

Farmers' Management of Sustainable Highland Land Use with Rotational Shifting Cultivation

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ABSTRACT

*Highland agriculture in Thailand has traditionally been dominated by subsistence production with shifting cultivation. However, there is increasing economic integration with cash crops in many highland villages, which has resulted in the reduction of forest cover and agricultural biodiversities. This paper describes studies of how traditional land use system of a highland village of Tee Cha village, Sob Moei sub-district, Sob Moei district, Mae Hong Son province affects agricultural productivity and conservation of biological diversity of natural and agricultural resources. In this Karen village farmers practiced traditional 7 year rotation of upland rice with a tree called Pada (*Macaranga denticulata*) as the primary species during the fallow period. The system was managed both communally and at the family levels, governed by sets of rules and custom. Households manage their own crops, however most farming activities were done by exchanged labor. For management of forest areas, including fallow forests in between cropping periods, care and conservation of forest resources are based on communal agreements and rules, backed rituals. For management of plant genetic resources, the farmers maintained a biologically diverse germplasm of agricultural species, many of which in many different varieties. The study has revealed that this land use practice of agrobiodiversity management in this highland village focusing on subsistent farming with the aim to provide food security for its members, also has an important function in conservation. The village helps to preserve in situ biological diversity of agricultural germplasm and wild species while maintaining a substantial forest area.*

Key words: Agrobiodiversity, *Macaranga denticulata*; Sustainable land use; Rotational shifting cultivation; Agricultural biodiversity

INTRODUCTION

The mountainous area of northern Thailand is home to ethnically diverse groups, many of whom have been living in the area for several hundred years or more, in particular the Karen, Lua and H' Tin. Others, such as the, Hmong, Lisu, Lahu, Yao and Akha, have recently arrived from neighboring countries and settled in Northern Thailand since the 1950's (Kunstadter and Chapman, 1978). All of these minority groups are generally referred to as traditional shifting cultivators who practice slash and burn cultivation of swidden farming for subsistence (Grandstaff, 1980).

For more than three decades, traditional swiddens in northern Thailand have been faced with rapid social and economic changes forcing them to practice sedentary agriculture and land use. This was brought about largely by government policies and large scale support from external development assistance both national and international agencies, including many NGOs. With successful development, traditional shifting cultivation in the country has been disappearing. Other forms of cultivation with increasing cropping intensity are taking place at a fairly rapid rate on a large scale (Rerkasem, 2003). The remaining shifting cultivators are facing pressures arising from forest and watershed protection policies and well as population increase. The major conclusion reached by many authors is that the shift from traditional swidden to alternative sedentary agriculture is expected to wipe out large number of crops grown in traditional swidden and hence their food security comes

under threat as the diversity of local food declines (Suthi, 1989; Santasombat, 2003).

On the other hand local land use and management have been found in which farmers are able to maintain productivity under pressure on the land. For example, the Pwo Karen communities in Sop Moei district of Mae Hong Son province in northern Thailand are managing *Macaranga denticulata* to enrich their short fallow shifting cultivation for upland rice production and have cycle period of 7 years instead of the 10-20 year-cycles of the past. The upland rice crops could give an average grain yield of 3 t/ha compared with only 1 t/ha without the *M. denticulata* and also conserving biodiversity (Yimyam et al., 2003).

Therefore, the objective of this study to understanding the farmer's management of land use for sufficient and sustainable. Understanding of how local communities manage their agrobiodiversity in the face of rapid land use and land management changes may be useful for policy decisions and development assistance efforts many levels.

MATERIALS AND METHODS

This case study was conducted at Tee Cha village, Sop Moei district, Mae Hong Son province. The altitude is about 600-900 meters above mean sea level. The villagers are Pwo Karen who practices traditional rotational shifting culture for subsistence. Data collecting of this study was as follows:

- 1) Interviewing the villagers about the village context (characteristic of the village) in general and land management.
- 2) Land use survey using a topographic map, scale of 1: 50,000 for land use mapping.
- 3) Collecting data on the biodiversity and land use in different areas. Descriptive statistics was used for analysis.

RESULTS

General information about the village

All of the villagers in Tee Cha village are farmers and practice rotational shifting cultivation with upland rice as the major crop for household consumption and other uses. The majority of farming households earn cash income from many activities. Major source of cash income derived from selling fresh and dry chili. Many households also harvest forest products, e.g. wild honey, mushrooms, bamboo worms, for selling to outside markets.

Social organization of the Pwo Karen community in Tee Cha is dominated by kinship networks. Labor is the major input in upland rice production and exchange labor which is organized within kin groups in the main form of labor management. Villagers in Tee Cha are also strongly influenced by customary rules and spiritual beliefs in various aspects of land use, from land allocation, organization of the slash and burn activities to labor exchange in the growing, management and harvesting of upland rice and rice seed maintenance and exchange.

Land use and land management

Land use

At present, shifting cultivation represents the dominant agricultural land use with an overall area of about 495.6 ha or 45.8% of total area. Area under natural forests remains 557.2 ha or 51.5% of total area in the village (Table 1). There are only 5 households that own paddy and a total area is less than 8 ha. A few farmers have developed mixtures of fruit trees with annual and perennial cash crops such as coffee as alternative income generating activities. Many cash crops have been introduced for the past few years and some starts production on commercial scale, e.g. cabbage.

