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Potentials and Constraints on Shifting Cultivation Stabilisation in Northern Laos

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ABSTRACT

The Government of Lao P.D.R. aims at a rapid reduction in shifting cultivation through land allocation, the promotion of permanent types of land-use, and through socioeconomic development. This policy may be justifiable considering the social, environmental and production problems associated with shifting cultivation in most of the country.

However, the development efforts are constrained by the mountainous topography, the undeveloped infrastructure, the limited market demands and processing facilities, the poverty of most shifting cultivators and by the lack of a suitable extension system. Many technical recommendations are not suited or adequately modified to the highly heterogeneous environment, socio-economic conditions and land-use potentials in the shifting cultivation areas. Development plans and their execution will therefore need to be flexible and diversified, and will often require further testing and analysis, preferably involving farmers and local extension staff. The success of these efforts will also depend on social progress, especially in improved education, slower population growth and opportunities for nonagricultural occupation.

INTRODUCTION

The topic of this conference is the role of livestock in upland farming systems in Laos. This theme is necessarily closely related to the Lao authorities' aim to stabilise shifting cultivation, which is the main upland farming system in Laos. The development strategy contains seven components; apart from the improvement and expansion of the livestock sector, these are land allocation, promotion of permanent cultivation, expansion of paddy production, tree planting, infrastructure improvement and social development. This paper will assess the potentials of and constraints on these strategy components for shifting cultivation development in Lao P.D.R.

Shifting Cultivation in Laos

Shifting cultivation is the dominant cropping system in the uplands and mountains of Lao P.D.R. As many as

300.000 families are fully or partially engaged in shifting cultivation, equal to about 1.8 million people or 40 percent of the population. Assuming that each family plants about 1.5 hectares per year, the shifting cultivation area used annually would be around 450.000 hectares. The total area in the shifting cultivation cycle is difficult to assess, but may be 2 - 2.5 million hectares, equal to about 10 percent of the area of Laos.

The Northern Region includes seven provinces[1], which account for 41 percent of the area and 33 percent of the population in Lao P.D.R. It is a predominantly mountainous region with only small areas of flood plains and larger river valleys. Permanent upland cropping and paddy farming are therefore secondary to shifting cultivation and about 65 percent of the shifting cultivators in Laos live in the North (Suvanthong 1995). Upland rice constitutes 65 percent of the total rice area in the North, compared to a national average of 31 percent (NSC 1997a). The prevalence of shifting cultivation has greatly contributed to the reduction of the current forest area[2], which is only about 36 percent in the North compared to 52 and 58 percent in the Central and Southern Regions, respectively (NOFIP 1992). Improving agricultural production is particularly difficult in the North because of the hilly topography, the often steep slopes, the small potential for paddy cultivation, and the limited infrastructure and market access.

The population of Laos consists of 66 officially recognised ethnic groups, many of which contain several subgroups (Chazee 1995). Laos' many ethnic groups are often divided into three main ethnic categories: Lao Lum (lowlanders), Lao Theung (midlanders) and Lao Sung (highlanders). The Lao Lum consists of the Lao or Tai speaking, mostly Buddhist groups and accounts for about 60 percent of the population (NSC 1997b). Although most Lao Lum farmers are engaged in paddy farming, a large proportion practices shifting cultivators. The Lao Theung and Lao Sung groups make up 30 and 10 percent of the population, respectively (NSC 1997b). In general, they are more dependant on shifting cultivation than the Lao Lum groups, but the land-use is very diverse and ethnic stereotypes often prove misleading (Roder et al. 1991, Hansen 1995).

Most shifting cultivators remain subsistence producers of upland rice, but commercial production of other crops is expanding in areas with adequate infrastructure and market access. In most places, the fallow periods have become critically short during the past 20-30 years; the main causes being population increase, government restrictions, and competing land-use objectives, as well as the concentration of people around urban centres and in areas with road and river access. This pressure on land has led to soil degradation, the proliferation of weeds and pests, lower yields and a greater demand for weeding. Many shifting cultivators are therefore experiencing increasing poverty and uncertain prospects, and are among the most disadvantaged groups in Laos. Few farmers would opt for shifting cultivation if alternatives were available, and where this is the case farmers have readily modified their land-use.

