

Palong and Black Lahu Ecological Knowledge of the Sustainability of Forest Watershed Management and Agroforestry Ecosystems¹

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ABSTRACT

For decades, land use practices of ethnic minority people in the uplands of northern Thailand have been blamed by many scientists and policy-makers as being unsustainable and causing degradation of natural forests and watershed functions. Recent flashfloods, landslides and droughts affecting the lowland areas have also been associated with upland agriculture. The objectives of this case study, carried out in Ban Nor Lae and Ban Khob Dong, Fang District, Chiang Mai Province, were to scrutinize these claims by exploring the knowledge of Palong and Black Lahu on sustainable forest watershed management and by contrasting their local ecological knowledge (LEK) systems with scientific findings.

Key informants and randomly selected villagers were interviewed by means of semi-structured questionnaires. Selected Participatory Rural Appraisal (PRA) tools, such as mapping and transects, were also employed to collect information. The elicited information was recorded in a durable and accessible way by the Agroecological Knowledge Toolkit (AKT5). This toolkit helped us to create text statements and to determine causal relationships through diagrams and hierarchies.

Based on the information collected, traditional agricultural systems of Palong and Black Lahu could be divided into three categories: swidden cultivation, paddy field and sylvopastoral system. Mixed orchards were only recently introduced as a major innovation into the farming system, partly on the initiative of the Royal Project Station in Angkhang. Lahu farmers in Ban Khob Dong – commonly labeled as ‘pioneer shifting cultivators’ in Thailand – have developed a sustainable system of paddy rice terraces. They supplement their diet through crops grown in

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home gardens, thus enabling them to base their livelihoods on a low-external input system. Recently, however, these traditional systems are increasingly replaced by very intensive cash crop production in greenhouses.

The Palong of Ban Nor Lae – who have a very recent history of settling in this Thai-Myanmar border region and face a shortage of water – are not able to grow paddy rice, but instead have developed a sylvopastoral system, raising mainly cattle, horses and mules. Apart from providing a major source of the family income, raising animals in the sylvopastoral and mixed orchard systems indirectly helps them in distributing seeds of valuable multi-purpose trees and in increasing soil fertility through animal manure. On the other hand, scientists have found that the tramping of animals decreases soil infiltration and water uptake of roots, thus reducing the growth rate of crops. These tradeoffs related to animal husbandry can be countered by limiting livestock numbers and by regulating grazing activities in mixed orchard systems according to seasons. As regards forest watershed management, Palong villagers conserve tree species with a high capacity of storing water and of gradually releasing it to the creeks. In areas where some villagers have cut these trees with high water absorption capacity, the Palong observed a decrease of the groundwater table. As a result they have stepped up their conservation efforts to ensure a continuous water supply for their village.

This study demonstrated that the Local Ecological Knowledge (LEK) collected from key informants and ordinary villagers was explanatory and of technical relevance. The knowledge and practices of ethnic minority groups contrast with the simplified and negative image that mainstream society tends to construct of highland agricultural systems. We conclude that if this knowledge is integrated into scientific analysis and policy-making it can provide a useful resource for improving the sustainability of the highland watershed agro-ecosystems.

Key words: Palong, Black Lahu, highland watershed, sylvopastoral system, animal husbandry, Local Ecological knowledge (LEK)

1 Introduction

Deforestation in the head watersheds of the Northern Thai highlands are of significant concern for policy-makers and scientists due to its presumed threat to the hydrological balance and biodiversity in this region. Among the adverse impacts attributed to forest loss are higher average temperatures, floods and landslides during the rainy seasons, extended droughts during the dry season, and reduced water quality. Swidden cultivation practices of ethnic minority groups are regarded as a major cause of deforestation.

This study of Palong and Black Lahu ecological knowledge aims at scrutinizing these perceptions by (1) recording local knowledge of Palong and Black Lahu on watershed and forest ecology system and agroforestry practices, and (2) comparing local and scientific knowledge.

2 Methodology

The two villages are located in the Thai-Myanmar border region in the northwestern part of Thailand and are among the target villages of the Angkhang Royal Project Station. Both villages have been subject to major development efforts, but are also under increasing pressure by the forest department to engage in reforestation and watershed protection activities. This study has employed various Participatory Rural Appraisal techniques (mainly mapping and transects) and semi-structured interviews to achieve a comprehensive understanding of the issues being investigated. The data collection and analysis follow the process as shown below. The use of structured hypotheses facilitates the collection of detailed Palong and Black Lahu ecological knowledge from a purposive sample of key informants and randomly selected villagers. The main issues addressed in the interviews were (1) the role of plants on uptake and storage of water, (2) the role of plants in enhancing or preventing soil erosion, (3) the relationship between large livestock (cattle, horses and mules) and forest ecology, (4) the relationship between upland fields and soil erosion, and (5) the role of agroforestry in buffer zones for head watershed protection.

