. During the survey farmers mentioned that as more of their food needs became satisfied by rice grown in highland paddies, they were able to reduce the area under upland rice and grow other crops in the uplands. Farmers considered the resulting reduction in area under shifting cultivation as an extra benefit.

The livelihood activities of farmers who have more paddy lands differ somewhat from those with little or no paddy lands (Table 3). Regarding activities for satisfying household consumption needs, upland rice production was ranked to be the most important activity by farmers who have no paddy lands. Obviously, for farmers with more paddy lands, the importance of upland rice in satisfying the domestic consumption requirement was less than for farmers with limited or no paddy lands. It is interesting to note that even those farmers who have more paddy lands considered the production of upland rice important. This may be due to inadequate production of rice in the paddy lands to meet domestic consumption needs fully and/or due to other characteristics of upland rice such as higher price and better quality.

Table 3: Priority farm activities according to paddy land endowment.

<table>
<thead>
<tr>
<th>Paddy land endowment</th>
<th>For home use</th>
<th>For cash income</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Upland rice</td>
<td>Upland rice</td>
</tr>
<tr>
<td>Smalla</td>
<td>Upland &amp; Lowland rice</td>
<td>Livestock</td>
</tr>
<tr>
<td>Largeb</td>
<td>Upland &amp; Lowland rice</td>
<td>Vegetable</td>
</tr>
</tbody>
</table>

*aSmall farms are farms with paddy land < 1 ha.

*bLarge farms are farms with paddy land >= 1 ha.

There are several possible benefits of growing upland rice even in situations when paddy lands can produce adequate supply to meet the household consumption requirement (Pandey 2002). Farmers value upland rice for its earlier harvest so that it can meet their food needs during the “hungry months” when the paddy lands are yet to be harvested. Upland rice harvest begins as early as late August or early September, whereas paddy rice harvest does not commence until October. Secondly, as these crops have different phonologies, production of rice in both the uplands and paddies can help get around the peak labour demand problem during planting, weeding and harvesting by staggering the labour needs. Thus, upland rice production can remain an important livelihood activity even when paddy lands may be able to generate sufficient food supply for the family.

In terms of activities for generating cash income, farmers without paddy lands considered upland rice as the most important activity. They sell part of their upland rice for generating the cash income needed to meet other livelihood needs. Hence, upland rice is both a subsistence and cash crop for them. However, in the case of households who have more paddy lands, vegetable and livestock production were considered to be the most important activities for generating cash income.

The level of household food self-sufficiency was found to be directly correlated with size of paddy land endowment. Households with a larger endowment of paddy land were found to have fewer food shortages than those with smaller endowments of paddy lands (Table 4). Almost a quarter of the farmers surveyed indicated that they were able to grow more cash crops as a result of an expansion in paddy lands (Table 5).

### Table 4: Number of years of rice shortage according to land endowment

<table>
<thead>
<tr>
<th>Years of rice shortage</th>
<th>No. of respondents</th>
<th>Average rice area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lowland</td>
</tr>
<tr>
<td>0</td>
<td>37</td>
<td>0.54</td>
</tr>
<tr>
<td>1 - 4</td>
<td>44</td>
<td>0.18</td>
</tr>
<tr>
<td>5 - 10</td>
<td>12</td>
<td>0.11</td>
</tr>
</tbody>
</table>

*Source: Troesch (2003).*

### Table 5: Effects of a shift from upland rice to lowland rice cultivation on livelihood activities

<table>
<thead>
<tr>
<th>Effects</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>More cash crops are grown</td>
<td>24</td>
</tr>
<tr>
<td>Better food security</td>
<td>19</td>
</tr>
<tr>
<td>Increased livestock production and fish farming</td>
<td>19</td>
</tr>
<tr>
<td>Stopped upland rice cultivation</td>
<td>16</td>
</tr>
<tr>
<td>More time for trading</td>
<td>11</td>
</tr>
<tr>
<td>Expansion of paper mulberry plantation</td>
<td>8</td>
</tr>
<tr>
<td>More time for working as wage labour</td>
<td>3</td>
</tr>
<tr>
<td>Total number of respondents: 37</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Troesch (2003).*
Constraints to further expansion of paddy lands were also elicited during the survey. The two major constraints mentioned by farmers were the lack of suitable land and the lack of water for irrigation (Troesch 2003). The high labour and cash requirements for developing the paddies came only third in the priority ranking. This response indicates that farmers would like to develop paddies wherever topographical conditions are suitable. Given the clear gains in productivity that can be realised, lack of labour and capital probably does not loom very large in farmers’ minds.

**Cost-Benefit Analysis of Paddy Development**

For an economic assessment of paddy development, it is necessary to account for the incremental costs and benefits that are realised over several years. Costs of paddy development are incurred in the first few years while the benefits accrue over future years. As a given amount of benefit received now is valued more than the same amount received in the future, these dated benefits and costs need to be suitably weighed to make them comparable.

The major benefit from converting sloping upland into terraced paddy land is the labour saved during rice production, the increased yield and the increased frequency of cropping over time. The labour released in this way may be utilised for income generation or for supporting other livelihood activities.

The major costs of developing paddies are the costs of constructing the terrace, and the weirs and canals needed for irrigation. These irrigation systems may be fairly simple, using local materials and labour, but there is nevertheless an opportunity cost incurred in the initial years while the terraces are being constructed. There may also be annual costs for stabilising and maintaining the terraces, at least during the initial years.

A full-fledged assessment of the economic value of paddy development will require a whole-farm modelling framework, as the survey indicates that allocations of land and labour to other farm and non-farm activities are also likely to be affected. The interactions among the various activities on the farm need to be adequately modelled and such a complete assessment is outside the scope of this paper. Instead, a ‘partial’ analysis is conducted using the likely alternative economic values of the resources released.

The estimates of the required parameters are based on a small sample survey (Table 6). These parameters vary considerably across farms, especially those related to terrace construction. Accordingly, a series of sensitivity analyses was conducted by varying these parameters from their base values in order to analyse the economics under different scenarios.

Development of terraces involves considerable movement and relocation of surface and sub-surface soils. As a result, it will take several years for rice yield to reach the average yield of a fully-developed terrace. The rice yield is assumed to increase linearly during this development phase of several years (initially set at three years for the base run) from 1.5 t/ha in the first year to 3.4 t/ha in year three.

The economic performance of paddy development was measured in terms of the internal rate of return (IRR), net present value (NPV) and the number of years required to recoup the cost of paddy development (the break-even period). The IRR is the average return earned by the investment made. If the IRR is higher than the going interest rate at
which farmers can secure a loan, the investment can be considered profitable. The NPV measures the total gain from investment made over the planning horizon. It is calculated by netting out all costs from the benefit streams and suitably discounting these streams for different time value of money. For an investment to be profitable, NPV must be greater than zero, with a higher value of NPV indicating more gains. The break-even period is an intuitive indicator of the profitability of paddy development. It measures the number of years needed to recoup the initial investment in paddy development. The shorter the break-even period, the more attractive the investment will be. The performance indicators for the base run are presented in Table 7.

The estimated NPV measures the net gain, in present value, of switching the production of household rice needs from uplands to paddies by constructing terraces. Over the 25 years considered in this case, the farmer stands to gain a total of US$ 690/ha after deducting all costs associated with terrace development. The IRR indicates that the investment will yield an annual return of around 51%. By most commercial standards, an annual rate of return of 51% is considered to be good.

**Table 6: Values of parameters used for the base run**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Values used in the base run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate (%)</td>
<td>10</td>
</tr>
<tr>
<td>Yield of upland rice (t/ha)</td>
<td>1.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Yield of paddy rice (t/ha)</td>
<td>3.4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cash cost of production of upland rice ($/ha)</td>
<td>10&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cash cost of production of paddy rice ($/ha)</td>
<td>20&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Farm-gate price of rice ($/t)</td>
<td>70&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cost of constructing terraces, weir and irrigation canals ($/ha)</td>
<td>300&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Frequency of rice cultivation in paddies</td>
<td>Once per year</td>
</tr>
<tr>
<td>Frequency of rice cultivation in uplands</td>
<td>Once every third year, with fallow in between</td>
</tr>
<tr>
<td>Planning horizon (years)</td>
<td>25</td>
</tr>
<tr>
<td>Loss of rice area due to terrace construction (%)</td>
<td>10</td>
</tr>
<tr>
<td>Number of years needed for the rice yield in paddies to reach the assumed yield</td>
<td>3&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Labour savings in rice production (person-days) per households</td>
<td>280&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Data source: MAF (2002). Yield data is for northern region.

<sup>b</sup> From survey data reported in Phouyyavong et al. (2004).

<sup>c</sup> From survey data reported in Troesch (2003).

<sup>d</sup> Assuming an average household size of six members and per capita rice requirement of 350kg per year, the total production needed to meet the household requirement is 2.1 t. Given the assumed rice yields, the upland and lowland rice area required to produce this amount is 1.2 ha and 0.6 ha, respectively. The corresponding savings in labour, using labour use per ha from Roder (2001), is thus approximately 280 person days (calculated as 1.2x294 - 0.6x122).
A more intuitive interpretation of the profitability is provided by the estimated break-even period. It takes approximately four years for farmers to recoup the cost of investment through higher rice yields and gains from savings in labour. In other words, the additional gain would not be sufficient to cover the additional cost incurred up until the third year from the commencement of terrace construction. Farmers who have a planning horizon of less than four years may not then consider the construction of terraces a rewarding proposition under the assumptions of the base run.

The results are sensitive to the opportunity cost of the labour released as a result of terrace construction. The profitability of terrace construction increases rapidly with the increase in the opportunity cost of labour released. Thus farmers who have a high opportunity cost of labour are likely to find rice production in the paddies a more viable economic proposition than those whose labour opportunity cost is low.

The cost of developing the terrace is the major investment cost. Hence, the results of terrace construction can be expected to be sensitive to this parameter. If the cost is half the amount assumed in the base run (i.e. only $150/ha), the IRR jumps to 98%.

The profitability of terrace construction is also determined by the number of years needed for the full-development of the productive capacity of terraces after the initial soil disturbance. The faster the productive capacity of the paddy fields is stabilised, the lower the break-even period will be. Thus farmers are likely to find construction of terraces more attractive in gentler slopes that require less soil disturbance. Autonomous construction of terraces in the uplands of Laos is mostly observed in the lower slopes. Alternatively, better terrace construction technologies that quickly stabilise and attain the average yield of a fully-developed terrace would be desirable.

**Discussion**

Highland paddies are clearly very important livelihood assets for farmers. Naturally occurring flat lands and valley bottoms which require little investment to be converted to paddy have been intensively cultivated in many Asian highlands with high population density. Indeed, even in northern Laos, the large flat lands have already been developed into paddies, assisted largely by government and aid projects. Much of the remaining area where paddy can be developed is limited to relatively small areas. Under the right conditions, farmers have already developed additional paddy lands by constructing terraces. In fact our data indicates that the development of paddy lands is increasing in the highlands of the Lao PDR.

As the farm-level survey indicated, farmers are clearly aware of the benefits of paddy land. Households with more paddy land are more food secure, wealthier and are oriented towards producing more cash crops. Farmers value the paddy land not only for its

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Resulting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV</td>
<td>$690/ha</td>
</tr>
<tr>
<td>IRR</td>
<td>51%</td>
</tr>
<tr>
<td>Break-even pe-</td>
<td>4 years</td>
</tr>
</tbody>
</table>

Table 7: Base run results.
higher yield but also for the possibility of continuous cropping, the more stable yields, and the lower labour requirement compared with the production of upland rice. Despite this, the access to paddy lands remains limited mainly to a small group of farmers.

The cost-benefit analysis presented earlier indicated that the economics of paddy development is generally favourable. The high opportunity cost of the labour released by switching rice production to paddies and the low cost of constructing terraces are the two major factors behind the profitability of terrace construction. In addition, a faster stabilisation of rice yield in terraces after the initial soil disturbances would favour the economics of terrace construction. Mapping of suitable areas for paddy construction, dissemination of this information and technical support can help reduce the cost to farmers. Research aimed at speeding up the productivity growth in newly constructed terraces would similarly help generate positive benefits.

The development of highland paddies provides an opportunity to augment food supplies through the expansion of area. However, additional improved technologies that further increase and stabilise the productivity are needed, as the rice yield in these highland paddies is currently relatively low and yield gaps are high. Productivity is constrained by several factors such as pests and diseases, poor nutrient availability, excessive flow of water, and low temperature during the dry season. Rice technologies which have been found to be successful in the irrigated lowlands could potentially be applied in these highland paddies. Firstly though, adaptive research is needed to suitably modify these technologies so that they fit the specific environments and farming systems. Important progress is being made in this aspect through Lao-IRRI collaborative research projects.

Despite the potential role of highland paddies in augmenting food production, it is very unlikely that upland rice production will be replaced completely (Pandey and Minh 1998). Even when all the potential areas suitable for paddy have been developed, a large number of highland farmers may still have no or limited access to these paddies. Terrain characteristics and water availability determine the total areas that can be developed into paddies. In areas with unsuitable terrain characteristics, farmers may continue to grow upland rice for subsistence. Hence, rice grown in both the uplands and paddies is likely to coexist both at the household and landscape levels. This implies that research and technology development for both ecosystems are likely to remain important in addressing food and environment concerns. Nevertheless, highland paddies can play an important role in improving farmers’ livelihoods while also protecting the environment.

**Conclusion**

Development of paddy land offers a valuable opportunity for addressing the problem of food insecurity and degradation of natural resources in the northern mountainous region of Laos. The economics of paddy land development seems favourable, especially on the lower slopes, where the cost of terrace construction is likely to be low. Better technologies for the construction and stabilisation of terraces, improved rice technologies adapted to the conditions of these paddies, and some assistance to farmers during the initial years of terrace construction are likely to encourage a further expansion of paddies. The household livelihood strategies in the northern region of Laos are based on the integrated management of various livelihood assets such as
uplands and paddies. Improved technologies and other interventions are hence needed to improve the productivity of both these land types.

Although paddy development can be expected to reduce the environmental degradation associated with shifting cultivation systems, new environmental problems may arise if intensive rice production in the paddies leads to misuse or overuse of chemicals. To avoid this possibility, it is important to develop environmentally friendly technologies for the highland paddies and support such technologies with suitable policies.

**Authors**

Sushil Pandey is an Agricultural Economist and Deputy Head of the Social Sciences Division at the International Rice Research Institute in Manila. E-mail: Sushil.pandey@cgiar.org

Karin Troesch is a student at the Swiss College of Agriculture.

Lingkham Douangsavang (E-mail: linkham_d@hotmail.com) is the Head of the Socio-Economic Unit at NAFRI

Khampou Phouynyavong is a researcher within Socio-Economic Unit of NAFRI.

Bruce Lindquist is an upland agronomist and project manager of Lao-IRRI. E-mail: b.linquist@cgiar.org

**Bibliography**


Improving Rice Based Upland Cropping Systems for the Lao PDR

Bruce Linquist, Kazuki Saito, Bounthanh Keoboualapha, Somphet Phengchan, Khamdok Songyikhangsutho, Kamla Phanthaboon, Bantasak Vongphoutone, Viengmany Navongsai and T. Horie

Abstract

Increasing population pressure is reducing fallow periods in the traditional slash-and-burn rice based upland systems of the Lao PDR. Short fallow periods have rendered these systems unsustainable as soil erosion, weed pressure and labour inputs have increased; and soil fertility and yields declined. The end result is lower returns on productivity and increased poverty. This situation has created a demand from both farmers and government agencies for sustainable agricultural technologies to improve upland farmer livelihoods.

Over the years considerable research effort has been devoted to the development of sustainable upland technologies, however, adoption by farmers has been limited. One reason for slow adoption is the high diversity encountered in the uplands. There is considerable biophysical diversity (as seen in differences in climate and soils), socio-economic diversity (such as ethnic and cultural diversity and large differences in opportunities and constraints between individual households) and market diversity (particularly market opportunities and market access). With such diversity, technology recommendations will necessarily be site specific. This diversity necessitates the use of participatory and adaptive research approaches through which researchers and farmers can develop technologies suited to local conditions.

The authors’ objective is to develop more productive and sustainable upland rice-based cropping systems. Ensuring rice sufficiency at the local level will allow for greater diversification in other upland fields. A multifaceted, participatory and adaptive research approach has been used to develop sustainable upland systems, which has resulted in the development of a number of technologies. First, superior upland rice varieties were identified. Traditionally, local upland rice varieties grown in Laos have been selected for their performance under favourable conditions with long fallow periods and, as such, are not well suited to short fallow conditions. Through a participatory variety selection (PVS) programme, two upland rice varieties have been identified which yield 0.3 - 0.5t/ha more than local check varieties (an 18-27% increase in yield). Second, improved rotational systems that address problems related to weeds, soil fertility and declining yields are being developed and tested by farmers. Depending on population pressure, potential cropping systems range from extensive (for farmers that still rotate fields) to intensive continuous cropping on the same piece of land. Examples of extensive systems are rattan, paper mulberry and pigeon pea rotated with rice on a three-year cycle. Intensive systems involve continuous cropping rotations with dry season fallows. This paper discusses these technologies in greater detail as well as the process by which these technologies were developed.
Upland rice systems in Laos - systems in peril

Rice is the most important crop in Laos and accounts for about 70% of total calorie intake across the nation (Maclean et al., 2002). Although at the national level Laos is sufficient in rice, northern Laos suffers a rice deficit, a situation that has either not improved since 1975 (figure 1) or is getting worse (ADB, 2001). This deficit is linked with increasing population pressure. Population pressure is increasing due to natural causes, but also due to village migration and land allocation policies, which have increased population pressure on limited land resources, especially along roads. Such pressures are putting stress on the fragile slash-and-burn agricultural systems in much of northern Laos resulting in declining upland rice (staple crop) yields and increasing poverty.

Upland rice is the main crop grown in the highlands of northern Laos where rice is grown in slash-and-burn systems. The normal rotational system for upland rice in slash-and-burn systems is a single year of rice followed by two or more years of natural or weedy fallow. Traditionally, fallows have been for up to 40 years but increasing population pressure is often reducing fallow periods in these systems to only two years. While it is not possible to provide a general figure for a minimum sustainable fallow period, all would agree that two-year fallows are not sustainable under current management practices. Short fallow periods have rendered these systems unsustainable as soil quality (due to nutrient depletion and erosion) is worsening, weed pressure and labour inputs are increasing and yields are declining with the end result being lower returns on productivity and increased poverty. This is supported by numerous surveys where farmers report that rice yields are declining and rice deficits are increasing. Since rice sufficiency is strongly associated with well-being, poverty is increasing as a result of short fallows (ADB, 2001). In upland rice systems short falls are resulting in a heavy investment in weeding. Farmers need to weed up to five times per season when the fallow is two years or less, compared with twice in a ten-year fallow (figure 2). Weeding alone accounts for about 50% of the total labour requirement of rice (150 person days/yr or more).

These issues have created a demand from farmers and government agencies for alternative agricultural solutions. Such solutions could either be:

- Improved rice production systems
- Alternative cash crops that allow for income generation and cash to buy rice.

Experiences from other Asian countries suggest that farmers are much more likely to diversify into other crops once they have achieved self-sufficiency in rice. Thus rice sufficiency is a platform for diversification. Lao-IRRI and NAFRI have been working together since 1991 to develop sustainable rice based systems. Research has focused on improving productivity and developing highland paddies (discussed by Pandey et al., in this book) as well as upland rice based systems. The following paper discusses the problems, challenges and progress to developing improved upland rice based systems.

Intensification of rice based systems

Land use and labour intensify as systems move from traditional slash-and-burn systems with forest fallows to annual cropping systems (figure 3). In Laos, traditional upland rice production practices have not changed despite shortening fallows, and this
has led to declining productivity. Research is necessary to identify improved cropping systems that are sustainable under the current land management practices.

Where villages have undergone land allocation, farmers typically have three plots of land; therefore the maximum fallow is two years. In alignment with this policy, research has focused on developing alternative upland rice based systems for zero (annual cropping) to two-year fallows. A multifaceted research approach is used that combines the development of suitable varieties with alternative rice based cropping systems (figure 3).

**Alternatives for short fallow systems**

**Varieties**

Traditional upland rice varieties are grown extensively in the uplands of Laos, in fact, there are no known improved upland varieties being grown. The diversity of varieties is high with most villages growing 10 to 20 different varieties and a single farmer growing two or three varieties on average (Appa et al., 2002). These varieties have been selected for long fallow conditions and are generally not suited to the short fallows that many farmers are currently experiencing.

Since 1991, the Lao-IRRI project has been collecting and preserving traditional Lao rice varieties. There are currently over 13,000 accessions in the Lao gene bank, with about half of these being upland rice varieties. The variety improvement program is screening these varieties to identify early and medium duration varieties that are suited to short fallows. Final testing and evaluation of varieties is done through participatory variety selection (PVS) trials under farmer management. Such trials have been conducted in all the northern provinces of the Lao PDR. Through this programme, two upland rice varieties (Nok and Makhinsoung) have been identified which yield 0.3 - 0.5 t/ha more than local check varieties which is an 18-27% increase in yield (figure 4). Nok is an early duration variety that has good yields and receives high farmer preference ratings due to its large seed and panicle, ability to perform in poor soils and high quality (aroma and softness). Makhinsoung is a medium duration variety that also receives high farmer preference ratings although the grain quality is lower than Nok.

While much of the research has focused on glutinous rice varieties, the programme has started evaluating non-glutinous rice varieties that may be more preferable to certain ethnic groups. These varieties come both from Laos and other countries. On-farm testing began in 2003.

**Cropping systems**

For systems with only two or three-year fallows to be sustainable, some form of fallow enrichment is required. Shrubby legumes are often suggested as possibilities as they add nitrogen to the system by nitrogen fixation and other nutrients due to deep rooting depths.

Farmer participatory research began in 2001 by testing a number of promising fallow species:

- leucaena (*Leucaena leucocephala*)
- pigeon pea (*Cajanus cajan*)
paper mulberry (*Broussonetia papyrifera*).

crotalaria (*Crotalaria anagyroides*).

All are legumes except paper mulberry, which was included since it is an indigenous fallow crop in northern Laos. Crotalaria and pigeon pea performed the best in the first year (data only available for fallow species establishment) but farmers preferred paper mulberry and pigeon pea because of the potential economic benefits, especially paper mulberry (table 1). Based on these results, the requirements of a good fallow or rotational species are that it:

- Provides some economic benefit.
- Is easy to grow and maintain.
- Requires minimum labour.
- Maintains or improves rice yields (presumably through nutrient replenishment and reducing nematode pressure).

The challenge for research is to not only identify species that suit these criteria but ones that also address the long term challenge of sustainability so that yields are maintained, soil fertility is replenished, weeds remain under control and soil erosion is reduced. Further research on short fallows has focused on paper mulberry, pigeon pea and rattan (also an indigenous fallow crop) in one to two year rotations with rice (figure 3).

**Rice - Paper mulberry rotations**

Paper mulberry has become an important cash crop in northern Laos. The inner bark is harvested and used for paper production. Paper mulberry is an indigenous fallow species and research has focused on the feasibility of intensifying paper mulberry as a rotational crop between rice crops. After establishing paper mulberry into upland rice the paper mulberry will continue to grow after the rice has been harvested. The paper mulberry is harvested 1.5 to 2 years after establishment and harvesting can continue until the next rice crop, at which time all the paper mulberry is harvested and the trees cut down in order to prepare the field for rice. The paper mulberry will regenerate from roots and stems during the rice growing season to continue the next cycle. Research on rice-paper mulberry rotations has focused on the following aspects:

- Paper mulberry establishment into upland rice fields: Three planting materials were tested (seedlings in polybags, root suckers and root cuttings). Survival and growth was best for the seedlings followed by root suckers (table 2). In all cases, paper mulberry growth was slow during the first year of establishment and did not reduce rice yields. However, due to this slow initial growth, weeding is still necessary after rice harvest until the paper mulberry has become fully established.

- Estimation of paper mulberry bark yield: A survey of 17 farmers was conducted which included crop cuts for above ground biomass (ranging from 1.5 to 27t/ha) and bark yields (ranging from 0.1 to 1.9t/ha). From this data a model was developed from plant height, stem diameter, and stem density that explains 95% of variation in bark yield (figure 5).

\[
\text{Ln(Bark yield)} = 0.82 \times \text{Ln(Height)} \times \text{Diameter}^2 \times \text{Density} - 7.02
\]
Rice production in a regenerated paper mulberry field: When paper mulberry regenerates from its roots and stems it is highly competitive with rice, unlike during the initial establishment phase. In order to sustain rice yields, the regenerated paper mulberry needs to be carefully managed by keeping it at a low density and at a lower height than the rice canopy. Densities of more than 1 plant/4m² have been shown to reduce rice yields (figure 6).

Nutrient cycling: Current research is studying nutrient cycling in these systems to determine if such systems are sustainable in terms of maintaining or building soil fertility. As of yet results are not available.

While the rice - paper mulberry system is indigenous to Laos, few farmers have attempted to intensify the system by planting and closely managing the paper mulberry. Instead they let a few trees come up and then harvest those. As long as the market remains good for paper mulberry this system has potential. It is also attractive in that most of the labour requirements for paper mulberry are during periods when labour demand for rice production is low. The main limitation to this system is livestock control. Cows and buffaloes graze on paper mulberry leaves and prevent good establishment unless the area is protected.

Rice - Pigeon pea

Pigeon pea has been evaluated as a potential rotational crop with rice since 1991. It has shown good promise in terms of its ability to suppress weeds, reduce nematodes (Roder et al., 1998) and maintain rice yields. It also has economic potential, although this has yet to be fully realized due to limited market potential. Where there is market potential farmers have shown strong interest.

The system is described as follows. Pigeon pea is planted three to four weeks after rice at a spacing of 1.25m x 1.25m. The late planting and wide spacing reduces competition with rice. The pigeon pea grows along with the rice and continues to grow after the rice has been harvested. Pigeon pea is a perennial and pods can be harvested once a year - usually in March and April. Grain yields range from 0.3 to 1.0 t/ha. The pigeon pea remains in the field (it can survive for two to three years) until the field is ready to be prepared for the next rice crop when it is then cut. When planting the next rice crop, pigeon pea will need to be planted again.

A good review of work conducted by Lao-IRRI up to 1996 on this system can be found in Roder et al. (1998). Here they report on pigeon pea variety and management trials. Roder et al. (1998) report that rice yields decline when pigeon pea is established with rice. However, this is most likely due to the high pigeon pea density used in those trials (plant spacing of 1.0 x 0.25m) and that pigeon pea and rice were planted at the same time. In more recent studies a lower pigeon pea density (1.25 x 1.25m) has been evaluated. When planted at this density three weeks after rice, rice yields are not reduced and pigeon pea yields average 0.5t/ha.

The rice - pigeon pea system is being evaluated for different length fallows. In two separate three-year studies involving one-year fallow systems (one year between rice crops) rice yields after pigeon pea were highest compared to all the other treatments, including natural and enriched fallows (Figures 7 and 8).
**Rattan**

An upland rice-rattan system was observed in Luangnamtha where rattan is an indigenous fallow crop between rice crops. In this system, rattan is harvested just before slashing the fallow vegetation in preparation for burning and land preparation. The rattan survives the cutting and burning and farmers allow it to regenerate during the upland rice cropping period. After the rice is harvested, the field returns to its natural fallow vegetation where rattan remains as one of the species. Due to the short fallows the rattan is harvested for edible shoots (as opposed to furniture material). Only certain species of rattan can survive both cutting and burning and this deserves more research, however, it is thought that * Daemonorops jenkinsiana* is one such species.

**Alternatives for annual cropping**

Development of improved annual upland rice based systems presents a unique challenge compared to other cereal crops grown in similar environments. Rice yields decline rapidly when continuously cropped for reasons that are not well understood. In a five-year experiment conducted in Luangprabang, upland rice yields declined from over 3t/ha to 0.5t/ha when rice was grown every year (figure 9). Such results are seen elsewhere in Laos (Figures 7 and 8), Asia (George et al., 2002) and South America (Evenson et al., 1995; Sanchez, 1983). Yields declined even when nitrogen (N) fertilizer (30kg N/ha at booting) was applied or when rice was grown between legume hedgerows (legumes were planted in rows at 1.5m spacing with four rows of rice grown in between) (figure 9). Results of other studies also indicate that nutrient limitations (including phosphorus) are not responsible for the rapid yield declines observed when rice is grown continuously (George et al., 2002; Evenson et al., 1995; Sanchez, 1983). Increased weed pressure associated with successively cropped fields may be a cause of declining rice yields, however, it is unlikely to be the sole cause. Even when weeds are well controlled (as in the experiments above) rice yields continue to decline. There is some evidence that the cause of the problem may be nematodes (*Meloidogyne graminicola*) (Prot and Matias, 1995). Indeed, nematode numbers and nematode infected roots are higher in successively planted rice (Roder et al., 1998). While it is still not clear, the cause of declining rice yields may be a combination of the above factors and current research is focusing both on understanding the cause as well as developing sustainable upland rice based systems.

**Varieties**

There has been limited research testing varieties under continuous cropping conditions. However, some upland rice varieties appear to do well under such conditions. In an experiment conducted in Luangprabang on a field in its third rice cropping cycle, several varieties produced yields of between 1.4 and 2.0t/ha while the other varieties yielded only 0.5t/ha or less. Research is ongoing to screen Lao varieties based on names farmers have given them which may suggest an ability to do well under continuous cropping (i.e. 'garden rice' and 'win over weeds'). While choice of variety will be an important component, these will still need to be integrated into appropriate farming systems.
Cropping systems

Little research has been conducted on intensively cropped annual upland rice systems. Based on this research the following points can be made.

Crop rotations

Rotation with other crops is necessary for sustainable systems. However, research to identify rotational crops is not promising. Limited research has shown that rice yields continue to decline when cowpea, maize and stylo are used as rotational crops (figure 8). The most promising species studied to date has been pigeon pea, which has shown promise as a one-year fallow species (Figures 7 and 8). Research is continuing to study the potential of rice and pigeon pea in more intensive annual systems. Pigeon pea is not a host for nematodes (Roder et al., 1998) and, if planted properly, can limit the growth of other weeds that may be alternative hosts for nematodes.

Nutrient replenishment

Nutrient replenishment is necessary in any intensive cropping system where crop products are annually removed. Under slash-and-burn systems the long fallow period allows time for natural soil replenishment. In annual systems, such enrichment can come from crops being rotated with rice (such as cover crops, green manures or hedgerows) or from fertilizers. These are discussed separately below. Pot studies on a limited number of soils show that upland soils are primarily deficient in N and P (Lao-IRRI, 2001).

Nutrient replenishment from companion crops

Growing rice continuously in hedgerow systems is not a sustainable option as rice yields decline when grown between leucaena, crotalaria or gliricidia hedgerows (figure 9). However, if alternative crop rotations are used between hedgerows, the hedgerows may provide a valuable source of plant nutrients.

Cover crops have also been considered for upland rice. Again there is little research on the topic but there are several considerations:

- First, care must be taken that the cover crop does not compete with the rice for water, light and nutrients. The most successful crops may be those that can be established into rice late in the growing season and then become a dry season fallow crop.
- Second, as mentioned above for the alternative fallow crops, farmers are not likely to grow a crop that does not itself provide some form of economic benefit.
- Finally, many farmers may not be interested if the cover crops require a lot of labour to establish, manage and harvest.

Scope for fertilizers

Between 1991 and 1998 fertilizer experiments were carried out at 25 sites. Only five of these experiments (20%) gave a significant grain yield response to applied fertilizer. In most of the cases nitrogen (N) was applied alone at a rate of 30kg N/ha and in all cases where there was a significant yield response, the response was to N. In one year 100kg N/ha was applied along with phosphorus (P) at three sites. Yields doubled at two of the three sites when both N and P were applied (there was no response to P only). The site
where there was no response had been in a 15-year fallow. Reasons for poor fertilizer response may be due to:

- The application rates were too low to observe a response given the high field variability. Where higher N rates were applied the yield response was more evident.
- In almost all cases, N was applied alone. N, P and potassium (K) were applied at only 5 of the 25 sites.
- Traditional varieties were used and these are typically not responsive to fertilizer applications.
- Fertilizer uptake may have been low due to run-off.

In 2003 a field experiment was conducted at two sites to compare the application of the following fertilizers to upland rice (table 3):

- Urea.
- Controlled-release urea (CRU).
- CRU + P.
- P.

The data suggests that N was limiting while P was not as there was no yield response to P, although total P uptake increased by 36 and 49% with P and CRU + P applications, respectively. This result is consistent with George et al. (2001) and Roder (2001). Roder (2001) reported that in northern Laos application of P resulted in a 38% increase in uptake of P but with no consistent effect on rice yields. When N was applied in the urea, CRU, CRU + P applications, rice yields increased by 30, 30, and 15%; total biomass by 32, 40, and 33%; and total N uptake by 56, 56, and 55%, respectively. There was no significant difference in these variables with urea, CRU, and CRU + P application methods. Positive responses to N applications (urea, CRU, and CRU + P) were greatest for total N uptake, followed by total biomass, and then rice yield.

**Authors**

Bruce Lindquist is an upland agronomist and project manager of Lao-IRRI. E-mail: b.linquist@cgiar.org

Kazuki Saito and T. Horie are students at Kyoto University, Japan

Somphet Phengchan, Khamdok Songvikhangsauthor, Kamla Phanthaboon, Bantasak Vongphoutone, Viengmany Navongsai are researchers at the Northern Agriculture and Forestry Research Centre (NAFReC/NAFRI), Luangprabang, Lao PDR.

Bounthanh Keoboualapha is Deputy Head of the Provincial Agriculture and Forestry Office, Luangprabang

Somnuck Chindalak is staff of the DAFO, Park Ou, Luangprabang, Lao PDR
Bibliography


Table 1: Evaluation of potential fallow species to be grown with rice. This evaluation was conducted during the first year when the fallow species were established with rice.

<table>
<thead>
<tr>
<th>Survival-1 mo after planting (%)</th>
<th>Leucaena</th>
<th>Pigeon pea</th>
<th>Crotalaria</th>
<th>Paper mulberry</th>
<th>Natural fallow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotational species ht (cm)</td>
<td>73</td>
<td>38</td>
<td>171</td>
<td>165</td>
<td>81</td>
</tr>
<tr>
<td>Rice yields (t/ha)</td>
<td>1.61</td>
<td>1.76</td>
<td>1.56</td>
<td>1.83</td>
<td>1.60</td>
</tr>
<tr>
<td>Farmer ranking</td>
<td>68</td>
<td>80</td>
<td>64</td>
<td>124</td>
<td>-</td>
</tr>
<tr>
<td>What farmers said they liked</td>
<td>Eat leaves and pods</td>
<td>Improve soil (dark color and wet)</td>
<td>Improve soil Suppress weeds</td>
<td>Sell bark</td>
<td>Use leave as feed for pigs, buffalo</td>
</tr>
<tr>
<td></td>
<td>Improve soil</td>
<td>Eat grain</td>
<td>Fire wood</td>
<td>Fire wood</td>
<td>Doesn’t shade the rice</td>
</tr>
<tr>
<td></td>
<td>Fire wood</td>
<td>Forest</td>
<td>Animals don’t like to eat</td>
<td>Fast growth</td>
<td>A lot of seed</td>
</tr>
<tr>
<td></td>
<td>Can raise stick lack</td>
<td>A lot of leaf and good cover</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>What farmers said they did not like</td>
<td>Slow growth</td>
<td>Shade the rice</td>
<td>Can not eat</td>
<td>Can not grow well in some soil</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Damage by insects</td>
<td>Lodging</td>
<td>-</td>
<td>Slow growth if do not plant on time</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Rats like to eat</td>
<td>-</td>
<td>Animals like it too much</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2: Survival and growth of different paper mulberry planting materials established in upland rice and subsequent rice yields.

<table>
<thead>
<tr>
<th>Planting material</th>
<th>Survival at end of first wet season</th>
<th>Paper mulberry height</th>
<th>Rice yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>cm</td>
<td>t/ha</td>
</tr>
<tr>
<td>Seedling</td>
<td>80 a</td>
<td>139 a</td>
<td>2.13 a</td>
</tr>
<tr>
<td>Root sucker</td>
<td>42 b</td>
<td>85 b</td>
<td>2.05 a</td>
</tr>
<tr>
<td>Root cutting</td>
<td>5 c</td>
<td>51 b</td>
<td>2.13 a</td>
</tr>
</tbody>
</table>

Key: within a column, values with the same letter (a,b,c) are not significantly different (P<0.05)
Table 3: Yield variables of upland rice in response to application of fertilisers in Laos (2003). CRU and P was applied at time of rice planting in the same hill as the rice seed. Urea was applied 30 and 60 days after planting in a trough running along the contour between the rice hills.