Today, shifting cultivation in Laos is largely based on the cyclical use of young secondary vegetation, although limited encroachment in older forest still takes place in isolated areas. However, over the years, shifting cultivation has considerably reduced the forest area to the detriment of timber resources and natural habitats. Where shifting cultivation is intense, accelerated erosion and changes in the water discharge may impair water resources for irrigation, hydropower and domestic use.

Because of these environmental and socio-economic problems, the stabilisation of shifting cultivation is a major priority of the Lao Government. The development strategy (DoF 1997) includes:

- Land use planning and land allocation,
- Promotion of permanent cash cropping,
- Expansion of the paddy area,
- Expansion of livestock production
- Tree planting by farmers
- Infrastructure development, and
- Socio-economic development work.

This report discusses the possible role of these strategy components in stabilising shifting cultivation in Lao P.D.R. Some main potentials, constraints and recommendations are summarised in Table 1. Much of the analysis is based on findings of the Shifting Cultivation Research Project in Luang Prabang during 1991-97 (see Sodarak et al. 1997, this volume).

Land-use planning and land allocation

Land tenure in shifting cultivation areas of Laos is traditionally acquired by bringing unclaimed land under cultivation. Until recently, land was abundant and therefore rarely a limited resource that required extra-local

control. The authorities moreover had little interest or capability in regulating farmers' access to land. With increasing population pressure and competing land-use objectives - especially forestry, irrigation and hydropower generation - the authorities have decided to regulate the acquisition of land. This is done through villagebased land allocation schemes that entail:

- Demarcation of village territories
- Demarcation of forest areas for conservation, watershed protection and production
- Allocation of agricultural land to individual households.

Although the authorities would ideally like to promote permanent land-use, it is realised that shifting cultivation currently is the only realistic option for many farmers. Cyclical shifting cultivation with up to three years fallow is therefore promoted in many areas, especially in the North.

The land allocation procedures and regulations vary between provinces and between projects, but shifting cultivators are usually allocated up to four plots of land. The plot sizes depend on how much land the household can manage with its available labour resources and production form. In practice, one to two hectares are allocated for annual use per family, or about four to eight hectares for a four-year rotation.

Where population densities are high, land allocation has not necessarily shortened the field rotations, which are already down to 3-5 years. In such areas, farmers have often been positive towards land allocation, as it helps solve land disputes within and between villages. However, where long rotation periods are still in use, land allocation reduces farmers' land access and is therefore less likely to be adopted and adhered to.

Table 1. Potentials and constraints on main development components in shifting cultivation areas of Laos

Development initiative	Potentials and benefits	Constraints and problems	Recommendations and remarks
Land allocation	Secure tenure and resolution of land disputes. Control of forest encroachment. Control of land grabbing. May increase farmers' interest in soil conservation and land development	Severe limitation on land access, which leads to lower productivity and sustainability Requires quick adaptation of new technologies Land allocation is time consuming and needs regular monitoring and revisions. Legal and administrative regulations not yet fully developed	Use flexible criteria based on local conditions. Technologies must be developed that can ensure reasonable productivity and sustainability under short fallow rotations. Extension and other support should be given concurrently with land allocation.
Permanent (cash) cropping	Higher farm incomes. Basis for industrial processing and for export income. Smaller imports from abroad. Better possibilities of crop diversification crop rotation and labour utilisation. Less pressure on the forest	Quality seed, suitable varieties, information and extension recommendations greatly lacking. Limited access to markets and processing. Need of alternative source of rice at reasonable price. Lack of capital to invest. Increased erosion problems. Greater demand for commercial fertilisers and pesticides. Environmental and health risks from pesticide use. Greater risks and more unstable income levels.	Adaptive research to screen and modify technologies to suit local conditions. Test and promote appropriate soil conservation and fertility management measures Credit and extension to facilitate adoption of appropriate technology. Further liberalisation of internal and external trading.
Paddy production	Higher and more sustainable rice production. Work load less than upland rice production.	Expensive and time consuming to develop irrigation facilities and terraced fields.	Threat to the limited areas of remaining wetlands and swamp forest.