A knowledge base of Palong and Black Lahu ecological knowledge of agroforestry and watershed practices was created by the use of a utilitarian knowledge-based system software, namely the Agro-Ecological Toolkit, Version 5 (AKT5) (Walker et al. 2001, Dixon et al 1999). Table 1 summarizes the data of the Palong and Black Lahu knowledge base. The statements are inferring the Palong and Black Lahu people's understanding of cause-effect relationships and the interdependence of many identified issues. The diagrammatic output given in Figures 2 and 3 provides a visual tool to present the interaction of statements within the knowledge base.

Table 1. Summary of respondents and data for the Palong and Black Lahu knowledge base

Number of key informants	24
Total number of statements	601 of which 51 are conditional.
Number of attribute statements	550 of which 49 are conditional.
Number of causal statements	51 of which 2 are conditional.

3 Results

3.1 Elicitation of Palong ecological knowledge

3.1.1 Sylvopastoral system integrated with orchards

In the Palong village, the main purpose of agriculture is to ensure food self-sufficiency. As the Palong migrated to this Thai-Myanmar border region only in the early 1980s, they did not find enough land for cultivation of major staple crops, such as corn or upland rice under a swidden or fallow system. Palong farmers do not plant cash crops in the watershed area because experience has shown that there is not enough water during the dry season. Since the production of vegetables or temperate fruits in upland fields is limited by low productivity, the Palong have developed an agroforestry system where raising animals is integrated with forests and fruit orchards (Figure 1). The main animal species in these sylvopastoral systems are horses and mules (Table 2). They reflect the necessity of both transportation and marketing which are crucial activities of Palong people living in remote areas. The market price of the animals is estimated at 7,000-8,000 Baht (\$220) for a horse and at 9,000-10,000 Baht (\$250-270) for a mule, and can therefore contribute significantly to household incomes. Mules fetch a higher price than horses because they are stronger, have more endurance and can carry higher weights. Animals can be sold at the age of 2-3 years for transportation purposes. The profitability of raising animals in the forest is higher when compared with cultivation of cash crops.

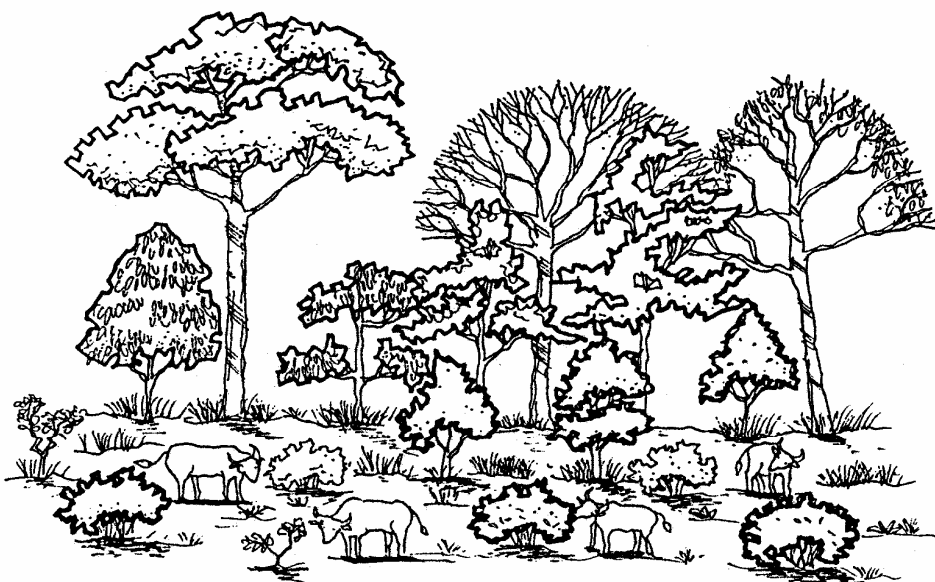


Figure 1. Animal husbandry system integrated with forest and fruit orchard

Table 2. List of animals in sylvopastoral system by Palong

Type of animal	Uses	Forage	Consumers
Horses	Transportation and sale	Grass	Chinese-Thai
Mules	Transportation and sale	Bamboo and wild grass species	Chinese-Thai
Pigs	Consumption and ceremonial purposes	Bamboo and wild grass species	Chinese, Lahu, local people and Palong
Chickens	Consumption and ceremonial purposes	Crop residues	Local people