<table>
<thead>
<tr>
<th>Category</th>
<th>Rice yield (t ha⁻¹)</th>
<th>Total biomass (t ha⁻¹)</th>
<th>Total N uptake (kg ha⁻¹)</th>
<th>Total P uptake (kg ha⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>1.9</td>
<td>3.6</td>
<td>25</td>
<td>5.9</td>
</tr>
<tr>
<td>Urea splits 40kgN ha⁻¹</td>
<td>2.4</td>
<td>4.8</td>
<td>39</td>
<td>7.5</td>
</tr>
<tr>
<td>CRU* 40kgN ha⁻¹</td>
<td>2.4</td>
<td>5.1</td>
<td>40</td>
<td>7.4</td>
</tr>
<tr>
<td>P 30kgP ha⁻¹</td>
<td>2.0</td>
<td>4.3</td>
<td>31</td>
<td>8.0</td>
</tr>
<tr>
<td>CRU 40kgN ha⁻¹, P 30kgP ha⁻¹</td>
<td>2.1</td>
<td>4.9</td>
<td>39</td>
<td>8.8</td>
</tr>
<tr>
<td><strong>Site</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 1 (Pakcheck village)</td>
<td>2.5</td>
<td>5.1</td>
<td>39</td>
<td>7.6</td>
</tr>
<tr>
<td>Site 2 (Pathung village)</td>
<td>1.8</td>
<td>4.0</td>
<td>31</td>
<td>7.5</td>
</tr>
</tbody>
</table>

**Anova summary**

<table>
<thead>
<tr>
<th>Source</th>
<th>F</th>
<th>P</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>0.046</td>
<td>0.048</td>
<td>0.002</td>
<td>0.068</td>
</tr>
<tr>
<td>Site</td>
<td>0.003</td>
<td>0.043</td>
<td>0.027</td>
<td>ns</td>
</tr>
<tr>
<td>Treatment x Site</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>LSD(0.05) (treatment main effect)</td>
<td>0.43</td>
<td>1.02</td>
<td>7.7</td>
<td>2.0</td>
</tr>
</tbody>
</table>

*CRU=Controlled-release urea fertilizer.

Figure 1: Lao rice production and rice requirement from 1976 to 2002. ‘South’ includes Vientiane province and all provinces south of it.
Figure 2: The number of weedings required in upland rice grown with different fallow period lengths (from Trosch, 2003).

Figure 3: Pathways for the intensification of shifting cultivation (after Raintree and Warner, 1986) highlighting some of the research areas.
Figure 4: Grain yields of Nok and Makhinsoung compared to local check varieties. Data is from a period of five years and represents over 25 locations in most provinces of northern Laos.

Figure 5: Allometry model to predict paper mulberry inner bark yield based on plant height, stem diameter and stand density.
Figure 6: Relative yields of rice at varying densities of paper mulberry.

Figure 7: Rice grain yields in the third year following either continuous cropping or different types of fallow. Pigeon pea and Leucaena were planted with rice during the first crop at a spacing of 1.25 x 1.25 m. In the third crop Leucaena was cut and allowed to re-coppice and pigeon pea was cut and replanted.
Figure 8: Rice grain yields in the third year of continuous cropping. In each case there was a different crop/fallow in the 2nd year. In the rice-stylo-rice system, rice and stylo were grown together in the first and third year and stylo only in the 2nd year.

Key: columns that have values with the same letter (a, ab, bc, cd, d) are not significantly different (P<0.05)

Figure 9: Rice yields during a five-year cropping period with different shrubby legumes planted with rice. In 1997, rice was planted but there no rice harvest data available.
EXPERIENCES IN UPLAND FARMING
DEMONSTRATIONS FROM BOKEO PROVINCE

Chansom Manythong and Holger Grages

Abstract

Since 1998, the GTZ (German Technical Cooperation) Rural Development Project (RDP) Bokeo has undertaken a number of on-farm demonstrations on improved upland farming techniques. Sloping Agricultural Land Technology (SALT) techniques such as hedgerow planting, mulching and integration of cover crops in upland fields have been demonstrated under farmer conditions in a number of villages.

Following a review of the project approach in 2003, new on-farm demonstrations were established with 11 farmers in 7 villages at the beginning of the 2003 rainy season and there is now at least one demonstration site in all project target districts. Hedgerows of various species have been planted and some farmers have integrated legume cover crops such as rice bean, lab-lab bean, black bean, mungbean and Stylosanthes.

Participating farmers are not paid for labour or fencing but the project does provide seeds, training and technical advice. Furthermore, to reduce risks for farmers, the project provides compensation in cases in rice yield losses for the first three years.

Although it is too early to talk about success results so far are encouraging. Hedgerow development is generally good, *Stylosanthes* shows promise as a cover crop and seedlings for living fences are growing well. Participating farmers are quite enthusiastic and have integrated other crops (sesame, cassava, chilli and bananas) into their plots and many other farmers show interest. Further steps and further training needs are being discussed with relevant farmers.

Introduction

Bokeo Province is composed of Tonpheung, Huoixai, Meung, Pha oudom and Paktha Districts as well as the Special Region Nam Nhou. The total area of the province is approximately 7,300km² with a population of an estimated 120,000. Most of the Province is mountainous and more or less inaccessible (with the exception of river transport). Some 40% of the area is under secondary forest, with very little undisturbed primary forest left (less than 15%).

The German Technical Cooperation (GTZ) started the Rural Development Project (RDP) Bokeo in 1995 and has been working in all districts in the province except Meung District. In January 2004 the RDP Bokeo was merged into the GTZ Rural Development in Mountainous Areas Program (RDMA). Road access to and within the Project area has improved since the project started in 1995 but is still difficult, especially during the rainy season. The main target group is poor farmers of ethnic minority villages.
Background

Most of the ethnic minority farmers are generally poor and do not produce enough rice to eat. Since there is not much flat land for paddy production farmers are forced to use sloping fields. Because of the increase in population and reduction of natural resources, traditional methods of shifting cultivation are no longer sustainable. It is therefore most important that these farmers adopt an improved and more sustainable form of upland farming.

First priority should be the creation of ‘lowland in the uplands’ by establishing upland paddy land with small-scale irrigation wherever it is feasible and funds are available. With Bokeo’s topography, there is still potential for opening up new paddy land. However, this potential is limited and it is obvious that many farmers will depend on upland farming for rice production in the future. Soil fertility is crucial and, in most cases, the application of chemical fertiliser is not an option.

Therefore the objective of the project is to introduce improved upland farming techniques that maintain soil fertility and increase productivity of upland fields.

Since 1998 the project has conducted a number of on-farm demonstrations on improved upland farming techniques. In May 2003 the approach of the project for long-term upland demonstrations was revised and a new concept was developed. This report aims to summarise experiences from the project up until January 2004.

Upland demonstrations

Objective and principle

The objective of the on-farm demonstrations is to demonstrate improved upland farming techniques such as hedgerow farming with regular mulching, incorporation of cover crops and improved fallow systems. The project does not intend to conduct scientific research but rather demonstrate under farmer conditions techniques that have been proven suitable in research centres or projects in neighbouring countries with similar ecological conditions. The project planned to establish at least one demonstration site in all project target districts.

The principle is to offer a wide range of different species suitable for the establishment of hedgerows and planting of cover crops (basket of choices) and to follow the principles of participatory planning, implementation, monitoring and evaluation. It is much more crucial for the project to test farmers’ acceptance of new techniques/species than to simply test the ecological suitability, as this has already been proved by Lao and Thai research institutions.

The project provides seeds and training to participating farmers. Farmers are not paid for the demonstrations but in order to reduce the risks of testing unknown technologies with uncertain results, farmers will receive compensation for losses in rice yields during the first three years. In cases where compensation is required, the project will pay the farmers concerned in kind, i.e. with rice.
Implementation of demonstration plots

Village meetings were conducted in order to inform villagers about the planned demonstrations, to raise the interest of villagers for new upland farming techniques and to select interested farmers for the establishment of such demonstration plots on farmers' fields. A survey of the upland fields of interested farmers was carried out the day after the meeting.

Contour lines were marked using an A-frame, which was constructed in the field with local materials (bamboo sticks, a simple rope and a stone as a weight). Participating farmers and DAFO staff were given on-the-job training in constructing and using an A-frames as well as planting methods. All data collected, including required labour input during implementation and follow-up, was documented in monitoring sheets.

After marking the contour lines, hedgerows of the following species were planted. All selected species have the potential to improve upland farming production by providing soil improvement, forage, fuel, food or even cash income:

**Legumes:**
- Leucaena
- Calliandra
- Gliricidia
- Flamengia
- Pigeon Pea
- Stylosanthes

**Grasses:**
- Signal
- Setaria
- Brizantha
- Gamba

Furthermore, the project promoted the establishment of living fences on upland fields. Demonstrations of planting living fences by direct seeding and cuttings in recent years failed because of bad germination and poor weeding. In the 2003 rainy season the project provided Leucaena, Gliricidia, Indigofera and Flamengia seedlings to demonstration farmers in order to plant living fences on the upland demonstration sites. The seedlings were produced in private farmer nurseries.

Technical specifications:

- Leucaena, Gliricidia and Calliandra seeds were treated with rhizobium.
- In order to compare the development of treated and untreated plants, untreated seeds of the respective species were planted at both ends of the rows of treated seeds.
- Most of the hedges were established by planting double rows. However, some farmers did not accept double rows and only planted single rows.
- Most hedgerows were planted as rows of single species although rows of mixed species were also planted at some demonstration plots.
- Cover crops were planted at the end of the rainy season in order to provide soil cover after rice harvest. In addition, cover crops can provide valuable animal feed and human food.
Rice beans, lab-lab beans, black beans and Stylosanthes were planted as cover crops at some of the demonstration sites.

**Observations from the demonstration plots**

Exchange visits among the demonstration farmers of all districts as well as farmer field days for promoting the newly introduced techniques to farmers from other villages were organised. The following sections: ‘observations from the demonstration plots’ and ‘Constraints and lessons learnt’ reflect discussions with farmers and involved government and project staff. Observations are as follows:

- The best development (fast growth, high row density) was observed with pigeon pea, the grass strips and Stylosanthes. Calliandra rows were also very dense and the plants appeared vigorous, but growth was slower.
- Many farmers preferred pigeon pea because of its rapid growth and multiple uses. At some plots lac insects were established on pigeon pea hedgerows and one farmer had substantial income from the sale of the lac produced.
- Leucaena grew very well in places, but there were gaps in the rows and at some sites germination and growth was very bad.
- Flamengia growth was good at most sites. Flamengia was found to be the best crop for mulching because of its slow rate of decomposition.
- Tephrosia and Crotalaria were planted in the 2003 rainy season. Both species developed very well and started flowering five months after planting.
- Farmers liked Crotalaria and Tephrosia because of their rapid and dense growth habits but certainly also due to the fact that the project will buy all seeds of these species in order to distribute them to other interested farmers next year.
- All varieties treated with rhizobium (Leucaena, Calliandra and Gliricidia) developed nodules. In particular Calliandra had very well developed nodules. The nodules appeared moderately red, which is a sign of active nitrogen fixation.
- The untreated plants did not develop nodules. Nonetheless, germination and first growth was not significantly different from the treated plants. However, at most sites, a few weeks after germination the growth of treated plants was generally faster and their appearance was more vigorous than the untreated ones.
- Stylosanthes was planted at some plots in contour rows. At two plots a small quantity of Stylosanthes was sown in rice six weeks before the rice harvest in order to test its suitability as a cover crop in upland rice. The Stylosanthes rows developed very well. The Stylosanthes sown as a cover crop grew so fast and vigorously that it even competed with the rice crop. Some farmers used Stylosanthes as feed for pigs and chickens and reported improved growth of their animals.
- The beans planted as cover crops were planted late and, because of this delay, development was not satisfactory. At some sites the rice was blown over by the wind leaving no standing rice plants in the field. This meant that cover crops could not be planted before harvesting the rice.
- Most farmers also integrated other crops such as sesame, cassava, chilli and bananas in their plots.
The grass strips were not cut regularly and farmers were concerned about the fast spread of the planted grass on their fields.

Seedlings for the living fences grew well and with good condition. Planted seedlings demanded less care than directly sown seeds and seem to be more appropriate for the establishment of living fences.

**Constraints and lessons learnt**

During the project, the establishment of hedgerows was successfully demonstrated! However, the purpose of the demonstration plots was to demonstrate improved upland farming and the hedgerows were established for soil improvement through mulching and/or as forage. It is disappointing that only a few farmers made use of the planted hedges. None of the farmers practised regular cutting and mulching. Only two farmers used the planted species as an additional source of forage and most farmers gave up after one year.

According to the farmers, the two major constraints to hedgerow cultivation are:

- Increased labour input for establishment and regular cutting of hedges.
- Loss of land for rice crops.

Field preparation of a field with hedgerows (cutting of hedges, no or only limited burning, mulching) demands much more labour than the traditional field preparation of only burning. It is necessary to demonstrate that additional labour in the beginning leads both to reduced labour during the planting season and increased productivity. Furthermore, it takes at least four to five years until there is noticeable soil improvement from hedgerows, cover crops and improved fallow systems. Therefore the long-term effects of the techniques tested have not yet been demonstrated and so far farmers have not adopted the new techniques.

Another major constraint was the lack of regular follow-up. Regular follow-up is most crucial for all kinds of demonstrations but especially for long-term demonstrations as it not only provides technical advice but also encourages and motivates the demonstration farmers.

Lessons learnt by the project and recommendations for the future can be summarised as follows:

- The establishment of hedgerows should be planned and implemented at the appropriate time. The hedgerows should appear before the annual crops are planted for several reasons:
  - The hedgerows serve as a reference for planting. All annual crops should be planted in rows parallel to the hedgerows, which means that all crops are planted along the contour thereby making best use of the available space of a field, which allows for more systematic intercropping
  - The hedgerows are able to establish without competing with the annual crops. In particular if maize is planted between the hedgerows the fast growth of maize can negatively effect hedgerow development. Slow growing species such as Leucaena particularly suffer from competition with fast growing annual crops.
The establishment of hedgerows requires a labour input of around 30 hours labour to plant hedges in a 0.5ha plot. Once the planting of annual crops starts, farmers do not have much spare time to establish hedgerows.

Treatment with rhizobium showed a positive effect on all treated species, particularly Leucaena. Leucaena seeds should be treated with rhizobium or mixed with soil from existing Leucaena plantations.

Hedgerows need at least one weeding in the first year. Slow growing species require more weeding.

Stylosanthes provides an excellent feed for ruminants, pigs and chickens. The project found that it is well suited to integration in hedgerow farming.

Grass strips should only be established if the farmer has a real need for additional forage and the field is not too far from the farm for daily cut and carry. If the grass is not cut regularly it can easily become a weed.

Beans used as cover crops in rice fields need to be planted earlier (6 weeks before rice harvest) to improve soil cover establishment. Stylosanthes should be planted at a later stage to avoid competition.

The planting of seedlings was, under Bokeo conditions, much more successful for establishing living fences than direct seeding or planting cuttings. The required seedlings can easily be produced in farmer nurseries.

For the first two years the selection of demonstration farmers did not follow clear criteria and some of the selected farmers did not have suitable conditions to take part. Only farmer families who are able to provide enough land and labour are suitable to conduct long-term demonstrations.

### Conclusion and Outlook

Although the project has been conducting demonstrations on improved upland farming since 1999, it is still too early to draw final conclusions. The establishment of hedgerows was successfully demonstrated but, considering that until December 2003 only a few farmers used the hedges as intended, the long-term effects of hedgerow farming could not yet be demonstrated.

However, as stated above, the project revised its approach and started new demonstrations in the 2003 rainy season with eleven farmers in seven villages. The concept was clearer, the farmers were selected more thoroughly and closer follow-up by government and project staff is being provided.

The new plots are developing very well. Most farmers who started in 2003 are very enthusiastic and many farmers who attended field visits to the demonstration sites would like to start in the 2004 rainy season. The demonstration sites will be further developed through:

- Incorporation of perennial crops and Non-Timber Forest Products (NTFPs).
- Further tests with cover crops.
- Mixed cropping of rice and crawling cowpea.
Crop rotation within plots.

Improved fallow with pigeon pea: Demand for pigeon pea by a local feed mill has meant that pigeon pea has become more attractive to farmers.

The ‘basket of choices’ principle of all the project's demonstrations offers a wide range of opportunities for upland farmers and can be adapted according to farmer needs. For example, some farmers may be mainly concerned about soil fertility and rice production, others like to produce mainly cash crops while other farmers need better quality feed for improved livestock production. There is no general solution for upland farmers but only individual solutions for individual needs.

Authors

Chansom Manythong and Holger Grages (hobuli@yahoo.com) work for the Lao-German Rural Development in Mountainous Areas Program in Bokeo Province, Muang Huayxai, PO Box 68, Bokeo Province.
Cash Crops in the Uplands: The Cardamom Experience

Olivier Ducourtieux, Phoui Visonnavong and Julien Rossard

Abstract

Farmers are often blamed for destroying tropical forests, especially in the Lao PDR. Converting shifting cultivation into cash crop-based agriculture is recurrently presented as the solution merging forest protection and poverty alleviation. However, many attempts in the recent past have ended in failure.

The Rural Development Project of Phongsaly District (PDDP) has tried to introduce cardamom cultivation for export to China. With nearly 300ha of transplanted cardamom, the crop now involves more than 75% of farmers in the region. Lessons can be drawn from this experience, especially regarding prerequisites. The first is to prioritise economic issues over agronomic matters, in particular identify markets, traders or commercial risks. The second lesson is to appraise how the new crop will fit into the farming systems, which are rationally managed by the different classes of farmer, in accordance with their means of production and socio-economic environment.

Introduction: are cash crops an alternative to shifting cultivation?

Around the world and especially in the Lao PDR, farmers are often blamed for destroying tropical forests. Many authors point to the widespread practice of slash-and-burn agriculture as threatening the future of the Lao forest in upland zones (UNDP 1995; Watershed 2000; NAFRI and CIRAD 2003; Vorakhoun 2003). Shifting cultivation on slopes plays a major role in the Lao economy. In a country where 80% of the surface area is hilly or mountainous, those crops grown under shifting cultivation provide jobs to over 250,000 families (MAF 1999), i.e. 35% of the country’s population, who are among the poorest in the country and essentially belong to ethnic minorities from the isolated mountains in the north, east and southeast of the country.

Introducing cash crops and promoting income-generating activities are the two means generally suggested by rural development programmes for achieving the independent and potentially contradictory aims of poverty alleviation and forest environmental protection, by restraining agriculture in mountain regions to permanent, limited areas. This policy relies on the rarely explicit presupposition that it is possible for farmers to sell commercial products, whether animal or vegetal, and that the cash income obtained allows them to buy rice instead of growing it using slash-and-burn practices.

Rarely debated, the alternative to swidden cultivation, i.e. cash crops, is systematically promoted by development projects with encouragement by the Lao Government.

1 This paper is derived from a forthcoming article submitted to “Agroforestry Systems” journal. To learn more, go to: http://www.kluweronline.com/issn/0167-4366

2 With irrigation, also.
(MAF 1999; MAF 2002; Lao PDR 2003) and International Organisations (ADB 1999; UNDP 2002; ADB 2003). Nevertheless, there have been many failures among recent attempts, (Ducourtieux 2000) and success has rarely been sustainable. Has the solution proven its effectiveness? This paper does not claim to provide a final response, but seeks to nurture debate by examining a local experience.

On the scale of a small agricultural region, this study deals with how a rural development project, the PDDP \(^3\), has taken into account the local conditions in Phongsaly to introduce a new cash crop, medicinal cardamom, for export to the traditional Chinese pharmacopoeia market. The PDDP project team focused on farming techniques for this plant, poorly known outside of China. This issue is often the agronomist’s first, or only, concern, yet dealing with it is far from enough if an operation is to be a success. The PDDP devoted most of its efforts to economic aspects: work productivity and risk limitation; and commercial aspects: market accessibility, limitation of commercial risks by identifying reliable operators, etc. The example of cardamom in Phongsaly will allow for a clearer definition of the conditions that need to be met for successfully introducing a cash crop.

---

\(^3\)Rural Development Project of Phongsaly District.
Table 1: Ethnolinguistic Families in Phongsaly District (rural villages)

<table>
<thead>
<tr>
<th>Ethnolinguistic Family</th>
<th>Ethnolinguistic Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phu Noy</td>
<td>58%</td>
</tr>
<tr>
<td>Ikko</td>
<td>13%</td>
</tr>
<tr>
<td>Ho</td>
<td>13%</td>
</tr>
<tr>
<td>Laoseng</td>
<td>10%</td>
</tr>
<tr>
<td>Lu</td>
<td>3%</td>
</tr>
<tr>
<td>Hmong</td>
<td>3%</td>
</tr>
</tbody>
</table>

Sources: Phongsaly District & PDDP surveys

**Agriculture in Phongsaly District**

**Economy based on shifting cultivation**

Phongsaly District, a unique and extremely landlocked region, belongs to the province of the same name, the northernmost in the Lao PDR, wedged between China to the west and Vietnam to the east.

The district is essentially covered with rain forest and especially uneven terrain. Furthermore, the forest is very productive and is characterised by an uncommonly wealthy biodiversity (Chaze 1990; De Koninck 1997). Human activities, and in particular shifting cultivation, have historically transformed the climax vegetation. The existing formations are very diverse, ranging from primary forests to fire-maintained *Imperata cylindrica* savannah (Alexandre and Eberhardt 1998; Laffort and Jouanneau 1998; Baudran 2000).
The population mainly belongs to the Sino-Tibetan ethnolinguistic family, with Lao Loum being absent from the rural environment: 20,000 inhabitants live in 82 rural villages\(^4\), of which 80% do not have access to a road or track suitable for vehicles. It takes at least three days or more to reach some villages by foot.

The population essentially makes a living from swidden cultivation, which, combined with hunting, fishing and gathering, accounts for over 80% of household income (Ducourtieux 2004). Agricultural alternatives remain limited due to the absence of flat land that can be developed in the V-shaped valleys, difficult access to markets for cash products and the high incidence of health problems in animal raising.

In a village, agricultural production is based on the use of three distinct areas:

- **Family gardens**: in the village and alongside it.
- **The agroforest crown**: around and slightly above the village.
- **The slash-and-burn zone**: that makes up the essential part of the village land, with farmed fields and forest regrowth - fallow land (Laffort 1997; Alexandre and Eberhardt 1998; Baudran 2000).

Every year, nearly 3,500ha of forest is planted in Phongsaly district, corresponding to about 2,000ha that is cleared. After two years of cultivation, plots are left for forest regrowth. The build-up of solar energy, via photosynthesis, enables the reconstitution of secondary vegetal formations (thickets, forests, etc.) during a long fallow period, lasting from 6 to 18 years. These substantial periods enable the reconstitution and accumulation of biomass, which is a source of fertility for the next slash-and-burn crop cycle (Roder 2001). The limited availability of manpower in this lightly populated region (eight inhabitants/km\(^2\)) is the bottleneck for Phongsaly's economy and agriculture. In Phongsaly's slash-and-burn production system, a family devotes 100% of its workforce to farming and hunting-fishing-gathering (Ducourtieux 2004). This workforce cannot clear more than 0.8ha land per active worker per year (Laffort and Jouanneau 1998; Keonuchan 2000) and any new activity involves dropping an already existing one.

With their means of production - manpower, limited capital and hand tools - and under Phongsaly's socio-economic conditions, farmers seek to maximise their work productivity\(^5\) and limit the technical, climatic and commercial risks to ensure a minimal income for their family.

Collection activities (hunting, fishing and gathering) are an essential component of family economy in the region and provide 41% of the total income\(^6\) for families in the village of Samlang, i.e. higher than crop (35% of the total income) or animal (18%) production. Gathering in the forest, mainly involves collecting bamboo shoots, “tipti” creepers (Urticaceae, probably *Boehmeria malabarica*) and wild cardamom.

Collecting (hunting, fishing and gathering) is therefore not a marginal or residual activity, although it is generally underestimated when surveys are conducted. Gathering is traditionally presented as being the survival strategy of the poorest, who otherwise

\(^4\)The nine villages forming the town of Phongsaly, with 5,900 inhabitants, should be added to that total.

\(^5\)Farmer rationality leads to maximising the income per active worker (Kip/workday), and not the yield (kg/ha or Kip/ha).

\(^6\)Hunting provides 22% of a family's total annual income (snares and traps), gathering 11% and fishing 8% (nets and hoop nets).
would not be able to feed themselves (UNDP 2002). This theory has proven to be unfounded in Phongsaly. The income earned from gathering is directly proportional to the total family income, which implies that the most well-off families are also the ones who profit most from gathering, hunting and fishing.

**Rural development project of Phongsaly District**

The Rural Development Project of Phongsaly District (PDDP) brings together the Governments of the Lao PDR and France to cooperate in an operation falling within the framework of poverty alleviation and environmental protection. The project’s first aim is harmonious economic development for all the district’s inhabitants. This economic development aim is a prerequisite to the second aim: limiting shifting cultivation in the long run.

To reach these two aims, the PDDP has targeted the development of cash products, making it possible to:

- Increase cash incomes (*Aim 1*).
- Purchase rice in order to progressively replace its production (*Aim 2, reduction of area used for slash-and-burn per family*).

Due to a lack of alternatives, such as development of valley bottom land, stabilising slash-and-burn at its current level requires the development of cash products to increase farmer income. The project is based on the hypothesis that higher food demand,

---

7 A family’s average total annual income: 15.6 million kip (US$ 1500, including the value of self-consumption), including 2.1 million kip (US$ 200) of cash income (Note: exchange rate 10,460 kip for US$ 1 in November 2003).

8 Since the limiting factor of family economy in Phongsaly is the workforce, the family income increases depending on the manpower available, which makes it possible to devote more time to gathering activities.
due to demographic growth, should be met by purchasing rice. Those purchases are financed by the sale of farm products, whether vegetal or animal.

The project began its second phase in 2002, with a budget of 5.2 million EUR, including 73% in the form of a grant from the French Development Agency (AFD) and 22% in village participation. The second phase will be completed in 2006, after activities in the following fields have been achieved:

- Animal raising.
- Cash crops and marketing.
- Opening-up access to villages.
- Village water supply.
- Primary education.

In 1994, the PDDP began by conducting an in-depth study of the agrarian systems in Phongsaly District (Alexandre and Eberhardt 1998; Laffort and Jouanneau 1998; Baudran 2000). The aim of this was to understand the coherence of local agriculture developed by farmers and to determine which proposals of action would be most relevant for submission to the farmers.

Cardamom emerged in those studies as an important component of family economies. At the time, it was the leading vegetal product officially exported by Phongsaly Province. The development of this gathered product was nevertheless hindered by two factors, which tended to limit the price offered to farmers:

- Social conditions of gathering (free access) tended to start the harvest too early, to the detriment of ripeness and hence product quality (Aubertin 2003).

---

Figure 4: Gathering Income and Total Income (Ban Samlang)

---

9 US$ 5.7 million; with the first phase (1996-2002), the operation’s total budget reaches US$ 12 million.
Wild cardamom does not have the same content in essential oils as the cardamom grown in China, preferred by industry, which limits it to only being a supplementary product, the prices of which depend on how much is produced in China.

The crop can be integrated into secondary forest formations that are dominant in Phongsaly, without any ecological damage. Planted under forest cover, it enables the conservation and development of a wooded stratum, a guarantee for the subsistence of forest environmental conditions (ecological diversity, soil structure and fertility, humidity, micro-climate, etc.).

Based on the project’s aims of increasing farmer income while preserving the forest environment as well as on the feasibility study conclusions, the PDDP focused on introducing cardamom farming in Phongsaly District.

**Introduction to cardamom cultivation**

**Medicinal cardamom: product, market and farming**

Medicinal cardamom (*Amomum villosum var. xanthoides*) is a non-ligneous perennial plant, of the Zingiberaceae family. It is used in traditional Chinese pharmacopoeia as an ingredient in the preparation of medicine for stomach aches. As such, it reaches a potential market of over 1.3 billion consumers, in addition to the Chinese dispersion in

---

10 Medicinal cardamom should not be confused with aromatic cardamom (*Elettaria cardamomum*), used as a condiment in India and the Middle East, as well as in cosmetics.
Asia (20 million, De Koninck, Roche et al. 2000) and the rest of the world. The demand by the traditional Chinese pharmaceutical industry accounts for 2,000t a year whereas production stagnates at half of that, with the remainder being met by gathered products of lower commercial quality (Saint-Pierre 1998).

Cardamom grows wild in Southeast Asian tropical forests at moderate altitude. It is fond of humid and shady environments. The most favourable conditions include a mean yearly temperature ranging from 19-22 C, with over 12 C in the coldest months, and annual rainfall of between 1,200 and 2,400mm (Zhou, Yao et al. 1999).

Cardamom produces new plants very fast from stolons (or runners) once it reaches one to two metres in height. The root system is not deep, extending out in aerated, humus-rich and slightly acid soil. Sensitive to drought, the April-May blossoming deteriorates if soil humidity is less than 22%. Flowers develop on the stolons, near the root plateau. Pollination is by insects (*Apiscerana indica and dorsati, Nomia strigate*; Zhou 1993).

The fruit ripens in August, the period in which it is picked, dried and marketed.

Generally gathered in the forest in Laos, medicinal cardamom has been grown for a long time in China in the Canton region. It was introduced in the 1960s to the Prefecture of Xhishuangbanna (Yunnan Province), where it has become a major product enhancing the economic development of the Phongsaly border region (Zaifu 1998; Zhaohua et al. 1998). The cardamom farming technique aims at imitating the spontaneous growth of wild cardamom: Plantations are located in natural shade after areas have been slightly cleared, seedlings are then transplanted once the topsoil has been prepared and weed-

---

11 From 10 to 60% of light transmitted, with an optimum of 30% to 40%.
12 80% of the roots are developed in the first ten centimetres of the soil; the root system is not over 20 cm deep.
13 Content in organic matter > 3 %, pH from 5.5 to 7.0 (tolerance from 5.0 to 7.5).
14 With the notable exception of the Bolovens Plateau, where it has been cultivated for decades (Ducourtieux 1994; Pelliard 1998; Babin 1999; Grimeaud and Meaux 1999).
15 8,000 ha, 80% of the Chinese production of cardamom in 1998.
ing is done for the first two years after which the plantation is thinned out annually\textsuperscript{16} (Zhou 1993).

The first fruit appears three years after planting, whereas the first economically significant harvests begin in the 5\textsuperscript{th} year and continue increasing until the 10\textsuperscript{th} year. The plot wears out slowly over a ten-year period. Reasoned management entails replanting around the 15\textsuperscript{th} year so that the crop can be regenerated.

Work is limited on a plot. The initial weeding, then clearing and harvest require less than 50 workdays per hectare, to which two to five days of drying in the sun should be added\textsuperscript{17}, depending on climatic conditions.

A one-hectare plot produces from 20 to 750kg of dried fruit depending on its age, conditions (shade, humidity, fertility) and the year: production varies substantially, depending greatly on the date when the rain starts in April-May, as this conditions the quality of blossoming and pollination. In September 2003, dried cultivated cardamom was marketed in Phongsaly at 20,000 Kip/kg (US$ 1.90/kg, producer’s price) this compares with 5,000 Kip/kg (US$ 0.5 /kg) for wild cardamom.

\textbf{The PDDP: preference for a commercial approach over an agronomic one}

The feasibility study mentioned the possibility of the PDDP being involved in the introduction of a cardamom crop. Before raising the issue with farmers, the project team strove to check the validity of this theory.

The first unknown factor dealt with the conditions of market access. In January 1998, a joint project/local agricultural service mission went to Xishuangbanna to meet with commercial operators and discuss market prospects for sugar cane, tea and cardamom. Only cardamom appeared to offer sustainable economic guarantees for the Phongsaly farmers, with a stable demand, a local offer restrained by limited Chinese resources in tropical forests and hence a lucrative price level for the farmwork, despite the costs of access (transportation) to an export market (Saint-Pierre 1998).

During this mission, the team also sought to identify private farm produce trading companies interested in operating with cardamom in Phongsaly.

As the market survey phase proved conclusive, the PDDP then went on to the second preparatory stage of introducing the cardamom crop. The issue was to check whether it was technically possible to cultivate cardamom with Phongsaly’s soil and climatic conditions. The project commissioned a team of XTBG\textsuperscript{18} researchers to carry out a research mission of the environment and soil, which concluded that it is possible to grow medicinal cardamom in the hills of Phongsaly District, as long as planting was avoided in bam-

\textsuperscript{16} The optimal density is around 20 plants/m , based on planting one plant/m . The transplanted stems can be transplanted on a new plot, enabling the extension of the plantation at a lower cost.

\textsuperscript{17} The use of a dryer increases work productivity while improving the quality of the product due to rapid, complete and controlled drying.

\textsuperscript{18} Xishuangbanna Tropical Botanical Garden in Menglun, research centre of the Chinese Academy of Sciences network. It is most likely the only institution having ever undertaken research on medicinal cardamom (Zhou 1993).
In order to limit risks for the farmers, the project team did not immediately start promoting the crop on a large scale. An experiment was first launched by 25 volunteer farming families, in five diversified villages in Phongsaly district. The aim was to use a limited sample to test the aptitude of the plant to resume growth after a lengthy transportation period and transplanting under Phongsaly conditions. With 6,400 stalks supplied by the project in July 1998, the families were growing 7,000 plants in late 1998 and 9,600 in March 1999. This provided proof of the possibility of introducing medicinal cardamom plants from China for a farm crop in Phongsaly.

After the conclusive phases of market study, commercial canvassing, agronomic research and farmer experimentation, the PDDP was able to promote cardamom growing on a large scale.

Together with the district authorities and the PDDP provincial steering committee, the project team studied several modalities of plant supply:

a) Project grant.

b) Cash purchase by farmers, with a very high cost per hectare (US$ 400) that was beyond their investment capacity.

---

19 Due to the competition between the superficial root networks and the level of soil acidity in bamboo forests.

20 Young fallow land is generally covered with fast-growing ligneous heliophyte species (Macarana denticulata Bl, Trema orientalis (Linn.) Bl, Mallotus paniculatus Muell-Arg.), which generally die after a five-year period (thus deteriorating the cardamom plantation) and are then replaced by long-life species (Antidesma acidum Retz., Astonica scholaris (Linn.) Kurz, Albizia chinensis (Linn.) Merr.).
c) Sale of plants on credit, at cost price, along the model of the Agricultural Promotion Bank operations for cash crops promoted by the local administrative services (sugar cane and tea).

d) Cash sale of plants, at a price sufficiently subsidised to make the planting of a plot accessible.

e) Credit in seedlings, with reimbursement in kind, after several years.

Options (b) and (c), and to a lesser degree option (d), are extremely unjust: the programme promoter, the PDDP, was definitely not taking a risk with the new crop. Option (e) was eventually chosen, since it offered the possibility of extending the plantations into new zones after a few years by distributing the reimbursed seedlings. Each farming family had the opportunity of borrowing a maximum of 1,000 seedlings, i.e. sufficient for a plantation covering one-tenth of a hectare.

Due to the proximity and similarity of the zones and farmer rationalities, the cropping system of the Xhishuangbanna farmers was selected as a model for popularisation.

In 1999, the PDDP signed a contract with a Chinese company for the supply of 1,150,000 cardamom seedlings, purchased from Chinese villagers, to be delivered in July to 1,050 families in 27 villages in the south-western part of Phongsaly District. The contract was original: the project paid only 80% of the total cost at seedling delivery; the remaining 20% was paid three years later, after the Chinese company had bought the first production21.

Monitoring of the newly planted plots showed high mortality of cardamom seedlings. In January 2000, only 27% of the plants delivered in July 1999 were still alive. This was not an incurable problem as the plants multiply rapidly by stolons (1-5 offshoots/year), but it delayed the beginning of production by one or two years. There are several reasons that may explain why the renewed growth was clearly lower than that experienced with the trial plots the previous year:

- The transplanting/replanting interval was too long. Some plants arrived too dry and then died before producing shoots.
- Delivery loads were scheduled too closely together, with plants suffering from transportation conditions (in particular crushing caused by overcrowded loads) as well as the time required for distributing 250,000 seedlings at each session.
- Overall, the seedlings were too old and leafless, which prevented their renewed growth and made offshoots the only possibility for regrowth.
- Planting took place too late (mid-to-end July), which only left two months of rainfall for the regrowth of the seedlings and also complicated distribution logistics, with rivers at their highest level and tracks that were unusable by trucks, making distribution lead-times even longer.