	Encourages stable settlements. Paddy fields are an economic resource and possible collateral.	Lack of suitable land, especially in the North. Paddy and irrigation potentials are usually overestimated.	Encourage gradual farmer-lead expansion through credit, extension, legislation and community development. Improve the planning and designs of irrigation schemes. Realistic goals must be made depending on local conditions. Develop and promote alternative dry season crops.
Livestock raising	Increased farm incomes Relatively stable prices and independence of infrastructure Basis for processing and export income Use of natural pasture, open forest and waste products. Manure produced for crop production Integration with conservation farming	Low area productivity, slow growth, and high morbidity and mortality rates. High investment and slow return rates on large ruminants. Encroachment in arable fields causes crop loss and conflicts, and limits farmers' interest in non-traditional cropping systems. Negative environmental impact through burning of natural vegetation, over-grazing, large area demands, and risk of interbreeding and disease transmission to wild animals.	Expand vaccination and other veterinary services. Provide credit to farmers with realistic opportunities of repayment. Assist communities in developing regulations on the livestock production. Develop and promote improved feed production systems. Make pasture grass and legume seed more readably available. Conduct further studies on the causes of the high mortality. Conduct further studies on local and supposedly improved management practices.
Tree plantations	Higher farm incomes with less work. Basis for processing and export income. May utilise steep land unsuitable for agriculture (but usually doesn't !).	Plantations occupy agricultural land. Returns often too late for farmers. Farmers sell use-rights to investors. Normally requires road and access nearby processing facilities. Lack of improved and locally tested provenances. Inadequate management applied in plantations and orchard.	Identify additional plantation species. Local testing of provenances. Establish seed production and distribution facilities. Clarify regulations on land tenure and transfer of land. Develop improved agro-silvo-pastoral systems. Develop and promote management recommendations.
Infrastructure development	Facilitates commercial land-use, improved government services and general economic development.	May cause disruptive social and economic change. Concentration of people along roads may increase land conflicts, land grabbing	More budget allocation for maintenance, and development of local capacity to construct and maintain rural roads.

		and local population pressure. Excessive erosion and land slides along the roads. Opens forests for exploitation. Very high costs for construction and maintenance. Rural roads are often ill designed or constructed.	Land allocation and environmental protection schemes implemented concurrently with the road construction to protect the forest areas and regulate land grabbing.
Improved education, health service and other social development	Improved living standard. Decreased rate of population growth. Facilitates alternative occupation of farmers	Quality and extent of public services very low in rural areas. Most public resources are spent in cities. Low expectation to the performance of staff. Little motivation and prospects for staff in remote areas. Conditions particularly difficult for female staff. Girls receive less education than boys.	Higher priority to development in upland areas and remote districts. Human resource development for district staff. Better incentives for staff to work in remote areas (allowances, long holidays, travel costs). More emphasis on public awareness and community development. Increased gender sensitivity in public administration.

A four-year rotation is probably unsustainable in most areas, unless farmers rapidly adopt conservation measures, crop rotation, fertilisers, improved fallows or other techniques that can replace the positive effects of long fallow periods. Technology development, testing and extension are consequently needed concurrent with land allocation.

Local conditions will determine the possibilities of both short-rotation cyclical shifting cultivation and permanent cultivation. The main factors are probably:

- Soil fertility,
- Slope conditions,
- The rate of forest regeneration,
- The crops being produced,
- Market access, and
- The possibilities of mechanisation and soil tillage.

Because these conditions vary from one place to another, it may be argued that field rotations longer than four years should be permitted in some areas. This may include areas of low soil fertility, high erosion potentials, or areas with high reliance on subsistence upland rice production.

A flexible approach can also be recommended for the type of land allocated for agricultural purposes. In 1992, the Ministry of Agriculture and Forestry decreed that agricultural land, including land for shifting cultivation, should have slopes of less than 23 percent, should be more than 300 meters from water courses, and more than 100 meters from roads. However, implementation of these regulations proved impossible in many places because of the lack of gently sloping land and because the best agricultural land often lies adjacent to roads and watercourses (Sipadit et al. 1997). Thus, while criteria for classification of agricultural land are needed, they should take the local conditions into account.