Raising animals in upland areas is gradually increasing because of the rising demand for meat in lowland areas. Animal husbandry is also supported by the Thai government, although forest browsing of animals is generally prohibited in the head watersheds of the northern Thai hillsides. Palong people believe that large livestock species decrease the danger of fire by grazing on weeds during the summer period. They hold that there is no adverse effect in terms of enhanced soil erosion from their hoofs, but rather that the tramping of the hoofs has a positive impact by increasing the porosity of the soil. This local view is supported by a study of Bezkorowajnyi *et al.* (1993) in the northwestern part of the United Kingdom that found that tramping of cattle increased the absorption capacity of the soil.

Palong farmers have observed that the tramping creates shallow holes that store water and decrease surface runoff. However, some scientists have stated that animal tramping is a major cause for soil compaction which would result in a higher surface runoff. Hence, the impact of raising animals on sloping land remains a contested issue that needs further studies to fully capture the cause and effect relationships of animal husbandry in upland areas.

The study suggests that Palong have an extensive knowledge of the ecology of their agroforestry system, such as the factors enhancing or reducing soil erosion, water storage capacity of the soil and wild plants suitable for forage. The major cause-effect relationships as revealed in the interviews with key informants are depicted in figure 2 which was developed with the help of AKT5 software.

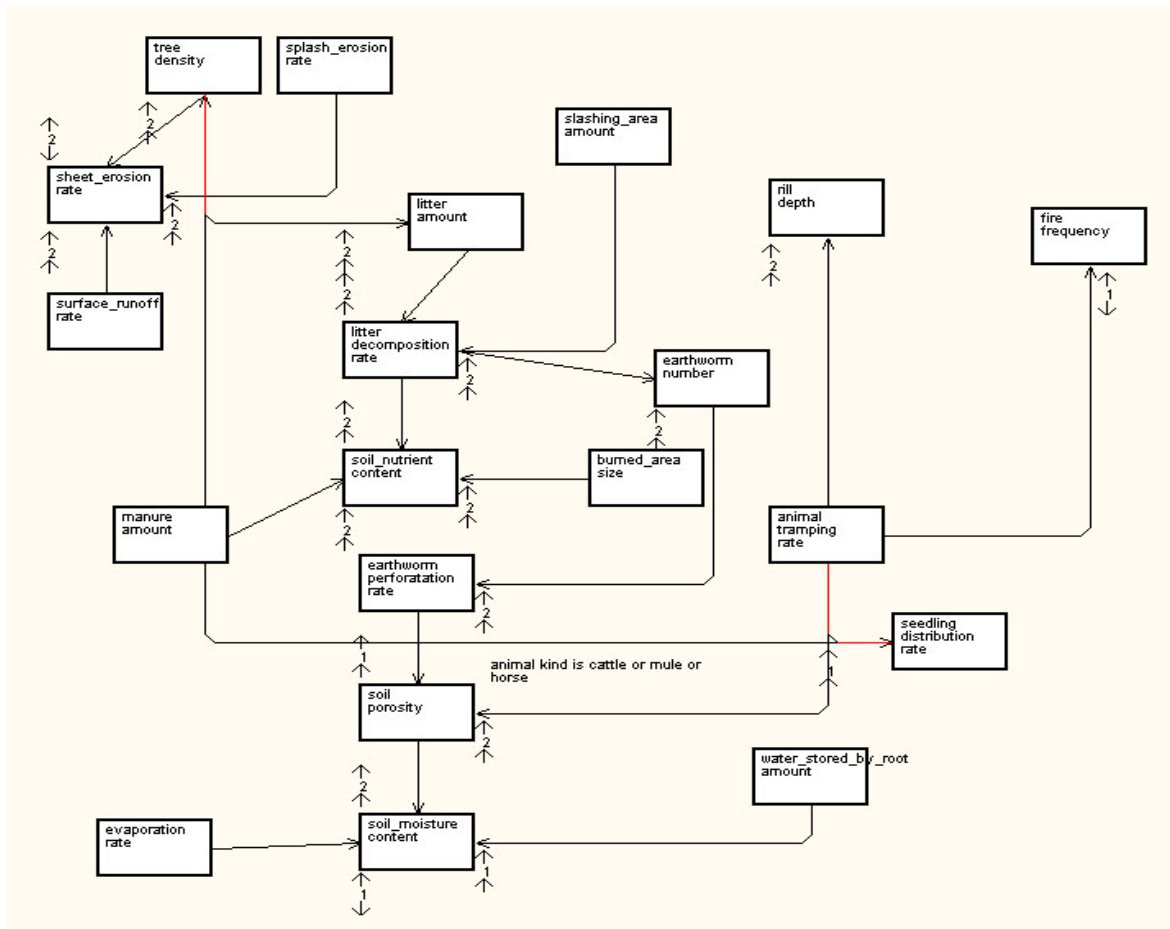


Figure 2. Diagram of cause-effect relationship of the agroforestry system of the Palong

Legend: Nodes (boxes) represent named attributes of components of the agro-ecosystem. Arcs represent a causal relationship between one node and another, as specified by the arrows and numerals. Small arrows represent the direction of change of values of the independent and the affected, dependent attribute; (↑) means an increase and (↓) means a decrease; (1) signifies a one-way relationship and (2) a two-way relationship.

As regards forest watershed management, Palong villagers conserve tree species with a high capacity of storing water and of gradually releasing it to the creeks. In areas where some villagers have cut these trees with high water absorption capacity, the Palong observed a decrease of the groundwater table. As a result they have stepped up their conservation efforts to ensure a continuous water supply for their village.

3.1.2 Home gardens