---

21 The farmers remained free to sell their cardamom to the traders of their choice, based on offers; the Chinese company was contracted to make sure that all the production had been marketed and if need be, buy the unsold stock.
Based on these observations, the project modified delivery logistics for the year 2000. Distribution was brought forward to June and carried out over several sessions, each one involving less villages, fewer, younger and leafier plants and trucks with smaller loads. 970 families in 35 villages received a total of one million plants.

Under these conditions, plant regrowth went more smoothly than in 1999 and by mid-2001, 63% of the plants delivered to the plots were still surviving.

The PDDP resumed the procedure in June 2001 for delivery to the last district villages whereby 830 families from 30 villages received 880,000 seedlings.

By late 2001, 4,900 families in 87 villages had begun growing medicinal cardamom. 72% of farm families in Phongsaly District willingly responded in favour of the project’s proposal and planted 220ha in a contractual approach. The project invested over US$150,000 for the purchase of the plants.

Although gathering cardamom is an ancient custom in the region, growing it is a new practice, not spontaneously mastered by the farmers. The PDDP accompanied the distribution of the plants with extension operations: in-field training by the project team and study trips to China. Each village selected a volunteer to become the community’s technical cardamom consultant; these representatives then participated in study trips to Xhishuangbanna aimed at:

- Training farmers on growing cardamom based on the experience of Chinese farmers.
- Enabling Phongsaly farmers to meet Chinese cardamom traders to discuss quality conditions and become more aware of their demand and organisation.
- Showing the Phongsaly farmers to what extent cardamom was essential in the economic start-up of Xhishuangbanna and how it still plays a role now.

In three sessions, from January to December 2000, all the district villages participated in this activity, together with project agents and local administrative civil servants (Phongsaly Province and District).

**Current results: success to be consolidated**

In August 2001, the first cardamom fruit was harvested from trial plots planted in 1998. These plots gave an average yield of 64kg/ha (dried), an encouraging result but varying substantially from one family and one village to the next (0 to 380kg/ha).

By the end of 2003, with the transplanting, the area of farmed cardamom reached 270ha in Phongsaly District. Production, still in the growing phase (refer to figure 8) reached 1,100kg (dried) in 2002 and 3,000kg in 2003, with a value of 20 million Kip (US$ 1,900) and 60 million Kip (US$ 5,700) respectively. Four to five years from now, annual income could reach 600 million Kip (US$ 57,000) from the same area of land.

---

22 13 deliveries of 77,000 plants each in 2000 instead of five deliveries of 230,000 plants in 1999.
Despite these encouraging results, the operation has encountered some problems, which, although not crippling, require the project team’s attention in order to maximise farmers’ profits:

- Prices have drastically dropped since 2000\(^{23}\). This drop is probably related to the disappearance of the State pharmaceutical companies who supervised the market in Xhishuangbanna (Saint-Pierre 2003) and the increase of regional production (China, Laos, Myanmar). Although, due to the progressive reorganisation of the industry, prices rose again in 2003 they have nevertheless still continued to fluctuate, depending on production levels in the Chinese provinces\(^{24}\).

- Marketing conditions have not established a balance of power that is favourable to farmers in their commercial negotiations, which partially explains why price levels in Phongsaly are clearly lower than those in Xhishuangbanna. Cardamom is marketed in late August-early September, at a time when rice stocks in the villages are at their lowest, or even totally finished. Farmers are in a hurry to sell their produce to buy the rice they are lacking. At this time, in the middle of the rainy season, drying the fruit on mats and in the sun is problematic. The product is marketed damp; and the loss of quality and risks of deterioration have repercussions on the price paid to farmers.

- Compared with wild cardamom, cultivated cardamom still only makes up a small portion of Phongsaly exports. This does not allow for any recognition of the qualitative specificity of the product to emerge, which is often sold in mixed batches at the price of gathered cardamom.

The project is currently working with villagers on two topics aimed at eliminating part of these constraints:

- Introduction of driers to help:
  - improve product quality;
  - reinforce farmers’ negotiation power by facilitating temporary storage;
  - reduce the work involved in the drying period.

- Commercial promotion of Phongsaly cultivated cardamom to make the market aware of its qualitative specificity.

The PDDP’s action for introducing a cash crop such as cultivated cardamom is not limited to the supply of seedlings and the extension of crop techniques. It is based on commercial work upstream and is broadened by technical and economic supervision downstream.

\(^{23}\) From 5 to 7 US$/kg dried in China in 1995-1998, the price bottomed out in 2002 at less than 2 US$/kg.

\(^{24}\) In addition to the production from the historically concerned provinces (Guangdong, Xhishuangbanna), there are new competitors — Guangxi and Guizhu provinces — with limited potential but which will play a role in forming prices (Saint-Pierre 2003).
Lessons learned from the experience: conditions to be met in order to successfully introduce a cash crop

In the Lao PDR’s upland regions, farmers clear away forest, creating a link between the two successive phases of slash-and-burn cultivation (Chaze 1998):

- A short crop period of one to three years using the fertility built up in the forest biomass.
- A fallow period, varying in length of one to twenty years, during which fertility builds up through regeneration of the forest.

These production systems are often effective for the economy of farming families in terms of security and productivity (Dufumier 1996; Ducourtieux 2004). Implemented for centuries, they have had a limited impact on the forest environment in Laos. They are nonetheless not sustainable, as demographic growth generally leads to accelerating crop rotations (Dufumier 1999). If the fallow period is less than three to four years, soil fertility is not renewed and erosion increases dramatically (Ramakrishnan 1992; Moa, Valentin et al. 2002; Van Keer 2003).

To prevent the crisis of shifting cultivation systems and limit their ecological impact, it is essential to plan ahead and promote new production systems based, in particular, on cash crops, to help:

- Improve the farmers’ standard of living by increasing their cash income.
- Progressively substitute rice production by rice purchase in upland regions, in order to reduce the area annually cleared by each family.

Nevertheless, a cash crop is not automatically a viable alternative to slash-and-burn agriculture. In some cases, erroneous choices can lead to an increase in poverty and forest degradation. Introducing sugar cane in the Phongsaly highlands degraded the soil through mineral exploitation of the fertility\(^{25}\), while reducing farmers’ income (Ducourtieux 2000). Those errors made by development projects and programmes, supported by the farmers, occurred due to a lack of study and comprehension of the local agricultural conditions. Although those in charge generally think about the agronomic adaptation to the natural environment, the socio-economic context (lasting access to the market, price conditions, farmers’ priorities, etc.) is too often neglected. Such oversights lead to unsuitable proposals, logically refused by the farmers, which both waste limited public resources, and are sources of tension between villagers and administrative services.

Introducing a new cash crop is not a foregone conclusion; it can only succeed if farmers accept it and make it their own. Based on the cardamom experience in Phongsaly, three conditions required for success can be identified:

1. **Cash crops proposed must be more productive** than shifting cultivation with regards to the limiting factor of agriculture in the zone: labour (workforce). In order for farmers to accept the activity conversion, the new speculation must bring in more per workday to the farmers than the current family production, i.e. a minimum level of 14,000 Kip (US$ 1.3) per workday (Ducourtieux 2004).

\(^{25}\) For a yield of 20-50 t/ha, a field of sugar cane removes over 200 kg/ha/yr of mineral elements from the soil, compared to 15-20 kg/ha/yr for a slash-and-burn field (CIRAD, GRET et al. 2002). At the end of the crop cycle, the slash-and-burn field has lost 40kg of mineral elements; the secondary forest is rapidly regenerated during the fallow period. For the sugar cane field, the mineral losses reach 600kg/ha and Imperata cylindrica is dominant on the fallow land to the detriment of the ligneous essences.
2. **Cash crops proposed must offer more security than** shifting cultivation. Farmers cannot accept a drop in their food production (rice) for a risky production, with inconsistent results according to good years and bad years. The risks to be minimised deal with the markets and economic fluctuations (price variation, evolution or disappearance of demand, etc.), as well as natural conditions (climate, soil, pests and disease, etc.).

3. **Cash crops proposed must be easily transportable.** In upland regions like Phongsaly, villages practising swidden cultivation are especially remote. Reaching roads open to vehicles and, from there, to markets requires hours or days of walking on steep paths. Cash crops must be sturdy and non-perishable in order to withstand such transportation conditions. The value per mass and volume unit (price/kg and price/m³) must be sufficiently high to enable economically profitable transportation.  

If only one of these conditions is not met, the failure of the cash crop proposed is predictable.

**Conclusion**

Introducing cash crops is not a miraculous solution, automatically crowned with success, for stabilising shifting cultivation. Their promotion requires prior in-depth thought about the socio-economic conditions and suitable research in an on-farm environment. A single crop cannot be a sustainable solution, in particular in terms of economic risks for the farmers. A crop must be planned in association with breeding activities and other crops, within the existing production systems. If well-designed and implemented, the promotion of cash crops can contribute to increasing farmers’ income while preserving the forest.

Trends and mirages are common in the development sector and often only lead to costly and dangerous failures for the farmers, the first victims of erring ways. Those in charge of development, projects and administrations alike, are much more effective when they take into account the socio-economic agricultural environment and its local historical evolution. By listening and better understanding farmers, those in charge are capable of developing new technical and economical practices with the farmers that make it possible to reach the national policy goals in the fight against poverty and environmental protection.

**Authors**

Olivier Ducourtieux is a Doctoral candidate at the Paris-Grignon National Institute of Agronomics (INA P-G). E-mail address is: olivier.ducourtieux@laposte.net.

Phoui Visonnavong is National Program Director, PDDP (Rural Development Project of Phongsaly District). E-mail: cclpddp@laotel.com

Julien Rossard is an agronomist working for the PDDP. E-mail: jrosaard@laotel.com

---

26 This article deals with cash crops, but these requirements also apply to breeding systems. Mobile cash products, like cattle, should be favoured in these regions.
Bibliography

ADB. 1999. Report and recommendation of the President to the Board of Directors on a proposed loan to the Lao People’s Democratic Republic for the shifting cultivation stabilization pilot project. Manila: Asian Development Bank. 72 p.


THE IMPORTANCE OF UPLAND FISHERIES IN THE LAO PDR: A CASE STUDY

Xaypladeth Choulamany

Abstract

The Mekong is a huge source of richness and diversity in terms of aquatic life and is a major food resource for the Lao PDR. This paper was written after research that aimed to provide a better understanding of fisheries in the uplands of the country. In an attempt to gauge the dependence of upland people on fisheries, this paper looks at fish consumption data, at how people obtain fish and aquatic animals and also at the absolute and relative economic importance of fishing in rural livelihoods.

The methodology applied was a questionnaire-based survey of a random sample of villages, households and individuals in Luangprabang Province. The study has shown that most official government figures refer only to ‘commercial catch’ and are not collected in any systematic way. Very limited data exists on subsistence fisheries.

While it was expected that local total fish production in the province would be relatively low since the region does not have as good fishery resources as the lowlands, the evidence shows that the resources and the current catch are still significant. There is a lot of potential for better integrating aquaculture into the farming system and some results from attempts to farm fish and other aquatic sources of protein are also presented.

Important living aquatic resource habitats in the Lao PDR

The main ecosystem for living aquatic resources in the Lao PDR is the Mekong River and its associated waterways and wetlands, which provide a myriad of habitats for the richness of aquatic life forms in the country. The fisheries ecology of the Mekong River Basin is intimately linked to, and influenced by, the morphological and hydrological characteristics of the basin. One of the main driving forces for fishery ecological processes is the physical separation of important wet season feeding habitats and dry season habitats.

The vast plains associated with the lower Mekong are crucial feeding and rearing habitats for the majority of fish species important to fisheries. However, as the flood recedes at the end of the monsoon season, it is equally crucial that fishes can seek refuge in appropriate dry season habitats. In general, dry season habitats are associated with the main river channel and with permanent water bodies on the floodplain (floodplain lakes and swamps). Within the main river channels, certain sections are better suited as dry season habitats than others. In particular, deeper sections of the river are used by a large number of species during this period of the year. These deep sections are often referred to as deep pools, a term that is increasingly being used in the context of Mekong Basin fisheries ecology (Anders 2001).
Fish

Although comparisons of biodiversity between regions and ecosystems depend greatly on the criteria used, it is worth noting that the fish species diversity of the Mekong, per unit area of catchments, is roughly three times that found in the Amazon River Basin. Furthermore, this figure is well in excess of that is normally associated with coral reefs, which are popularly expounded as highly diverse aquatic ecosystems.

Fish species diversity in the Mekong basin is current estimated at 1,200 species. In addition, the Mekong fish fauna, as in other large rivers, is probably characterised by a high degree of within-species diversity. This is in part brought about by the zoogeographic history of the region, whereby different sections of the basin have been isolated and reunited over time.

The dynamic nature of floodplain ecosystems also drives fish to migrate, often over long distances, contributing to both genetic mixing and isolation of populations. Although to date only a fraction of migratory species has been studied, and only in modest detail, a high proportion of these are thought to have distinct populations within the Mekong basin (Coates et al. 2001).

In the Lao PDR, some 500 indigenous fish species are reported to live in the Mekong and its tributaries (Kotellat 2001). Of these species, 25 are suitable for aquaculture (DLF 2001). LARReC, in cooperation with the MRC, is carrying out ongoing research on fish habitat and spawning grounds to close important knowledge gaps. The results are expected in 2004/05 and meanwhile further research, on the introduction of other species to captive breeding, is ongoing.

Reptiles and amphibians

Knowledge of which species occur where is fundamental to conservation of biodiversity, yet the amphibian and reptile composition of the Lao PDR has long remained unknown. Previous reports on the herpetofauna (Gressitt 1970; Salter 1993b) are based largely on secondary, regional accounts or are extrapolations from documented occurrence in adjacent countries. Various workers made some small museum collections earlier in the century, yet no attempt has been made to compile these records. Recent surveys, supplemented with specimen and photographic contributions of conservation workers and the holdings of specimens in various museums, have recorded at least 166 species of amphibians and reptiles for the Lao PDR (LARReC 1999).

Other aquatic animals

Although poorly documented, invertebrate diversity is likely also higher in tropical freshwater ecosystems than in marine ecosystems, at least for crustaceans, mollusks, insects and especially for nematodes. Biodiversity is rich in semi-terrestrial/aquatic ecosystems, such as riparian vegetation and flooded tropical forest, which are part of and dependent upon the river aquatic ecosystem.

Government fisheries policies

The main government policies for an agriculture and forestry-based economy aim at improving and increasing the productivity of all types of agricultural commodities in order to satisfy national food security in line with population growth, the urbanisation
process, the improved living standard of the people, specific market incentives and future export possibilities.

The fishery sub-sector plays an important role in the economy, accounting for about 22 percent of GDP. In general, information on the economic significance of the fisheries sector is difficult to obtain. Although the development of fisheries in the country is mainly aimed at attaining food security and improving the daily protein intake of the population, most fish caught and cultured in the Lao PDR is consumed by the fishermen and fish farmers themselves. Increasing population pressures in recent years and the deterioration of resources, through over-fishing and other unfavourable human interventions, are the main causes that have led to a gradual decrease in catches from natural water. Environmental changes, brought about by deforestation, water pollution through indiscriminate use of pesticides, discharge of domestic and industrial wash water, and water resource development projects including dam construction and broad land use, are also starting to show negative impacts to fish production, causing significant fish losses which are not easily compensated for. Further deteriorating the situation are the lack of understanding of and the insufficient information base on bio-economic parameters of the lower Mekong River fishery, on which resource identification, protection and community management of the resource depend. The declining catch in rivers, lakes and reservoirs is a matter of serious national concern. The problem has focused more attention on culture fishery development, which holds a lot of promise in progressively compensating for the decline in fish production, but which needs considerable inputs and skilled manpower.

The government's highest priority is to obtain food self-sufficiency both in agriculture and fish products to overcome poverty in rural areas and to improve nutritional levels and general economic status. Current national agricultural and fisheries development policies centre on:

a) Meeting food security (especially the animal protein intake of the population, currently averaging 8 kg/capita/year and projected to reach about 20-23 kg/capita/year by 2020).

b) Ensuring the provision of fishery products as commercial commodities for local markets and for future export.

c) Supporting rural development in the perspective of poverty alleviation and income generating opportunity.

d) Contributing to the gradual reduction of slash-and-burn shifting cultivation by integrating fish culture into upland farming systems.

e) Upgrading and establishing the appropriate basic infrastructure required for further aquatic resources research, management and development.

f) Strengthening, upgrading and performing technical support services in research, extension, management and development of the sub-sector, with more capacity and capability to collaborate and participate in sub-regional/regional and international aquatic resources research and development ventures.
Considering the present situation, and taking into account the need for research and development of fisheries and aquatic resources, the technical action programmes of the Department of Livestock and Fisheries for this sub-sector will focus on four major priority areas:

- Aquaculture and floodplain management.
- Reservoir management.
- Aquatic resource identification assessment and management.
- Post-harvest fisheries technologies and regulations.

**Status of fisheries information**

The Lao PDR covers about 202,000 km² of the total Mekong catchment, which accounts for about 97% of the total area of the country. It contributes some 35% of the average annual flow of the Mekong. Data on living aquatic animals is limited: generally speaking, statistical data and information on the economic significance of the fisheries sector is difficult to obtain because of the limited financial support and human resources and the low statistical knowledge of fishery scientists. A lack of information and statistical data on inland fisheries has undermined management of these resources. With a growing population, it is important to maintain the contributions of inland fisheries to food security and to increase production. Concerted action is required in this regard: there is a need to improve the collection of statistical data that can be interpreted in economic, scientific and ecological terms for use in planning and development.

Statistical data is not readily available or, if available, is scanty and not always accurate. For example, fish production data for inland fisheries is only available through estimates calculated by sampling the yield per unit of a particular type of water body, then multiplying by the water area. The main reasons for the poor knowledge of these fisheries lie in the large number, dispersion, variety and dynamic nature of inland water bodies and the diversity of their aquatic fauna. The complex and numerous array of fisheries gives rise to a variety of distribution and marketing systems. This makes the collection of data costly, but when weighed against the contributions of the sector in the larger socio-economic context, it may be well worth undertaking.

**Luangprabang fisheries survey**

The fisheries survey was carried out in a random sample of 27 villages in Luangprabang Province, in northern Lao PDR, between May and August 1999 by five LARReC staff and nine provincial and district staff, with technical support from the Assessment of Mekong Fisheries Component (AMFC). The survey was one of a number to be implemented by LARReC in selected areas of the Mekong River Basin in the Lao PDR, with assistance from the AMFC (1997-2003) under the Mekong River Commission Fisheries Programme, and in conjunction with relevant government agencies.

The objective of the survey was to provide mainly quantitative but also qualitative information on fisheries (including the collection of aquatic animals) in northern Laos, exemplified by Luangprabang Province. Basic fisheries-related information was collected at the village, household and individual level. The information includes the degree of...
participation by people in, and their dependence on, fisheries and collection of aquatic animals, the absolute and relative economic importance of fishing in rural people’s livelihoods, and information on fishing gear, fishing activities, fishing grounds and fish consumption. The following is a brief analysis of the main features of the data; for further analysis, the full data set is available on CD-Rom.

The methodology applied was a questionnaire-based survey of a random sample of 27 villages, 179 households and 500 individuals. This sample size is believed to have sufficient power to make relevant assessments of the total fisheries in the whole province with due consideration to the statistical uncertainties involved in extrapolation.

Though a mountainous region, Luangprabang Province is rich in aquatic resources with 1,053 km of major rivers, 7,284 km of medium rivers, and 17,722 km of small rivers and streams (according to GIS analysis of stream data provided by the MRC Watershed Classification Project). There are few floodplain areas, but rice fields are habitats for fish and aquatic animals that are extensively exploited. In 63% of the surveyed villages, more than 95% of the households are reported to be dependent on fishing and collection of aquatic animals for subsistence. In another 22% of villages, between 75% and 25% of the households are likewise dependent. Fishing and collection is overall ranked as the third most important activity after rice farming and livestock rearing.

In rural Laos in general, the economy is largely non-monetary and fishing, in common with most activities, does not appear to be important for cash income. Two surveyed villages (7.5%) have professional (commercial) fishermen and 10% of the households in those villages get their main income from fishery related activities. Overall, 83% of these households report fishing and collecting aquatic animals and in these households, on average, 41% of the household members, of whom 20% are children, are actively involved. A large variety of equipment is used.

The most important fishing grounds (habitats) in the area surveyed are rivers and streams of varying sizes followed by rice fields. April and May are the most important fishing months followed by March, June and July. However, fishing activities are reported throughout the year. Aquaculture is not as important as capture fisheries in this area. Only four households (2%) ranked it as important for food, and only one household (0.5%) for income. The average yearly production per household from aquaculture ponds was the same as the average catch of the much larger number of households fishing in rivers.

Community-based management systems for living aquatic resources are widespread. 52% of the villages report having some form of local management system for their resources. These include conservation zones and restrictions on seasons, gear and fishing certain species. They often apply to migratory species and relate to specific spawning sites. Some of these fish stocks are very likely trans-boundary in nature, that is, they migrate to and from different countries. However, the current management activities appear to relate only to local fishing effort and access.

Most of the fish and aquatic animals caught are consumed in the household of the fisher. However, a sizeable amount is given away to other households or villages, sold, or used in barter trade. The average yearly per capita consumption of all fish and aquatic animal products is estimated to be 29 kg per person per year, with fresh fish accounting for between 16 and 22 kg (at 95% confidence level). Fish and aquatic animals account
for 43% of the total animal product consumption, but for 55%-59% of the total animal protein intake if standard conversion rates are applied in order to correct for differences in the protein content of various foods. These figures correspond well to comparable survey data. The survey includes information on the fishing practices of 500 individuals in all age groups. 55% of the 500 individuals interviewed reported that they fish or collect aquatic animals. The individual yearly catches show a mean of 54 kg with a range within 30 kg to 78 kg. The median is 10 kg, meaning that half of the fishing respondents catch less than 10 kg per year.

There are various methods of calculating total catches of fish (and other aquatic animals) for the whole of Luangprabang Province, based on extrapolations of the available data. The relatively small sample, combined with the significant standard deviations in catches, provides for estimates with an error margin of about 5,000 tonnes. However, a very good fit between the extrapolated household consumption figures and the extrapolated individual catches is found. The extrapolated data on consumption of fresh fish corresponds well with the consumption data from the Lao Expenditure and Consumption Survey (LECS) 1997/98 for Luangprabang and the northern region. Thus, the estimated total production of Luangprabang Province is between 10,000 and 15,000 tonnes per year, of which about half is fish and aquatic animals that are processed, primarily dried, after catch. The survey also confirms the findings of the 1998/99 Agricultural Census, and the LECS, that fishing and collection of aquatic animals is very important for subsistence and is integrated with all aspects of people’s livelihood strategies. According to the Agricultural Census, 35,100 households, or 56% of the total households in the province are engaged in capture fisheries.

**Frog culture in Park Ou District, Luangprabang**

In 2002 LARReC held frog feeding trials in Luangprabang province, in villages close to the Nam Ou River. The results from these trials were very encouraging: these areas have good conditions for raising frogs with minimum costs. Feed is mainly earthworms, which are plentiful here. The growing season is from June to November, during which time the frogs grow to 150-200 g. December and January are too cold for the frogs and they will not eat.

The trial was conducted with 18 families in Park Ou district, in fenced earth ponds with a small pond in the middle. The size of these earth ponds is 2 x 2 metres, and the fence is 120 cm high. The frogs were fed with catfish feed and earthworms in three different combinations: 100% earthworms, 50% earthworms - 50 % catfish feed, and 25% catfish feed - 75% earthworms (total 18 earth ponds). The trials were managed by the farm households and the frogs were monitored for growth and survival.

The frogs in all trials showed good growth and good survival. The use of earthworms as a feed increased the growth of the frogs and reduced the cost to the farmers. Future activities will continue to focus on finding low-cost technologies for producing frogs at the household level, and making frog spawn available in the uplands.

**Research on Mekong prawns**

Prawns from the Mekong River were identified as important for study by LARReC researchers: because of their large size and popularity the prawns may have economic potential if it were known how to raise them in ponds. However, there was no informa-
tion available on how to culture or reproduce them. In 2002, LARReC hatched larvae in small aquariums in the laboratory. Despite all efforts with different start feed, all larvae died after five to seven days. In 2003, LARReC again began prawn trials at Na Luang Fishery Station in Luangprabang. This research aimed to hatch, larvae, nurse them as juveniles and grow them to marketable size. Some adults are to be kept as brood stock for breeding next year.

Incubation of eggs was conducted in March with brood stock already at the Na Luang Fisheries Station. Females with eggs were collected and kept for hatching in glass aquaria and mesh hapas in a pond. The hatching rate in the aquaria was approximately 85%. In the hapas, the hatching was estimated at 70% (the females were collected early to avoid cannibalism). The larvae were nursed for 45 days (20 March to 5 May) in glass aquaria, net hapas, and in an earthen pond. In the aquaria, the larvae only survived 16 days. Survival in the hapas at the end of 45 days was 20%, and in the pond 65%. Samples of prawns were measured and weighed every five days. Nursing of juveniles took place for two months (5 May to 6 July), in net hapas and an earth pond. Prawns in the hapas had a 75% survival rate, and in the pond about 90% survival. The grow-out trial showed that the prawns had good survival, but lower than expected growth (average size was 11 grammes). Samples of prawns were measured and weighed monthly.

Aquaculture in the uplands

Participatory farmer trials were held in 2003 in Park Ou district, culturing indigenous fish in household ponds and in cages in the Nam Ou River. Both the pond-based and cage-based trials focused on using locally available feed inputs such as rice bran, broken rice, and corn in aquaculture. The cage trials were also trying to find an option for producing fish in areas where appropriate land for pond construction is limited.

Although these trials showed that small-scale aquaculture can be a successful activity in the uplands, more work needs done to find locally available feed inputs and improve availability and quality of fish seed in upland areas.

Conclusion

In conclusion it can be said that there is a rich biodiversity of fish, crustaceans, amphibians, mollusks, reptiles and plants that are utilised in Lao rice fields. These aquatic animals play an important role in the livelihood of the local people, particularly in providing protein to the rural poor. The collection of aquatic animals is an activity widely practised within the whole community and engaged in by rich and poor alike, although the types of species targeted and the areas where they are caught may vary depending upon wealth level.

Women play an active role in the collection of aquatic species from paddy fields and adjoining wetlands, streams and channels. They are also the principal people engaged in the preservation of aquatic products.

To be able to maintain this rich biodiversity there is a need to manage the paddy field, i.e. both rice production and fish culture. It is also crucial to understand how the systems inter-connect. The intensification of agriculture and use of chemicals will surely have an impact on the living aquatic biodiversity and the livelihoods of rural people. The
replacement of these resources through the culture of fish is not guaranteed since access to suitable land for pond construction is limited and the open-access features of the rice field also apply to privately owned fish ponds. The impact therefore, of a loss of aquatic biodiversity will be greater on the poor, who are more reliant on such resources.

**Comments and recommendations**

Aquatic resources are important in people’s livelihoods in terms of consumption and as a household activity.

- Household fisheries need to be better understood, and sustainable use and management needs to be promoted, where appropriate, through community based management (co-management) of common property or open-access fisheries (such as rivers, streams and rice fields).

- Aquaculture at the household level can be successful, but is still practised in very few households.

- More work should be done to develop appropriate methods for small-scale aquaculture. Constraints that need to be addressed include:
  - Lack of basic information among farmers.
  - Lack of fish seed (both quality and quantity).
  - Lack of low-cost, locally available fish feed.

- There is a lot of potential for better integrating aquaculture into the farming system.
  - There is a need for continued coordination and collaboration among the partners to address specific needs.

**Author**

Xaypladeth Choulamany, Deputy Permanent Secretary, Ministry of Agriculture and Forestry, Lao PDR. E-mail: Xaypladeth@yahoo.com

**Bibliography**


The Department of Livestock and Fisheries (DLF). 1995. *The fishery development sector in Lao PDR.*


DLF. 1999. *Policy framework for fishery development in Lao PDR.*

DLF. 2000. *Annual report on Livestock and Fisheries Development in Lao PDR.*


Integrated Fruit Tree Systems in Luangprabang: Scaling-up Sustainable Technologies and Processes

Chun Lai, Houmchitsavath Sodarak, Bounthanh Keoboualapha and Bruce Linquist

Abstract

In 1999, the Lao National Agriculture and Forestry Research Institute (NAFRI) teamed up with several international partners to establish the Integrated Upland Agricultural Research Project (IUARP), which aims to develop sustainable upland livelihood systems through an integrated, participatory, on-farm research approach.

Based on findings from a participatory problem diagnosis exercise, exposure through field days and cross visits with other farmers, as well as interaction with IUARP staff, about 20 technology options have been selected and tested by farmers.

Two of the main problems identified by farmers were declining rice yields and limited opportunities for income generation. Many farmers consider fruit trees as a good option for generating cash, which can be used to purchase rice if necessary. While farmers liked this idea, their major concern was the time lag before harvesting fruit - usually five years or longer. A sustainable system that ensures a continual source of benefits was developed, integrating an annual crop such as upland rice with a medium-term fruit such as pineapple or banana, and longer-term fruit trees planted along contour hedgerows.

Integrated fruit tree systems have clearly emerged as the most popular technology among farmers. Within the past three years, over 60 farmers have been testing and expanding this technology in the IUARP villages. To meet the increasing demand for fruit tree planting materials, some farmers were trained in nursery development. Since then, three farmer nurseries have been established, mainly to produce fruit tree seedlings. Meetings between nursery operators and interested farmers were facilitated to negotiate ‘fair prices’ for seedlings that the latter were willing to pay, generally about half of the prevailing market prices in nurseries in Luangprabang.

Moreover, to enable the expansion of medium-term fruits, a ‘sucker bank’ system was conceived. Suckers are fruit-bearing shoots that can be used as planting material. In this system, farmers who received pineapple suckers from IUARP as planting material agreed to provide, after three years, the same number of suckers to interested farmers. Thus, a sustainable source of planting material has been established, ensuring that more farmers can develop such systems on their own in the future.

A downward spiral in the Lao uplands

In the Lao uplands, land use pressures have been intensifying due to increasing population, relocation of villages, spontaneous migration to areas along roads, and the implementation of new land allocation policies. This process has led to reduced fallow periods - now typically only two to three years - in the traditional slash-and-burn, rice-based
upland farming systems. Shortened fallow periods have rendered many of these systems unsustainable. Soil erosion, weed pressure and labour inputs have generally increased, while yields have declined, fuelling the increasing incidence of poverty in the uplands.

This downward spiral has created a demand from both farmers and government agencies for developing sustainable technologies and processes to improve upland farmer livelihoods.

Over the years, a considerable amount of research has been conducted to develop suitable upland technologies. However, adoption by farmers has been limited. The high diversity encountered in the uplands - in terms of biophysical, socioeconomic and market conditions - is one key reason why adoption has been slow. With such wide diversity, as well as changes induced by external factors, technology recommendations must be site specific. This points toward the use of participatory and adaptive research and development approaches, through which researchers, extensionists and farmers can work together to develop technologies and processes appropriate for specific conditions.

In 1999, NAFRI teamed up with several international agricultural research centres (IRRI, ICRAF, CIAT, IWMI and ACIAR) to establish the Integrated Upland Agricultural Research Project (IUARP), with the objective of developing sustainable upland livelihood systems through an integrated and participatory research approach. The IUARP works in seven villages in Park Ou district, Luangprabang province, northern Laos. These villages represent wide ethnic, socioeconomic and market diversities.

In this paper, we share our experiences with developing integrated fruit tree systems, which hold great potential for scaling-up sustainable technologies and processes.

**Integrated fruit tree systems: a potential solution?**

Based on findings from a participatory problem diagnosis exercise, exposure through field days and cross visits with other farmers, as well as interaction with IUARP staff, a wide range of technology options have been selected and tested by farmers. In the first year of the IUARP, 50 farmers were involved in testing seven different options. In the second and third years, between 200 and 300 farmers - representing about half of the households in the seven villages - were evaluating some 20 different technology options. Thus, participating farmers are in various stages of adapting, expanding and integrating suitable technologies into their farming systems.

**Problems being addressed**

Two of the main problems identified by farmers were declining rice yields and limited opportunities for income generation. Many farmers consider fruit trees as a good option for generating cash, which can be used to purchase rice if necessary. While farmers liked this idea, their major concern was the time lag before harvesting fruit - usually five years or longer.

---

1 International Rice Research Institute (IRRI), World Agroforestry Centre (ICRAF), International Centre for Tropical Agriculture (CIAT), International Water Management Institute (IWMI), Australian Centre for International Agricultural Research (ACIAR)
To address this concern, a sustainable system that ensures a continual source of benefits was developed, integrating an annual crop such as upland rice with a medium-term fruit such as pineapple or banana, and longer-term fruit trees planted along contour hedgerows.

The IUARP team has assisted interested farmers by providing training, planting materials and follow-up support for fruit tree production. During 2001 and 2002, a range of planting materials was provided to interested farmers, including fruit tree seedlings (1,560), pineapple suckers (60,400), banana suckers (1,000) and paper mulberry seedlings (6,600). To date, pineapple has emerged as the most popular medium-duration fruit. By 2003, some farmers who had planted pineapple in 2001 were able to harvest fruit to sell on local markets.

**How to cope with growing demand?**

Integrated fruit tree systems have clearly emerged a popular technology among farmers. Over the past three years, more than 60 farmers have been testing and expanding this technology in the IUARP villages.

In the first year, it was mostly better-off farmers who were interested in evaluating fruit trees. However, other farmers are increasingly testing these systems as they see the benefits emerge. Interestingly, many farmers have been developing some of their fields into intensive fruit tree based gardens. This has been done by adding other plant species into the system (e.g., non-timber forest products, vegetables), raising small livestock on the easily available forages, and where water is available, constructing and stocking fishponds.

**Farmer nurseries**

To meet the increasing demand for fruit tree planting materials, and to develop greater self-reliance in planting material production, some farmers were trained in nursery development. Since then, three farmer nurseries have been established, involving six households. The nurseries will mainly produce fruit tree seedlings.

These nurseries have proven to be a very good entry point to work fine with farmers. Tangible benefits - seedlings - can be produced after just a few months. The nurseries provide a useful venue for meetings and training activities. They are also cost-efficient, as local materials can be used or recycled (e.g. as containers for growing the seedlings), and seedling transport costs and time are greatly reduced.

Moreover, farmer nurseries may potentially provide livelihoods if there is sufficient demand from villagers and/or projects for the seedlings produced. Ultimately, it is hoped that this process will lead to community self-reliance in planting material production.

IUARP staff helped to facilitate meetings between nursery operators and interested farmers to negotiate ‘fair prices’ that the latter were willing to pay for seedlings. The prevailing market prices in Luangprabang nurseries for fruit tree and other seedlings were provided to the nursery farmers and their potential customers. Then they were asked to indicate their relative preference for the various species, and to come to agreement on what would constitute fair prices for the farmer-produced seedlings.
average, the agreed upon fruit tree seedling prices were about 60% of the market prices in Luangprabang. The fruit trees in highest demand were rambutan, litchi, sapota, mango, tamarind, lime and guava (see table 1).

<table>
<thead>
<tr>
<th>Species</th>
<th>Preference**</th>
<th>Market prices in Luangprabang</th>
<th>Farmer agreed ‘fair prices’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Kip</td>
<td>Kip</td>
</tr>
<tr>
<td>Rambutan</td>
<td>5</td>
<td>15,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Sapota</td>
<td>4</td>
<td>10,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Litchi</td>
<td>5</td>
<td>5,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Mango</td>
<td>4</td>
<td>15,000, 3,000*</td>
<td>5,000, 1,700*</td>
</tr>
<tr>
<td>Sweet tamarind</td>
<td>4</td>
<td>10,000</td>
<td>7,000</td>
</tr>
<tr>
<td>Lime</td>
<td>4</td>
<td>5,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Guava</td>
<td>4</td>
<td>5,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Pomelo</td>
<td>3</td>
<td>6,000*</td>
<td>4,000*</td>
</tr>
<tr>
<td>Jujube</td>
<td>2</td>
<td>10,000*</td>
<td>6,000*</td>
</tr>
<tr>
<td>Longan</td>
<td>1</td>
<td>5,000</td>
<td>2,500</td>
</tr>
<tr>
<td>Jack fruit</td>
<td>1</td>
<td>5,000*</td>
<td>3,000*</td>
</tr>
<tr>
<td>Custard apple</td>
<td>1</td>
<td>5,000*</td>
<td>3,000*</td>
</tr>
<tr>
<td>Papaya</td>
<td>1</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>Paper mulberry</td>
<td>3</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

*non-grafted; **1=low, 5=high

**Sucker banks**

During a facilitated meeting of 26 farmers (20 existing participants and six ‘new’ farmers), the issue of how to establish 'sucker banks' was actively debated. Given that the IUARP had already provided some 60,000 pineapple suckers and 1,000 banana suckers to farmers in 2001 and 2002, it was felt that these farmers should be willing to make some suckers available to new farmers who were interested in establishing fruit tree gardens.