Permanent upland cropping

Replacement of shifting cultivation by permanent field cropping is promoted through extension and land allocation schemes. Cash cropping has expanded rapidly in places with access to roads, markets and processing facilities. In such areas the transition from shifting to permanent cultivation is often eased by the already degraded state of the shifting cultivation system. Thus, low yields and high labour requirements cannot justify the extra labour and taxation associated with field rotation. Permanent cultivation of cash crops, such as maize, soybean, cotton, and cassava, is likely to increase due to improved market access and infrastructure, the ongoing economic liberalisation and the increased use of tractor ploughing, pesticides and fertilisers.

Under suitable conditions permanent cash cropping may be advantageous to farmers as they can expect higher incomes, better use of their labour resources, and better possibilities of crop diversification and crop rotation. Permanent cash cropping may also reduce the pressure on the forest, be the basis for a processing industry, provide export income, and limit the import of agricultural products from abroad.

Permanent upland cropping usually means the full or partial replacement of upland rice with cash crops since upland rice yields usually drop sharply when the same land is cropped for more than one or two years. The promotion of cash cropping is therefore also seen as a means to reduce shifting cultivation. However, cash cropping is realistic only in areas with reasonable road and market access. In much of the country, farmers are therefore compelled to practice shifting cultivation to obtain a reasonable subsistence rice production.

The prospects of permanent field cropping are also limited by high erosion risks, low inherent fertility, low productivity, and by weed problems. While traditional shifting cultivation could limit such problems through the positive effects of the fallow periods, other measures must be taken under permanent cultivation. Such methods may include crop rotation, the use of fertilisers and pesticides, soil tillage, and soil conservation methods. Regrettably, adoption is constrained by the need for extra labour and capital, by the lack of awareness, and by the unsuitability of many technologies promoted by projects. Some measures may also have negative consequences, such as pesticide pollution and increased erosion from intense soil tillage.

Unless appropriate soil conservation methods are adopted, permanent cultivation of sloping land will cause more erosion than shifting cultivation. Slope criteria should therefore be stricter on permanently farmed land. If gently sloping land is not available, shifting cultivation or improved fallow systems are probably the best form of arable cropping.

Poverty restricts farmers' opportunities to adopt cash cropping because they lack investment capital and are unable to wait for long term returns. New technology also contains an element of risk, which particularly poorer farmers are not prepared to take. Richer farmers are thus better able to adopt new technologies and to take advantage of the emerging market opportunities. Increasing polarisation consequently takes place in many rural communities, with growing gaps in income levels, social standing, and influence.

Paddy farming

Paddy farming in Laos prevails on the plains along the Mekong River and its main tributaries, particularly in the central and southern parts of the country. The North accounts for only 18 percent of the national paddy area (NSC 1997a), since land suitable for paddy cultivation is scarce in the largely mountainous region. With the increasing pressure on shifting cultivation, more farmers attempt to acquire paddies, as these is usually give higher and more sustainable yields with less work expended. Paddy fields are moreover an economic resource and potential collateral. As an alternative to shifting cultivation, paddy farming causes less forest destruction and encourages stable settlements.

The promotion and adoption of paddy farming in shifting cultivation areas is, however, constrained by the scarcity of suitable land, and by the high investment of capital and labour for constructing paddies and irrigation facilities. Furthermore, considerable time often lapses from the initial planning to the completion of paddy and irrigation systems, in many cases around 10 years. Long-term credit schemes may be useful by enabling farmers to devote time to construct paddies and irrigation canals.

Another concern is the frequent overestimation of the potential paddy and irrigated areas. The reason seems mostly to be the lack of proper ground checking, and maybe also the desire to conform to the authorities' ambitious development strategies. Consequently, local development plans and strategies are often unrealistic, and many paddy and irrigation schemes turn out to be very expensive per hectare because plans could be only partly implemented. Sometimes irrigation schemes aimed at providing alternatives to shifting cultivation merely improve the water supply to existing paddy fields, while few or no new paddy fields are constructed. Improved planning, evaluation criteria and staff training are thus needed in many places.

