UPLAND AGRICULTURE

Thailand

By

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1. INTRODUCTION

The individual country briefs present the general features of agricultural production systems with particular focus on upland agriculture. The production systems are viewed in their agro-ecological, policy and socio-economic contexts. The connection between poverty and environmental degradation is accepted as the platform for analysis. The analytical framework for decision-making in search of alternative environmentally, economically and socially sustainable livelihood options is presented in the Regional report; this country report applies that, in a broad sense, to the situation in Thailand.
2. AGRO-ECOLOGY OF UPLAND AGRICULTURE

The land area of Thailand is 517,000 sq. km. Central Thailand is characterised by flat plains which mostly produce paddy rice. In the north-east the Korat plateau is bordered by mountain ranges. Agriculture is still the major economic sector in Thailand. Thailand ranks first in world rice exports and is also the largest rubber producer. Other export crops include tapioca, coconut, maize, sugar, pineapple, soybean and jute. Upland agriculture is 17% of the total agricultural production.

The northern part of Thailand is a subtropical mountain region, which covers an area of 100 000 sq. km. There are three distinct seasons: May-October, rainy season; Nov-January cool and dry season and February to April hot and dry season. Annual precipitation ranges from 1000 to 2000 mm/year.

20% of northern Thailand consists of river valleys and basins. These lowland areas are suitable for paddy rice production practised by ethnic-Thai. The soils are fertile and mainly allocated to wetland rice production. Going towards the foothills and lower mountain slopes the soils get sandier, being former forest land. Agricultural production features rainfed swidden farming and fruit production. The actual highlands begin at the altitude of 500 m, consist mainly of hills and mountain ranges and cover about 80% of the North. Most of these hilly areas are inhabited by non-Thai ethnic minorities who total about one million. Their livelihood rests largely on mountain agriculture of upland rice swidden cultivation, and increasingly of fruits and vegetables as cash crops (Van Keer et al. 1998).

3. TRENDS IN UPLAND AGRICULTURE

The upland farming systems are rapidly evolving in Thailand from traditional to modern systems. The transition is influenced mainly by external socio-economic factors rather than agro-ecological determinants. As contacts to lowland markets increase, the transformation to cash-based economy accelerates. For example, among the Karen the role of soybean cultivation has changed as the community has moved more towards a cash economy. The Karen have traditionally grown soybean on rice paddies after rice harvest. In the middle zone, soybean was also grown in the rainy season in upland fields. As the demand for soybean from the agro-industry in Thailand increased, forests were cleared for more land for upland soybean production. In parallel, experimentation on fixed-field upland rice began and soybean was introduced in fixed field rotation. This proved to increase both rice productivity and cash income from soybean.

Traditional subsistence farming is based on rainfed upland rice production. Production of irrigated rice along the narrow valleys and terraced hill slopes is also increasing with the increase in population pressure. In addition to upland rice, maize, pulses, vegetables and spices are produced. Livestock supplements the food and income derived from crops. Forests, both trees and NTFPs, are important as sources of food, medicine and off-farm income.

Opium poppy used to be the source of cash income, but after the banning of its production other cash crops have entered into the system. Temperate and sub-tropical vegetables are an important source of income. These include litchi, cabbage, ginger, citrus fruits, strawberries, potatoes, carrots, flowers, sweet pepper. Many of these crops require intensive management and agrochemical use, and small scale irrigation has expanded (Van Keer, 1998).

Most of the highland farms are managing a mix of subsistence and cash-oriented farming systems, one or the other dominating. Closeness to market, technical competence in new crops and degree of risk aversion by the farmer are contributing factors to the choice of the degree of intensification.

Watershed in change, Mae Chaem watershed 4200 sq.km, Northern Thailand. Part of north-south ridges dominating Northern Thailand and Northeast Myanmar.

Of the total area of 420 000 ha: forest 320 000 ha, crops 12 212 ha (Dept of Ag.Extn, 1995). Of crops: rice-paddy 21%, rice-upland 19%, soybean 29%, red onion 9%, cabbage 6%, carrot 4%, other 5%.
4. HIGHLAND POLICIES

Until rather recently in history (1960’s) the million or so hilltribe people in northern Thailand (Karen, Hmong, Lahu, Lisu, Akha, Lua, Khamu, Ittin and Mlabir or Phitong Luang), were left more or less on their own by the Thai government. Since the 1960’s, highland peoples’ policies have been implemented. In 1960’s the policies included land settlement, hilltribe development projects, construction of welfare centres and a tribal research centre. In 1976 the policy was revised, emphasising an integration policy for hilltribes to become self-reliant, get citizenship and have the right to practice their own culture and religion. To implement this policy the government introduced a zonal development approach and ranked highlands into use classes based on slope level: 0-5 degree slope for paddy, 5-20° for paddy or crops combined with soil conservation measures, 20-45° for fruit trees and/or wood lots, and above 45° preserved for protected forest. In 1982 the policy focused on promotion of sustainable farming systems and intensification of crop production for domestic consumption and for sale.