After considerable debate and discussion, the farmers reached consensus on the following arrangements:

- The 2001 and 2002 farmers will give back to the sucker banks 50% of the pineapple suckers they initially received within three years of receiving them, and 100% of the banana suckers within two years.
- The new farmers (starting in 2003) agreed to give back 100% of pineapple suckers they received to the sucker banks in three years, and 100% of banana suckers in two years.
- The suckers will be distributed to new farmers between April and May.
- Old farmers will take responsibility for collecting the suckers, but not for their transportation. Therefore, the new farmers will come and collect the suckers.
The distributed pineapple suckers should be root suckers, not from the top of the pineapple fruit.

At the end of the meeting, the IUARP team proposed and discussed with farmers how to implement the activities. It was agreed that for 2003 the project would provide pineapple suckers to new farmers interested in developing an integrated fruit tree garden. The new farmers would also purchase fruit tree seedlings from the farmer nurseries (if these species were available) or through the IUARP (if desired species were not available from the farmer nurseries) at the agreed upon fair prices.

In 2004, pineapple suckers from the 2001 farmers should be available for the initial sucker banks, which will benefit new farmers who wish to test planting pineapple in integrated fruit tree systems. It is extremely important both to ensure that this process works smoothly this year and to establish suitable arrangements and mechanisms for the villagers to manage and monitor the sucker banks in the future.

**Towards a sustainable and profitable system**

By successfully negotiating the terms for farmer-produced seedling prices and the sucker banks, a system has been established that can potentially provide sustainable sources of planting materials for farmers, as well as a livelihood option for the farmer nursery operators. The general concept of this system is illustrated below (figure 1).
Future considerations

The IUARP team is in the process of finalising their participatory monitoring and evaluation (PM&E) strategy, as well as providing training to staff and farmers on the use of selected PM&E tools such as farm mapping, focus groups and self-assessment techniques.

Among other things, the PM&E will collect and analyse information in order to track the evolution and impacts of integrated fruit tree systems and farmer planting material production.

Will farmers invest?

In order to scale-up integrated fruit tree systems to other farmers and villages, as well as to enable the farmer nurseries to become sustainable and profitable without further IUARP inputs, interested farmers will have to be willing to invest.

Based on the experience thus far, farmers usually start with a small area - say 0.1 hectare - for establishing and evaluating fruit tree gardens. If these become successful, farmers then may decide to expand their gardens in subsequent years.

A farmer would have to be willing and able to make the following investments to establish a 0.1 ha integrated fruit tree garden:

- Invest about 125,000 Kip (or US$12) as start-up capital to purchase fruit tree seedlings - assuming 6 x 6 m spacing and an average seedling cost of 5,000 Kip from farmer nurseries.
- Have access to pineapple and/or banana planting material from sucker banks.
- Be able to collect material (seed, cuttings) for hedgerow establishment from local sources.
- Be willing to provide the necessary labour inputs.

Finally, there are some key questions that should be answered as outcomes emerge and relevant information becomes available:

- Can farmers produce high-quality seedlings (e.g., grafted fruit tree seedlings)?
- How much income can they generate from selling seedlings, and who will buy?
- Will farmers be willing to invest to start-up integrated fruit tree gardens (see above)?
- Will the ‘sucker banks’ be able meet the growing demand of farmers for pineapple and banana suckers?
- What will happen to prices in future years as pineapple and other fruit production expands?
- Can farmer seed production (e.g. stylo) be feasible and profitable in the IUARP area?
- What types of further support are needed by farmers (e.g. training and follow-up on grafting techniques, provision of updated market information)?
Authors

Mr. Chun K. Lai is the senior capacity building specialist for ICRAF. e-mail: ChunKlai@cs.com

Mr. Houmchitsavath Sodarak is the Director of the Northern Agriculture and Forestry Research Centre/NAFRI in Luangprabang, e-mail: frclpb@laotel.com

Mr. Bounthanh Keoboulapha is Deputy Head of the Provincial Agriculture and Forestry Office, Luangprabang, e-mail: laoirril@laotel.com

Mr. Bruce Lundquist, is the adviser for the Integrated Upland Agriculture Research Project, email: b.linquist@cgiar.com
Strategies for Scaling Up: Technology Innovation and Agro-enterprise Development

John G. Connell, Joanne Millar, Viengxay Photakoun and Ounkeo Pathammavong

Abstract

Upland farming systems in the Lao PDR are complex and diverse. For promising agricultural technologies to be successful, they must be accompanied by new approaches to (a) integrate the technologies into the existing farming systems and (b) make markets accessible.

To address the first of these issues, the Lao Ministry of Agriculture and Forestry (MAF) and the International Centre for Tropical Agriculture (CIAT) have developed participatory extension approaches to introduce forages to upland farmers. These methods encourage farmers to take the 'raw technologies' (well adapted and productive forage varieties), and innovate ways to fit them into their production system. This has led to increased livestock productivity and reductions in areas of shifting cultivation, which in turn has released time, allowing farmers to further diversify their livelihood systems.

Market issues are being addressed through the introduction of an agro-enterprise development approach, examining the whole supply-chain from producer to consumer, and involving all actors along the chain to identify 'critical points'. Solutions to bottlenecks can lie not in increasing productivity, but rather in gaining efficiencies further down the chain, such as quality improvement or 'value adding'. Business development services then need to be developed, to continue to serve the chain and ensure it remains responsive in the long term.

Introduction

Considerable research has been carried out on the production systems and issues affecting the uplands. The diversity and complexity of upland production systems make research a challenging task. Even when promising technologies have been identified, this complexity and diversity has continued to inhibit them from improving livelihoods or reducing shifting cultivation (Connell 2001). It appears that in addition to identifying promising technologies, additional issues need to be addressed if impacts are to emerge:

- **Technology development and adaptation**: Improved technologies derived from research require some degree of adaptation and innovation. If they are to be integrated into local farming systems. Indeed, new production systems seem to be needed before technologies can affect livelihoods.

- **Linking farmers to markets**: Highland areas have advantages for many products (e.g. fruit, NTFPs), but rural communities are not well-linked to markets and not able to respond to market demands.

These are two areas that MAF, together with CIAT, have been addressing. While they are two quite different issues, they have been grouped together for discussion in this
paper as they both have significant roles to play in helping to realise the opportunities promised by new technologies in the generation of improved upland livelihoods.

**Technology development and adaptation: the case of forages**

The significant role of market-oriented livestock systems in providing options for farmers to diversify their farming systems away from shifting cultivation is described by Phengsavanh et al. (these proceedings). A key factor enabling farmers to develop these livestock systems is the availability of a managed feed resource. This allows farmers to pen their animals closer to home and to provide a greater intensity of management and health inputs. Without such a feed resource, none of these other inputs are possible (Hansen 1998; Horne 1998; Pravongvienkham 1998).

The use of forages as a managed feed resource for livestock (cattle, buffalo, pigs, fish and poultry), has long held the promise of increasing productivity, generating income, and so replacing shifting cultivation. Various projects over the years have attempted to introduce forages into the Lao PDR and other countries in southeast Asia, but have been frustrated by the complexity of the system and ultimately failed to leave behind any significant impacts (Horne et al. 2004).

Recently however, using participatory research approaches, MAF and CIAT have been able to identify a small range of broadly adapted and robust forage varieties that are well suited to the environmental and farming systems of the Lao uplands1. These are described in more detail in Phengsavanh et al. in these proceedings. These varieties could be considered ‘raw technologies’, which when applied in the right way in the right place, have delivered significant livelihood and environmental impacts to smallholder farmers in the uplands, including:

- Allowing increases in herd size (e.g. from 2-5 cattle to 10 or more).
- Enabling fattening of cattle and buffalo for regular sale (e.g. selling one every 2-3 months).
- Reducing time needed to raise pigs to saleable age (e.g. from 12 months to 5-6 months).
- Increasing the rate of twins born and survival of goats.

With such improved productivity, farmers have begun to realise that raising livestock can become a reliable source of income, not just of livelihood security. This is a significant shift in attitudes. With this new income from livestock, some have been able to reduce their area of shifting cultivation (e.g. from two hectares to half a hectare or less). The reduction in shifting cultivation has further released time, which farmers have then used to diversify into other activities, thus broadening their livelihood base. The use of forages has therefore provided these farmers with a pathway out of shifting cultivation and out of poverty.

Consider the following case, one of many emerging in the Lao uplands, from Kieuw Talun Nyai village, Xieng Ngeun district, Luangprabang:

---

1 Much of the work referred to in this paper has been conducted as part of the AusAID-funded “Forages and Livestock Systems Project”, managed by NAFRI and CIAT.
To escape from shifting cultivation, Mr. Jong Gor Her bought a cow and two calves. Each year when the cow was calving, it was kept by the house and had to be fed by hand. Jong had time to collect only one basket of local grasses each day. The cow lost weight on this poor diet and the calves were born weak. In the first four years, two calves died out of the four that were born.

After he had planted forages close to his house, Jong was able to feed the cattle twice as much, with only a few minutes needed to collect the forages. Within five years his herd had increased to five adult cattle and ten calves. In the last two years he has been able to sell off 1-2 calves to buy rice and other comforts for the home. With this income his family has reduced their shifting cultivation area from 2 to <0.5 ha. With the time saved in this way, his wife now does embroidery, and Jong is preparing to grow cucumbers as a cash crop.

This is not an isolated or exceptional example. Nor are Jong and his wife ‘model farmers’ who have enjoyed special support. While the overall numbers of farmers with these benefits are still limited, they represent a real trend, which is expected to increase rapidly over the next year.

**From raw technologies to impact-yielding systems**

**Providing a framework for innovation: extension of raw technologies**

These impacts have been gained from new systems for raising livestock, where forages are the main feed source, and the animals are managed close to the home for most of the year. While such new systems for raising livestock in the uplands have long been envisioned, MAF and CIAT did not begin by trying to define or introduce the improved systems to farmers, but rather focused on trying to solve the ‘immediate problems’ that farmers had with feed. It was then the farmers themselves who innovated new ‘impact-yielding systems’ based on forages.

How did all this come about? Starting in 2001, the following process was applied to introduce forages to farmers:

**Site selection**

The project initially selected villages where farmers already spent time collecting native grasses to feed their livestock for some period of the year. Thus ‘cut and carrying’ of feed was already part of the system, and forages simply reduced the time and labour for this, without any systems change being required. In other words, sites where forages were expected to have a role were pre-selected.

**Identifying the immediate problems**

Tools commonly used in Participatory Rural Appraisal (PRA) were borrowed for problem diagnosis, to help farmers to identify the root causes of poor performance in their livestock production. While death from disease was a factor, constraints due to lack of feed were the most common and recurrent problem².

---

² As local grasses disappeared they had to spend longer time collecting feed, gradually reducing the amount they collected and in some cases reducing the number of animals they could maintain.
**Testing options**

Forages planted in small plots were presented as solution to the immediate problem of time constraints in collecting feed. A range of eight forage species were provided for farmers to assess which performed best under local conditions, and to then select those most suitable for feeding their animals\(^3\).

**Follow-up and expansion**

District staff visited the farmers regularly to check the establishment of the plots and their initial use as feed. Discussions were held within a focus group of farmers to share lessons learnt. Later this group related their experiences back to the whole village, encouraging expansion of the use of forages within the villages.

The initial expansion of forages was based on farmers’ ability to solve the immediate problem of lack of time to collect feed. Most farmers were satisfied with the convenience of having feed nearby and the time this saved. A few farmers, however, thought beyond the immediate problems. They noticed a range of other benefits such as improvements in the condition of their livestock, more rapid weight gain, clearer skin, reduced thirst and higher milk production for suckling. They then sought ways to gain more consistently through expanding the area of forage grown, and keeping the livestock closer to their house so that they could be fed on forages more regularly. Thus new ‘impact-yielding systems’ emerged. It is important to recognise that the impacts gained were often quite different from simply resolving the original immediate problem, as the following case from Xang village, Pek district, Xiengkhuang illustrates;

Mr. Neng cultivated a small area of paddy as well as upland rice, but because of limited feed resources he was not able to keep a draught buffalo all year. Each year he purchased a draught buffalo and resold it at the end of the ploughing season. During this period of peak labour he had to spend two to three hours each day collecting feed. Even this was not enough and with the hard work, the buffalo usually lost condition and was sold at a loss.

After using forages to feed his buffalo, he found that not only had he saved time, but the buffalo had improved in condition. So in addition to ploughing his fields, he also made a profit! The following year he increased the area of forages, and was able to sell the next buffalo at a profit. Then, instead of waiting to buy a buffalo for ploughing the next season, he immediately purchased another animal and fattened it during the dry season. By the end of 2003 he had converted all of his upland fields to forages and was regularly fattening buffalo for sale.

It is also important to realise there is more than one impact-yielding system for fattening. For instance, within Xang village, seven other households have begun to follow Mr. Neng’s example. Some choose to fatten cattle and others buffalo; some buy thin animals and others rotate animals from their upland pastures. Almost 70% of the farmers in the village now grow forages for their own animals or for sale. The type of forage grass farmers use also varies, depending on the soil and moisture conditions.

Across the 50 villages where these forages have been trialled, a wide range of new impact-yielding systems are now emerging for cattle, buffalo, pigs and goats.

---

\(^3\) Six to eight species, with sufficient seed to grow plots of 10x10 m. Usually five to eight farmers were involved.
Initiating a problem solving attitude

To a large degree the innovation that farmers have made has been to find ways to integrate the raw technologies of half a dozen forage species into their livestock system. This is by no means a simple matter, or something that can be taken for granted. During the earlier small-plot testing phase, many farmers grew and used forages to some extent, yet their use did not persist or expand. The ‘raw’ technologies do not automatically suggest a result: it is only once a few innovative farmers have adjusted their system based on the raw technologies, and gained impacts, that the potential is revealed. Without this step being taken, the raw technologies remain dormant.

This process may appear to be unpredictable, in that it is not possible to know which farmers will be active in innovation or what new systems they will develop. A few simple mechanisms were used to initiate a problem-solving attitude with farmers. These were:

Problem diagnosis

PRA type tools were used for problem diagnosis, which enabled farmers to define and then focus on resolving their immediate problems. Thus the technical interventions, such as forages, were seen not as ‘recommendations’ to be followed, but rather as potential solutions to be assessed.

Technology options

Providing a range of forage varieties immediately placed the farmers in the position of evaluation. Limiting the initial introduction of forages to a small number of farmers, and small areas, also reinforced the sense of a trial to be learnt from.

Together these two basic mechanisms engaged farmers in a problem-solving process, which led a few farmers to go beyond resolving their immediate problem to thinking about what further benefits could be gained from the technologies. These mechanisms are neither novel nor difficult and are in fact already applied by many projects and development organisations.

‘Creative follow-up’ to consolidate and disseminate innovation

In the first year, farmers had a number of technical problems with establishing their forage plots. Follow-up provided by the DAFO staff was timely and technically competent. They used problems in the field as learning opportunities with the farmers. The reasons for poorly-established plots were quickly understood, enabling the farmers to feel confident they could correct these in the following seasons. This ‘technical follow-up’ was essential at this early stage and meant that farmers were able to properly establish their plots and so grow some forages to begin feeding their livestock. While the plots were small, generally providing insufficient forage to generate impacts among the cattle, the time and labour saved in collecting native grass feed was sufficient to interest most farmers and to drive expansion in the use of forages in the second year.

4 Farmers have also innovated new technologies. The first of these is to expand their area of forages by growing from cuttings, and the second is to produce leaf meal from Stylo, one of the legumous forage species, so that it can be available as a supplement during the dry season.

5 These were mainly associated with the small size of forage grasses, i.e. seeding too densely, too deep or too shallow; removal of seed by ants; seeding too early; washout by heavy rains etc. These problems were greatly diminished in the second year, and by the use of cuttings instead of seed to expand plots.
During the first year, a few farmers did note an improvement in the condition of their animals and began to innovate new systems that would lead to impacts. Thus in addition to carrying out ‘technical follow-up’, DAFO staff also carried out ‘creative follow-up’ to the support and capture innovations. DAFO staff actively observed how farmers were using the forages, and were sensitive to any special benefits or impacts that were emerging. When these were observed, staff would first support the farmer, so that the effects and impacts were recognised and noted. Staff then used a number of ‘farmer to farmer’ approaches to consolidate the impacts and disseminate them to other farmers. These approaches were applied in a phased manner as the different needs and opportunities required.

**Focus group meetings within villages**

The small group of farmers who had grown forages on trial formed a focus group. At key times staff brought them together to discuss their experiences. In this way they all became aware of ways to solve problems, and of the benefits emerging from forages.

**Cross-visits**

As impacts emerged with a few farmers in a few villages, selected farmers were taken on cross-visits to these villages. More important than any technical understanding that they gained was the chance to witness forages being grown extensively and see the benefits of using them as a regular feed source.

**Village planning and interest groups**

Planning at village level did not play a large role until impact-yielding systems became available. When these were then introduced, the farmers could focus and objective shifted from how much they wanted to expand their forage plots, to how raise their livestock according to the new impact-yielding systems. Such planning implicitly contributed to consolidation of interest groups with common goals (small or large animals).

Focus group meetings, cross visits and village planning were together critical in reinforcing the new systems and their impacts with the few farmers who had independently begun to explore and establish them. Disseminating and exchanging these with other farmers helped to stimulate further refinement and innovation within the broader population of farmers using forages. Without this consolidation and dissemination, isolated occasions of new impact-yielding systems might have been missed.

Various activities such as focus group meetings etc. are commonly applied when introducing technologies to farmers. If they also aim to support innovation by farmers, staff must be prepared to: (a) be familiar with how technologies are applied and be sensitive to any innovation by farmers, and then (b) use farmer-to-farmer approaches to consolidate the innovations, and in turn stimulate further innovation across sites.

‘Technical follow-up’ is not yet a regular practice among DAFO staff, and this ‘creative follow-up’ was a new and more challenging role to require of them. To help DAFO staff to be sensitive to emerging innovations, they received on-the-job training, which included them writing a case study of selected ‘champion farmers’ (those farmers who

---

6 The focus group was the small group who made the initial forage usage trials. They can be considered to be a sub-group of the large ‘interest group’ of farmers who were interested in raising livestock.
were doing better than others). The case studies focused on (a) factors that had previously limited the farmer's livestock production; (b) the benefits they had noticed from forage use, and (c) their plans for improving livestock raising in the future. The studies were then discussed within each province through peer review, to encourage staff to be more analytical and more aware of issues affecting farmers' decisions, and to ensure that staff were aware of the whole range of innovations and impacts that was emerging. The cases were then used as the basis for selecting sites for cross visits.

**Accelerating impacts**

It took three years to move from identifying immediate problems, to identifying new impact-yielding systems through farmers' innovation. With these systems maturing, it should now be possible to short-cut the process and directly introduce the new impact-yielding systems to farmers at new sites. With the confidence inspired by the impacts already gained, more farmers might begin to apply forages, and apply them in a substantial way to gain impacts more quickly.

Forages are a simple technology. The learning curve for planting a plot of forage grasses or cutting it to feed to livestock is low compared to, for instance, that of learning the procedures for livestock vaccination. While the technology barrier is low, the livestock production systems and opportunities are diverse (Pravongviengkham 1988), so farmers may still need to innovate to gain impacts. As the potential opportunities from forages become more evident, there will be a strong urge to disseminate them as widely as possible. It will be important to understand: (a) how quickly the use of forages can be scaled-up to new areas, and (b) how much support will be needed within a site to allow its effective establishment. The key issues appear to be the following:

**Issue 1 Maintaining farmer innovation**

Maintaining farmer innovation is likely to remain important in the uplands for two reasons:

(a) The highland environment is diverse. If presented with ready made impact-yielding systems, new farmers will still need to adjust and tailor systems to fit their particular conditions.

(b) In existing forage villages, farmers will soon begin to face a set of ‘second generation’ problems, including: managing soil fertility to maintain forage yields, dealing with animal health interventions as livestock become more concentrated, and dealing with community issues when extra stock place burdens on local resources, such as water supplies.

These second-generation problems are not unexpected and a range of options already exists for overcoming them, but farmers will need to be innovative in how they apply these ‘solutions’ to fit their own situations.

**Issue 2 Levels of support required**

District staff have provided high inputs of time for follow-up to support the development of these impact-yielding systems. With these new systems now proven, it should be possible to reduce this level of follow-up. Some assessment is needed of the degree of follow-up that will be required, and for how long, to ensure that forages are still well established.
Issue 3 Management of extension

Extension has previously been conducted in the Lao PDR on a limited scale. Widespread introduction of forages will require effective strategies to manage extension, including staff capacity building, and planning and monitoring of complex activities.

These issues are being researched by a new project, Accelerating Impacts from Participatory Research, funded by the Australian Centre for International Agricultural Research, or ACIAR (Millar et al. 2003). The project will examine the use of different extension approaches to introduce impact-yielding systems to farmers and how farmers then apply forage technologies, including whether they continue to innovate, and what level of support is still needed. The project will also examine the administrative and human resource requirements that are needed to conduct extension in the uplands.

In the lowlands, extension usually aims to introduce new 'component technologies' such as a new variety of rice, or a new cash crop, within an existing production system. In the uplands it appears that such component changes are not sufficient, and that systems changes are needed before farmers will gain significant impacts. Thus in the broader context of the challenges facing extension in upland areas, the project will be examining the issues of scaling-up the use of new systems (in this case 'livestock production based on forages') in a complex environment.

Linking farmers to markets

The uplands have often been regarded as a disadvantaged area, but many of the environmental conditions in the uplands can be seen as an opportunity for particular livelihood activities (such as crops suited to cooler areas and livestock production). A common problem limiting the achievement of this potential is the lack of access to markets. In many cases the solution to this has been to search for a market which will be willing to purchase the product for an acceptable price. This fails to address the issue of the underdeveloped market structure in the Lao PDR, including the poor flow of market information, the absence of checks and balances to ensure quality, and a lack of services to support the development of enterprises (GoL 1999). Unless these underlying issues are addressed, then solving marketing problems, product by product, will at best be a piecemeal approach.

This is a new area of research for NAFRI and CIAT, which have begun to examine these issues through a new project in Xieng Khouang and Luangprabang. The Small-scale Agro-enterprise Development for the Uplands (SADU) project commenced in 2003. The project has two underlying principles:

- That farmers must respond to market requirements, and should not expect that the market necessarily accepts what they want to produce.
- That assessment of market opportunities and constraints should be a participatory process which involves all actors.

This project has two core approaches (Lundy et al. 2004):
**A territorial focus**

This means that the project focuses on a geographical area, and aims to enable the farmers in that area to identify products for development as enterprises, and to learn how to access markets. Thus the focus is on enabling farmers, rather than improving the performance of a commodity or a sub-sector. At later stages of development, the territorial focus also means that the different resources and actors in the same area can be better coordinated to work in an integrated manner.

**Supply chain focus**

A market chain consists of the producers, local collectors, traders, processors, retailers and consumers who are interdependent. It is possible that by influencing the activity of traders or wholesalers, through interventions such as improved processing and packaging, farmers’ products are better able to compete in the market place.

The agro-enterprise development approach being taken is quite simple:

- **Livelihood and production assessment:** this enables villagers to assess which products they believe they have the capacity to develop commercially.
- **Market opportunity identification:** with the farmers’ participation, these potential products are then assessed at the market place for their demand in terms of quantity, quality, prices and trends. Villagers will then be able to make an informed decision on which products they want to focus on.
- **Supply chain analysis:** all stages in the market chain are surveyed and then analysed with all the actors involved to identify critical points which need to be resolved. This participatory analysis allows all actors to understand their interdependence, and also generates a greater degree of cooperation.
- **Action plan:** activities to resolve critical points are identified and implemented.

This is a straightforward approach, but its strength lies firstly in that it works across the whole supply chain and is not confined to any individual part, such as the suppliers. Secondly, the joint analysis of constraints and identification of critical points by all actors together generates a sense of cooperation towards a common goal for all. Development projects are very familiar with working alongside villagers to improve the supply of products, but for many products the critical points which impede development exist at other points in the chain. One example can illustrate this:

*Vegetables can be grown in Xiengkhuang cheaply with good flavour and without use of chemicals. Despite these advantages, they are difficult to sell on the large Vientiane market due to damage during transport. If Xiengkhuang traders could improve their methods of packing, vegetables would arrive on the market with a better appearance and so take advantage of their better flavour. Another opportunity that has not yet been exploited would be to conduct a campaign to convince consumers in Vientiane of the benefits of chemical-free vegetables.*

Both these points of action are downstream from the field production of vegetables. Yet working to resolve these critical points would result in demand being transferred back up the chain and so stimulate increased production in Xiengkhuang.
Working on the production end of the chain does play an important role in improving regularity of supply and quality of products. However, it is important to recognise the equal importance of working with traders, wholesalers and processors to resolve the constraints that exist there.

There are many products and each product will have a market chain with its own particular issues. While working on specific chains to generate real benefits, NAFRI and CIAT will also work at two other levels:

(a) Supporting the development of business development services.

This can include input suppliers, processing for added value, market information brokers and sources of credit. These ‘service providers’ are often lacking in the Lao market environment. They are small businesses in themselves and so once they do emerge, they will be able to stimulate and support expansion along the chain. Indeed, it will be in their own interest to do so.

(b) Institutionalisation of agro-enterprise development concepts.

This can be gained firstly through working with other agencies interested in applying agro-enterprise development, such as projects and NGOs. It is expected that as local authorities become aware of this approach, when faced with problems of specific commodities they will also be able to examine all factors that affect the operation along a market chain. Institutionalisation might also help regulate the enabling factors for more efficient market structures, such as improved tax collection and better logistics.

Conclusions

Technology Development and Adaptation

Working with complex systems in a diverse environment such as the uplands of the Lao PDR is challenging, yet real gains are being demonstrated in forage and livestock systems. Farmers are beginning to gain real impacts and as a result are finding new livelihoods not based on shifting cultivation. This is a significant outcome, and it is worthwhile reviewing the key elements that have made it possible.

The raw forage technologies, while continuing to prove robust and broadly-adapted, required another stage of development where innovative, new impact-yielding systems were developed. In a complex and diverse environment, this is an almost impossible task to address within a conventional research structure. In the case of the forage and livestock systems, it was addressed through introducing the raw technologies to farmers in the context of a participatory extension approach. The technologies were introduced in ways that engaged farmers in a problem-solving rather than a conventional adoption approach based on ‘finished technologies’. The mechanisms to do this were not complex:

Problem solving is stimulated through:

- Conducting problem diagnosis to help farmers identify ‘immediate problems’.
- Providing a range of technologies for farmers to assess.
This was maintained and consolidated through a number of farmer-to-farmer approaches:

- Focus group meetings within villages.
- Cross-visits between villages as impacts emerged.
- Village planning to consolidate interest groups within villages.

The outcomes of this farmer innovation could not have been predicted, either in terms of the systems themselves or in terms of the fact that farmers would emerge as the innovators. Staff had to take on a new role during follow-up, to identify innovations as they occurred and then to quickly communicate these within their own extension group, so that they could be then be used across various sites.

The complex systems and diverse environments are challenges that will apply to most farming systems in the uplands, not just livestock. Research produces the initial ‘raw’ technologies, but these need to go through a further process, to be integrated into new impact-systems, before they can be widely applied by farmers. Rather than attempting to do this within the research sector, it seems that it can be achieved more efficiently by working through extension, which will provide the opportunity for unstructured innovation by a broad population of farmers. This innovation then needs to be ‘harvested’ and further disseminated.

It is useful to reflect on the structural arrangements that have allowed this to take place with forages:

**Stage 1 Identifying the raw technologies**

NAFRI staff worked directly with farmers to carry out participatory research. This resulted in identifying a range of core forage varieties (the ‘raw’ technologies), which were broadly adapted to the environment in the Lao PDR.

**Stage 2 Identifying impact systems**

DAFO staff are using participatory extension approaches (described above) with a broad population of farmers. This is stimulating innovation amongst farmers, who are in turn developing a range of impact-yielding systems. While it is DAFO staff who are implementing this at the field level, the work must still be considered an extended phase of research, and so is led by NAFRI, with support from NAFES.

**Stage 3 Expanding and stabilising the use of systems**

Once new impact-yielding systems have matured, they can be disseminated widely through the extension service. At the same time, second generation problems will emerge and require further technical support and innovation. This implies the need for: (a) participatory extension approaches that continue to be applied to stimulate innovation amongst farmers, and (b) mechanisms to link extension and research, to ensure ongoing technical support for this new round of innovation.

---

7 During the Forages for Smallholders Project (1995 - 1999)
8 Currently being carried out under the Forages and Livestock Systems Project (2000 - 2005)
These experiences and structural arrangements could provide ideas for complementary roles between research and extension in the Lao PDR for the longer term. Identifying mechanisms for on-going interaction between research and extension, to deal with new technical issues in the field and include new farmer innovation in research, is something that has yet to be addressed but will certainly be needed as Lao research and extension institutions mature.

**Linking farmers to markets**

This is perhaps an even greater challenge. Finding models for interaction between research and extension has been difficult. The issue of linking farmers to markets cuts across sectors (such as agriculture, transport and commerce) and geographically spans districts and provinces.

Perhaps one of the first steps is accepting these difficulties and being prepared to work across boundaries, even though there is no single agency with authority over all these sectors. This will be a challenge not just for national agencies and institutions, but also for projects and NGOs, who must be willing to engage constructively with traders, merchants, processors and retailers all the way down the market chain.

**Authors**

John G. Connell, Centro Internacional de Agricultura Tropical (CIAT), PO Box 783, Vientiane, Lao PDR. E-mail: j.connell@cgiar.com

Joanne Millar, Social researcher, Charles Sturt University, NSW, Australia. E-mail: jmillar@csu.edu.au

Viengxay Photakoun, National Agriculture and Forestry Extension Service. E-mail: flspvte@laotel.com

Ounkeo Pathammavong, Centro Internacional de Agricultura Tropical (CIAT). PO Box 783, Vientiane, Lao PDR. E-mail: o.pathammavong@cgiar.org

**Bibliography**


Principles of Direct Seeding Mulch-Based Cropping Systems - A Holistic Research Approach Implemented in Laos

Florent Tivet, Bounsay Chantharath, Ho Tran Quoc, Patrick Julien, Pascal Lienhard, Khamkeo Panyasiri, and Lucien Seguy

Abstract

This paper gives an overview of the holistic research approach implemented by NAFRI and CIRAD and the principles of direct seeding mulch-based cropping (DMC) systems. Conventional agriculture and intensification of shifting cultivation are now being questioned, as they seem unable to face the main challenges of food safety, soil and water conservation, environmental protection and cost reduction. A holistic approach has been developed and managed by farmers, researchers and extension agents, whose aim is to propose agro-ecological systems that are compatible with farmers' strategies and conditions and which can be reproduced inexpensively on a large scale. Agro-ecology is the understanding of dynamics and functions of agro-ecosystems, including all physical, economical and human environments. Direct seeding mulch-based cropping (DMC) systems, replicating functions of forest ecosystem, are one of the components of agro-ecology strategy. The main principle of these systems is that the soil is no longer disturbed by mechanical action, and is always kept covered by former crop residues and dead or living mulch. These systems can be based on annual and perennial crops integrated with one or two cereal or forage crops per year, which may be associated with livestock production. Systems of no tillage and proper use of cover crop stop soil erosion and increase organic matter. Deep rooting cover crop systems improve physical soil structure, increase below-ground insects and microbial communities and recycle nutrients leached deep in the soil. If the quantity and quality of mulch are sufficient, weeds are controlled and water availability for crops increases. This leads to environmentally friendly and technologically and economically efficient agriculture.

Introduction

Poverty alleviation is strongly dependent on soil and natural resource access and preservation. Maintaining productive capacity of the soil is a crucial element for long-term improvement of smallholder conditions. Shifting cultivation is one of the best examples of farmer ecological strategy: with a mosaic of sites under fallow and some in cropping, soil potential is maintained and biodiversity (source of gathering and hunting, medicinal plants, firewood) is optimised by smallholders (Roder 1995; Altieri 2002). However, intensification of shifting cultivation, with longer periods of cropping and more frequent return to a given field, is now being questioned as it seems unable to face the main challenges of food safety, soil and water conservation and environmental protection (Hansen and Sodarak 1996; Roder 1997a). In many countries, including the Lao PDR, the rationale of slash-and-burn collapses under changes in social conditions (increasing population density) and modification of land access. During the past few decades, many
approaches and alternatives, based on bench terracing, reforestation and alley-cropping, have been tested and scaled-up for the uplands without achieving the expected results (Fujisaka 1991; Roder, 1997b). This paper gives an overview of the holistic research approach implemented by NAFRI and CIRAD and the principles of direct seeding mulch-based cropping (DMC) systems.

**Principles of agro-ecology and direct seeding mulch-based cropping systems**

Many authors emphasise that in creating new technologies, deep knowledge of agro-ecological conditions should take precedence over permanent transfer of technologies (Fujisaka 1991; Roder 2001).

The technologies that should be promoted are those which focus on agro-ecosystem processes such as organic matter accumulation, water resource, soil biological activity, resource preservation and general enhancement of agro-biodiversity and synergisms between components (Altieri 2002). In many countries, and specifically in Latin America, smallholders and different stakeholders (researchers, extension workers and the private sector) develop alternative systems based on green manure, mulching and use of cover crops to preserve soil potential, stability of the plant-soil system, and farmer livelihoods (Flores 1989; da Silva 1999; Richter et al. 2002).

Altieri (2002) and Dalgaard et al. (2003) define agro-ecology as a holistic study that focuses on the form, dynamics and functions of agro-ecosystems, including all physical, economical and human environments. Direct seeding mulch-based cropping systems are considered as one component of agro-ecology strategy. To be efficient, DMC systems should mimic the functioning of ecosystem forestry (S guy et al. 1998; Ewel 1999, cited by Altieri 2002): a natural ecosystem is sustainable as soil is continuously created and permanently protected. Stability and resilience of plant-soil systems create the conditions that allow the systems to persist (Gobat et al. 1998). Plants provide energy that fuels the biological processes and either directly or indirectly create the structure within soils. For example, a large amount of photosynthate is allocated to roots and much of that photosynthate is diverted to mycorrhizal symbionts or exuded into the surrounding rhizosphere. Eliminating energy inputs may significantly affect the physical as well as the biotic structure of soils (Perry et al. 1989). Corman et al. (1987) reported that populations of mycorrhizal fungi and Rhizobium sp. drop rapidly in the absence of living roots. Mycorrhizal fungi produce extracellular polysaccharides that glue mineral particles together into water-stable aggregates (Lynch and Bragg 1985; Gobat et al. 1998). The basis of DMC is to maintain an equilibrium system of plant and soil where the diversity in plants (crops and cover crops), insects and microbial communities stabilise the system during environmental fluctuations.

A description of the principles of DMC systems is given in recent articles by S guy et al. (2003) and Scopel et al. (2003):

- **Soil is no longer disturbed**, or as little as possible, by mechanical action and is always kept covered by crop residues and the cover crop. By stopping mechanical action, soil sensitivity to erosion decreases because of soil cohesion improvement. Recent works by de Rouw et al. (2004) showed that conventional weeding could contribute significantly to soil erosion in the uplands whereas a layer
of mulch on the soil can control soil erosion caused by rainfall runoff, decrease soil temperature fluctuations and enhance macro- and micro-fauna activity (Boyer et al. 2001; Scopel and Findeling 2001).

- **Spatial and temporal diversified schemes** (rotations, association, annual crop sequence) are provided in order to increase farming incomes by reducing cost production and climatic risks (S guy et al. 1998; Richter et al., 2002).

- In order to **maintain soil-plant stability and resilience**, cover crops are used to produce grains and dry matter (soil protection and rational use of fodder to feed cattle) when available resources are too limited for main crops (S guy et al. 1998).

- **Cover crops enhance the efficiency of the whole system** fulfilling many agronomic and ecological functions. S guy et al. (2003) emphasise the multi-functionality of cover crops, which are considered as nutrient-pumps.

**Above-ground biophysical and chemical functions:**
- Permanent protection against erosion by rainfall runoff.
- Increasing water availability (Abrecht and Bristow 1990; Scopel et al. 1999) and water use efficiency (Fischer et al. 2002).
- Decreasing soil temperature variations (Thiagalingma et al. 1996).
- Integrated management of pests (equilibrium between populations) and weeds through shade and/or allelopathic effects (Florentin et al. 1991; S guy et al. 1999; Chiapusio et al. 2002).
- Nutritional function for the main crop via mulch mineralization.
- Trapping herbicide on mulch cover (Jansen 1999).