Home gardens, also known as forest gardens, are found in many upland farming systems. Palong farmers use the system of intercropping in their home gardens to cultivate temperate fruit trees and crops, and raise small livestock. The most important characteristics of home gardens are their location adjacent to homesteads, close association with family activities and a wide diversity of crop and livestock species to meet family needs. Trinh, Watson et al. (2003) studied

home gardens in Vietnam and found agroecosystems with a high diversity of indigenous crops and rare varieties of plants. Most of the non-staple food consumption of the Palong comes from home gardens where food is available all year round. One interviewee described the home garden as a “food bank”. Preechapanya (1996) found that farmers who live in upland areas of northern Thailand plant vegetables, herbs and fruit trees for home consumption because their settlements are far away from the market. Given the crucial importance of home gardens for food security, farmers establish natural fences to protect the crops in the homegardens from animals by planting bamboo and small shrubs. The crop diversity of the Palong home gardens is shown in Table 3.

Table 3. Crop diversity in home gardens of the Palong

Common Name	Scientific Name	Utilized plant parts
Pumpkin	<i>Cucurbita sp.</i>	Fruit for sale, stems/shoots for forage
Bird pepper	<i>Capsicum frutescens</i>	Fruit
Galangal	<i>Languas galanga</i>	Root, flower
Lemon grass	<i>Cymbopogon citratus</i>	Root
Ginger	<i>Zingiber officinale</i>	Root
Yam bean	<i>Ipomoea batatas</i>	Young leaves
Coriander	<i>Coriandrum sativum</i>	Stem
Shallot	<i>Allium ascalonicum</i>	Stem
Egg plant	<i>Solanum melongena</i>	Fruit
Pomelo	<i>Citrus maxima</i>	Fruit
Mango	<i>Mangifera indica</i>	Fruit
Sponge gourd	<i>Luffa acutangula</i>	Fruit
Egg plant	<i>Solanum torvum</i>	Fruit
Corn	<i>Zea mays</i>	Pod
Banana	<i>Musa sapientum</i>	Fruit
Cucumber	<i>Cucumis sativus</i>	Fruit
Chaom	<i>Acacia insuavis</i>	Leaf
Pak pam	<i>Acanthopanax trifoliatum</i>	Leaf
Papaya	<i>Carica papaya</i>	Fruit
Bamboo	<i>Bambusa natans</i>	Shoot
Bamboo	<i>Dendrocalamus membranaceus</i>	Shoot

3.2 Elicitation of Black Lahu ecological knowledge

3.2.1 Swidden cultivation and paddy fields

Unlike the Palong, the Black Lahu practice swidden cultivation in the area around the village. They firmly believe that slash and burn agriculture with long fallow cycles can increase soil fertility. In swidden fields they do not only grow corn and upland rice, but also cucumber or other vegetables for consumption. Recently, swidden cultivation areas have been reduced

because Lahu farmers have accepted the high-input, commercialized and permanent farming system introduced by the Royal project to increase villagers' income and improve their livelihoods.