Paddy production is generally preferable to shifting cultivation from an environmental protection point of view, but an important exception may be paddy development in threatened lowland environments, such as swamp forest and wet lands. Large-scale irrigation schemes may also affect fish migration, although larger rivers are rarely dammed.

Cultural bias and lack of knowledge are often stated as important constraints on shifting cultivators' adoption of paddy farming. However, such constraints seem far less important than those mentioned above, and there are

many examples in Laos of unaided adoption of paddy farming once people have the resources and motivation to do so.

Paddy production may be improved through irrigation facilities, by introducing dry season pulses or cover crops, using improved rice varieties, and by intensifying the pest, weed and fertility management. Such technologies are usually simple to introduce, but may need local testing.

Animal husbandry

Animal raising is important in the upland farming system for food, income, saving, transport, ritual use, and for utilisation of waste products and fallow vegetation. In many shifting cultivation communities animals provide the income needed to cover rice deficiency and the purchase of market goods. An advantage of animal raising is its relative independence of road access, which makes livestock production one of the few alternatives to shifting cultivation in remote areas. Another advantage is that farmers can choose to sell animals when cash is needed and the price is satisfactory. This partly explains the relatively high price stability compared with many cash crops. Fodder production can also be incorporated in the crop rotations, hedgerows, ley farming, and plantations, which can make such undertakings more realistic to farmers (Hansen 1997, this volume).

The livestock sector offers good opportunities to help farmers, particularly through vaccination, veterinary services, advice on improved management, and through credit schemes. Such activities have already been tested many places and are cheap to implement. The main problems in animal raising in the upland farming systems are high mortality, low productivity due to disease and low fodder quality, and the high initial investment for purchase of large animals.

Disease problems often occur in epidemics, which may wipe out most, and sometimes all, pigs and chickens in a village. Cattle and buffalo disease outbreaks are usually less severe, but the economic loss can be substantial due to these animals' higher value. Promotion of livestock production should be accompanied by veterinary regulations and services, including vaccination. Promotion of vaccination is, however, constrained by difficulties in maintaining the cold chain, insufficient organisation in the villages, and by the death of animals from other causes, which makes farmers believe vaccination is ineffective. Prevention and treatment of diseases are also constrained by the lack of qualified field-based veterinarians. More training is needed of field based staff and village volunteers in diagnosing and treating diseases.

Low fodder quality severely limits the growth rates of animals in most shifting cultivation communities. Ruminant production is usually based on the free ranging of animals in young secondary vegetation, such as bush and grass lands. Similarly, pigs are normally raised in a free range system, supplemented by rice bran, other household waste products and some wild tubers. Larger pig producers are mainly owners of rice mills, or communities with a tradition for double cropping of maize and opium poppy.

While improved fodder production systems and suitable crops have already been identified in Laos, their adoption by farmers is limited by the need of additional land and labour. This is aggravated by the hilly topography in most shifting cultivation areas that makes even simple mechanisation impossible. Furthermore, if livestock production is promoted as an alternative to shifting cultivation (i.e., not merely as a supplement) each family would need larger areas to get the same income as from shifting cultivation. Another constraint may be the need for farmers to revise their approach to livestock production, which has traditionally been based on a low input-low output system.

Where ruminant production is based on open forest and young secondary vegetation, farmers will almost invariably burn the grazing areas to encourage grass production and thereby damage forest regeneration and humus accumulation. Large scale cattle production may also cause severe overgrazing, especially near water sources, villages, and other places where animals congregate.

A major cause of conflict in villages is the encroachment of animals in the fields. Some villages have introduced regulations or banned livestock ranging. Such problems will increase if stocks are increased and if innovative plant production systems are adopted, e.g., improved fallows, cover cropping, edible hedgerows, tree plantations and orchards.

Tree plantations[3]

Establishing private tree plantations is a relatively new possibility for farmers in Laos, but has expanded rapidly in many places during the last 3-5 years. This has been facilitated by changes in tenure laws, the depletion of wood supply from the natural forest and the emergence of markets for relatively young trees, such as teak (*Tectona grandis*), *Eucalyptus spp.* and *Acacia spp*.