**Above-ground systems integration:**
- Nutritional function for livestock by rational use of fodder (S guy et al. 1998).
Below-ground:

- Adding crop residues to the soil and root system of the cover crop, helping to avoid soil compaction.
- Replacing mechanical actions by biological improvement of the soil structure through the strong root systems of cover crops.
- Increasing organic skeleton to maintain and restructure the soil through the rooting systems and biological activity (S guy et al. 2001). One of the main functions of cover crops is to enhance below-ground insect and microbial activity, which improve soil structure and plant nutrition (Boyer et al. 1998; Chabanne et al. 2001).
- Integrated management of macro-fauna and micro-flora communities (Michellon 1996; Boyer et al. 1998),
- Tapping deep ground water and recycling nutrients leached deep in the soil below soil layers used by cash crops or rice, through deep rooted cover crop systems (S guy et al. 2001).
- Quicker recycling process, linked to biological activity increase and reduced pesticide pollution (Crovetto 1999).

It is estimated that 72 million hectares of DMC are cultivated throughout the world and that 47.5% of this area is located in Latin America, 36.7% in the United States and Canada, 12.5% in Australia, and only 3.3% in the rest of the world (Derpsch and Benites 2003). In the south of Brazil, smallholders have tested and adapted these systems since 1972. However, Latin America, and specifically southern Brazil, is an exception. Elsewhere in the world it is hard to find smallholders conducting DMC systems on a large scale. Soil conservation technologies in Brazil have received support from different agronomic institutes that have implemented many technologies (e.g. cover crops, mechnisation) and have obtained wide success in adapting these technologies with smallholders. Involvement of different stakeholders (farmers, researchers, extension workers and the private sector) has been a crucial element in extending these systems (da Silva 1999; Richter et al. 2002). Organisation by group helps farmers to exchange experiences, to overcome technical constraints (technical skills requirement, calendar labour requirement, weeds and pests management) and to define adequate socio-economic conditions for adoption (access to credit; collective management on landscape unit of grazing areas, erosion and wild-fires).

**Methodological framework**

The Lao national agro-ecology programme follows a holistic research approach based on knowledge of local farming systems, including all agricultural aspects and socio-economic factors, and technology generation focused on soil conservation. This approach is composed of five interdependent components in order to create, adapt and validate technologies with and by smallholders (S guy et al. 1998):

- Agro and socio-economic diagnosis of the region and farming systems, conducted during the first season (environmental and socio-economic analysis).
Setting-up short (one season) and long-term (at least four seasons) experimental units on different topics (cultivars comparison, cropping systems, livestock, perennial crops, non timber products etc.).

Adaptation and validation by smallholders:
- on-farm experiments;
- landscape and village levels.

Permanent training for farmers and extension agents and information provision to policy makers.

Follow-up and analysis of the conditions of extension and adoption by farmers.
Evaluation of farming systems and the environmental, social and economic aspects of the sub-region and region.

The experiences of the national agro-ecology programme in southern Xayabury and Xiengkhuang provinces are related below.

**Agro and socio-economic diagnosis**

Knowledge of farming systems is key to rational generation of technologies (Fujisaka 1991). Our research priorities are based on agricultural aspects, socio-economic needs and the environmental conditions of farmers. Initial assessment of the situation has been carried out at different levels in order to integrate all aspects of smallholders’ strategies and environmental conditions. The first and second steps are based on data collection (province, district, extension services, village) and environmental diversity observations: agricultural and demographic evolution, topography, landscape and nature of soils, meteorological data, land allocation maps, land use diversity and village accessibility. Headmen and village councils are interviewed in each village to assess community practices and recent changes related to land tenure and agricultural aspects. Information on market channels is obtained through interviews with agriculture officers, traders and village headmen. The third step records knowledge of farming systems in order to identify the advantages and constraints of present systems and to evaluate new technologies at farm level. Quantitative and qualitative household surveys are carried out on targeted farmer groups, as identified with project partners (agriculture officers, village council), in order to acquire information on household conditions and farming systems. These surveys were carried out in Kenethao, Parklai and Botene districts in Xayabury (four, two and two villages respectively) and in Nonghed, Pek and Kham districts in Xiengkhuang (seven, seven and eight villages respectively) during 2003. A total of thirty-one and seventy-four households were surveyed in Xayabury and Xiengkhuang respectively. The following agricultural aspects and socio-economic factors were recorded:

- Description of farming systems (cropping and livestock production, calendars, skills, labour requirements, division of labour, production cost, yield and labour productivity per crop or livestock unit, net income, self-sufficiency, fallow management practices).
- Use of natural resources (non-timber forest products).
- Non-farming activities and interactions with farming activities.
- Infrastructure and market access, credit.
- On-farm consumption.
Setting-up short- and long-term experimental units

Agro and socio-economic diagnosis provides a basis for modelling cropping systems and their components. In southern Xayabury, following the initial assessment, long-term experimental units representing the biophysical (integrating soil, slope and climate) and farming system diversities were set up in order to provide a large sample of cropping systems. Cropping systems comprise three major components (Figure 2):

- Soil management and land preparation through either conventional land preparation (slash-and-burn, ploughing) or through direct seeding (mulching, use of crop residues and cover crop).

- Crop management (rotation, association or crop sequence in the same season; sowing date and plant density). In DMC systems, efficient crop management can reduce weeds and pest pressure and maintain the main functions as close as possible to the natural ecosystem.

- Thematic adjustment (cultivar, fertiliser, pesticides).

Soil and crops management, cultivars and others inputs and natural conditions can be cross-linked to obtain a set of highly varied conditions (S guy et al. 1998). The experiment in southern Xayabury involves the iterative generation of cropping systems. The first step is based on modification of soil management and land preparation. Weed and pest management and cultivar potentiality have strong relationships with soil characteristics. Soil with high biological activity and organic matter generally has good fertility and beneficial organisms that prevent diseases (Gobat et al. 1998). Moreover, S guy et al. (2003) recommend that specific crop improvement programmes have to be established on DMC systems to radically modify the functioning of soil-plant systems.

Land preparation is first based on crop and weed residues management. In southern Xayabury, traditional cash crops like Job’s tears (Coix lacryma Jobi) and rice-bean (Vigna umbellata) can be considered as key crops for providing DMC systems with crop residues. These species, with long cycle durations, produce a large amount of dry matter and degradation of these residues is relatively slow due to a high rate of lignin. This provides good soil protection, reducing evaporation and weed pressure. Moreover, the strong root system of Job’s tears improves soil structure, making it a useful pre-crop for upland rice, rice-bean and sesame.

The second step integrates soil and crop management (association, rotation and/or annual crop sequence) in order to diversify production (grain production, rational use of forages by grazing and/or cut and carry), and so reduce economic and climatic risks.
while optimising the main functions of DMC systems through adequate use of main crops and cover crops. Main crops like Job’s tears and rice-bean must return to a given field frequently to renew the beneficial characteristics they bring to the soil.

Many options are available when using additional crops (cover crops) but in the case of smallholders, who usually lack market access, an integrated cropping and livestock production system is more suitable. Two main systems are being tested in southern Xayabury:

a. Rotations with direct-seeded grain crops (maize, Job’s tears) followed by forage production for grazing (S guy et al. 1998; Kluthcouski et al. 2000). Species like *Brachiaria ruziziensis* are sown at the first weeding stage by seed broadcasting in order to limit the additional working time. After two or three years, depending on the farmers’ strategy, crops can be direct seeded on forage mulch. Due to their strong rooting systems, the most efficient species for recycling nutrients and using water deeper than 2 m are forages (*Brachiaria* sp. and *Stylosanthes guianensis*).

b. Grain production based on two crop sequences - a main crop of short cycle (peanut, sesame) followed by a crop for small animal feeding (sorghum, finger millet). The aim of this system is to use annual species which can produce grain and a high amount of dry matter, and which have a sufficiently strong rooting system to replace mechanical action.

Throughout the experiment, DMC systems are continuously compared with traditional cropping systems, which remain the reference. The systems are modified gradually in order to evaluate each component’s influence on system performance. In different experimental units, soil and crop management sets are conducted under three levels of fertiliser (conventional system without use of mineral fertiliser; a medium level which compensates nutrient exportation by grains; and an optimal level which compensates nutrient exportation by grains and straw) in order to assess the evolution of the different systems under time.

Short-term experiments, based on thematic adjustments (germplasm evaluation, introduction of new species and/or cultivar, use of inputs already available on site), have been conducted during the first year in order to build a strong and confident relationship with smallholders. This step provides better knowledge of farm practices and traditional cultivars used by smallholders.

**Adaptation and adoption by smallholders – collective land management**

**Adaptation and validation at farm level**

The third component of this holistic approach is based on on-farm adaptation and validation of the simple technologies from the experimental units. The validation and adaptation component is a demand-driven process, meaning that priorities are defined by smallholders in light of the constraints of their farming systems, the overall environmental conditions and the economic situation (market demand, inputs, credit etc.).

This step focuses on adaptation of DMC systems with and by farmers, and advises them on adequate crop management (rotation and/or annual crop sequence). In southern Xayabury, land preparation has for the last fifteen years been based on burning residues and ploughing on steep slopes. This ‘mining’ development is copied from Thailand and generates land erosion, fertility losses, yield decrease, chemical pollution, and
road and paddy field destruction. Because of the environmental and financial costs of conventional land preparation (ploughing), farmers are shifting to herbicides, which are sprayed before and/or after crop emergence. However, crop residues and weed mulch are usually burned, increasing mineral losses and erosion on bare soil. Many farmers have requested technical support to modify land preparation. Experience has shown that organisation of farmers through groups is crucial for the adaptation and adoption of DMC systems which modify mostly conventional agriculture. Farmer groups were organised for a total of 53 families in Kenethao, Parklai and Botene districts (four, two and two villages respectively) to validate technical options aimed at decreasing production cost and labour, and limiting rainfed area erosion.

DMC systems for crop residues are carried out for upland crops such as maize, Job’s tears and rice-bean. A few modifications to cropping systems are proposed to smallholders in order to set-up, adapt and validate each step using current crops and cultivars. DMC systems for crop residues can exhibit very good results in terms of net income, yield and labour productivity (Tivet et al. 2004). In the southern Xayabury tests, adoption of simple DMC systems by smallholders can be related to five main effects: labour and drudgery both decrease, while net income, access to credit, and calendar flexibility all increase.

**Adaptation and validation at landscape and village levels**

Interaction between farmer groups and other farmers who request technical support is essential to analysing the process of generating and adapting technologies at the village level. These interactions can be based on:

- Mutual training.
- Tool and cultivar exchange.
- Field day participation and evaluation with farmer groups.
- Access to technical support.

Follow-up should identify the constraints and the synergies of this dynamic. At present, the objective is to implement and generate environmentally sound alternatives with technologies which have been validated by farmers. For example, experimental trials have to be implemented in order to assess the modifications of land use and the integration of livestock, cropping and trees associated with DMC systems. Managing the interface between animal and crop components is crucial to the success of these systems. Over-grazing of cover crop or crop residues during the dry season may leave too little mulch for sowing the following wet season crop, thereby affecting the main functions of the DMC systems. Specific forage use and control of wild-fires on the landscape unit must be defined by farmers during the dry season.

In order to implement these activities at village level, formalising a research-development programme with the community appears to be necessary. The methodological framework of this programme is inspired by the work of Chaze (1994) and comprises the following topics:

- Analysing short- and medium-term strategy in the village.
- Analysing needs.
- Formal contracting of the research and development programme with the community.
Definition of the activities which will be implemented with the community,

Planning, from the beginning, for the continuation of this research-development process with farmers, headmen, and district and provincial agricultural services after the end of the programme.

This framework seem essential to understanding the effects and impacts of our activities and particularly for understanding the whole *problematique* at the village level and the strategies followed by the community, which themselves indicate other forms of approach and other topics of research and development.

*Permanent training of farmers and extension agents and keeping policy makers informed*

The different components of this holistic approach generate a strong training environment for smallholders, research and extension officers and all of the stakeholders involved in development:

- Medium- and long-term training of smallholders is carried out throughout the different steps of the cropping system (soil and crop management, thematic adjustment). Training is conducted by research and extension officers on evaluation of fodder species, mechanisation, and use of pesticides,
- Organisation of farmers into groups for collective decisions and validation of soil conservation technologies and pasture land management,
- Organisation of village community,
- Decision-making for development programme priorities,
- Practical training for master's degree students.

*Technical and socio-economic viability of DMC systems*

Progressive changes in conventional cropping systems are better than drastic modifications, which are highly risky and often rejected by smallholders. Aggregation of cropping system components is a medium- and long-term process which implies defining a close link between the experimental unit and on-farm adaptation and validation. Feedback from smallholders is essential in order to integrate any constraints of new agricultural systems and modifications of socio-economic aspects into the experimental unit. In order to promote DMC systems for smallholders, the technical and socio-economic viability of different types of DMC systems (residues and/or cover crops) must be evaluated continuously. The circumstances of generation and adoption by smallholders must be analysed in order to identify priorities and key factors for extension: access to credit and inputs; mechanisation improvement, through specific tools like the hand-jab seeder; iterative modification of land preparation. Recent work by Erenstein (2003) gives a guide for understanding technical and socio-economic complexities related to the adoption of different DMC systems.

**Conclusion**

Few realistic alternatives presently exist to cropping under slash-and-burn shifting cultivation systems. Increasing population density and modifications in land access have
drastically altered agricultural production in the uplands. During the past few decades, with the modification of land tenure, cultivated area per household has decreased and long fallow periods have disappeared (Fujisaka 1991). These recent changes do not allow for sustainable agricultural production or the preservation of soil and natural resources.

Soil conservation is the cornerstone of sustainable agriculture in the uplands. The main objective is to stay as close as possible to the natural ecosystem while improving soil-plant stability. Agro-ecosystem processes have to be emphasised: in order to convert the incomplete shifting cultivation system (i.e. rapid return of crop to a given field and reduction of fallow period) to a stable system, it is necessary to integrate DMC systems, livestock, trees and forestry products.

However, it is unrealistic to think that these approaches, based on soil conservation (DMC systems) and integration of systems, can be efficient in the uplands unless the land tenure of each household is defined. Land allocation must be flexible, taking into account the diversity of livelihoods and conditions in the uplands. Protection and conservation of natural resources is not possible without the involvement of local communities: including smallholders in the process of defining natural resource use is essential. Maintaining and protecting biodiversity will be effective if land tenure is modified so that a large area is allocated to smallholders for the integration of forestry area and resource uses. New farming systems based on the integration of forestry products, livestock and DMC systems could be stable and sustainable if, at the same time, economic incentives (access to market, inputs, credit, agriculture and forestry product processing) are promoted to allow this development. Through these methods, self-sufficient agriculture based on upland rice production can develop into soil conservation systems with diversified schemes that generate cash income and preserve natural resources.

In Mekong corridor conditions, promising results were obtained in southern Xayabury using simple DMC systems based on residue management for cash crop production (Tivet et al. 2004). This first step can be further improved by using cover crops and integrating livestock and tree production (like paper mulberry) as suggested by Fahrney et al. (1997). It seems to be possible to convert the present ‘mining’ production, based on cash crops and ploughing on steep slopes, to a system that conserves soil and nutrients, and is productive and economically viable for at least some smallholders. In the future, given the limited cultivated area available to each household, innovations that will generate added value and new non-farming activities must be considered. Possibilities include product processing (of crops and non-timber forest products) and short-term small animal production using locally produced cash crops. In addition, cattle production must be developed so that breeders can attain added value.

DMC systems are promising and could allow smallholders to preserve soil potential, which represents their major asset. Nevertheless, these systems depend largely on land tenure, the amount of cultivated area per household and local economic incentives.

**Acknowledgement**

The authors wish to thank the French Agency for Development (AFD), the World Environmental French Funds (FFEM) and the French Ministry of Foreign Affairs (MAE) for financial support.
Authors
Florent Tivet, Lucien Seguy, Ho Tran Quoc and Pascal Lienhard work for the Annual Crops Department and Agrosystems Programme, Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD-CA). Email: ciradca@laotel.com

Khamko Panyasiri and Bounsay Chantharath work for the National Agroecology Program based at NAFRI. Email: naep_laos@yahoo.com

Patrick Julien is an Agronomist consultant

Bibliography


Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR


Michellon, R. 1996. “Modes de gestion cologique des sols et systèmes de culture base de granium dans les Hauts de l’Ouest de la Réunion”. CIRAD-CA No. 47/96, La Réunion, France. p.97.


How to Combine Scientific and Local Knowledge to Develop Sustainable Land Use Practices in the Uplands - A Case Study from Vietnam and Laos

Ming Ha Hoang Fagerström, Tran Duc Toan, Houmchitsavath Sodarak, Meine van Noordwijk and Laxman Joshi

Abstract

Global population growth and increasing wealth exert pressure to convert forests to agricultural, industrial or residential land. Land use changes, together with the diversity in physical and socio-economic conditions in the uplands of northern Vietnam and Laos, require new sustainable land use options for obtaining food security as well as for environmental protection.

A Knowledge-Based System (KBS) approach, whereby local and scientific knowledge are combined to develop new land use options, is being tested by a consortium of researchers, extension agents and farmers in the Dong Cao catchment, Hoa Binh province, Vietnam, and in Pakchae village, Pakchao District, Luangprabang, Laos. The methods employed are field measurements of erosion on a catchment scale, computer simulations using the Water, Nutrient and Light Capture in Agroforestry Systems (WaNuLCAS) and Generic Model for River Flow (GenRiver) models, application of PRA/RRA tools and the Agro-Ecological Knowledge Toolkit for Windows - WinAKT 4.06. Effects on soil and water conservation, as well as on household economies of current and future land use options in different landscape units at the two sites have been evaluated.

Introduction

Global population growth and increasing wealth (the Millennium Development Goal is 50% reduction of poverty by the year 2015 counted from the year 2000) exert a pressure to convert forests to agricultural, industrial or residential land. Land degradation followed by declining crop yields have been recognised as major problems in the uplands of the humid tropics when forests are converted to farmland and cultivation becomes more intensive (Pandey and Dang van Minh 1998). The uplands of Vietnam and Laos are characterised by a high diversity in physical and socio-economic conditions, as well as by the effects of these conditions on farmers’ livelihoods and agricultural systems. This diversity requires a number of options to meet both the short- and long-term needs for food production and sustainable environmental development.

A combination of proper watershed management based on landscape features with a participatory approach involving local as well as external stakeholders, could be decisive for the development of sustainable land use practices. Farmers’ knowledge of landscape relationships and farmers’ perceptions of an underlying logic play an important (although not exclusive) role in their management decisions. However, the knowledge, perceptions and interests of other stakeholders concerning the status of upper
watershed areas have traditionally been more effectively communicated and thereby influenced the decisions and plans made by policy makers. Farmers’ perspectives, along with those of researchers on land use suitability, can form valuable inputs to a participatory analysis of different land use scenarios as a basis for negotiations of land use change and land use policy. By using both local and scientific knowledge, the quality of research projects may be improved. Furthermore, the dialogue between farmers and scientists may become more efficient and farmers can participate more actively in the decision-making process.

In the Mae Chaem watershed in Chiangmai province, Thailand (ICRAF 2001), studies have been carried out to understand Local Ecological Knowledge (LEK) and integrate it with scientific knowledge in order to understand watershed functions as well as to suggest improved management approaches for monitoring and assessing environmental conditions. The knowledge of different stakeholders has been combined during participatory land use planning, and various tools have been used to facilitate mutual agreements. For evaluating land use impacts; rainfall, stream flow and water turbidity were monitored. For water quality evaluation, aquatic insects were used as indicators. This approach enabled local people to conduct direct measurements of some watershed service variables. In this way, the field observations resulted in the development of detailed local spatial information systems. Efforts were made to apply these tools in strengthening local land use management of and providing good arguments for solving land use conflicts. In Nepal, comparisons have been made between farmers’ evaluation of the nutritive value of tree fodder and laboratory analytical methods used in animal science (Thorne et al. 1999; Walker et al. 1999). The results from this have led to a reconsideration in the planning of fodder tree research where tree crown architecture was given a greater importance than before. At the same time farmers also realised how little they knew about below-ground interactions. In Indonesia two studies have combined local and scientific knowledge about agroforestry related to jungle rubber (Joshi et al. 2001) and soil and water conservation (Chapman 2002).

Figure 1: Knowledge Based-System (KBS) approach, which is being developed by the LUSLOF project
A Knowledge-Based System (KBS) approach (figure 1), whereby local and scientific knowledge is combined to develop land use options is being tested by a consortium of researchers, extension agents and farmers at Dong Cao catchment, Luong Son district in Hoa Binh province, Vietnam as well as in Pakchae village, Park ou District, Luangprabang, Laos. This is part of a project called “Sustainable Land Use Practices for the Uplands of Vietnam and Laos: Science and Local Knowledge for Food Security – LUSLOF”. The project duration is from 2002 through 2004 (Hoang Fagerstrm 2001). The research process and some of the first findings of the KBS approach are presented in this paper.

### Materials and Methods

#### The study site

Dong Cao catchment, Luong Son district Hoa Binh province, Vietnam and Pakchae village, Park ou district, Luangprabang, Laos (20° N, 105° E) are situated in the same agro-ecological zone. This area receives a mean annual rainfall of about 1,500mm that falls mainly between April and September (table 1).

#### Research process and methods used

**Dong Cao catchment, Vietnam:** The land use options were developed in two steps. Step one is called Participatory Landscape Land Use Planning (PLLUP) while step two focuses on participatory testing and predicting the effects of the identified land use options.

**Step one - Participatory Landscape Land Use Planning (PLLUP), carried out during 2002-2003:**

The Managing Soil Erosion Consortium MSEC/IRD – Vietnam team have been conducting erosion measurements since 1999 (Toan et al. 2001). In 2002, measurements were carried out simultaneously with a WaNuLCAS survey, i.e. a survey for gathering input parameters for the modelling work, and three participatory surveys. The participatory surveys include:

- Participatory Landscape Analysis (PaLA), (Hoang Fagerstrm m et al. 2002),
- Participatory Household Economy Analysis (PHEA) (Hoang Fagerstrm m et al. 2003),

---

**Table 1: Some characteristics of the study sites**

<table>
<thead>
<tr>
<th>Study sites</th>
<th>Ethnicity</th>
<th>Average temperature rainfall</th>
<th>Elevation (masl) and slope (degrees)</th>
<th>Main soil types</th>
<th>Main land use types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dong Cao village, Hoa Binh¹</td>
<td>Muong, Kinh</td>
<td>25°C 1,500 mm/y</td>
<td>100-700, 15° -40°</td>
<td>Acrisols</td>
<td>Forest and upland crops</td>
</tr>
<tr>
<td>Pakchae village, Luangprabang</td>
<td>Leue</td>
<td>25°C 1,400 mm/y</td>
<td>320-800</td>
<td>Luvisols</td>
<td>Forest and shifting cultivation</td>
</tr>
</tbody>
</table>

¹ Fagerstrm m et al. 2002 and Toan et al. 2001
Local Ecological Knowledge (LEK) survey on soil-tree-crop interactions along a landscape transect (Johansson 2003).

During the PaLA survey, with participation of 14 farmers, farmers’ perceptions concerning current land use both in time and space, as well as visions for land use change were investigated using PRA/RRA tools such as village modelling, village sketch maps with local names, transects and timelines (Hoang Fagerström et al. 2003).

The focus points in the landscape – including weak points such as sensitivity to erosion (figure 2), and filters, i.e. the strategic water supply area in the catchment (figure 3) were identified both in reality and on maps. The characteristics of the focus points, including their soil-plant-water-light interactions in space and time, were studied using timelines, brainstorming techniques as well as the Agro-Ecological Knowledge toolkit for Windows: WinAKT 4.06 software (Dixon et al. 1999). Ten farmers were interviewed in order to get information concerning their knowledge and understanding. Farmers from both upstream and downstream areas in the catchment were consulted and the distribution of knowledge in the electronic knowledge base was verified following the recommended methodology (Dixon et al. 2001). Farmers’ knowledge was analysed with respect to their understanding of erosion and filter functions in the landscape. Particular attention was given to the filter efficiency of plant species such Acacia mangium, Vemicia montana and bamboo species.

Based on the PaLA survey, a number of issues regarding sustainable land-use were identified. For each of these issues, hypotheses were formulated about soil-plant-wa-

![Figure 2: Transect 1 - The most eroded part of the catchment](Sketch and Photo by Dan Olsson, 2002, A bamboo hedgerow is being grown on the borders between fields).

![Figure 3: Transect 2 - The filter place, i.e ‘water supplier’, for the downstream catchment area](Sketch and Photo by Dan Olsson and Kerstin Schwan, 2002)
ter interactions. From the hypotheses, modelling scenarios were suggested for the 
WaNuLCAS simulation (Olsson and Schwan 2003). Four key informants (two women and 
two men: Head of village women’s association, one randomly chosen woman, village 
leader and village party secretary) wealth ranked all 40 households in the village. Following 
this, a PHEA survey was completed with 14 households, representing the three 
wealth groups in the village, and whose fields are located in the three representative 
landscape units (table 2). The findings from these surveys were presented to local 
stakeholders on a poster during a one-day workshop organised in February 2003. This 
workshop, together with several field visits by the local farmers to experimental sites 
and demonstration sites, assisted land users/farmers to select some of the land use 
scenarios (figure 1).

**Step two - Participatory testing and predicting the effects of the land use options**

Local farmers are testing the scenarios using the Farmers Field School (FFS) approach 
(Lubis 2003; Puentes 2003) and the water and soil conservation effects of different 
land uses are being simulated using the WaNuLCAS (van Noordwijk and Lusiana 2000) 
and GenRiver (Generic Model for River Flow, van Noordwijk et al. 2003) models. The 
WaNuLCAS model simulates soil and plant water balance, lateral water flow, dynamic soil 
structure and agroforestry interactions at the plot level, while GenRiver simulates the 
water flow in a whole watershed (catchment) containing sub-catchments that receive 
partially independent rain and have separate land use trajectories. The sub-catchments 
all feed into a single river that drains the whole catchment (van Noordwijk et al. 2003).

**Pakchae village, Luangprabang, Laos:** Similar PaLA and LEK surveys to those conducted 
at the site in Vietnam (described above), were carried out at Pakchae village in 2003. 
Three sub-catchments, Pahi, Pu Phadeng and Pu Nan Ut, were selected for transect walks. 
14 farmers, whose fields are located in the sub-catchments and are representative of 
different land use types and different landscape units, were selected for the interviews. The farmers’ perceptions concerning current land use on a temporal and spatial 
scale as well as their visions of land use change were gathered using PRA/RRA methods 
(figure 4). The findings gained during the surveys were reported to the local farmers on 
a poster during a one-day workshop at the site.

**Some findings and further actions**

*Land use-erosion interactions: Farmers’ perceptions and knowledge gathered through Participatory Landscape Analysis (PaLA) as a complementary tool to scientific erosion measurements*

This section answers a number of questions:

**Are planted trees good for erosion control?**

During the PaLA survey, land use changes during the last 30 years in different landscape 
units in the Dong Cao catchment were recorded. Planted trees, mainly *Acacia mangium*, *Cinamon spp*, *Ecalyptus spp*, and *Vemicia Montana*, had been planted at different places in the catchment during 2000 – 2001. It was found that the high amount of bed load (sediment amount measured at the weirs) did not only reflect the effects of
the current land use, but also those of previous changes in land use (figure 6 and table 2). For example, zone one (the lower part of the catchment), was the most eroded partly due to a long period (30 years) of intensive cassava monocropping in some fields. This intensive cultivation may be a result of the easy accessibility of this zone. Free grazing was another factor contributing to the high erosion level in this zone. On the other hand, zone three (the upper part of the catchment), had a smaller number of planted trees compared to zone one. However, due to the long fallow history (16 years), erosion was less than in zone one. This shows that although planting trees may have a retarding effect on erosion, it takes some time before the effect becomes apparent.

**Does cassava always give bad effects regarding erosion?**

Different ways of cultivating *Cassava* affect erosion differently. *Cassava* in a rotation with long fallow (taugya system) did not lead to obvious erosion hazards (see zone three in figure 6 and table 2). Reasons for planting *Cassava* or trees do not seem to be connected with household economy, since both rich and poor farmers planted *Cassava* (table 2).

**What are the underlying reasons behind farmers’ decisions?**

The main factors behind the farmers’ decisions seem to be

- Land quality.
- “Do the same as my neighbours do”.
- The economical benefit of the species.
- Need for *Cassava* in the taugya system (farmers considered *Cassava* to both protect young trees from cattle grazing and trampling as well as to suppress weeds (table 2).

These diverse factors indicate that there is a need for a holistic view when proposing any new land use practices to be adopted by farmers. Moreover, it is necessary to evaluate land use practices both on a spatial and a temporal scale. A package of different research tools is needed for this purpose.

Model simulations may be suitable for predicting the effects of tree-based land use systems for a long time period, while a PaLA survey is useful both for spatial and temporal aspects (in cases where there is no data on land use changes in the past, farmer
Role of trees for soil and water conservation – Formulation of hypotheses for simulation work based on LEK and PaLA

When asked about their visions for land use change, the farmers in the Dong Cao catchment mentioned tree planting (table 2). Specifically, the interviewed farmers mentioned the role of trees in “absorbing” and “releasing” water, as well as in providing “soil softness and dark/fertile soil”. Farmers used *Acacia mangium*, *Vemicia montana*, and *Bamboo spp.*, i.e., the most common “woody” species in the Dong Cao catchment as examples, when explaining the mechanisms by which size, colour and density of leaves, as well as rooting behaviour of different kinds of vegetation influence soil erosion and fertility (figure 7). Farmers believe that:

- Trees retain water during the day and, by doing so, resist heat from the sun.
- Leaf litter covers the soil and also absorbs rainwater.
- Tree crowns reduce splash erosion by intercepting raindrops before they hit the soil.
- Good soil can be retained in fields where vegetation functions as a living fence along the fields’ lower boundaries.
- Dong Cao farmers perceive that tree roots actually release water into the soil leading to higher and continuous water flow in the streams.
- The more trees there are in the catchment, the higher the uniformity of water flow and its discharge volume into streams.

Farmers regard bamboo as a very good hedgerow plant along field boundaries. This is because according to local farmers, bamboo:

- Prevents animals from moving into fields.
- Slows the downward movement of soil.
Traps and retains soil through its dense clumps (locally called *boi*).

- Keeps soil from being washed away through its fine and wide spreading roots.
- Stems reduce water runoff.

However, farmers said that the extensive and fine roots of bamboo also absorb or ‘eat’ soil fertility, and thereby significantly affect annual crops in the vicinity. Hill farmers in Nepal reported similar observations of root competition and they consequently maintain bamboo only along field boundaries and never in the middle of fields (Thapa et al., 1995).

Hypotheses were formulated, mainly based on the gathered farmers’ perspectives and knowledge, and used for the simulation work. This was done in order to predict long term soil and water conservation effects of tree-based land use options associated with low cost, i.e. no need for long-term erosion measurements. Some examples of such hypotheses are:

For the weak points of the catchment – Transect 1 (figure 3):

- Hedgerows of bamboo are better for preventing erosion than *Acacia mangium* and *Tephrosia candida* hedgerows. (WaNuLCAS simulation)

- Improved fallow of *T. candida* (two years) in rotation with cassava (two years) prevents erosion better than hedgerows of bamboo intercropped with Cassava (WaNuLCAS simulation)

For the strong points in the catchment – Transect 2 (figure 3):

- Trees in transect 2 (the strategic water supply place) will conserve water for the whole catchment. (GenRiver simulation)

- Acacia and bamboo species are better than weeds/short natural fallow for water conservation (WaNuLCAS simulation).
Identifying options for the short-fallow crop rotation in the upper part of the landscape in Pakchae village, Laos - A combination of PaLA, LEK, PHEA and modelling is suitable

One of the most important findings of the PaLA survey in Pakchae was the dilemma relating to the short fallow-crop rotation in the upper part of the landscape, in connection with a new land allocation policy whereby local farmers were allocated two or three pieces of land where they rotate upland rice and fallow (personal communication with a local policy maker). The fixed four-year rotation crop-fallow system in the upper part of the hills seems to face serious weed problems. The Integrated Upland Agricultural Research Program (IUARP) of the National Agro-Forestry Research Institute (NAFRI) made efforts to find several useful innovations (table 2) for the lower part of the landscape. The strategy was to increase income for farmers, thereby reducing the pressure on the upper part caused by cropping intensification. Production options under this strategy seem to be suitable for places that have good market access, because most of the tested options provided products that could be sold at the market. This was the case for Pakchae village. A Participatory Household Economy Analysis (PHEA) is recommended in order to predict the effects of these innovations on the household economy. It is important to see to what extent the lowland options can repay the opportunity cost of not planting upland rice in the upper parts of the landscape. The WaNuLCAS and GenRiver models, which are being calibrated for the site in Vietnam, could be used to predict effects of different tree-based systems and to evaluate their suitability for replacing the current problematic fixed four-year rotation crop-fallow system.

Farmers in Pakchae clearly explained the reasons why they select different species for different landscape units (table 2). This shows that the PaLA survey is a good tool to use when searching for more land use options. It is recommended that a PaLA survey is carried out in a village that is more remote than Pakchae. The options for a remote village, with restricted access to the market, will certainly be different from the Pakchae case. Experiences from the Vietnam site on how to explore the LEK and PaLA surveys for formulating hypotheses for simulation work should be shared with the Laos site.

Conclusions

The combination of local and scientific knowledge, using a holistic approach for evaluating and planning land use on a catchment level, has proved to be powerful due to its cost efficiency and dynamics. During one year, the awareness of both local and external stakeholders of the strengths and weaknesses of the natural resources at the Dong Cao catchment has been raised by a considerable extent. This has helped people to meet the needs of a quickly changing reality. The focus related to poverty reduction and environmental protection for the Dong Cao catchment should be on tree management and the market for tree products. As a result of the planning process, local stakeholders recently showed great interest for some new land use options, which are now under the Participatory Testing and Predicting Step. As discussed in the previous section, the KBS approach developed at the Vietnam site has been shown to be useful for the Laos site. This can be explained by the fact that the two sites belong to a similar agro-ecological zone.
Acknowledgements

This research is funded by the Rockefeller Foundation and the Swedish International Development Agency – Sida/SAREC. The authors are grateful to farmers at the study sites for their active participation in this research. The erosion measurements at Dong Cao catchment were done by the MSEC/IRD – Vietnam team, under the lead of Dr. Didier Orange. Several researchers and students from Vietnam, Laos and Sweden contributed to this work. They are Prof Thai Phien, La Nguyen, Tran Si Hai, Do Duy Phai, Tran Dinh Tuan and Le Xuan Anh (NISF); Thongsavanh K., Saysana, I., Phonekeo, P., Boonhom, S. (NAFRC and PAFO); Johan Iwald, Dan Olsson, Kerstin Schwan, and Linda Johansson (SLU). The training and fieldwork in Laos in 2003 was carried out in collaboration with ICRAF Chiangmai and North Watershed Research Center, Chiang Mai, Thailand. Special thanks to Prof. Ingvar Nilsson (SLU) for editing this manuscript and Prof. Mats Olsson (SLU) for the development of research ideas.