In contrast to the negetative stereotype of Black Lahu as being pure shifting cultivators, the villagers in Ban Khob Long have also a long-standing tradition in wet-rice cultivation on terraced fields. This system, though, is also gradually changing, as paddy rice is increasingly replaced by temperate vegetables under the influence of the Royal Project. However, the Black Lahu still use their local knowledge for preparing the fields.

3.2.2 Sylvopastoral system integrated with orchards

Given their strong emphasis on cash crop cultivation, the Black Lahu's intensity of animal husbandry is somewhat lower than in the Palong village. Still, raising buffaloes is crucial for providing cash income, and cattle are important for transportation and consumption. Pigs and chickens play a major role in ceremonies (Table 4). Like the Palong, the Black Lahu make their large animals browse in the forest, but also in fruit orchards (under supervision) and in harvested fields.

Table 4. List of animals in sylvopastoral systems of the Black Lahu

Type of animal	Uses	Forage	Consumers
Buffaloes	Sale	Bamboo and wild grass species	Local people
Cattle	Transportation and consumption	Bamboo and wild grass species	Local people
Pigs	Consumption and ceremonial purposes	Bamboo and wild grass species	Chinese, Lahu, local people and Palong
Chickens	Consumption and ceremonial purposes	Crop residues	Local people

Since especially large ruminants (buffaloes and cattle) fetch high prices in the market, the return per labor is very high as compared to the cultivation of cash crops which is much more labor-intensive and requires expensive external inputs, such as agrochemicals and improved seeds. The variable costs of raising animals is considerably lower, since farmers use natural forages,

such as “Tong gong” (*Thysanolaena maxima*), “Yha yoong kor lek” (*Cyrtococcum pilipes*), “Yha ka” (*Imperata cylindrica*) and others as shown in Table 5.

Table 5. Examples of local and scientific names for forage plants

Local Name	Scientific Name
Pai rai	<i>Gigantochloa albociliata</i>
Pai bong	<i>Bambusa longispatha</i>
Pai sang	<i>Dendrocalamus strictus</i>
Kra tin	<i>Leucaena leucocephala</i>
Tong gong	<i>Thysanolaena maxima</i>
Yha gay	<i>Eulalia siamensis</i>
Yha fak	<i>Themeda triandra</i>
Yha phank kwai	<i>Axonopus compressus</i>
Yha kam	<i>Phragmites karka</i>
Yha ka	<i>Imperata cylindrica</i>
Yha yoong kor lek	<i>Cyrtococcum pilipes</i>
Yha nad lek	<i>Pluchea eupato</i>
Yha kom bang	<i>Corex indica</i>
Yha dok kam	<i>Gymura crepidoides</i>
Yha rok krea	<i>Terminalia alata</i>
Bai ma kok pa	<i>Spondias pinnata</i>
Bai dok tien	<i>Impatiens chinensis</i>
Bai ta lo	<i>Schima wallichii</i>

The Black Lahu believe that cattle are an integral part of the forest ecology, as they encourage the germination of forest tree seeds by breaking the dormancy and scattering the seeds. Thus, forest tree density is indirectly increased by this system (Figure 3). Since the animals browse mainly on grass and occasionally in the orchards, they do not cause much damage to the forest trees as often stated by scientists. These results are in line with an earlier study on the Karen people in northern Thailand by Choocharoen et al. (2003) which found that their sylvopastoral practices integrated with fruit orchards were part of a sustainable agroforestry system.

Black Lahu farmers also stated that through moderate grazing of brushwood, small shrubs are regularly pruned which keeps undergrowth vegetation under control. According to key informants the animal tramping also decreases the frequency of forest fires during the dry season (Figure 3).

In terms of protection of the head watersheds, the Black Lahu were well aware of the significance of certain tree species for the watershed ecology and for the wildlife.