In Central and Southern Laos, the establishment of pulp and board factories have prompted many farmers to plant industrial tree species such as eucalyptus and acacias. These trees sell at a low price, but the rotation periods are short and the labour requirements are small, especially where mechanisation is possible. However, the lack of processing facilities in the North limits the planting of such species.

In the shifting cultivation areas of Northern Laos, the main plantation species is teak, because it is relatively easy to manage and propagate, grows fast in the early years, and is tolerant to fire. The potential income and economic spin-offs from teak planting are high, particularly compared with current land-use. Further expansion of teak is eased by the large areas of degraded forest and by favourable laws and policies. Improvements in the road system will further expand the potential for teak planting.

Teak is usually established in taungya systems, i.e., inter-planted with agricultural crops during the first one to three years. This normally ensures adequate weeding and protection of the teak in the early years, which few farmers would have sufficient labour resources to carry out if crops and teak were planted in separate areas.

Until recently the government strategy has been to promote as much tree planting as possible, but various problems and constraints have become apparent. Thus, the rapid expansion of teak planting during the past five years is to a large extent related to the possibility of selling the 1-3 year old teak plantations to investors. Consequently, almost all plantations are established along roads, as investors are almost exclusively interested in such land. While selling their plantations can give farmers a high and quick return on their investment, they may eventually lose access to land, especially when land allocation schemes have been introduced.

Another problem is farmers' preference of the flatter land for their plantations, which therefore compete with crop production for the scarce flat lands and push arable farming up on the steeper slopes. However, the use of flat land for tree plantations may result in faster growth of trees and may ease mechanised weeding and harvesting in commercial plantations When inter-planting with agricultural crops ends after 1-3 years, little management is applied except the slashing of taller weeds and, sometimes, controlled burning early in the dry season.

Regrettably, few farmers prune low branches or forked trees, the latter sometimes occurring in more than 50 percent of the plants. Furthermore, thinning usually takes place too late, often when the trees are ten to fifteen years old. The lack of sufficient management is a major constraint on the growth and quality of trees. There is therefore much scope for improving production through timely weeding, thinning, pruning and fire control, as well as improved propagation methods and the selection of seed sources. However, farmers' incentives to improve the management are low if they intend to sell their plantations.

The expansion of teak planting has led to concerns that teak mono-cropping may lead to devastating pest attacks, especially of bee-hole borers and caterpillars. Furthermore, teak offers little soil protection, and sheet, rill and gully erosion are often seen in older plantations[4]. Casual observations in 15-20 years old plantations also suggest that little accumulation of organic matter takes place.

Fruit production

Apart from coffee, which has become an important export crop in the South, fruit production is mostly aimed at subsistence use, and receives little management attention. The limited commercial fruit production is concentrated on the Boloven Plateau and in Vientiane. Attempts have been made by many projects to introduce commercial fruit production in shifting cultivation areas, but adoption rates have generally been low.

Slow returns and the uncertain market are probably the main constraints. The marketing problems are caused by the limited road access and processing facilities, and by the small quantities currently produced, which makes trading and processing uneconomical. Also, most fruit trees are local varieties that often have little commercial value. Further introduction of improved fruit tree varieties is needed, along with local testing in representative agroecological pilot areas. The seasonal peak production combined with the lack of processing plants further depresses prices. Finally, staff and farmers lack management skills and extension recommendations.

However, fruit orchards could provide a high area productivity, high degree of sustainability and could generate a reasonable income for the producer. Opportunities to expand commercial fruit production in Laos seem good considering the large fruit import from Thailand and China, and the likely increase in fruit consumption that follows growing urban prosperity. The relatively low income potential of shifting cultivation and the low labour costs will also encourage some farmers to adopt or expand fruit production. Highly variable agro-ecological conditions in shifting cultivation areas may also open up for a varied and seasonally staggered production.

Infrastructure development

Most villages in the uplands and highlands of Laos lack roads and have limited access to markets, which greatly limits the land-use options available to farmers. Thus, further infrastructure development is a prerequisite for most of the development initiatives discussed above. Road development usually leads to considerable land-use changes, independent of other interventions. Improved market access has probably been the most important single cause of the astounding change in the highlands in Northern Thailand during the past twenty years. Establishment of roads also improves access to public services in education, health care and agricultural extension.