The on-going discussion on highland peoples’ development options evolves from different views on the relative value of different watershed functions. The watersheds have become important for their productive, aesthetic, environmental and protective functions and there is active debate on how to rank these different functions. Van Keer et al. (1998) have made an interesting list of the potentials and constraints of highland agriculture:

<table>
<thead>
<tr>
<th>Table 1. Potentials and constraints of highland agriculture (modified from van Keer et al. 1998).</th>
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<tbody>
<tr>
<td>Climates variability allows cultivation of temperate and sub-tropical crops</td>
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<tr>
<td>Most soils have good physical characteristics</td>
</tr>
<tr>
<td>Small-scale irrigation enables year round water supply</td>
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<tr>
<td>Forests a source of additional income</td>
</tr>
<tr>
<td>Potential for Arial expansion in highland exists (not in the lowlands)</td>
</tr>
<tr>
<td>Farmers do not have a title and often not even full citizenship</td>
</tr>
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</table>
The trends with increasing linkages to lowland economy are especially important to the mid-elevation zone communities, where the ‘economic pull forces’ can be felt and benefited from. In the high elevation remote communities the situation is often very different. As population pressure grows, the communities have intensified livestock production and cultivation of marginal lands and have moved further into the forests. Gradually, the high elevation communities get further marginalised and resort to further encroachment. What to do? Privatisation will not reach up there because of the difficult access. Thus, medium term (10-15 years) government assistance is required to enable these communities to be ready for economic interaction with lowland communities (personal communication, Dr. Sivakoti, Farming Systems Research, AIT).

5. Experiences from the Multiple Cropping Programme in Chiang Mai University

It is fair to say that Chiang Mai University is a centre of expertise in upland agriculture in the GMS. One long term programme has been the Multiple Cropping Programme, part of the Agricultural Systems Programme at Chiang Mai University. The programme was initiated in 1970. Initially the focus was on irrigated rice systems, but at the beginning of the 1990's the emphasis moved to upland production systems because land degradation was proceeding fast in the uplands. In upland agriculture development, Thailand shares the same concerns of stabilising and intensifying agricultural production as its neighbouring countries (personal communication Dr. Gypmantasiri, Director of the Agricultural Systems Programme, Chiang Mai).

In the northern uplands the soils are shallow and sandy while rainfall is about 800 mm/a. The project found that the best long term land use choices are fruit trees, with mango having the most potential. In general a shift towards perennial crops is occurring and the Government has now incorporated the growing of woody perennials in the uplands into their development plans.

For field crops the cropping systems programme has also experimented on green-manuring crops, such as Sesbania rostrata, as a precrop. The pre-crop was found to supply about 25kg/ha of N which is half of the recommended rice fertiliser level. In-between the mango trees, the programme recommends Stylosanthes, a N-fixing forage crop which competes well with weeds and can be used as cattle feed. This is important for families, who are engaged in cattle fattening to raise money. Normally the livestock is fed either by free grazing in the forest or by a cut and carry system. The concept of improved pastures is not known or practised by the farmers.

Introduction of new ideas or practices proceeds in steps, and adoption takes quite a long time. There is a Bank of Agriculture and Agricultural Co-operatives, which gives credit to farmers with 9-12% interest, while the commercial bank rate is 14%. If the government is supporting a particular policy it subsidises the credit by lowering the interest to 6%. The input supply system is good, but inputs are not subsidised and fertiliser is quite expensive to the farmer. Of the upland crops mango, corn, litchi and sugarcane are exported to other countries. Cassava is exported to EU.

The temperate vegetables promoted by the Royal Project are very susceptible to insect pests and several insecticide sprayings are required in a season. This has adverse effects on water quality, poses a health risk to the farmers and increases the production cost considerably. Plutella xylostella (the diamondback moth) is the worst insect pest in cabbages in Thailand. The Royal Project is looking for alternatives to insecticides. Biotechnology approach based on Bacillus thuringiensis insecticidal protein expression in the vegetable crops would be a good alternative to reduce insecticide use. However, there is rather active NGO discussion on the health and ecological risks of genetically modified crops. This has slowed down the introduction of this technology in field crops.

A tremendous amount of information and research results have been generated during the past ten years of the project. In total, 80 MScs have graduated from the Multiple Cropping Systems Programme (Agricultural Systems Programme, 1996).