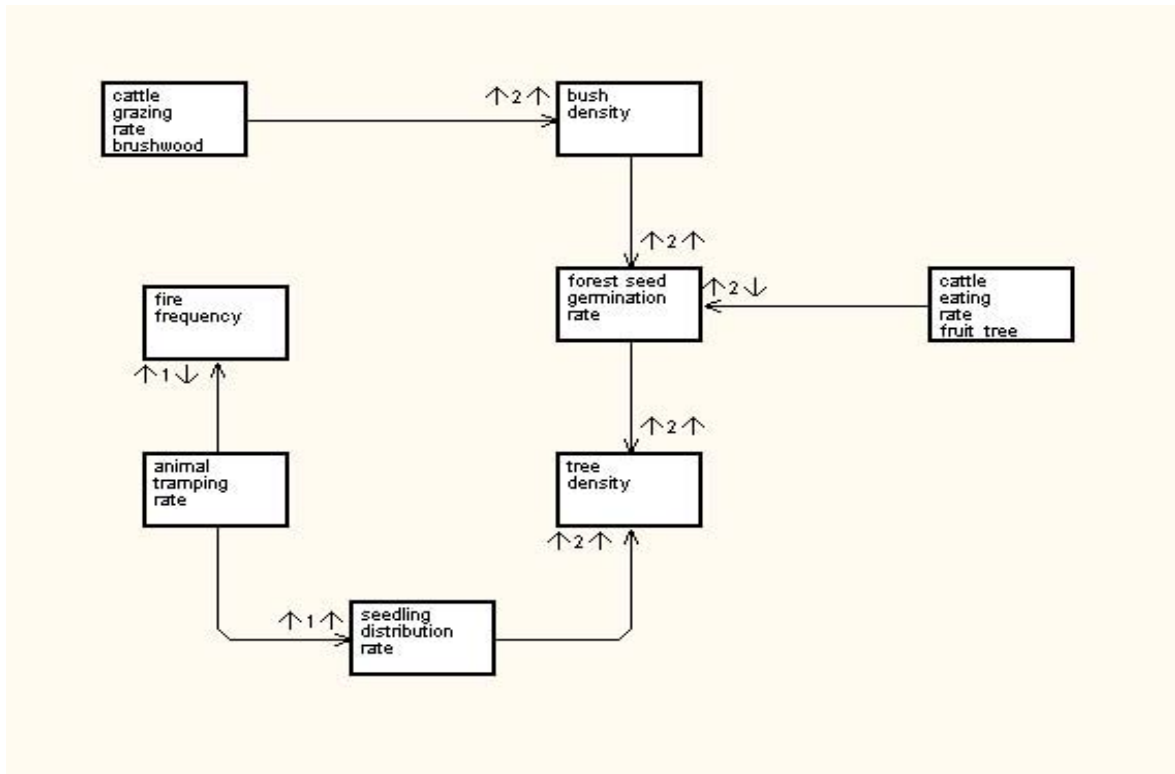


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3.2.2 Home gardens

In the Black Lahu village, the traditional form of home gardening is only maintained by a few farmers with larger landholdings. Home gardens used to be places where innovation was nurtured. Many technical and market developments have benefited from traditional home gardens. Some crops were first adopted in home gardens and then produced on a wider scale in upland fields. Today, however, the home gardens of the Black Lahu are subject to rapid modifications and increasingly transformed into very intensive systems, such as greenhouses for vegetable and flower production.

4 Conclusions

The Palong and Black Lahu in the study villages are facing increasing challenges through both development and conservation efforts of various agencies. Their local knowledge, however, has been hardly recognized by development workers and conservationists. Since swidden cultivation has come under increasing pressure through reduction of available area for cropping and fallow

periods, Black Lahu farmers have shifted to more permanent forms of highly intensive agriculture under support by the Royal Project. They have even started to replace their ecologically sustainable paddy cultivation by temperate vegetables and flowers. Animal husbandry with its low external inputs and high economic returns provides an important backstopping mechanism, although forest browsing is regarded as harmful to the watershed ecology and therefore prohibited in many watershed conservation zones. The Palong have seized the market opportunities of livestock by keeping horses and mules in forest and orchard areas close to the settlement. Both groups claim that animal husbandry has a variety of positive effects on the watershed ecology. Rather than categorically opposing livestock raising in forest areas, scientists, conservationists, development workers and local people should try to integrate local and scientific knowledge to jointly identify sustainable sylvopastoral systems under increasing population pressure. The carrying capacity may be enhanced, for instance, by planting forage trees and grasses in fallow areas (cf. Thapa 1997, Thapa and Paudel 1999).

In sum, the knowledge and practices of ethnic minority groups contrast with the simplified and negative image that mainstream society tends to construct of highland agricultural systems. Local knowledge can offer alternative and/or complementary explanations of ecological cause-effect relationships which may need further scientific investigation and cross-checking with experience from elsewhere. We conclude that if local knowledge is integrated into scientific analysis and policy-making it can provide useful resources for striving towards more sustainable highland agro-ecosystems.

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