Authors

Dr. Minh Ha Hoang Fagerstrom works with the World Agroforestry Centre (ICRAF), Southeast Asia program and is a professor at the University of Agricultural Sciences, Department of Soil Sciences, Uppsala, Sweden. E-mail: minh-ha.fagerstrom@mv.slu.se

Tran Duc Toan is the Vice Director of The National Institute for Soils and Fertilisers (NISF), Vietnam. E-mail: tdtoan@fpt.vn

Houmchitsavath Sodarack is the Director of the Northern Agro-Forestry Research Centre (NAFRC)/NAFRI in Luangprabang, Laos. E-mail: frclpb@laotel.com

Meine van Noordwijk works with the World Agroforestry Centre (ICRAF), Southeast Asia, Bogor, Indonesia. E-mail: M.Noordwijk@cgiar.org

Laxman Joshi is an Ethnoecologist at World Agroforestry Centre (ICRAF), Southeast Asia, Bogor, Indonesia. E-mail: l.joshi@cgiar.org

Bibliography


<table>
<thead>
<tr>
<th>Least crowded</th>
<th>Medium erosion</th>
<th>Most crowded</th>
<th>Reason for choosing species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field is still good (terraced)</td>
<td>Trees such as acacia and Sal</td>
<td>Close to roads and villages</td>
<td>Cassava is the dominant species</td>
</tr>
<tr>
<td>Cassava, fallow is in rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed long-fallow and Cassava</td>
<td>Cassava was planted in a large area</td>
<td>Cassava was planted in a large area since it is easy to sell and the neighbors like it</td>
<td>Cassava was planted in a large area since it is easy to sell and the neighbors like it</td>
</tr>
<tr>
<td>2 households are rich</td>
<td>Locked up fields and high earnings</td>
<td>Less household income and is poor</td>
<td>Less household income and is poor</td>
</tr>
<tr>
<td>2 households are average and 2 households are poor</td>
<td>No specific comments</td>
<td>Cassava moves to mountain sites and turn to mountain fields</td>
<td>Cassava moves to mountain sites and turn to mountain fields</td>
</tr>
</tbody>
</table>

**Table 2: Links between land use and erosion at the study sites**
<table>
<thead>
<tr>
<th>Vegetation for land use</th>
<th>Focus Issues</th>
<th>Reasons for species</th>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest keeps more moisture</td>
<td>Teak gives better price</td>
<td>Soil has more rocks, this part is suitable for fruit trees and teak.</td>
<td>Most</td>
</tr>
<tr>
<td>Forest on the slope is more suitable for upland rice, because the slope is suitable for fruit trees and teak.</td>
<td>New forest and fallow</td>
<td>Fisonpods, Teak, Paddy and some</td>
<td>Less</td>
</tr>
<tr>
<td>Vitamin for land use</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Agriculture and Forestry Service’s Extension System

Somxay Sisanonh

Abstract

Until recently Laos did not have a genuine agriculture and forestry extension service. Technology transfer was carried out by the technical departments of the Ministry of Agriculture and Forestry (MAF) on a campaign promotion basis while projects and programmes conducted extension following their own individual approaches. Therefore, there was a need for a Lao extension system operating on a sustainable and independent basis, able to effectively coordinate various donors as well as operate when projects retreat. The National Agriculture and Forestry Extension Service (NAFES), with support from the Laos Extension for Agriculture Project (LEAP), has developed an efficient and effective extension service for achieving food security, improving the livelihoods of Lao farmers and alleviating general poverty in rural areas. This is called the Village Extension System (VES), and will be presented in this paper.

The main principles of the VES are:

- Village authorities organise the VES.
- Village authorities give the mandate to the Village Extension Workers (VEWs).
- VEWs work with groups of interested farmers on a particular topic (production groups).
- The VEW’s task is to ensure that innovations spread throughout the village.
- District extension agents interact with the VEWs and provide technical training and information.
- All resources for the VES are organised and managed by the village authorities.

This approach had been applied successfully (e.g. In Nambak and Park ou Districts, Luangprabang Province) with particularly significant results regarding improving family income generation for upland farmers.

Introduction

The recently reformed Integrated Strategic Direction of the Lao Revolutionary Party and the Government of the Lao PDR focuses on restructuring so that:

- Provinces become socio-economic strategic planning units.
- Districts become development planning and budgeting units.
- Villages become implementing units.

This strategy aims to step-by-step liberate the nation from its position among the least developed countries of the world. To be fruitful it requires all Lao people working in all technical sectors as well as local ethnicities to join hands in order to efficiently fulfil their designated roles, rights and duties.
It also clearly spells out that there is a need to change the current ‘nature dependent’ production society to a more developed modern production society, characterised by scientifically and technically proven high productivity, with high-quality production management models and systems. It is strongly believed that this shift will help improve the livelihoods of the Lao people and thereby achieve the Lao nation’s development goal.

The National Agriculture and Forestry Extension Service (NAFES) is a technical unit with the mandate of providing extension services as well as supporting and providing leadership for farmers in agricultural production. This will secure stable food sufficiency and enable agricultural commodity production to progress at speed, but with sustainable momentum. This highly important duty requires that all extension staff actively concentrate on the implementation of their roles and responsibilities which also supports capacity building for local people in agricultural production. Furthermore, there is a need for a good coordination system among government agencies, the private sector, and international organisations in order to push, support and enable conformity between extension processes and the socio-economic development strategy of the Lao Government.

The proposed improvements of the agriculture and forestry extension system and the subsequent model presented in this document are a summary of the analysed strengths and weaknesses of extension work that have been implemented by various projects in the agriculture and forestry sector. In addition this document contains concepts and recommendations generated from two workshops on improving the extension system as well as from studies on actual implementation of extension at provincial and district levels.

Part 1: Overview of problems entrenched in agriculture and forestry extension

Core agriculture and forestry related problems in Lao PDR

Although agricultural production has been the main occupation of the Lao people and has been carried out for centuries, key agricultural associated problems remain in need of urgent solutions. Urgent solutions are essential as the biggest portion of the country’s population (83%) is agriculture dependent. This is particularly relevant for agricultural production in mountainous areas where the majority of people do not have permanent occupations, face extreme poverty, and still rely entirely on production under natural conditions. The main agricultural problems can be categorised as follows:

- Education levels of farmers are still quite low and some cultural or traditional practices hinder improving their farming systems.
- Lack of appropriate inputs such as improved variety of seeds, planting materials or access to veterinary services for livestock
- Lack of appropriate extension techniques, technologies, and methodologies.
- Market associated problems.
- Inappropriate agro-credit and other support systems such as high interest rates, unstable pricing for agricultural and forestry products, etc.
- Problems associated with weaknesses in staff performance.
 Constraints

- Provincial Agriculture and Forestry Extension Service (PAFES) is a newly established provincial extension body, which although given an extensive role and responsibility, operates with a limited number of experienced extension staff, limited vehicles, budget and other facilities.
- PAFES lacks detailed instructions and guidelines on how to implement its roles and responsibilities.
- In some years there is no budget for DAFO to conduct seasonal production extension. Fieldwork is heavily dependent on the already limited budget allocated on annual basis to DAFO for administrative purposes.
- Vehicles and extension tools/equipment are extremely limited at DAFO.
- DAFO staff have only very limited knowledge/experience in extension services.

 Risks

- It seems, from experience, that the relevant authorities at provincial and district levels are waiting for the initial interface to come from each other. This can lead to declining trust in the vertical extension administration and decreased effectiveness. Ultimately this can contribute to delays and unimproved extension work.
- Delays in determining clear roles and responsibilities for extension services at different levels (central, provincial and district) or failure in the implementation of the existing roles and responsibilities imply a weak extension system. This certainly leads to a 'stand-still' in disseminating techniques and technologies to farmers that can cause them to lose trust in the government technical support promised to them.
- A long waiting time faced at the grassroots level plus doubts about the performance of NAFES, PAFES and DAFO most likely leads to a slow pace in the transforming process from natural or semi-natural production systems to more modernised systems. This also has a negative affect on the struggle to meet the Government's target of liberating its people from poverty and the nation from out of its position as one of the least developed countries.

Therefore it is now time that all of us prioritise and that we join hands to develop and improve methods and systems for agriculture and forestry extension services in a tangible manner.

 Part II: Alternatives to improve and develop the agriculture and forestry extension system

The principles of agriculture and forestry extension are to:
- Build farmers' capacity to help themselves and enable them to apply technologies suitable to their situation and available resources.
- Transfer techniques and technologies acquired from agriculture and forestry based research as well as other crosscutting information sources.
- Provide consultation and technical services to solve farmers' problems.
With regard to the development of production in the agricultural sector it is true to say that all relevant sectors have equal importance. However, when considering designated roles and responsibilities there is a need to raise extension work at all levels and to improve extension implementation methods in order to meet the actual needs of local farmers as well as adapt to changes that are occurring in all aspects of society. Improvement should be initiated by having a clear vision, concept and implementation methods applicable to real conditions, scientifically proven and dynamic. Only in this way, can we help Lao farmers gain knowledge and develop on a step-by-step basis.

For this reason, one of the top priorities is to provide support and staff to provincial and district authorities to enable them to develop concepts on how to improve working methodologies and implement extension in an appropriate manner that is suited to reality and meets today’s demands.

**Strategy and principles**

Enable staff who are responsible for the management and implementation of extension to fully understand about the duties and targets of extension work in order to:

- Build farmers’ capacity to identify production models that are both suitable for available resources and can maximise profits for themselves, for their communities as well as for their collectives.
- Enable the development of practical and sustainable management and coordinating networks for extension throughout the country.

The two aspects mentioned above should be considered as an important goal for extension work or to be an important target for improving our extension systems.

In addition, it is very important to focus efforts on how to make all parties understand the importance of improving the extension system both in short and medium term periods as follows:

- Regardless of what methodology is applied, it is most important that staff being involved in extension work have the right attitude and that they fully understand about the goals and core duties of implementing extension in order to ensure the scaling up of agriculture and forestry development policies and programmes.
- Improving implementing procedures and methodologies for extension workers from central to grassroots levels, while taking into account that capacity building, along with the provision of support and demonstrations of actual implementation, is spearheading agricultural development in the field.
- Increasing fundamental knowledge and capacity for extension training (technology transfer), monitoring, and expanding knowledge to relevant agricultural staff at all levels to develop capacity for generalists to at least meet minimum district requirements.
- Strongly pushing and closely coordinating with subject matter specialists for centralised technology dissemination regarding actual production processes (in specialised technological, educational, research and other relevant institutions).
- Improving managerial mechanisms for agricultural extension training from central, provincial, and district down to village levels.
Enabling a rapid improvement and expansion of information distribution, extension media and campaigns.

Supporting farmers in organising themselves in production groups in order to expand and be able to manage agricultural production, as well as establish and speedily expand the VEW network.

Coordinating, supporting and facilitating the establishment of markets as well as marketing groups to supply agricultural produce.

### Models/methods for the actual improvement

In order to improve management mechanisms of the existing extension system and adapt them to conditions in the short and medium term, the first step is to establish training and extension units from central to grassroots levels, before moving ahead to improve the entire structure of the extension system at PAFES and DAFO. Such improvement aims to create a simple but effective Extension Coordination and Management Unit at the provincial level in order to enable step-by-step growth in the training and extension capacity of DAFOs covering a larger range of activities within the DAFOs working structures.

### Proposed structure of an interim extension coordination and management system

The proposed structure of an interim extension coordination and management system is illustrated in figure 1. To be able to strongly push and raise the effectiveness of PAFES and DAFO to achieve the target of improved extension, it is essential to clearly determine, from early on, the roles and duties of the Extension and Training Unit (ETU). Detailed roles and duties of ETU are described in a separate document.

Any action performed by the ETU in accordance with its roles and duties is aimed at creating an effective working coordination system between extension, relevant sectors at the macro level and other crosscutting sectors.

### Methods/mechanisms for transferring the implementation of extension work from district to village levels

It is essential that there are mechanisms to distribute specific roles and responsibilities to DAFO extension staff located in different geographical zones. This is because each district has its own specific characteristics, particularly in terms of village concentration, and number and capacity of extension staff. For example some villages are located far from the district centre, they can be very difficult to reach and require high travel costs. To solve this problem the establishment of field extension offices in each zone is deemed necessary. These offices should serve as accommodation for the extension staff to be based there. It is believed that these offices will ease extension work such as recording production information, providing technical assistance to help solve farmers' problems and building closer relationships between farmers and extension staff. In the long run, if village extension workers gain sufficient experience and are capable of doing the job for themselves, DAFO extension staff will be withdrawn to serve in other districts. This is considered to be ‘local self-capacity building’.

In other words, extension support from districts should be area based. This can be carried out by setting up Agriculture Extension Zone Offices (AEZO), which will provide
the base for the extension team who work in that particular zone. The tasks of the team are to build up learning process (training & coaching) in all relevant aspects throughout production seasons in line with the prescribed roles of the AEZO mentioned earlier. In addition, the team is tasked to monitor and report to DAFO on a monthly, quarterly and annual basis. More details about the working mechanisms and methodologies are presented in figure 2.

**Village Extension System (VES)**

It is clearly stated in the Government’s socio-economic development policy that the village is the official unit for the implementation of all village development activities. Therefore, the establishment of Village Extension Systems (VES) at the village level to support agriculture and forestry extension is essential.

**What is VES?**

VES is a model developed for organising agriculture and forestry extension work that should basically be implemented under the managerial ownership of village authorities.

Recognising the biophysical and socio-economical diversity in each village and zone, there is no doubt that methodologies and technical services (types and levels of services, methodology, including techniques, technology and other relevant inputs) suitable for the diverse local needs will differ from one place to another. It is therefore essential to develop a general set of procedures that can be modified by districts and zones in order to make them applicable to their specific needs and targets.
Important components of VES

- **Village Extension Network**: comprised of competent Village Extension Workers (VEWs) and robust production groups.
- **Internal support (from villages)**: village authority with good vertical coordination.
- **External support**: district extension staff, development projects.
- **Funds**: can either come from production group owned funds or village development funds. These funds will be used to support and stimulate knowledge and experience delivery to households or new production groups. However, their use may depend very much on the decision of the production groups and village authorities.

**General procedures for the development of VES**

- After selecting target villages or zones, extension workers (either district or project staff), should be involved in providing support to the establishment of voluntary production groups. This can be done by involving interested households in any particular subject matter and formulating a learning process to cover at least one seasonal production cycle. The learning process should start from problem and need analysis by target groups or households, followed by determining training topics, conducting training, and providing support and regular monitoring throughout the period of applying theoretical lessons in practice. This process can help build confidence for households in applying the desired techniques and technologies at each step. In addition, extension teams will keep records and periodically prepare progress reports to inform all concerned parties about the progress and problems encountered. At the end of the training process an evaluation will be conducted.
Lessons learnt will then be used in consultation with the involved households to rectify the planning process in order to avoid problems from reoccurring. When entering into the second production cycle, extension staff will focus on group organising, including supervising production groups and VEWs on how to perform their duties. Additional technical assistance will also be provided as required.

- Providing support to production groups and upgrading dominant individuals to become official VEWs. These people will continue to deliver knowledge and coordinate with other relevant organisations. In a given village there will be different kinds of learning groups and VEWs depending on areas of interests and relevance for that particular village. These may include, for instance, livestock, crop, irrigation, forestry, etc.

- After evaluating implementation of village learning groups, if any other household is interested in participating in the process, further delivery of knowledge will be conducted by VEWs, depending on village plans, agreements and support from village authorities.

- At this stage, the main task of extension staff is to either provide new knowledge to households in the first batch of production groups or provide them with relevant information for strengthening group management capacity and improving VEW performance.

- The task of the village authority is to form production groups, build up VEWs and help them to improve their knowledge in order to increase productivity for the villagers for whom the authority is responsible.

- Exploring for resources for maintenance and expansion of the village extension network is another important task for village and district authorities. The most important resource here is available funds.

When the learning process is over, extension staff still have to work closely with VEWs in order to:

- Provide training and new information on specific subjects that VEWs have not previously been aware of.

- Establish a coordination network among VEWs or among best performing households.

- Organise and facilitate exchanges of experiences between villages, well-performing households and VEWs.

Carrying out these activities can help the learning process and technology delivering system to grow.

**Funding**

Another deciding factor that needs to be considered when developing VES is the identification and management of funds. Taking into account that there are differences in terms of culture, customs, and socio-economic conditions in each development zone, district and village, which influence local capacity and knowledge, it is important to use an appropriate model to procure and manage funds suitable to these specific conditions. This helps identify appropriate additional training for village authorities, production groups and village technical staff to strengthen their capacity in seeking and managing funds for village extension work, particularly regarding:
Management and utilisation of village development funds.
Absorption of funding support from the Government Poverty Eradication Fund.
Funding from other development projects.

Another important factor that needs to be considered is that good implementation of a VES can only be achieved if extension staff have sufficient capacity to perform throughout the whole extension process. It is therefore important for DAFO staff to develop their capacity to become generalists. More details are presented in Figure 3.

Part III: System for training and forming teams of generalists for the sake of VES

An important factor contributing to the development of an efficient extension system is training to strengthen capacity of government staff and local people. For example DAFO staff must have good knowledge on how to work with local people, taking into account that the best way to do this is to set up a strong network within the production base. This means that:

**There must be a sufficient number of VEWs within villages to be able to provide extension assistance that meets the needs of people in the target villages. In addition, production groups must also be organized.**

This implies that to pave the way for efficient implementation of Government Policy there has to be an emphasis on local capacity building by local people to suit their needs. In short, training has to be considered as a spearheading tool for developing the extension structure and management network. The ultimate result of this will be a sustainable increase in crop and livestock yields.

In addition, such an approach fosters innovative thinking in local society thereby helping release a heavy carrying load from the Government. *This implies that local people must be trained to know about their own duties and technologies and to be able to utilise them with good and continuous monitoring, evaluation, lessons learnt and expansion to a larger scale.*

The first step in applying this kind of training, is for central trainers to build capacity for provincial and district trainers where extension work is just beginning. After Provincial Extension Trainer Teams have been formed and have gone through the whole training process, such teams should be able to expand extension work to other districts by themselves. This supports district staff and enable them to effectively perform extension duties and strengthen their extension network by themselves. On the other hand, trainers at the central level will have time to develop new extension methods that are more appropriate and suitable for situations that keep changing along with changes in development.

Basic knowledge needed for an agricultural based generalist should be diverse, covering a number of subjects and discipline as summarised below.

- Policy and direction related to agriculture and forestry extension/development.
- How to move from a concept to developing new methodologies following the community development approach.
Methodologies for developing production and service groups.

VEWs and gender in community development.

Participatory extension procedures, steps, techniques and training.

Knowledge and tools for effective implementation of extension.

Roles and responsibilities (generalist) and extension management.

Analysis and planning methods for extension support and on-site training in target groups.

Methodology for implementing monitoring plans (province, district and farmers)

Evaluation, drawing out lessons and expansion of methodologies.

Other technical aspects needed for extending processing, credit and marketing.

(For each topic above there are many specific sub-topics in the actual curriculum)

Experiences and skills that are needed by extension staff to implement the extension process include:

- Production analysis for agricultural communities.
- Relevant training needs assessment.
- Identifying curriculum, training tools and equipment.
- Ability to apply PRA tools and facilitating skills.
- Monitoring and evaluation.
- Knowledge transferring.
- Scaling up the learning process in communities.
(Training and facilitating should be carried out and improved in a continuous process depending on season and type of production).

What are the immediate challenges?

The Lao extension system has been thoroughly tested and includes experiences of all stakeholders. It seems the right strategy to approach the diverse requirements of the people in Laos. Nevertheless the approach is still quite new and only a few provinces and districts are familiar with the idea. Thus, the challenge for the future is to spread the concept throughout the country to every province, district and village. This requires a concept for the delivery mechanisms of services to the village including a model for training district generalists. Furthermore, successful examples for financing the VES are going to be explored and spread.

Three challenges have been identified in developing an appropriate extension system for Lao PDR.

- **The Financial Aspects of the VES:** Each village will need to have its own method of organising the required funds to run the VES. Clearly, some common features will emerge. However, we need to explore various ways villages can compensate the work of their VEWs. We must identify successful ways and network between experienced villages and those who want to learn how to arrange their finances. There is also a need to think hard on what kind of training village authorities and VEWs need in order to mange their resources. No doubt the village development funds will have a crucial role to play. All these financial aspects at the village level and the required training needs must be explored and developed.

- **The delivery mechanisms of DAFO services to VES:** Here there is a need to focus on the operational concerns. What are the most efficient procedures for DAFO services to be readily available for the VES? There is a need to explore what the most useful distribution of roles and responsibilities. This again will probably depend on the specific situation in each district.

  Another challenge is logistics. In certain regions of Laos, it can take quite some time to get from one village to another or from a village to the district headquarters. There will be a need to find a solution to this problem of distance in remote areas. There has been discussion of sub-centres in the district, which will be located where villagers can meet the district extension generalists. These sub-centres may later be under the sole responsibility of the village clusters that are serviced by them.

- **Training DAFO staff to be competent service providers to VES:** This is the most serious immediate bottleneck. There is a need for capable extension generalists who can help start VES programmes and support their further activities. Training people in each and every district will be time-consuming.

Author

Somxay Sisanonh is the National Project Director of the Lao Extension for Agriculture Project which is based at the National Agriculture and Forestry Extension Service, PO Box 9077, Vientiane, Lao PDR. E-mail: cetdu@laotel.com
FAO Special Programme for Food Security: Problems and Opportunities in Reaching Rural Women in the Uplands of Northern Laos

Mr. Nhoungthong Sihanath, Ms. Ingrid Baken and Ms. Pernille Dyg

Abstract

In achieving food security and poverty reduction in the Lao uplands, it is crucial to include gender analysis. Women are often ignored, overlooked or forgotten in many agricultural programmes, even though they are the backbone of agricultural production, processing, and marketing, and of domestic work and the household economy. The current general lack of reliable data, and the lack of recognition and valuation for women’s unpaid work in agriculture hampers a complete understanding of the situation and environment that upland women work and live in. Extension services, government bodies and international agencies need to better understand gender issues and women’s needs in order to establish proper programmes and appropriate technologies.

To facilitate sharing of experience, innovations, ideas and the dissemination of technical know-how, the Special Programme for Food Security (SPFS) operating in Luangnamtha and Oudomxay uses the concept of Farmers’ Field Schools (FFS). Livestock raising and mushroom growing FFS are well attended by women, since such production is mainly their domain. These activities require little or no land - a resource to which women have limited access. The main constraints and difficulties in reaching upland women are limited gender awareness among staff, language problems between upland women and project staff, and limited available time for both women and project staff. To increase and encourage women’s participation, SPFS tries to organise separate meetings at convenient times and locations for women, select topics of interest to women, and look at the workload required by newly introduced technologies. The project also stimulates the use of gender as a factor in the development of training materials, manuals and participatory training programmes for FFS activities. For the coming year, SPFS will include gender training and curriculum building activities in FFS and collect information on gender. Finally, more hands-on field training in gender disaggregated data collection, compilation and analysis is needed for government and project staff.

Special Programme for Food Security (SPFS)

FAO estimates that 800 million people globally are still subject to under-nourishment. Seventy percent of the poor live in rural areas, where agriculture is the main provider of food, employment and income opportunities. In the Lao PDR, half of the provinces are still food insufficient, especially the north (NIAPP 2000). The development of the agricultural sector is vital to the success of the national poverty alleviation strategy. This reasoning provided the main rationale for FAO’s Special Programme for Food Security, which
focuses on improving the food production and productivity of small farmers and their access to food (SPFS website).

The Special Programme for Food Security (SPFS) in the Lao PDR is funded by the Government of Japan and implemented by the Lao Government (GoL) under the initiative of the National Agriculture and Forestry Extension Service (NAFES). A team of national experts runs the five-year programme, which started in May 2001. The programme aims to strengthen human capacity, boost food production through intensification and diversification, and increase household income.

SPFS uses participatory and demand-driven approach, which is an important part of the programme’s capacity building support. All activities accommodate community needs. The main food security concern of all target villages is achieving rice-sufficiency throughout the year. Other priorities are improvement of on-farm water management; animal husbandry practices, vegetable and fruit production, handicraft development, post-harvest and agro-processing and forest resource management.

**Socio-economic profiles of northern sites**

SPFS currently works in four provinces (Luangnamtha, Oudomxay, Vientiane and Borikhamxay) and six different sites in line with the government’s priorities on poverty alleviation. All sites are vulnerable to food insecurity and have a substantial level of rice insecurity for three to six months of the year. Five site selection criteria are set forth in the SPFS guidelines: 1. National food security importance, 2. Replicability, 3. Availability in province of sustainable technologies for demonstration, 4. Interest of local communities, and 5. Vulnerability to food insecurity.

Two project villages are outlined below as examples of target groups.

**a) Nam Leu in Luangnamtha**

The village is located about 14 km from the provincial capital, has 57 households and a population of 395 inhabitants. The average household size is six persons. The village has a multiple ethnic composition comprising of 47 Laenten\(^1\) and 18 Khmou\(^2\) households. The population is relatively young, with almost 40% of people under the age of 14 years. Females represent almost 52% of the population. The young population and the number of opium-addicted persons in the village mean there is a shortage of labour\(^3\).

The economy of the village relies largely on traditional shifting cultivation with some lowland cultivation, on exploitation of non-timber forest products (NTFP), and on production of handicrafts. Animal husbandry is not well developed due to high incidences of fowl and pig diseases. The average income per household is estimated at around US$ 270 per year. Sixty-three percent of household income comes from paddy production, 11% from cattle production and about 21% from off-farm activities. Nam Leu has severe food vulnerability and a substantial level of rice insecurity, with 93% percent of house-

---

\(^1\) Laenten or Lao Huay originate from the Yao ethnic group, who migrated from Southern China. They have their own language script similar to Chinese.

\(^2\) The Khmou sub-ethnic group belong to the Austro-Asiatic or Mon-Khmer ethno-linguistic group. They have inhabited Laos since pre-historic times.

\(^3\) According to the village chief, about 50 people (13.2%) in the village are opium addicts. At the district level, Namtha has 766 opium addicts (UNODC Laos Opium Survey 2003)
Table 1: Nam Leu rice production per capita

<table>
<thead>
<tr>
<th>Rice Production</th>
<th>Area (ha)</th>
<th>No. of hhs</th>
<th>Average farm size (ha)</th>
<th>Area planted (ha)</th>
<th>Area harvested (ha)</th>
<th>Estimated yield (kg/ha)</th>
<th>Estimated production (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low land</td>
<td>18</td>
<td>25</td>
<td>0.72</td>
<td>18</td>
<td>18</td>
<td>2,000</td>
<td>36,000</td>
</tr>
<tr>
<td>Upland</td>
<td>216</td>
<td>45</td>
<td>4.8</td>
<td>40</td>
<td>40</td>
<td>1,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Dry season</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>234</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td>76,000</td>
<td></td>
</tr>
</tbody>
</table>

Average gross harvest per capita (kg) 192.40
Average net rice production (after threshing) per capita (kg) 115.44

Source: SPFS Baseline Survey

holds facing rice deficit for three to six months. Rice production is insufficient (115 kg/person/year), for while there are no landless farmers in the village and everybody has access to land, rice cultivation is limited by the small area of lowland paddy and the low yield of upland rice (less than 1 tonne/ha). Only 38% of the households have access to lowland paddy fields, with an average size of 0.72 ha and the shifting cultivation cycle is short, with fallow periods of only three to four years.

When the district authority completed land demarcation and allocation in the area, about 2,542 ha was allocated to the village, 97% of which is forest and shifting cultivation fallow land. This has resulted in relatively easy access to NTFPs and wildlife as food resources. However, due to increased population density, and the construction of a hydro-electric dam on the lower part of the river, there is over-exploitation of the forest area, rivers and streams.

b) Nasenkham in Oudomxay

This village is located about three and a half kilometres from the national road and seven kilometres from the provincial capital. The village has 56 households and 378 inhabitants, all of the Hmong (Lao Soung) ethnic group. The population is relatively young;

Table 2: Nasenkham rice production per capita

<table>
<thead>
<tr>
<th>Rice Production</th>
<th>Area (ha)</th>
<th>No. of hhs</th>
<th>Average farm size (ha)</th>
<th>Area planted (ha)</th>
<th>Area harvested (ha)</th>
<th>Estimated yield (kg/ha)</th>
<th>Estimated production (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low land</td>
<td>39</td>
<td>46</td>
<td>0.71</td>
<td>33</td>
<td>33</td>
<td>2,500</td>
<td>82,500</td>
</tr>
<tr>
<td>Upland</td>
<td>28</td>
<td>56</td>
<td>0.49</td>
<td>14</td>
<td>14</td>
<td>800</td>
<td>11,200</td>
</tr>
<tr>
<td>Dry season</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>0</td>
<td>0</td>
<td>47</td>
<td>47</td>
<td>93,700</td>
<td></td>
</tr>
</tbody>
</table>

Average gross harvest per capita (kg) 246.66
Average net rice production (after threshing) per capita (kg) 147.99

Source: SPFS Baseline Survey

Mountain people
almost 45% are under the age of 14 years. Females represent almost 53% of the population. There is a shortage of farm labour due to opium addiction among productive male adults and migration to town centres in search of more profitable employment opportunities.

The economy of the village depends on agricultural production, such as paddy, crops (including opium), and livestock, and, due to its location near the provincial capital, off-farm income (wages-labour and trading). Eighty-two percent of households have access to lowland paddy fields, while upland rice, cereals (maize, Job’s tears), starchy root crops (sweet potatoes, cassava), fruit (pineapple, melon) and opium are cultivated in the upland areas. A traditional weir and several canals have been constructed to provide extra water during the wet season. Animal husbandry is not well developed due to high incidences of fowl, cattle and pig diseases and lack of grazing land for cattle.

The villagers are officially restricted to a very limited area of land (307 ha), of which only 77 ha is demarcated as cultivation land. Because of this limitation, most villagers farm the remoter areas where their village used to be. The average income per household is estimated to be around US$ 520 per year. 23% of this comes from paddy production, 40% from opium, 7% from livestock and about 23% from off-farm activities. Nasenkham is poor, with food vulnerability and a substantial level of rice insecurity: 71% percent of households face rice deficit for three to six months. The rice production of 148 kg/person/year is not sufficient, due to the limited lowland paddy area. The shifting cultivation cycle is very short with fallow periods of only one to two years.

There is very limited use of existing natural resources. The forest allocated to the village is not rich in NTFPs or wildlife. Off-farm activities and opium cultivation are used to compensate for the deficit in rice.

Women’s participation

Women work alongside men in agricultural activities and often account for 70% or more of the rural workforce in the Lao PDR (FAO Fact Sheet). Traditionally, men plough, make bunds and prepare seedbeds, and women do more than half of the transplanting of rice, weeding, harvesting, threshing, and post-harvest operations. In the northern uplands, the traditional task division has changed due to lack of male labour. In both northern sites of the SPFS, opium addiction among productive male adults is feminising agriculture. Other factors that determine the shortage of farm labour are the very young population, and migration of young men to town centres seeking more profitable employment opportunities. This places an extra strain on women, who are increasingly involved in land preparation, irrigation and preparing bunds and seedbeds. It has also been noted that shorter fallow periods result in more weeding, which affects women’s workload directly, since they are mostly responsible for weeding the upland fields (Souvanthalisith 2002). Furthermore, women are mainly responsible for assuring the health, nutrition and feeding of the families. They often choose which foods to purchase and find ways to feed the family when supplies run low.

Women’s participation is the key to success in SPFS activities. Women process and store food, prepare and distribute the food that the family eats, collect firewood and carry water. In Laoms, SPFS tries to encourage women’s participation in project activities and Farmers’ Field Schools as much as possible by selecting topics of interest to women,
looking at the workload required by newly introduced technologies and carefully pre-
paring group meetings at a convenient time and place for women. Given that many women
have little time to devote to attending group work and training courses, special arrange-
ments have to be made to ensure their participation. In Nam Leu village, women have
indicated that their top priority is improvement of lowland paddy production and the
intensification of village handicrafts (cotton and bamboo based). The women cultivate
organic cotton in the upland fields and have a long tradition in bamboo paper produc-
tion. Their main constraint is lack of marketing experience (quality control, labelling,
packing, selling procedure, receiving orders, etc.). Furthermore, the tools and equipment
they use are very labour intensive. In Nasenkham village, women’s priorities are intensi-
fication of fruit-tree plantations (seen as an alternative high value crop to opium pro-
duction), intensification of poultry production, and the intensification of village handicrafts
and cottage industries. Their main constraints are lack of time and very limited knowl-
dege on marketing their products.

**Schools without walls**

To reach the communities, the SPFS uses the concept of Farmers’ Field School (FFS).
These ‘schools without walls’ are centred on sound community-based adult-oriented
education practices and are an effective way of transferring knowledge through learn-
ing-by- doing. The schools provide a forum for learning from each other and building
capacity. Rather than simply demonstrating technologies to increase yields, the pro-
gramme also seeks to look at farming systems as a whole, identifying and demonstrat-
ing solutions to different problems. Special attention is paid to determining constraints
and bottlenecks by gender and by specific groups, and to finding appropriate solutions.
Furthermore, the FFS method used in SPFS follows a multi-disciplinary approach in recog-
nition that farmer’s problems are multifaceted.

**Gender integration in FFS**

In general, women in Laos have strong decision-making and labour roles in achieving
food security through production and diversification of agriculture. Women’s participa-
tion is actively promoted in all SPFS activities and their involvement is promoted by se-
lecting topics of interest to them. Around 85% of participants in livestock FFS are women,
with the proportion being 70% in mushroom production. This is due to the fact that
these activities are in general the domain of women. However, women’s participation in
FFS for rice cultivation is rather limited, especially in the section covering land prepara-
tion and tillage. Women’s overall participation in the northern project sites (36%) is far
lower than in the central sites (53%). More than 33% of the FFS participants in Nam Leu
are women and in Nasenkham the figure is 38%. Further training will be given to district
staff in 2004 to improve gender sensitive extension principles and practices, along with
training programmes to strengthen the village-level functioning of women’s groups.

**Difficulties in reaching rural women**

*Time limitation:* In spite of the objective of integrating women, district, provincial and
project staff often take very limited time to prepare training materials and field activi-
ties. This results in very general training handouts and field activities that are not adapted to local environmental conditions or to the interests and needs of different target groups (men, women, elders, etc.). Moreover, insufficient time is given to the collection and analysis of secondary data at provincial and district levels. In conclusion, the formulation and design of project activities is often performed in a hasty manner. Due to unfamiliarity with the local conditions, the limited technical knowledge of district staff and the lack of sufficient time to properly research, discuss, document and negotiate appropriate programme interventions, the outcomes are often based on risky assumptions. Hence, SPFS may often risk starting off in the wrong way, with inappropriate and inadequate facility interventions and activities. To overcome those problems, SPFS is trying to provide district extension staff with technical advisors and to tackle the above-mentioned constraints during monitoring and evaluation workshops. In addition, project staff give training to provincial and district staff in the field once a week, to demonstrate new technologies, to motivate, and to follow up on project activities. They try to identify farmers’ interests and adjust activities accordingly.

**Communication:** The gap between programme policy and implementation is a severe problem. Programme policy is well outlined and documented, but implementation and the delivery of services to villagers often lag far behind planning. One of the reasons is the lack of capacity among government and project staff to communicate with upland villagers and, more specifically, with upland women. In both the example sites profiled above, there are some communication difficulties between villagers and project staff. Project staff are Lao speakers while the majority of women in both sites do not speak or understand the Lao language. Village chiefs usually help interpret during meetings with women and elders but there is some doubt as to whether conversations are interpreted correctly. Adding to this concern is the fact that project and district staff do not question whether data acquired through translation is accurate and/or correct. To overcome this communication problem, SPFS is actively looking for translators/interpreters who speak and understand the local languages. Awareness training for district staff in how to communicate with the farmers (learning to ask why!) is another way of creating better understanding between stakeholders and project staff.

**Participation:** Although participation is one of its main approaches, the SPFS programme has in fact been designed, planned and implemented with little general participation from villagers. The participation of women in SPFS activities is generally lower than that of men, especially in the area of rice and cash crop cultivation. Those remain largely men’s domains, in spite of women’s major and ever-increasing contribution to rice and crop cultivation activities due to migration and opium addiction among men. It can also be noted that the participation of women is higher in Lao Loum\(^5\) and Lao Theung\(^6\) societies than it is among Lao Soung groups. Furthermore, women do not automatically attend meetings unless specifically asked or encouraged to come. The fact that the majority of women in villages such as Nam Leu and Nasenkhham cannot read, write, speak or understand Lao language represents a big challenge to the introduction of new and appropriate technologies at FFS. Another factor that plays a role is women’s limited availability, due to their very full schedule. In addition to agricultural production, women are also responsible for tasks such as cooking, cleaning, fetching water and

\(^5\) Lowland people
\(^6\) Upland people
collecting firewood. The number of trainers and district staff who are women is also low. Of all master trainer participants, only around 10% are women, and these women mainly work in the field of animal husbandry. During FFS monitoring and evaluation workshops, women's participation is slightly higher, at around 20%, and including a female village chief, district extension staff and NAFES planning division staff.

**Food security and rural women's access**

*Availability* of food is linked to the capacity of households to produce for consumption and market, while *access* to food includes ability to obtain food through exchange in kind or cash (Rivera 2003). One of the project's constraints is that there is very little relevant and reliable information on rural women's social and economic roles in household food security in general, including in the Lao PDR (Balakrishnan 2003). Therefore, the problem identification and needs assessment at SPFS sites should be broader than just the identification of activities undertaken by men and women in the fields and homes. Appraisal should also explain in detail the constraints and bottlenecks women encounter in adopting proposed new activities and technologies.