Because of these advantages, settlements often concentrate along roads, which may lead to more land disputes, land grabbing, and agricultural expansion on unsuitable land. Road construction is also frequently followed by uncontrolled logging and by forest encroachment by farmers. Land allocation and land-use planning schemes should therefore be carried out concurrently with road construction to protect the forest areas and regulate the acquisition of agricultural land.

A basic constraint on road development is the high construction and maintenance costs. Moreover, roads are often ill designed, which leads to rapid deterioration, excessive erosion, land slides, and to pollution of nearby watercourses. It is also sometimes stated that roads may help control logging, opium production and migration, but usually roads have the opposite effect.

Because of the significant impact of roads, the development strategy should distinguish between areas with and without road access and modify development efforts accordingly. For instance, where road construction is unattainable, traditional or improved shifting cultivation may be preferable, at least until alternative production systems have proven viable.

Social development

Although Laos is still relatively thinly inhabited, the population density is already critical in most uplands since shifting cultivation requires large areas for field rotation and little land is suitable for arable cropping. With the current annual population growth of 2.5-3 percent, most shifting cultivation communities will soon need to adopt new production systems, nonagricultural employment and family planning measures . Thus, better health and education facilities are needed, but such services are constrained by inadequate budget allocations, limited staff motivation and career prospects, and by inadequate training and facilities. Nevertheless, social development efforts may well have a bigger impact on shifting cultivation stabilisation than that of agricultural and forestry development.

Conclusion

Shifting cultivators in Northern Laos are under pressure to modify their land-use because of population growth, declining natural resources, and government regulations on land access. In areas with good road and market access many changes have taken place in the past five to ten years, e.g., adoption of new cash crops, establishment of farmer owned teak plantations, and increased livestock production. These changes have been possible through infrastructure development, economic liberalisation, and the general economic progress.

However, in most of the Northern Region a rapid transformation of shifting cultivation seems unrealistic considering its scale, the poverty of most shifting cultivators, the mountainous topography, the current institutional capacity, and the undeveloped market, infrastructure and processing industry.

Some technologies promoted by projects or by the regular extension system have proven technically inappropriate, socially unacceptable, dependent on road access, or suitable only on gentle slopes. Furthermore, some alternative land-use practices, especially permanent arable cropping, may be more prone to accelerated erosion and fertility decline than shifting cultivation. Shifting cultivation partially restores soil fertility during the fallow periods, and limits erosion through minimal tillage, maintenance of a favourable soil structure, and through the distribution of erosion over a larger area. From an environmental point of view, shifting cultivation may also be preferable to the types of cash cropping that use large amounts of pesticides.

Development strategies and activities need to be flexible and diversified to suit the very variable environments, socio-economic conditions and land-use in mountainous areas. On a regional level, the main factors determining potential land-use improvements are probably the agro-ecological conditions and road access. A diversified approach is also necessary at the individual village level because farmers' capabilities, resources and inclinations usually vary considerably between households. Moreover, further method development, staff training and institutional development are needed, especially at provincial and district level, where actual implementation will take place.

Although most development efforts have taken a technical approach, land-use problems are rarely purely technical, nor are technical problems necessarily farmers' main concern. Other problems equally or more important may be:

- Resource access, especially land and capital.
- Social problems and poverty.
- Market access because of the lack of roads, processing facilities, and consumer demand.
- Market organisation and inappropriate import and export regulations, monopolies, and subsidies.
- Non-agricultural occupation.
- Lack of public services, such as education, health service and public information.
- Inappropriate or undeveloped laws and regulations.

Much of the solution to shifting cultivation stabilisation therefore lies outside the agricultural and forestry sectors. While the authorities expect farmers to adopt major changes in their production systems, it seems reasonable that shifting cultivators can rely on the government to provide adequate education, family planning and health facilities, along with a balanced economic policy that expands the manufacturing and service sectors.

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References

Chazee, L. 1995 Atlas des Ethnies et des Sous-Ethnies du Laos. Bangkok, private publishing. 220 pp.