Another centre of expertise in farming systems in the region is the Asian Institute of Technology located in
Bangkok. Recognising the need for integrated watershed management, AIT has developed a proposal for an MSc curriculum “Integrated Watershed Development and Management” (1998) and is seeking funding for the programme. If the programme is realised it will be the first in integrated watershed management in the GMS. Formal training in multi-disciplinary watershed management is urgently required to provide leadership for the development processes in the watersheds.

6. ICRAF’s WORK ON WATERSHED MANAGEMENT

The ICRAF office located in the Chiang Mai University Campus is the lead agency of a global CGIAR-wide project ‘Alternatives to Slash and Burn (ASB)’. The programme areas include Mexico and Peru from Latin America; Thailand and Philippines from Asia and Cameroon from Africa. Vietnam and probably Lao PDR will be included in the next phase. The collaborative sites have been selected based on an eco-region concept, and the site in Chiang Mai represents mountainous SEA.

As discussed above, in Northern Thailand the forces driving the change from shifting cultivation include human population increase, migration, improved roads, reduction in opium production, increased market integration and environmental degradation. ICRAF chose a benchmark site to understand the impact of these push and pull forces. The site is Mae Chaem watershed, which is 4000 sq. km in size and historically a shifting cultivation, opium-growing area. The site is relatively accessible. The project is establishing a spatial database for the site. The main aim is to identify ‘best bet-alternative scenarios’ for the present shifting cultivation systems. Remote sensing images are used as the basis for the spatial information into which other databases are integrated (census data, land use etc.). By inter-linking the databases, interactions between the different factors can be studied and the system responses modelled. The national research system, and Chiang Mai University in particular, are part of the ASB network. This project could provide valuable experiences and tools for watershed management in general and for the Phase II planning of the present RETA project in particular.

The ICRAF program has also developed matrices for decision-making paths. Firstly, in all of the participating countries the elevation (low, middle, high) sets the agro-ecological framework for the watershed. The decision-making process helps the planner to identify gaps in knowledge, the impact of different measures, limitations of the system, etc. The ASB programme collects data and experiences from different collaborators. For example, with the Karen the aim of watershed management is to evolve the changes around the existing shifting cultivation system and use participatory land-use planning in doing so. With Karen this approach is very meaningful due to their traditional ecologically sensitive land-use practices. The ICRAF ASB programme also co-operates with other projects, like the Queen's project involving participatory land use planning in developing community watershed mosaics. Another collaborator is the other Royal Project (the former King's project), which has introduced annual horticultural crops like cabbage and carrot to replace opium production. As indicated earlier, in this project the issue in focus is the environmental impact of the new cropping systems: e.g. heavy use of pesticides has an adverse impact on water quality and human health. Another environmental concern is erosion as the temperate vegetables are row crops, vulnerable to soil loss. The ASB projects assess the feasibility of tree-horticultural crop intercropping systems to reduce some of the environmental effects. Many areas are presently being planted with the new systems but some are also already coming to production and the project is using data from those areas to make the economical analysis (Personal communication, Dr. D. Thomas, ICRAF).

Other exciting aspects of the ASB programme include a spatial economic model to assess the impact of road infrastructure on economics of an area. The model is based on the work of Maureen Cooper from the World Bank and ICRAF is attempting to adopt her model of coarse resolution to the watershed scale. For the policy analysis, the ASB project has applied the matrix system, PAM, but more of the fundamental building blocks are needed before the PAM system can be used instrumentally. Even simple physical data on yields in a production system are desperately needed.

Yet another interesting aspect in the ASB is to assess plant biodiversity by a system called plant functional attributes (PFA), which describe the ecosystem function of a plant species and it position in the plant community structure. The father of this concept is Dr. Andy Gilleson.

To recap, while the three step elevation dimension sets the basic framework for watershed management, the location specific socio-cultural variation is significant in a community’s response to change. The ICRAF programme, with its normative thinking and the tools developed to study watershed management, can provide invaluable support for Phase II of the present RETA project.
7. CONCLUDING REMARKS

The changes that the upland agriculture systems are undergoing are similar to those in other GMS mountain areas. The well-developed manufacturing industry in Thailand gives more opportunities for processing introduced upland crops. There is also extensive research being done on upland agriculture, which can provide answers to many technical, economic and social questions. The main constraint for development is that as new income generation opportunities arise, there is rapid expansion of production of that crop. This often leads to further encroachment into the forests or a ‘second generation’ of problems like high pesticide use in vegetable production. In the area of NTFPs this is very pronounced. If there is demand for a particular plant or animal species in China, collection of that species by communities can quickly bring it close to extinction.

Because of the strong research capacity it might be interesting to explore the biodiversity of GMS and to assess the capacity to domesticate certain species of pharmaceutical or other industrial interests and to capture the value of the bioactive compound by chemical extraction. Biotechnology can offer exciting possibilities for this area.

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