Given the predominant role of women in agriculture and food security, it should be clear that women must be equal partners in the agricultural development process in upland areas. In order to promote agricultural development and enhance food security, it is of vital importance that gender analysis be incorporated as an integral component of the programme at all stages and levels (FAO-SEAGA 2003). Moreover, for women to increase agricultural production they need access to land - which is linked to ownership, property and land rights - and access to credit, which is again linked to land ownership. Banks are often less inclined to lend to women if they have no land. Access to agricultural inputs is also of vital importance. Extension service and cooperatives that distribute inputs rarely reach women, who in any case often lack cash to purchase inputs. This contributes to their low level of production. Access to extension and training services is another area that needs to be improved. Few services focus on women or have a significant number of female staff. Extension services tend to focus mainly on commercial crops rather than the subsistence crops which are of primary concern to women. Finally, increased access to education, technology, rural organisations (cooperatives, farmer's organisations) and services (transport, markets) would enable women to improve agricultural production and food security at the household level (FAO Gender and Development Plan of Action 2003).

**FAO's role in promoting gender sensitive approaches and technologies relevant to upland areas**

The Lao extension programmes can only be tailored to address women's priority needs if men and women farmers are listened to at the village level and when methods such as participatory rural appraisal are employed. FAO could play a vital role at national level in strengthening the capacity of NAFES on gender responsive extension, i.e. an extension system that would be able to reach women farmers (FAO Internal Document 2003).
An important step is to ensure that staff and programme approaches at NAFES include an understanding of gender and complex ethnic issues in agriculture. NAFES is the largest implementing agency in Lao agricultural development and has strong links with the provincial and district level staff who interact directly with rural communities. For that reason, it is important that the staff at NAFES and at Provincial Agriculture and Forestry Offices (PAFO) and District Agriculture and Forestry Offices (DAFO) acquire a sound understanding of gender issues in the agricultural sector. Apart from raising gender and ethnic awareness in NAFES, PAFO and DAFO, there is also a great need to increase the number of women extension workers from different ethnic groups.

It would be desirable to cooperate with the many donor agencies working with NAFES to provide technical advice in developing a gender responsive extension plan, thereby creating an opportunity to build the capacity of staff to understand and work with gender issues in the field. A national taskforce could be set up to oversee the development of this extension plan and to check that donor-funded projects address gender considerations. Another approach can be to provide assistance to developing a gender-responsive curriculum in agriculture and rural studies in national institutions, in order to improve the understanding of who does what in agriculture and forestry and to improve technologies and extension services based on this understanding (FAO Internal Document 2003). FAO can provide technical support for such initiatives at the request of the government.

There is also a need to develop the capacity of Ministry of Agriculture and Forestry (MAF) staff members, to enhance understanding of both women’s and men’s roles in the agriculture and rural development sectors at all levels. FAO has the expertise to provide technical assistance support to develop a Gender Plan of Action similar to that employed by FAO itself (FAO Internal Document 2003). This plan could be linked to the NPEP to integrate gender-responsive agricultural development and rural poverty reduction strategies.

In addition to enhancing the gender responsiveness of NAFES and MAF, there is a need to increase the awareness of and responsiveness to ethnic groups’ livelihoods and needs. Reaching ethnic groups involves similar problems to making sure that women farmers are included. Awareness raising efforts, and building the capacity of NAFES and MAF staff to work with ethnic groups and a gender-inclusive approach, should go hand in hand, along with efforts to have more ethnic groups and women represented in the extension system.

**Conclusions and recommendations**

Reaching rural women in the uplands is of vital importance, in order to ensure that new technologies and alternative development options are suitable for women and are sensitive to the division of labour in the uplands (gender sensitive). In addition, there is a need to measure the contribution by women to national food security and household food security. Part of the challenge is the weak gender analysis capacity of civil servants. Even more complex is the limited understanding of the upland situation. With a total population of around 5 million, the Lao PDR has more than 230 ethnic groups from four ethno-linguistic families (UNDP 2001). This enormous diversity calls for more research and data collection in order to gain better understanding of the structures and
functioning of local communities. Various research activities in the country are currently trying to give a clearer picture of Lao society, but it is still far from complete. Agencies and government bodies need to better understand the environment they are working in so that they can better define the needs that are key to establishing proper programmes.

Participation is seen as an essential element of effective development. The success of poverty alleviation programmes is based on social mobilisation, i.e. involving local communities as active stakeholders. However, the process of facilitating and empowering local communities and building their capacities, which is a prerequisite for effective implementation of the SPFS programme, remains seriously challenged by underdeveloped staff capabilities. The Lao Government has identified human resource development as one priority in reducing poverty but the weaknesses of local capacities and poor participation of local people represent critical gaps in the development strategy (UNDP 2001).

Promoting gender equality is an important national goal, as reflected in Articles 22 and 24 of the 1991 Constitution. The recently established National Commission for the Advancement of Women (NCAW-Lao) is guiding the line ministries, agencies and mass organisations on developing strategies and action plans to promote gender equality at national, provincial, district and village levels. For the agricultural sector, this means that research and project planning should integrate gender-related data, take steps to involve women in project activities, and hire more female staff (NPEP 2003).

Agricultural extension services fail to reach women farmers effectively, both in general and in Laos. One of the reasons is that women are often excluded from rural organisations. An FAO survey shows that worldwide, women farmers receive only 5% of all agricultural extension services and only 15% of agricultural extension agents are women (FAO Gender and Development Action 2003). A similar picture is evident in the Lao PDR. Development programmes do not address the specific requirements, needs and problems of women farmers. Therefore, they fail to recognise the entire work women farmers do, meaning that it is mainly male farmers that are targeted by programmes (Rivera 2003). This is a reflection of the lack of information and understanding about the important role played by women. It is known that extension services usually focus on cash crops rather than subsistence crops, which are grown mainly by women and are often the key to household food security. As mentioned earlier, available data on the diverse rural society in Laos is limited and rarely indicates women’s responsibility for much of the day-to-day work and decision-making on the family farm. The data also fails to reveal the many other important food production and processing activities that women commonly perform, such as home gardening, tending livestock, gathering fuel or carrying water. To reach women, SPFS and agricultural extension should also focus on upland cropping (rice and cotton) and vegetable production, to improve nutrition and improve the food security situation. This is an area mainly controlled by women, who therefore have some control over the in- and outputs. When focusing on cash crop production, it is important to verify if there are nearby markets, if women have access to market information, financial facilities and transport etc. It is normally men who have better access to such things. SPFS is to conduct a workshop to improve access to markets and provide better understanding of marketing and financial planning. The purpose is to strengthen the capacity of provincial and district staff, and village participants including women, as managers of household budgets and in financial planning for enterprise de-
velopment and diversification. Workshop topics include how to assess household cash flow and credit needs.

Some recommendations

- To increase women's participation, it is advisable to organise separate meetings at convenient times and locations for women, although there are no cultural obstacles to organising gender-mixed meetings.

- Gender equality should be taken into account in the development of FFS training materials, manuals and participatory training programmes. Such materials should be practical, simple and visual, as many women are illiterate.

- Women farmers and extension workers should be involved in FFS activities focusing on the management, conservation and rehabilitation of degraded and problem soils.

- Try to direct the extension system to consider rural women's resources and available time and to target their needs specifically.

- Include gender training and curriculum building activities in FFS and collect gender information that can be discussed and analysed during FFS activities or other meetings.

- Providing more hands-on field training for government and project staff in gender disaggregated data collection, compilation and analysis.

In conclusion, women's empowerment will require a step-by-step process to remove the barriers and tackle constraints.

Authors

Mr. Nhoungthong Sihanath is the National Field Manager for the Special Programme for Food Security and is based at the National Agriculture and Forestry Extension Service. E-mail: spfslaos@laotel.com

Ms. Ingrid Baken is the Socio-economic & Constraint Analysis Advisor for SPFS. E-mail: spfslaos@laotel.com

Ms. Pernille Malberg Dyg is the Food Security & Agricultural Development Advisor and works at the Food and Agriculture Office/Lao PDR E-mail: Pernille.dyg@faolao.org

Bibliography


FAO. 2002 and 2003. SPFS FFS and Progress Reports. Vientiane. FAO


Internet resources

FAO-SEAGA. www.fao.org/sd/SEAGA

SPFS. www.fao.org/spfs/asia
Changes in Houay Cha Village – from Shifting Cultivation to Integrated Upland Farming

Lothar Kinzelmann and Sonevilay Nampanya

Abstract

The development goal of the Community Based Rural Development Project for Conservation of the Nam Beng/Nam Mau and Nam Phak watersheds, Oudomxay Province is the efficient and sustainable use of natural resources to improve food security and living conditions of the local population and for conservation of the watershed function of the designated headwaters. A major focus of the project is on developing sustainable farming systems along with improving livestock production and management of non-timber forest products. Houay Cha is a Khmou village located in the uplands at altitudes of between 800 and 1,339m. When the project began extension activities in late 2000, upland shifting cultivation was the major livelihood activity. More than two-thirds of the population experienced rice deficiency of between three and six months. Since the project introduced sedentary upland farming and integrated farming techniques, more and more farmers are adopting these techniques. Since 2000, two farmers have completely abandoned shifting cultivation and derive higher income than before from their agricultural activities. Other farmers plan to follow their example. In 2003 over 80% of the total population was classified as self-sufficient. There are changes going on in Houay Cha village...

Background Information

The Project

Oudomxay Province is located in the north of the Lao PDR bordering China and five other northern provinces, namely Phongsaly, Luangprabang, Xayabury, Bokeo and Luangnamtha. The province covers an area of 15,370km² divided into seven districts with a total population of 236,525. The population density of 15 people/km² is below the national average of 22. According to a poverty assessment study conducted by the ADB in 2001, approximately 70% of the population were classified as poor with poverty still increasing over the past years.

The development goal of the 'Community Based Rural Development Project for Conservation of the Nam Beng/Nam Mau and Nam Phak Watersheds, Oudomxay Province' is the efficient and sustainable use of natural resources in order to improve food security and living conditions of the local population and for conservation of the watershed function of the designated headwaters. The project reaches approximately 1,500 households in 19 target villages in Xay, Beng and Namor districts of Oudomxay Province. The ethnic groups present in the project target area are Lue, Khmou, Hmong and Akha. The development goal requires that all population strata have sufficient access to land, means of production and natural resources.
The project supports land use planning and land allocation by district authorities, promotes development of agricultural production areas (e.g. creation of paddy land, irrigation, permanent upland farming plots) and extends sustainable farming techniques along with improved livestock production and sustainable management of non-timber forest products. Improved sanitation facilities (water supply systems and latrines), primary healthcare (village pharmacies) and education facilities are meant to further contribute towards improving living standards in the target villages.

**Major issues**

The problems to be addressed concerning the overall goal of conservation of the watershed function and the natural resources in general are, to a great extent, linked to the traditional slash-and-burn upland farming systems. As paddy land is very limited, upland shifting cultivation is traditionally practiced for subsistence rice production.

Houay Cha village is a small community of 63 households of the Khmou ethnic group. It is located 11km from Xay district town in an upland area at elevations of between 800 and 1,339 metres in the water-catchment of the Nam Mau river. When project activities in the village were initiated in late 2000, the major livelihood activity was upland shifting cultivation, due to the very limited availability of paddy land. Villagers recognized problems of decreasing soil fertility and low economic returns from upland rice cultivation, while fallow periods were becoming shorter and shorter. The challenge for the project, in co-operation with the villagers, was to find ways and means to develop more economically and ecologically sound farming and livelihood systems for smallholder farmers.

**Concepts, ideas, main message**

This paper focuses on one village in the project target area with a typical upland shifting cultivation pattern. The project promotes diversified integrated farming systems (upland contour hedges, integration of permanent crops, livestock and fisheries) as alternatives to shifting cultivation, while also providing assistance with community development. There are no really new ideas or concepts in the approach; the project rather offers the target communities an integrated development approach with a basket of choices for the farmers. Farmers decide which techniques are the most appropriate for their conditions and needs. The extension approach then focuses on continuous monitoring and exchanges both between participating farmers and the target villages.

The example of Mr. Vanthong’s family, as described below, shows that integrated and more diversified farming techniques are an economically viable option for smallholder farmers in mountainous northern Laos. By diversifying farming systems two goals can be reached: providing better income for small farm holders while also using natural resources in a more efficient and sustainable manner.

**Development in Houay Cha village**

**Community level approach**

The project first conducted a series of PRA exercises to identify village resources, shortcomings, constraints, problems and their causes. The outcome of this exercise
was a list of suggested activities ranked according to prioritised needs. These were then integrated into a village development plan.

For the integrated farming activities the following steps were followed:

- Discussion on suitability of activities with village administration and village development committee.
- Farmer selection according to farm land, availability of labour, interest and motivation.
- Establishment of interest groups, agree on conditions and group regulations and plan group activities.
- Implementation of activities; to establish and support integrated farming activities, the project offered training in various technical matters along with material support for establishing contour hedges, fish pond excavation (food for work scheme) and a revolving fund for investment in livestock.
- Monitoring of activities at group and project level and experience exchanges both within the group and with farmers from other villages.

**Case study for Mr. Vanthong’s family**

Mr. Vanthong’s family consists of seven members (four women/girls and three men/boys). As all five children are attending school, Mr. Vanthong and his wife do nearly all of the farm work.

Before project intervention the family had been living from upland shifting cultivation for 14 years (1986-2000). The family harvested an average of 1.5-2t of rice per year, which was enough to feed the family and even to sell some rice for cash (between 150,000 and 300,000 Kip per year). Apart from rice, they grew some minor crops and kept one to two pigs and some chickens for home consumption (“we were not raising animals, they were raising us”).

When asked why the family gave up shifting cultivation even though they were able to feed the family and derive a small cash income, Mr. Vanthong stated the following points:

- “Upland shifting cultivation is very hard work; there wasn’t hardly any time to rest during the year”.
- “The way to the fields is very long and a lot of time and energy was lost on walking to and from the fields”.
- “Cash income was not enough to provide decent medical care for the family and provide for education of the children”.

**Change from shifting cultivation to integrated upland farming**

Mr. Vanthong adopted the integrated farming techniques promoted by the project and gave up shifting cultivation right away. He had regularly listened to the national radio where integrated farming is promoted as an alternative to shifting cultivation but he did not know how to start. Mr. Vanthong’s family received a land title for 3.6ha of land in a
single plot during the land use planning and land allocation procedure. This gave a solid base for the family to set up an integrated farming system. In the first year (2001), the family first dug a fishpond through a food-for-work scheme offered by the project, after which they then cultivated part of the land. Leguminous contour hedgerows were established to reduce soil erosion and improve soil fertility through nitrogen fixation and mulching. Crops grown included maize, cassava and other fodder crops to feed the livestock as well as vegetables. Rice was not cultivated. In addition, fruit trees were planted on the strips between the hedgerows.

The family built pig and chicken pens and bought some animals using a 450,000 Kip loan from the village development fund established by the project. The project also provided training on livestock raising and basic veterinary skills. Due to their high motivation and serious efforts the family successfully changed their farming system. They were able to increase their livestock from 1-2 to nearly 20 pigs and 10-20 to almost 100 chickens. Livestock mortality sharply decreased when the family moved their animals out of the village and took better care of them with regards to feeding, hygiene and vaccination.

The family is now able to feed themselves well, send the children to the adjacent village for extended education (elementary grades three to five) and to the district town (secondary school) while also building up savings through the community savings and credit group.

### Table 1: Comparison of family income shifting cultivation versus integrated farming

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Integrated farming</th>
<th>Shifting Cultivation</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gross income</td>
<td>9,460,000</td>
<td>1,915,000</td>
<td>+7,545,000</td>
</tr>
<tr>
<td>2</td>
<td>Profit</td>
<td>8,359,000</td>
<td>1,838,000</td>
<td>+6,521,000</td>
</tr>
<tr>
<td>3</td>
<td>Net income</td>
<td>8,331,000</td>
<td>1,808,000</td>
<td>+6,523,000</td>
</tr>
<tr>
<td>4</td>
<td>Income per manpower</td>
<td>4,165,500</td>
<td>904,000</td>
<td>+3,261,000</td>
</tr>
</tbody>
</table>

For more details on economic data please refer to the annex

**Quantitative aspects**

The 4.6 fold increase in income shows that permanent integrated farming is a viable option for upland farmers. The higher and continuous income derived from the diversified farming system allows for investments in productive means to further improve efficiency as well as allowing for better education for the children.

**Farmer’s perception and qualitative aspects**

When Mr. Vanthong compared the present integrated farming system to traditional shifting cultivation he stated:

“Upland shifting cultivation is hard work which just gives you enough to eat and in good years a small surplus for sale. With the integrated farming system we work hard as well. We need to weed the upland contour farming plots, but weed-
ing is easier as you have less weeds and the soil is becoming softer. We have to take care of crops and the fruit trees, maintain the fishpond and feed the animals, but we get good returns for our labour. We have continuous income from selling crops and livestock and we always have good and enough food to eat. We can provide our children with decent education.”

“When working on the upland fields before, we spent a lot of time walking to and from the different plots. Now we have everything together, our fields, the fishpond and the livestock. This way we have more time for working on the farm.”

When asked about the family’s further plans, Mr. Vanthong continued:

“We want to carry on what we are doing. We plan to expand the fishpond, improve the animal pens and take good care of the fruit trees, because in 2 to 3 years the trees will start to produce fruit and provide us with additional income. As members of the integrated farming group we want to learn more about this technique and share our experience with neighbours and other farmers.”

Changes at village level

In late 2000, when the project began working in Houay Cha village, there were 47 families in the village. During a wealth ranking exercise conducted by the project in November 2000 using PRA techniques, 24 families were classified as poor (chronic rice deficiency), 11 families as intermediate and 12 families as self-sufficient. When the exercise was repeated in March 2003 there were 63 families out of which 10 were classified as poor, while 53 families were classified as self-sufficient or intermediate.

Upland integrated farming is still a new technique for the villagers but many farmers have become interested. The integrated farmers group in Houay Cha village now has 35 members (end 2003). This is an increase from 26 in 2002 and 15 in 2001). Two of the members have already abandoned shifting cultivation and are model farmers for other villagers. Surveys conducted by the District Agriculture and Forestry Office (DAFO) show that many more farmers have the potential and motivation to switch from shifting cultivation to permanent upland farming. In 2004 another four to six farmers plan to give up shifting cultivation in favour of permanent integrated farming. The village development committee approves of the changes in the agricultural system as the techniques prevent destruction of forest land while at the same time increase productivity. Furthermore, farmers do not rely as much on weather conditions (rainfall).

With the integrated project approach the village is also improving sanitation and basic healthcare. With project support the villagers built a gravity-fed water supply system and latrines, established a village pharmacy and a community-based savings and credit group.

Conclusions

The example of Houay Cha village, a typical example of an upland village in northern Laos which has subsisted for a long time on shifting cultivation, shows that contour farming and integrated farming techniques are a viable option for upland farmers. It also demonstrates that socio-economic development and environmental conservation can go hand-in-hand.
The most decisive factors for this development, in the case of Houay Cha village, are:

- Participation of the villagers to adapt interventions to actual needs and to prepare villagers for innovations.
- Well-functioning traditional community structure with responsible leadership supported by capacity building activities.
- Integrated development approach.
- Land use planning and land allocation as a prerequisite for sustainable land use.
- Formation of interest groups and involvement of both the village administration and the village development committee in all steps of development activities, such as:
  - data collection and analysis,
  - activity planning and implementation,
  - monitoring and evaluation.
- When introducing new technologies, attention is paid not only to productive and quantitative factors but also to qualitative factors, such as genuine interest, ownership and participation of the target group.

**Acknowledgements**

We would like to express our gratitude to Mr. Vanthong and his family for their patience and helpfulness in answering our questions and express our respect for their achievements in integrated upland farming.

**Authors**

Mr. Lothar Kinzelmann is the project manager and Mr. Sonevilay Nampanya provides technical assistance on livestock for the Community Based Rural Development Project for Conservation of the Nam Beng/Nam Nau and Nam Phak Watersheds, German Agro Action, P.O. Box 146, 079/6 Ban Phoxay, Oudomxay, Lao PDR E-mail: gaaudx@laotel.com

**Bibliography**


Deutsche Welthungerhilfe/German Agro Action, 2002. *Project Proposal for the Community Based Rural Development Project for Conservation of the Nam Beng/Nam Mau and Nam Phak Watersheds, Phase II.*

Annexes: Economic evaluation of Mr. Vanthong’s current integrated farming system as compared to his former shifting cultivation farming system.

Annex 1: Economic Analysis of Mr Vanthong’s Integrated Farming System

I. Crops

I.1. Crop Gross product (CGP)

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity (kg)</th>
<th>Price (Kip/kg)</th>
<th>CGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>2,000</td>
<td>800</td>
<td>1,600,000</td>
</tr>
<tr>
<td>Casava</td>
<td>1,500</td>
<td>300</td>
<td>450,000</td>
</tr>
<tr>
<td>Paper</td>
<td>50</td>
<td>15,000</td>
<td>750,000</td>
</tr>
<tr>
<td>Banana</td>
<td>100</td>
<td>500</td>
<td>50,000</td>
</tr>
<tr>
<td>Papaya</td>
<td>300</td>
<td>1,500</td>
<td>450,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>3,300,000</strong></td>
</tr>
</tbody>
</table>

I.2. Intermediate Consumption (IC)

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity (kg)</th>
<th>Price (Kip/kg)</th>
<th>IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize seed (local)</td>
<td>30</td>
<td>800</td>
<td>24,000</td>
</tr>
<tr>
<td>Maize Seed</td>
<td>2</td>
<td>30,000</td>
<td>16,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>40,000</strong></td>
</tr>
</tbody>
</table>

I.3. Fixed Capital Consumption (FCC)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Present Price (Kip)</th>
<th>Possible year of use</th>
<th>FCC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knife</td>
<td>6</td>
<td>8,000</td>
<td>3</td>
<td>16,000</td>
</tr>
<tr>
<td>Hoe</td>
<td>6</td>
<td>20,000</td>
<td>3</td>
<td>40,000</td>
</tr>
<tr>
<td>Harvesting tools</td>
<td>12</td>
<td>5,000</td>
<td>3</td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>76,000</strong></td>
</tr>
</tbody>
</table>
II. Animal Raising

II.1. Annual Animal Gross product : AGP

<table>
<thead>
<tr>
<th>Item</th>
<th>Pig</th>
<th>Chicken</th>
<th>AGP Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Value of product</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B: Value of herd at end of year</td>
<td>4,300,000</td>
<td>1,200,000</td>
<td>5,500,000</td>
</tr>
<tr>
<td>C: Value of herd at beginning of year</td>
<td>4,600,000</td>
<td>1,500,000</td>
<td>6,100,000</td>
</tr>
<tr>
<td>D: Sold or Consumed animal</td>
<td>4,200,000</td>
<td>2,400,000</td>
<td>6,600,000</td>
</tr>
<tr>
<td>E: Bought or receive animal</td>
<td>550,000</td>
<td>220,000</td>
<td>770,000</td>
</tr>
<tr>
<td>Total (B-C+D-E)</td>
<td>3,350,000</td>
<td>1,880,000</td>
<td>5,230,000</td>
</tr>
</tbody>
</table>

II.2. Intermediate Consumption: IC

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity (kg)</th>
<th>Price (Kip/kg)</th>
<th>IC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial feed</td>
<td>30</td>
<td>4,000</td>
<td>120,000</td>
</tr>
<tr>
<td>Vaccination</td>
<td>5</td>
<td>9,000</td>
<td>45,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>165,000</td>
</tr>
</tbody>
</table>

II.3. Fixed Capital Consumption: FCC

<table>
<thead>
<tr>
<th>Item</th>
<th>Present Price (Kip)</th>
<th>Possible year of use</th>
<th>FCC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>chicken House</td>
<td>500,000</td>
<td>2</td>
<td>250,000</td>
</tr>
<tr>
<td>Pig Pen</td>
<td>300,000</td>
<td>2</td>
<td>150,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>400,000</td>
</tr>
</tbody>
</table>

III. Fish Culture

III.1. Fish Culture Gross Product: FGP

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity (kg)</th>
<th>Price (Kip/kg)</th>
<th>FGP Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td>60</td>
<td>15,000</td>
<td>900,000</td>
</tr>
</tbody>
</table>

III.2. Intermediate Consumption: IC

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity (no.)</th>
<th>Price (Kip/fingerling)</th>
<th>FGP Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fingerling</td>
<td>1,700</td>
<td>100</td>
<td>170,000</td>
</tr>
</tbody>
</table>
III.3. Fixed Capital Consumption: FCC

<table>
<thead>
<tr>
<th>Item</th>
<th>Present Price</th>
<th>Possible year of use</th>
<th>FCC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond</td>
<td>750,000</td>
<td>3</td>
<td>250,000</td>
</tr>
</tbody>
</table>

IV. Economic Evaluation of Agricultural Production

<table>
<thead>
<tr>
<th>Item</th>
<th>Crop</th>
<th>Animal</th>
<th>Fish</th>
<th>Total</th>
<th>AV/ Ha, AI/Ha</th>
<th>AV/Act, AI/Act</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Product</td>
<td>3,330,000</td>
<td>5,230,000</td>
<td>900,000</td>
<td>9,460,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>40,000</td>
<td>165,000</td>
<td>170,000</td>
<td>375,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCC</td>
<td>76,000</td>
<td>400,000</td>
<td>250,000</td>
<td>726,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV</td>
<td>3,214,000</td>
<td>4,665,000</td>
<td>480,000</td>
<td>8,359,000</td>
<td>2,321,944</td>
<td>4,179,500</td>
</tr>
<tr>
<td>Loan rental</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan interest</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxes</td>
<td>7,000</td>
<td>0</td>
<td>21,000</td>
<td>28,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid wages</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI</td>
<td>3,207,000</td>
<td>4,665,000</td>
<td>459,000</td>
<td>8,331,000</td>
<td>2,314,167</td>
<td>4,165,500</td>
</tr>
</tbody>
</table>

Key: AV = Added Value, AI = Annual Agricultural Income, Act = Active = manpower = 2
Annex 2: Economic Evaluation of Mr Vanthong shifting cultivation Farming system

I. Crops
I.1. Crop Gross product (CGP)

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity (kg)</th>
<th>Price (Kip/kg)</th>
<th>CGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>1,500</td>
<td>1,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Maize</td>
<td>100</td>
<td>800</td>
<td>80,000</td>
</tr>
<tr>
<td>Vegetables</td>
<td>50</td>
<td>2,000</td>
<td>100,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>1,680,000</strong></td>
</tr>
</tbody>
</table>

I.2. Intermediate Consumption (IC)

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity (kg)</th>
<th>Price (Kip/kg)</th>
<th>IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize seed (local)</td>
<td>5</td>
<td>800</td>
<td>4,000</td>
</tr>
<tr>
<td>Maize Seed</td>
<td>2</td>
<td>5,000</td>
<td>10,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>14,000</strong></td>
</tr>
</tbody>
</table>

I.3. Fixed Capital Consumption (FCC)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Present Price (Kip)</th>
<th>Possible year of use</th>
<th>FCC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knife</td>
<td>3</td>
<td>8,000</td>
<td>3</td>
<td>8,000</td>
</tr>
<tr>
<td>Hoe</td>
<td>3</td>
<td>20,000</td>
<td>3</td>
<td>20,000</td>
</tr>
<tr>
<td>Harvesting tools</td>
<td>6</td>
<td>5,000</td>
<td>3</td>
<td>10,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>38,000</strong></td>
</tr>
</tbody>
</table>
II. Animal Raising

II.1. Annual Animal Gross product (AGP)

<table>
<thead>
<tr>
<th>Item</th>
<th>Pig</th>
<th>Chicken</th>
<th>AGP Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Value of product</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B: Value of herd at end of year</td>
<td>500,000</td>
<td>100,000</td>
<td>600,000</td>
</tr>
<tr>
<td>C: Value of herd at beginning of year</td>
<td>800,000</td>
<td>125,000</td>
<td>925,000</td>
</tr>
<tr>
<td>D: Sold or Consumed animal</td>
<td>600,000</td>
<td>150,000</td>
<td>750,000</td>
</tr>
<tr>
<td>E: Bought or receive animal</td>
<td>150,000</td>
<td>40,000</td>
<td>190,000</td>
</tr>
<tr>
<td>Total (B-C+D-E)</td>
<td>150,000</td>
<td>85,000</td>
<td>235,000</td>
</tr>
</tbody>
</table>

II.2. Intermediate Consumption (IC)

No inputs such as vaccination, commercial feed.

II.3. Fixed Capital Consumption (FCC)

<table>
<thead>
<tr>
<th>Item</th>
<th>Present Price (Kip)</th>
<th>Possible year of use</th>
<th>FCC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken House</td>
<td>25,000</td>
<td>1</td>
<td>25,000</td>
</tr>
<tr>
<td>Pig Pen</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>25,000</strong></td>
</tr>
</tbody>
</table>

III. Economic Evaluation of Agricultural Production

<table>
<thead>
<tr>
<th>Item</th>
<th>Crop</th>
<th>Animal</th>
<th>Total</th>
<th>AV/ Ha, AI/ Ha</th>
<th>AV/Act, AI/ Act</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Product</td>
<td>1,680,000</td>
<td>235,000</td>
<td>1,915,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>14,000</td>
<td>0</td>
<td>14,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCC</td>
<td>38,000</td>
<td>25,000</td>
<td>63,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV</td>
<td>1,628,000</td>
<td>210,000</td>
<td>1,838,000</td>
<td>510,556</td>
<td>919,000</td>
</tr>
<tr>
<td>Loan rental</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan interest</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxes</td>
<td>30,000</td>
<td>0</td>
<td>30,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paid wages</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI</td>
<td>1,598,000</td>
<td>210,000</td>
<td>1,808,000</td>
<td>1,205,333</td>
<td>904,000</td>
</tr>
</tbody>
</table>

Key: AV = Added Value, AI = Annual Agricultural Income, Act = Active = manpower = 2
SEP-Dev: Testing New Approaches for Remote Area Development

Chanhome Mahaxay and Jacquelyn Chagnon

Abstract

In 1999, the challenge for the Sekong Ethnic People’s Development Programme (SEP-Dev) seemed awesome: to develop a community development strategy and institution aimed at improving the living conditions of multi-ethnic communities in the remote districts of Dakcheung and Kaleum.

Huge questions had to be answered. Could the programme mould the critical core of necessary development professionals from the local multi-ethnic populace? Could it afford the time and slow pace needed for capacity building, rather than undertaking numerous community development activities quickly? Could a programme, largely funded by external donors, develop into a permanent sustainable institution within the local government – i.e. a long-impact programme, not just a short-lived project? Could development improvements in isolated remote villages eventually gel into area-wide development of trade, marketing, service outreach, and transport?

This paper focuses on these four challenges and the lessons that SEP-Dev has gained over the past five years.

Introduction

In 1999, SEP-Dev conducted a problem analysis and design workshop (SIP-Dev 2000), at which province and district officials decided to:

- Focus on both building local capacity and community activities.
- Aim for a long-term, sustainable programme – not a five-year project.
- Build the capacity of local technical services.
- Start with road access to communities.
- Move slowly from village to area development.
- Rely on local personnel with local language and cultural skills as much as possible.

To meet these conditions, SEP-Dev had to find creative solutions to its institutional development. At the same time, SEP-Dev had to cope with enormous constraints:

- Isolated and diverse ethnic villages (10 different ethnic groups in Kaleum and Dakcheung).
- Newest province administration, created only in 1984.
- Limited and dangerous road access to the districts (six to eight months per year).

SEP-Dev is a program of the Sekong Government, and receives support by the United Nations Development Program, the Norwegian Agency for Development and World Food Program. In Phase 1 (1999-2001) SEP-Dev was known as the Sekong Indigenous People’s Development Program (SIP-Dev).
Few tertiary dirt tracks to villages.

12 phone lines and irregular electricity in the provincial capital.

District government staff with low education and technical levels.

No critical core of experienced community development professionals.

Limited technical skills in the private and government sectors.

 Barely visible transport and market systems (SIP-Dev 2000).

One other extraordinary constraint was noted. Kaleum and Dakcheung have “very high levels” of unexploded ordnance (UXO) contamination (Lao National UXO Programme 2001), a post-war consequence of the Indochina War (1964 - 1973). Lying along the historic Ho Chi Minh Trail, these districts easily top world records as the most heavily bombed areas in world history with an estimated four tons of bombs per inhabitant (Lao National UXO Programme 2001). In terms of current development work, UXO must be cleared from all sites prior to commencing construction of water supply systems, irrigation, roadways, paddy fields, and gardens.

Lesson one: Set an appropriate pace for building local capacity

In 1999 SEP-Dev faced a choice for framing its SEP-Dev’s programme management and community development efforts.

Choice One: Move quickly into its community development component by bringing in many experienced external professionals. This would show immediate and visible community activity results. The long-term risk, however, was the possible loss of building a local sustainable development institution staffed largely by local managers and developers.

Choice Two: Pace the rate of fieldwork commensurate with local staff capacity. In Sekong this meant starting from the basics of programme management and community development. Daily tasks would serve as learning platforms for local programme managers and developers. The risk was that low initial outputs on community poverty reduction would mark SEP-Dev as a “slow mover” which could dissuade long-term financial support.

The 1999 Design Workshop firmly endorsed Choice Two. Citing the poor results of an externally driven development project in Dakcheung ten years earlier, the province decided to concentrate on building local ownership and capacity first. Furthermore, both the province and its external donors recognised that establishing a sustainable rural development institution rooted in good governance practices could take a decade or two.

For the first three years SEP-Dev concentrated heavily on building local management capacity, with repeated training on the Government of Lao - United Nations Development Program (GOL-UNDP) National Execution system. Fieldwork was limited to five target villages in Kaleum and Dakcheung and two roadway accesses. To the casual observer, SEP-Dev’s pace appeared to be tedious with not very striking community results.
In 2002 and 2003, as staff capacity increased, the pace and volume of fieldwork climbed. By the end of 2003, SEP-Dev had supported development plans in 64 remote villages of Dakcheung and Kaleum:

- 17 target villages with intensive development activities.
- 9 pilot villages on one initial test activity.
- 140 kilometres of modest dirt roadways and footpaths.

In the end, the time spent in the beginning on building local capacity on management and community development has not hindered the scaling-up of fieldwork, despite an enormous learning curve for the local staff. Furthermore, the chances for a sustainable provincial development institution have certainly improved, as highlighted in the 2004 external mid-term review.

In particular, the review cited SEP-Dev’s strong ownership, good governance practices in its programme management, and effective participatory approaches in its community development. The review also urged SEP-Dev to further strengthen its monitoring system and district teams’ skills in management and community development. If these improvements can be achieved, SEP-Dev will have a firm institutional base to continue into a Phase Three in 2006.

**Lesson two: Mould the critical core of province and district developers from local people**

In 1999, SEP-Dev’s initial and most immediate task was to create a local core of community developers. SEP-Dev’s staff had to become the key facilitators between remote, under-served communities, government technical services and external funding support.

How could SEP-Dev create such a team of professional development facilitators when so few province and district officials and private citizens had development experience or training? At the same time, how was SEP-Dev going to find a staff that could handle the cultural and linguistic diversities of Kaleum and Dakcheung?

The choice was between expediency and time-consuming capacity building. SEP-Dev could either import experienced external personnel or train up local citizens. As language ability would be essential for working in these ethnically diverse districts, the 1999 Design Workshop resoundingly chose the second option: mould the critical core of developers from local residents.

At the province level, local staff could be recruited. However, the Design Workshop recognized two major constraints for staffing in Dakcheung and Kaleum.

1) Qualified civil servants were insufficient or unavailable.
2) Qualified private developers, notably women, did not exist yet.

In the end, workshop participants came up with a bold new approach for the Lao PDR: create District Management Units consisting of 2 government-appointed District Managers and a team of local development interns, called District Development Volunteers (DDVs).
This solution allowed SEP-Dev and the districts to recruit core staff from both government offices and private citizens, and to strive for ethnic diversity and gender balance. All staff have to come from the district and be fluent in at least one local language.

Today the district teams function like a hand. The two government-appointed District Managers form the palm of the operations. They direct the team according to SEP-Dev’s principles and standards as well as the government’s policies and planning, and they solicit district technical support for community activities. The DDVs in each district are the fingers that facilitate the daily development activities in various villages. DDVs ensure good communication between villagers, SEP-Dev and the technical services. They facilitate community discussions on data collection, planning, and agreements. They alert district managers about problems and monitor inputs and outputs. DDVs are provided basic stipends and continual on-the-job and semi-formal training for up to five years.

The DDV concept is providing the country’s first attempt to offer vocational development internships on development to remote area, multi-ethnic peoples with limited education and development exposure.