DoF (Department of Forestry) 1997 Plan to the Year 2000 for Stabilizing Shifting Cultivation by Providing Permanent Occupation. Paper presented at the "Stakeholder Workshop on Shifting Cultivation Stabilization", Vientiane, Laos, 6-7 February 1997. Ministry of Agriculture and Forestry and Asian Development Bank.

Hansen, P.K. 1995: Shifting Cultivation Adaptation and Environment in a Watershed Area of Northern Thailand. Communities in Northern Thailand. Ph.D. Dissertation, Department of Crop Husbandry, Royal Veterinary and Agricultural University, Copenhagen, Denmark. 280+140 pp.

Hansen, P.K. 1997 Animal husbandry in shifting cultivation societies of Northern Laos. Proceedings of the conference on Upland Farming Systems in the Lao P.D.R.: Problems and Opportunities for Livestock.

Australian Centre for International Agricultural Research (ACIAR) and The Department of Livestock and Fisheries, Lao P.D.R. ACIAR Proceedings No. XX

Hansen, P.K., Sodarak, H. and Savathvong, S. 1997: Teak production by shifting cultivators in Northern Laos.

Paper presented at the ICRAF workshop "Indigenous Strategies for Intensification of Shifting Cultivation in S.E. Asia. Bogor, Indonesia, 23-27 June 1997. 13 pp.

Hedegart, T. 1995 Teak Improvement Programmes for Myanmar and Laos. FAO Regional Project "Strengthening Re-afforestation Programmes in Asia" (STRAP), Field Document No. 3. Food and Agricultural Organization of the United Nations. 29 pp.

NOFIP (National Office of Forest Inventory and Planning) 1992 Forest Cover and Land Use in Lao P.D.R. - Final Report on the National Reconnaissance Survey. Department of Forestry, Ministry of Agriculture and Forestry. 71 pp + appendices.

NSC (National Statistical Centre) 1997a Basic Statistics about the Socio-economic Development in the Lao P.D.R. State Planning Committee, Vientiane. 129 pp.

NSC (National Statistical Centre) 1997b Results from the Population Census 1995. State Planning Committee, Vientiane. 94 pp.

Roder, W., Leacock, W., Vienvonsith, N. and Phantanousy, B. 1991 Relationship between ethnic group and land use in Northern Laos. Poster presented at the International Workshop on Evaluation for Sustainable Land Management in the Developing World. Chiang Rai, Thailand 15-21 September 1991. IBSRAM, Bangkok.

Sipadit, V., Sodarak, H. and Hansen, P.K. 1997 Land Allocation in Shifting Cultivation Areas of Northern Laos: The Experience of the Shifting Cultivation Stabilisation Project 1992-97. Technical Report No. 3. Shifting Cultivation Research Sub-programme, Department of Forestry, Luang Prabang, 18 pp

Sodarak H., Ya V., Souliyavongsy S., Ditsaphone C., and Hansen P.K. 1997 Livestock development by the Shifting Cultivation Research Project in Luang Prabang Province, Lao P.D.R. Proceedings of the conference on Upland Farming Systems in the Lao P.D.R.: Problems and Opportunities for Livestock.

Australian Centre for International Agricultural Research (ACIAR) and The Department of Livestock and Fisheries, Lao P.D.R. ACIAR Proceedings No. XX

Suvanthong, P. 1995 Shifting Cultivation in Lao P.D.R.: An Overview of land Use and Policy Initiatives. IIED Forestry and Land Use Series No. 5. International Institute for Environment and Development, London. 38 pp.

White, K.J. 1991 Teak - Some Aspects of Research and Development. RAPA Publication: 1991/17. FAO Regional Office for Asia and the Pacific, Bangkok. 70 pp.

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[1]The seven provinces are Phongsaly, Luang Nam Tha, Bokeo, Udomxai, Luang Prabang, Houaphan and Sayabuli. The two other regions in Laos are called the Central and the Southern Regions. Note that official statistics usually include Xieng Khuang Province in the Central Region.

[2]Current forest is defined as areas suitable for forest production and having a tree cover with a crown density of at least 20 %.

[3]This section has largely been taken from Hansen et al. (1997).

[4]This has also been remarked upon by Hedegart (1995) and White (1991).