Today, there are 23 provincial and district staff working on management and fieldwork. Of them 91 percent are local residents and 78 percent come from local ethnic groups and speak local languages. SEP-Dev’s gender balance is impressive for the Lao PDR: half are women. Furthermore, over 60% have gained five years of on-the-job development and management experience (SEP-Dev 2003).

Success has varied between the two districts. In Dakcheung, where staff continuity has been excellent, a critical core of local developers is emerging. Kaleum, on the other hand, has presented tougher challenges. Finding appropriate local personnel proved difficult from the beginning. In 2003 the Kaleum team was reformulated and young people with high school education and exposure to other areas were found. The chance of forming a critical core of developers in Kaleum now seems plausible.

After five years, what has SEP-Dev learned about creating a Critical Core of Local Developers?

1. Districts teams are the lynchpins of development communications with remote ethnic villages, especially for women and children. Each member of staff must be able to communicate in local languages, to appreciate the richness of subtle cultural diversities, and to help SEP-Dev’s development efforts become ethnically sensitive and appropriate. However, the qualifications for staff selection often need to be lowered to be compatible with local conditions.

2. Attaining both gender and ethnic balance in staffing is possible and highly advantageous for working in remote, ethnically diverse areas. Through such staff, SEP-Dev easily involves those who cannot communicate their desires and ideas in Lao language, many of whom are women.

3. Remote area districts need intensive and continual on-the-job training and side-by-side coaching. At least five years of support – and maybe up to ten – is required. To mentor the district teams more effectively and continually, SEP-Dev decided to base advisory support at the district level from 2004. Refresher training is essential. For example, in 2004 SEP-Dev will offer training on basic maths, calculating budgets and doing basic bookkeeping, document filing, typing and computer operations, Lao language training (the meaning of Lao words such as document, accounting,
objective, receipts and monitoring), simple drawing skills, making charts and diagrams, and basic data analysis.

4. Establishing job descriptions, criteria for personnel selection and assessment processes demonstrates good governance practices to district authorities. SEP-Dev provides an excellent learning venue for modelling such new governance concepts in remote districts. Such practical learning is also helping districts take up their decentralised tasks.

Lesson 3: Foster close linkages with local government services

SEP-Dev’s mandate calls for making linkages between participatory community development plans and GOL services. However, government services often have too much work and too little money. At the district level, technical skills are rather low.

Again, government participants in the 1999 design workshop came up with useful suggestions for fostering a mutually beneficial relationship.

1. Incorporate senior department authorities into SEP-Dev’s planning and review processes. Quarterly and annual coordinating committee meetings provide key venues for activating critical linkages between community plans and government technical services.

2. Train up and use local technical officers of departments as much as possible. Today, SEP-Dev works closely with GOL technicians on livestock raising, paddy rice extension, roadway construction, water supply, hygiene and health promotion, and school improvements.

4. Strengthen the technical and outreach capacity of GOL departments and mass organizations through Mini-Projects. Here SEP-Dev devised a unique and popular approach. Each department or service unit can apply annually to SEP-Dev for small grants (up to US$ 2,000) for training and piloting new efforts in remote areas. In this way, departments learn how to write and implement small funding proposals and how to monitor their work. Mini-Projects have covered a range of concerns: hygiene promotion, training on agriculture extension, governance training for village leaders, education statistical gathering, upgrading non-qualified teachers, gender awareness, HIV public awareness campaigns, and many more. Since 1999, SEP-Dev has allotted over US$ 50,000 for Mini-Projects. In the end almost all of them directly or indirectly complement and promote SEP-Dev’s mandate.

After five years of using these approaches, SEP-Dev and its provincial and district partners have established a mutually beneficial relationship. Provincial and district authorities share annual plans with SEP-Dev, as they are beginning to realise SEP-Dev’s role as a “facilitator of development”. Department heads send staff to join SEP-Dev’s training processes on community planning, monitoring and assessments, and technical training. Furthermore, the Administration has asked that SEP-Dev’s work be institutionalised into mainstream GOL efforts and that SEP-Dev assist the province and districts with facilitating the creation of annual Development Forums with external partners.
Lesson 4: Improved access central for dissolving remoteness

In the original formulation document, SEP-Dev’s initial community development strategy focused largely on direct interventions in remote villages. However, SEP-Dev has now realized the critical importance of small-scale access improvements as the first intervention in isolated areas.

From numerous community dialogues, villagers expressed a high demand for pathways, small-scale dirt roadways, and safe stream crossings. Villagers understood well that whatever improvements they made to education, water supply, health, food security and income production, they still needed to break the yoke of isolation.

The demand was logical and wise. With access improvements:

- UXO Lao could bring in its vehicles and equipment to clear land of unexploded ordnance.
- Time and human labour required for transporting materials (water pipes, tools, rocks for gabion weirs. etc.) were reduced dramatically.
- Inter-village exchanges, trading and even development planning could emerge.

From five years of practical learning, SEP-Dev has reformulated its Strategy for Community and Area Development into four steps with improved access initiating the process (figure 2).

Step 1: The district and SEP-Dev consider possible development areas. Community dialogues are initiated in a few villages to identify problems and help villagers create community plans. Invariably, the demand for small-scale access improvement usually emerges as a major concern. At the same time SEP-Dev approaches other villages along and near the proposed roadway to see if there is a common interest in improving access through manual labour. After agreements are made, UXO Lao is requested to clear the ordnance, a survey is done, shovels and hoes are purchased, and Food for Work from the World Food Programme is requested. At the same time, SEP-Dev invites a few villages along the roadway to start one pilot activity (usually clean water supply or a school is chosen).

Step 2: As the access roadway is built, pilot activities are implemented and more pilot villages are taken on. Based upon performance on the roadway construction and the pilot activity, a few communities are invited to become Target Villages. This designation allows SEP-Dev to support longer-term community development. Step-by-step, villages choose their next activities to promote crop and livestock production, improve health and education, or to reduce daily labour.

Step 3: In year 3-4, additional pilot and target villages are selected along the roadway and community development activities started. The inter-village road maintenance meetings and development exchanges stimulate the beginnings of area cohesion.

Step 4: By Year 5, SEP-Dev and the district facilitate an Area-wide Planning Workshop to foster Area Development Plan. The Area Plan might include development of a 15-day market system, a secondary school, a clinic, and an agriculture extension office – all of which would prove cost-effective for a group of communities.
SEP-Dev envisions that the implementation of these Area Development Plans, coupled with developing personnel and institution capacity, will form its next challenges in Phase three.

**Conclusion: for sustainability choose the local capacity building path**

Most integrated rural development projects in the Lao PDR have aimed for quick community-focused results, often at the expense of building a permanent institution and critical core of local development professionals.

SEP-Dev, on the other hand, has chosen to take a different path, the one that is less expedient and rarely travelled in this country’s development history.

SEP-Dev’s approach is like building small-scale dirt roads to remote isolated villages. You can hire outsiders and heavy equipment, both at great expense. When finished, you have a road, but local people still do not know how to maintain it or construct more roads. Alternatively, you can take the time to train people to build their own road and to learn how to care for it, hopefully for many decades.

**Authors**

Ms. Chanhome Mahaxay, a Taliang from Dakcheung, has been the National Programme Director of SEP-Dev since 1999. She works full time on SEP-Dev. P.O. Box 071, Sekong. E-mail: SEPDEV@Laopdr.com.

Ms. Jacquelyn Chagnon first served as the Institutional Advisor in 1999 and returned in 2003 as the Senior Programme Advisor. P.O. Box 071, Sekong. E-mail: SEPDEV@Laopdr.com.
Bibliography


FRUIT GROWING AS AN ALTERNATIVE TO SLASH-AND-BURN AGRICULTURE: FINDINGS AND DISCUSSION

Rick Dubbeldam

Abstract

Many previous publications suggest that growing fruit trees is one of the most promising, sustainable and viable alternative to slash-and-burn practices in the uplands of the Lao PDR. These publications then suggest that marketing is one of the inhibiting factors to this, especially in the north of the Lao PDR. From activities conducted over the previous one and a half years through the cooperation between the German Development Service (DED) and the Upland Agriculture Development Centre (UADC) the following has been established:

- Marketing problems hardly occur within the target districts in which UADC undertakes activities.
- In comparison to Thailand, most fruit trees planted in the Lao PDR are not of improved sources.
- In order to make fruit growing with farmers a success, extension activities (field visits) are of utmost importance, possibly more so than training before planting.

The UADC has been experimenting using a variety of participatory extension methods. The Centre has tried to adapt the ‘farmer’s field school’ methodology to suit orchard inputs. The response by farmers was highly successful, with many farmers adapting their orchards accordingly to enable them to produce both higher quantities as well as higher quality of fruit.

Introduction

The Upland Agriculture Development Centre (UADC) was initiated in the early 1990s by a World Bank/AusAid project aiming to assist the Lao government in decreasing the amount of slash-and-burn agriculture. The emphasis then lay with (re)constructing irrigation schemes in four target districts (Feuang, Hinhrup, Vangvieng and Kasy) of Vientiane province, Lao PDR. Since 1998, the Lao government has continued the centre without external funding, concentrating on the introduction of fruit growing in the uplands as a means of decreasing slash-and-burn agriculture.

Between 1997 and 2003 UADC organised three training courses on orchard establishment, which were attended by 34 farmers from the aforementioned target districts. In the corresponding years, 2,750 fruit trees (mostly improved varieties) were planted by 50 farmers, most of whom had received training (figure 1). During the first few years (from 1997 – 2000) while the centre gained experience with handling such programmes and developed its own capacity to multiply fruit trees, the overall results were rather disappointing, both in terms of quantity and quality. This was mostly due to a lack of expertise and capacity to undertake extension activities.
The centre is currently expanding its ability to produce a greater variety of fruit seedlings (rambutan, longan, jujube) as well as improving seedling quality. Staff at the centre now possess better skills in producing quality seedlings, training farmers both before, and especially after, planting and are, slowly, gaining more knowledge on extension (providing farmers with advice regarding crop management as well as pest and disease control). This improved extension method is characterised by the training approach adopted whereby orchards already planted by farmers are more frequently used for demonstration purposes. This results in better adoption of techniques.

**Findings**

The following findings are the results of a survey (Dubbeldam 2003) undertaken in three target districts of Vientiane Province (Kasy, Hinhurp and Vangvieng). The survey comprised of nearly 150 farmers who, at some point in the past, started growing fruit trees:

- Farmers who establish fruit orchards have a high degree of rice self-sufficiency.
- At least two-thirds of the orchards are derived from unimproved seedlings.
- Most fruit growers have never received training.
- In the target areas, 62% of the respondents reported having *Citrus spp.* orchards, with only two other fruits (mango and rambutan) having significant numbers.
- The average size of orchards is just over 100 trees per orchard.
- Main problems perceived by respondents were diseases/pests (36%), pruning (24%) and irrigation (19%).
- Marketing is perceived as a problem by only 1% of the respondents.

Other findings from the cooperation between DED and UADC are the result of extension work and field visits during 2003:

- Orchard maintenance by farmers during the first two to three years following planting is poor. Follow-up programmes can contribute to improved management during this time. Pruning during the first few years is essential as otherwise the trees will grow too tall and become unmanageable.
Farmers have little knowledge of management beyond planting. They lack the know-how concerning pruning, small-scale irrigation and disease/pest control of various fruit trees. The same can be said about front line extension staff.

Farmers who live in relatively densely populated areas are more inclined to plant and invest labour in the management of orchards.

Farmer-to-farmer extension methods, whether approaching a subject before planting or after, will increase farmer motivation and result in a much higher adoption rate.

**Discussion**

**Marketing**

Though fruit tree cultivation is generally acknowledged as one of the better viable alternatives to slash-and-burn agriculture, there are divided opinions that point to the factor of marketing:

- “Lack of market is a serious constraint to horticultural production and opportunities for upland farmers to integrate trees and other perennials into their farming systems are limited” (Roder et al. 1992).
- “Fruit trees except for home consumption, are inappropriate if markets do not exist” (Roder et al. 1995).
- “Slow returns and the uncertain market are probably the main constraints (of fruit growing)” (Hansen 1998).

The latter author points out that in Northern Thailand large-scale road construction helped overcome many marketing problems. This may be the same for the Lao PDR. However, even under current poor road conditions, fruit travels far. Some examples:

- When in season, oranges from Luangprabang find their way into the markets of Vientiane. Ban Somsavat (a village in Vangvieng district which grows oranges on a large scale), reported no problems selling their fruit crop at prices even above those of Chinese imports.
- Bananas are regularly transported from Luangprabang to Vientiane, despite being highly perishable when transported by road.
- On a visit to an orange orchard near Borikhamxay it was reported that large quantities of the fruit are transported to Pakse.
- It is common knowledge that durian from the Bolaven Plateau is transported to Bangkok.

Most fruit tree growing projects concentrate on small-scale farmers. The amount of fruit produced by these farmers under low-input circumstances is often small, and initiators hardly produce more than the surrounding market demands. Returns are estimated at US$ 8-10 per tree. With a small-scale orchard of 25-50 trees returns can be obtained of US$ 200-500 per year, bearing in mind limited local demand and low-input orchards.

The conclusion is that marketing is hardly a problem and should not be a determinant for expanding orchards for projects focusing on small farmers. It is therefore not justi-
fied that marketing problems are used by projects/researchers to rule out growing fruit as a viable alternative to traditional slash-and-burn agriculture.

However, marketing situations in the Lao PDR are set to change in the near future. Most current research efforts have focused on the national market, while this national market (Vientiane) is being supplied by Thailand. Import duties are set to drop to zero percent in 2008 and Lao farmers will be forced to produce better quality fruit or accept lower prices. In a recent development, trade liberalisation between China and Thailand has resulted in falling prices for oranges in Thailand as Thai consumers are opting to purchase cheaper Chinese apples instead of more expensive Thai produced oranges.

**Expertise**

The constraint to the success of fruit tree growing is possibly a lack of expertise. This is already apparent in most nurseries, where the use of rootstocks needed for good root growth, as well as grafting superior varieties, is seldom practiced. The consequence is that inferior trees are planted, resulting in poor growth, poor fruit setting and/or poor fruit quality. Most Lao government and project nurseries focus on quantity rather than quality, meaning that grafting is not carried out. Hansen (1998) also explores the possibility that the inputs (seedlings) are of poor quality and, as such, result in low viability of fruit orchards.

Once fruit trees are planted, project inputs are mostly completed. It is possible that monitoring missions may be held a year or so later to see how many seedlings are still surviving, but farmers are seldom advised on how to improve their orchards.

Experience has shown that the reasons for pruning (keeping the trees manageable and opening up the canopy to allow better air circulation, thereby decreasing disease incidence) are totally unknown. Farmers, extension staff, project staff as well as large-scale growers are not familiar with this cultivation technique, whereas it is common practice in Thailand. In specific cases farmers wonder why a male rambutan tree does not fruit. When confronted with disease/pest problems, neither farmers nor extension staff are able to obtain solutions.

**Land/labour availability**

Another factor influencing orchard management is the availability of land. The more pressure there is to seek alternatives to traditional slash-and-burn agriculture (due to factors such as declining productivity and the need for higher levels of income), the more farmers are interested in and motivated to establish good fruit tree orchards. Essentially, the returns to labour in traditional slash-and-burn are insufficient. This is also illustrated by Ducourtieux (2000, 2004) in his studies in Phongsaly Province. Land pressure near the UADC is high and consequently orchards are generally better managed then some examples that can be seen in Vangvieng, Kasy and Feuang districts where land availability, especially for irrigated rice paddies, is better.

**Extension techniques**

As mentioned before, the need to use farmers' orchards within training is essential. Experiments in 2003 were carried out using a 'farmer's orchard school' whereby local farmers meet each other on a monthly basis at different orchards. Some of the principles of 'Farmers Field Schools' (as used with Integrated Pest Management (IPM) in
rice) were tried but lacked both the single crop approach (as a variety of crops were grown) as well as the community approach (as participants came from one district). Apart from providing a location for specific training, orchards were also compared and farmers became more motivated to improve their own orchards. In this respect the experience was successful. However, in hindsight, it may be better to use the term 'practical fruit study group' rather than a 'farmer's orchard school'.

Training sessions on management practices were also held in farmers’ orchards so that not only practical skills were acquired but also other matters such as fertilizer application and disease/pest control could be discussed. Again, when compared to usual training sessions held in meeting halls, this practical approach proves to be much more effective.

Experiences outlined in this paper stress the need for specific expertise on fruit growing, which is currently limited in the Lao PDR. Table 1 provides a short overview of aspects to consider when instituting a fruit tree cultivation programme in the uplands of the Lao PDR. Even though the list is brief, it will help avoid making many mistakes when commencing a fruit-growing programme.

**Lessons learnt so far**

- Marketing, although important, is not an impediment to expanding orchard areas in most upland areas of the Lao PDR.
- Most of the fruit trees distributed in Lao PDR so far, are derived from unimproved materials. This results in inferior orchards.

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Obtaining seedlings</th>
<th>Growing conditions</th>
<th>Management</th>
<th>Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Citrus</strong></td>
<td>Though it is possible to get improved varieties, adequate rootstocks are seldom used.</td>
<td>Widely adapted but preference for places where soil moisture is above average.</td>
<td>Pruning essential, excellent response to additional irrigation.</td>
<td>Excellent as the fruiting season is extended or, in the case of lime, year round.</td>
</tr>
<tr>
<td><strong>Mango</strong></td>
<td>Preferred choice should be grafted seedlings, with varieties common in Thailand and little incidence of anthracnose</td>
<td>Widely adapted.</td>
<td>Pruning essential, chemical treatment for anthracnose required</td>
<td>Planting different varieties within the same orchard spreads the season</td>
</tr>
<tr>
<td><strong>Rambutan</strong></td>
<td>Grafted seedlings essential</td>
<td>If possible small-scale sprinklers should be used.</td>
<td>Pruning required</td>
<td>Demand for local tasty types grown under local conditions rather than imported fruits</td>
</tr>
</tbody>
</table>
Lack of expertise of extension staff and/or extension efforts in general are more of an impediment to expanding the upland fruit-growing sector in the Lao PDR than perceived marketing problems.

Farmer-to-farmer exchanges are essential in any fruit-growing programme.

**Author**

Rick Dubbeldam is a DED Development Advisor working at the Upland Agriculture Development Centre, Hin Huep, Lao PDR. Email: rd_kv@hotmail.com

**Bibliography**


EXPERIENCES AND LESSONS ON GROUP BASED EXTENSION METHODS AND FARMER NETWORKS IN THE CATCHMENT AREA OF NAHOM FOCAL SITE, BENG DISTRICT, OUDOMXAY PROVINCE

Eco-Development and Irrigation Project

Abstract

Previous extension efforts in the Lao PDR have focused on transferring results from research centres to farmers through extension staff in a 'one-way' flow of information. This has been shown to be ineffective and wasteful of resources. To address this issue, many organisations have sought to develop more appropriate extension systems that suit local conditions. This paper describes the group based extension system, as developed by the Eco-Development and Irrigation (EDI) Project in Oudomxay Province. In contrast to earlier extension methods, the group based extension system places high emphasis on networking, participation, capacity building as well as exchange of experiences and lessons. The system encourages a dynamic and multi-directional flow of information with good communication between farmers and extension agents. The group based extension approach is a process containing a number of activities and steps. This paper outlines the various steps and activities by using examples from the project's work in Oudomxay.

Background of extension methods

Over the last decade, since the constitution of the Lao PDR was established in 1991, the country has experienced a period of unprecedented change. During this time, the Government of the Lao PDR issued a development policy aimed at increasing the pace of production to catch up with other countries and in particular to produce enough food to meet the needs of the Lao people and release them from poverty. Many International Organisations (IOs) have assisted the Lao Government to implement this policy in the areas of development and research. As a result many research stations and centres have emerged in large districts where most agricultural production areas are found. Previously, most research activities were conducted at centres and stations to produce results, which would then be transferred to farmers through extension staff. Farmers were encouraged to use imported materials, especially chemicals and fertilisers at high application rates. This high incidence of chemical use showed positive effects in some areas, but in most cases increased farmers’ chronic debts.

Past extension efforts to transfer knowledge and experiences from extension staff to farmers can be considered as one-way communication mainly occurring on an individual or family basis with no proper participation or involvement of local knowledge. Extension focused on giving the necessary tools and materials to motivate farmers to produce more without exchanging knowledge and experiences among extension staff and farmers or among farmers themselves. This led to ineffective production while
wasting resources, including time, money, human resources and other materials while at the same time devaluing the extension system for many people.

Due to this, development projects operating in catchment areas in Oudomxay Province have paid a lot of attention to improving and developing appropriate and effective extension systems that can be applied in these areas. The most appropriate method that has been developed is the group based extension system. This is because the system is the one that most likely leads to sustainable development resulting from its stable group capacity building through:

- Actively encouraging groups to coordinate and consult with each other.
- Concentrating on exchange of experiences and lessons within and between groups.
- Encouraging group members to strengthen their capacity in order to work as village technical assistants, coordinators and facilitators.

Learning from past mistakes, the project has taken on the idea to develop a group based extension system.

The group based extension system works through a process of activities in the following steps:

**Feasibility studies**

Prior to the implementation of any activity a number of feasibility studies need to be conducted by project staff. These include:

- Finding out farmers’ interest in forming groups such as a fruit tree cultivation group, rice experimenting group, etc. At the same time, organising groups and determining their roles and responsibilities.
- Collecting information and compiling a list of interested farmers as well as other relevant statistics related to land area, labour and levels of interest.
- Assisting farmers to select group members by setting selection criteria that really support the selection of poor families.
- Once group members are selected, extension agents accompany group members to go and inspect planting areas in order to check the suitability of the areas, e.g. soil characteristics, water source, size of planting area, etc.

Parties involved

- Focal site extension staff.
- Village authorities and villagers.
- Project coordinating staff.

Study method

- Meeting villagers and field visits.
- Collecting information related to the number of interested families.
**Preparation of agreed minutes**

Before implementing activities it is necessary to have agreed minutes containing and specifying detailed commitments or obligations of all involved parties and individuals. These minutes should be developed and agreed on jointly by all stakeholders, particularly groups of villagers or other beneficiaries.

The objectives of preparing agreed minutes are to:

- Build common understanding relating to any specific activity such as roles and responsibilities, relevant documents, tasks, etc.
- Initially assess readiness of activities to be implemented in relation to labour and materials available.
- Identify clear strategic implementing directions in order to achieve set objectives and targets.

Details of the agreed minutes include:

- Objectives.
- Expected outputs.
- Roles, responsibilities and tasks of each of involved party.
- Budget.
- Time frame.
- Implementation plan.
- Group organisational structure.
- Group ToR.
- Regulations on the establishment of funds (releasing and returning money), etc.

In the case of the Nahom focal area located in Beng district, Oudomxay province, there are ten extension groups comprising:

- Six fruit tree and model households on integrated farming groups.
- One maize based group.
- One soybean based group
- One ground bean based group.
- One lowland rice testing group.

Separate agreed minutes are essential for each interest group as a condition for accessing EDI funding support.

**Implementation of activities**

The project provides funding in the form of provision of seeds and seedlings as well as extension staff to coordinate and facilitate interest groups, provide technical advice, facilitate meetings and workshops, etc. The actual implementation of activities is the direct task of interest groups, while extension staff are there only to assist with technical and managerial advice.
During activity implementation, extension staff play a role in providing interest groups with mainly on-the-job technical advice and training. For example, in the case of site preparation for planting fruit trees, interest groups are first informed technically about what and how to do it and then they are asked to carry out activities by themselves, while extension staff observe and follow up. Additional advice is given only as necessary. For monitoring purposes, the groups are asked to report on progress or any difficulties and/or constraints that they have faced during actual implementation. The extension staff prepare monitoring plans (table 1) and meet with interest groups on a monthly basis.

### Establishment of learning processes for interest groups

Organising learning processes for interest groups is the task of extension staff. This can be done in many ways, for example: through meetings, seminars, workshops, or field visits. Organising learning through visits seems to be the most appropriate method because it enables the most efficient discussion and exchange of experiences. However, it is seasonally dependent which means that visits need to be arranged at a suitable time. For example, a visit to rice based activities can be organised at three times, when the rice is:

- Developing clumps.
- Starting to flower.
- Being harvested.

When organising learning in this way, extension staff need to:

- Identify group presenters or farmers who own the activities. Such presenters or farmers should ensure that all information required is well prepared in advance. This includes, for example:
  - the topic(s) that will be presented;
  - the kinds of communication tools that will be applied;

---

**Table 1: Outline of monitoring plan**

<table>
<thead>
<tr>
<th>Activity group</th>
<th>Working step</th>
<th>Monitoring details</th>
<th>Necessary information</th>
<th>Source of information</th>
<th>Method</th>
<th>Responsible party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit trees at Phakeo village</td>
<td>- Site preparation</td>
<td>- Digging planting holes</td>
<td>- Spacing - Hole size</td>
<td>- Farmers - Observation</td>
<td>Observation</td>
<td>- Ext. staff - Group leaders</td>
</tr>
<tr>
<td>Fruit trees at Nahom village</td>
<td>- Site preparation</td>
<td>- Digging planting holes</td>
<td>- Spacing - Hole size</td>
<td>- Farmers - Observation</td>
<td>Observation</td>
<td>- Ext. staff - Group leaders</td>
</tr>
<tr>
<td>Rice testing at Savang village</td>
<td>- Seedbed preparation</td>
<td>- Preparing seeds - Preparing seed beds</td>
<td>- Seed selection - Size of seed bed</td>
<td>- Farmers - Observation</td>
<td>Observation</td>
<td>- Ext. staff - Group leaders</td>
</tr>
<tr>
<td>Model household</td>
<td>- Site preparation</td>
<td>- Measuring distances - Digging fish ponds</td>
<td>- Row spacing - Size of fish ponds</td>
<td>- Farmers - Observation</td>
<td>Observation</td>
<td>- Ext. staff - Group leaders</td>
</tr>
</tbody>
</table>
ensuring that there is sufficient information.

- Prepare details for the target group or visiting group, such as:
  - location for visit;
  - interesting topic(s);
  - time frame for the visit;
  - method of travel.

- Extension staff need to prepare themselves to facilitate the visit. This could include preparing guiding questionnaires or important technical issues that need to be clarified in conjunction with the field visit. This ensures that group members have common understanding and thereby the objectives of the visit can be achieved.

Facilitating learning in this way is expected not only to build farmers’ capacity, but also to generate group presenters. In addition, through such interaction, farmers gain a deeper understanding of extension work.

**Facilitating how to draw out lessons**

Lessons can be drawn out and learnt through meetings or discussions among groups and between group members organised after completing a particular activity. Such ‘lesson learning’ events are normally organised in a participatory way involving all concerned parties, especially the core activity groups. The objectives of drawing out lessons are:

- To provide all parties with the opportunity of summarising experiences gained from implementing a particular activity.
- To help groups draw out lessons from within their own group.
- To analyse and evaluate the strengths and weaknesses of groups. These can be used as a foundation for sustainable development in the future.

The main tasks of extension staff during the process of lesson learning is to encourage and facilitate group members to identify and analyse problems. In particular, extension staff ask guiding questions which lead groups into thorough discussion thereby drawing out lessons. To facilitate problem analysis, tools such as an analysing matrix are used. The process of analysing starts by reviewing the objectives and expected outputs of the activity in question and then compares them with the actual results achieved.

**Results**

**Lessons learnt**

- The group based extension method facilitates and enables closer communication between extension staff and farmers.

- On-the-job training is very successful because it helps group members to have deeper understanding.

- Agreed minutes prepared for each activity enables clearer understanding about groups’ roles and responsibilities.
Using the group extension system increases farmers’ capacity to be subject-specific local presenters.

Group extension methods that focus on farmer exchange notably help deepen farmers understanding.

Organising cross visits helps build an extension network within the area.

The group extension system requires that extension staff have a certain level of knowledge on time management, facilitation skills, and other relevant skills.

### Problems and constraints

- The group extension method is not yet fully familiar to farmers and, as a result, extension staff must work hard to form and organise groups in a systematic manner.
- Because the majority of extension staff do not have sufficient knowledge and experience about group extension methods, a lot of time is spent on preparation.
- Extension staff still lack knowledge and experience, in particular skills in facilitating learning or encouraging, motivating and helping arrange important learning events.

### Recommendations

- Training on curriculum development for facilitating learning or organising other events is essential for extension staff.
- Extension staff need to have a diverse range of knowledge and experiences.
- In order to strengthen capacity of farmer groups, extension work for each activity must be relevant, continuous, and process oriented.
- The extension process should consider the farmers’ group as its core or centre and should be flexible.
Example: Establishment of agreed minutes on fruit tree planting in Phakeo village, Focal site Nahom

Background of Phakeo village

Phakeo is one of 12 villages located in the Nahom focal site, Beng District, Oudomxay Province. The village is located about four kilometres north of the focal site and 18 km from Oudomxay city centre. Phakeo is a Hmong village with a total of 433 inhabitants (201 women) who live in 68 families and 49 households. In the past these families used to live in Nampae village and emigrated to this village as a result of improved road access.

In the past, shifting cultivation and growing opium were the main occupations for these families, while livestock raising, growing vegetables and other crops and hunting wild animals were deemed secondary occupations. After resettlement in the new village near to the Nam Gnao stream and with good road access, the families changed their way of their life to more sustainable occupations such as growing lowland rice, raising fish in ponds, planting fruit trees and vegetables. To date, people in the village own 14.94 ha of paddy fields, 19 fish ponds and some other cropping areas.

Details to be agreed in a participatory manner

Identifying stakeholders and developing respective TOR

Identifying stakeholders:
- Focal site extension staff.
- Village authorities and target groups.
- Watershed development project.

Identifying TOR for relevant stakeholders:
Beneficiary group:
- Contribute labour to clear planting sites, dig planting holes, as well as provide other labour needs as required.
- Involvement in meetings, training, and study tours.
- Implement rules, regulations, minute conditions, report on progress as well as problems and issues.

Focal site extension staff:
- Encourage, monitor, support implementation, and transfer knowledge for all activities.
- Provide training.
- Reconcile conflicts that may arise.
- Regularly report progress of activity implementation to other involved parties.
- Monitor materials and equipment management.
- Coordinate with other concerned parties.
- Organise and facilitate meetings and training.
Prepare weekly and monthly plans.

EDI project (Project Coordinator):
- Contribute funds for purchasing seeds.
- Provide necessary tools and equipment.
- Provide vehicles and fuel to facilitate monitoring and transporting seedlings.
- Send technical coordinator to regularly follow up activities.
- Provide daily subsistence allowance for district technical staff.

**Objectives – set in a participatory way**
- Build up 25 model farmers and increase their capacity to transfer knowledge to other interested households.
- Ensure that farmers have sufficient fruit for food as well as for earning additional income.
- Replace opium cultivation and move towards shifting cultivation stabilisation by planting fruit trees as an alternative, permanent livelihood.
- Reduce future deterioration of the ecosystem.

**Expected outputs**
- 25 model farmer households that are able to transfer knowledge to other interested households.
- In the next 5-6 years, target households will have sufficient fruit for food and will earn an annual income of five million Kip from selling fruit.
- In the next 5-6 years 25 farmer households will cultivate 17.36 ha of fruit tree orchards and thereby will have reduced the area of land under shifting cultivation by 25 ha.

**Participatory planning**
This process generates workplans and monitoring plans (tables 3 and 4)

**Evaluation plan**
Evaluation needs to be planned in advance in order to review activity implementation in terms of strengths, weakness, lessons learnt, and constraints as well as to identify solutions to address these issues.

**Formation of production groups for implementing rules and regulation**

**Responsibilities**
Roles and responsibilities of the production group head and deputy:
- Coordinate and provide information to focal site and district extension staff.
- Assemble group members to attend evaluation workshops and training organised internally or by the project.
Shifting Cultivation and Poverty Eradication in the Uplands of the Lao PDR

Table 3: Work plan, required materials and budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit cost (Kip)</th>
<th>Total (Kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longan seedlings</td>
<td>1,248</td>
<td>9,000</td>
<td>11,232,000</td>
</tr>
<tr>
<td>Orange seedlings</td>
<td>1,000</td>
<td>8,000</td>
<td>8,000,000</td>
</tr>
<tr>
<td>‘Sour’ orange seedlings</td>
<td>3,000</td>
<td>8,000</td>
<td>24,000,000</td>
</tr>
<tr>
<td>Pomelo seedlings</td>
<td>312</td>
<td>8,000</td>
<td>2,496,000</td>
</tr>
<tr>
<td>Plum seedlings</td>
<td>600</td>
<td>7,000</td>
<td>4,200,000</td>
</tr>
<tr>
<td>Plastic bags</td>
<td>6 ea.</td>
<td>25,000</td>
<td>150,000</td>
</tr>
<tr>
<td>Sugar</td>
<td>25kg</td>
<td>4,000</td>
<td>100,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>50,178,000</strong></td>
</tr>
</tbody>
</table>

- Lead group members in implementing group activities such as intercropping cash crops with fruit trees, caring for fruit trees, and planning.
- Monitor and report on growth of, and problems related to, fruit trees. Also monitor and report on monthly group progress to the focal site and district extension staff.
- Manage materials and equipment to ensure long-lasting use.

Roles and responsibilities of group members:
- Implement activities in accordance to instructions from the focal site and district extension staff.
- Return loans in a timely manner, using one of two methods:
  - **revolve** multiplied seedlings to other members in the originally received amount;
  - return money to the group according to present prices for the materials received.

**Participatory regulation development**
- All members must follow the instructions of the production group head and deputy.
- In case of failure to take care of provided planting materials, group members must:
  - repay the costs of provided materials, when the loss or damage to planting materials occurs as a result of poor care or maintenance such as being damaged by animals, and/or due to failure in fertilising and weeding;
  - not pay back the costs of provided materials when damage to planting materials occurs as a result of uncontrolled natural disasters such as drought, frost, flood, and others. However, such exemptions can only occur when the damage is evaluated and certified by the group head and deputy, chief of village, focal site and district extension staff.

Table 4: Monitoring plan

<table>
<thead>
<tr>
<th>Activity group</th>
<th>Working step</th>
<th>Monitoring details</th>
<th>Necessary information</th>
<th>Source of info</th>
<th>Method</th>
<th>Responsible party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit trees at Phakeo</td>
<td>Site prep</td>
<td>Digging &amp; planting holes</td>
<td>Spacing-hole size</td>
<td>Farmers - observation</td>
<td>Observation</td>
<td>Ext. staff - group leaders</td>
</tr>
</tbody>
</table>
Time frame for returning funds:
- funds must be returned within five to eight years after the date of planting trees. Funds can be repaid in two ways:
  - returning multiplied seedlings to other households in the amount received;
  - returning the cost of received materials in cash at present prices.
- Group members must regularly report on the status of their fruit orchards to the group head and deputy.
- Regulations formulated are to be used as the legal framework for the management of fruit orchards. They become effective after reading them to all group members to understand, agree and sign.

**Requesting budget and procurement**

Requests for budget and procurement of goods and materials are directly undertaken by the project following prescribed steps and processes. It is, therefore, not necessary to explain in this paper.

**Training, site preparation and seed delivery**

**On-the-Job training and site preparation for planting**

On-the-job training is used to illustrate ways of conducting activities to the group so they are able to carry out those activities at their own sites. Such activities include:
- Establishment of contour lines.
- Spacing of planting lines that vary depending on desired species and degree of slope.
- Method of digging planting holes, particularly the size of the hole and method of keeping surface soil.
- Methods of putting fertiliser at the bottom of planting holes, watering and taking care of planted trees.
**Seedling delivery**

After delivery to planting sites, seedlings need to be nurtured at the focal sites for at least one month by the respective extension staff before they are delivered to individual production groups. Before delivery, production groups shall be informed and provided with additional instructions.

**Monitoring group actions**

**Monitoring method**

Production groups should be followed up by reviewing their roles and responsibilities, implementation and monitoring plans. This information is needed for further monitoring purposes.

**Training and transfer of knowledge to production groups**

Training and transfer of knowledge to production groups focus on filling knowledge gaps identified in assessment workshops including, for instance, problems related to planting and maintaining fruit trees and other relevant issues. On-the-job training is applied for this purpose.

**Participating parties**

- Focal site extension staff.
- Project coordinator and staff.
- Heads and deputy heads of production groups.

**Methods applied:**

- Workshop on analysis of problems and constraints.
- Participatory identification of objectives and expected outputs.
- Participatory identification of criteria for selecting participants for training and study tours.
- Participatory identification of participants for training and study tours.
- Participatory preparation of content and plan of training and study tours.

**Evaluation**

Production groups are evaluated in a participatory manner by project staff, focal site staff and production groups on the following aspects:

- Knowledge of group members.
- Group rules and regulations.
- Group organisation structure.
- Fund establishment of groups.