Table 1. Land use in Tee Cha village.

Type of land use	Area	
	ha	%
Natural Forests	557.17	51.48
• Conservation forest and head water	84.21	7.78
• Community forest	47.19	4.36
• Utility forest: deciduous	422.30	38.01
• Cemetery	3.47	0.32
Village site	5.50	0.51
Agriculture lands	519.68	48.01
• Shifting cultivation	495.6	45.79
• Permanent fields	16.08	1.49
• Paddy fields, and fish pond	8.00	0.74
Total Area	1082.35	100.00

Land allocation and tenure arrangement

In Tee Cha, land allocation and tenure arrangement are based on local tradition, customary rules and regulations. Shifting cultivation fields were managed on communal basis except during the cropping phase. Virtually every decision, from choosing land for opening up, time of slashing and burning, allocation of land to individual household for upland rice production is made communally. With increasing pressures on land, the previous plot allocated for household production is allocated and fixed permanently to household members in the village. Rights to land ownerships are determined by families who open up the land first. One of the rules for allocation of land for shifting cultivation is that every household in the village must have access to at least a piece of land for upland rice cultivation. The land has to be redistributed among the member households. Final decision has to be reached before agreement to opening up fallow field for slash and burn. The timing of operations and how management decisions are made are show in Table 2.

Table 2. Activities of rotational shifting cultivation of farmers in Tee Cha village.

Activities	Timing (month)	Management decision
1. Village meeting • New year ceremonial • Selection of field plot for cropping • Land allocation to each household • To ask permission land spirit	- February February February February	- Communal Communal Communal / Household Household
2. Slashing and looping big trees	March	Collection
3. Drying and burning • Firebreak construction • Control burning • Land spirit ceremonial (in the 7 days after burning) • Cleaning • Shelter • Fencing	April End of April April-May May May May	Communal Communal Household Household Household Household
4. Preparing seeds (rice & swidden crops) • Planting pre-rice-swidden crops • Planting upland rice • Planting seven-hole rice • Planting post-rice-swidden crops	May May May May May	Household Household Collection Household Household
5. Rice establishment	June-July	Household
6. Weeding • First weeding • Second weeding • Third weeding	June July August	Household Collection Collection
7. Spirit ceremonial • Seven-hole rice spirit ceremonial • Land spirit ceremonial • Trees spirit ceremonial • Protection bad spirit ceremonial	July July July July	Family Family Family Household
8. Animals protection	July	Household
9. Harvesting swiddens	July-January	Household
10. Harvesting and staking	End of Oct - Nov	Collection
11. Rice drying	November	Household
12. Threshing • Rice spirit ceremonial	December December	Household Household
13. Transportation	December	Household / Collection
14. Storage	January	Household

Maintenance of the biodiversity

For biodiversity management, it was found that the farmers maintained a rice diversity of cultivated crop species and varieties. The collected plant sample from field survey and farmers interviewing are more than 56 kinds, whereas the rice are 17 varieties. For the diversity index it is different both in between the farmers and also the period of cultivated seasons.

1. Genetic diversity of upland rice

In Tee Cha, farmers were planting both glutinous and non-glutinous rice type for their own requirement. There are some 17 named varieties in total, i.e. 12 varieties of non-glutinous and 5 varieties of glutinous type. On average, a household would grow 3-5 varieties, depending upon the conditions of the field and their preference.

2. Species diversity of swidden crops

The total number of swidden crops grow in Tee Cha was found to be as high as 56 species.

The swidden crops ranged from cereals, grain legumes for food crops to vegetables, spices, cut flowers, for cooking as well as ceremonial purposes. The average number of species grown by farmers in the whole village remained fairly constant 35 species.

3. Plant species in various land use stages and field types

In Tee Cha, farmers are managing *M. denticulata* to sustain their traditional shifting cultivation for subsistent production of upland rice and a rich diversity of other swidden crops with fairly short rotation.

DISCUSSION AND CONCLUSION

Changing of land use on highlands of northern Thailand

Presently the land use on highlands were rapidly changing, as the result of highland resource conservation policies, the government policy on prohibiting shifting cultivation, the reduction of fallow period and the promotion of new economic crops. Therefore, farmers who practice shifting cultivation have to reduce period between cropping phase while some of the farmers have changed to cultivate those higher income cash crops with the result of losses in forest cover.

Land use management

All of the villagers in Tee Cha village are managing *M. denticulata* to enrich their short fallow shifting cultivation for upland rice production and have cycle period 7 years. Moreover, the farmers also reserve some areas to be various conserved forest such as utility forest, watershed forest, community forest and mutual utility forest for nearby villages.

For crop production, the farmers practice subsistence farming with upland rice as the major crop. There were also some other crops in the upland rice system with the objective for household consumption and other uses. In general, labor exchange plays the key role in crop production, with arrangement made mainly within kin-groups. Decisions on land use rights were made communally. The land was divided for every household accordingly to appropriate fallow period. The newly setting family without land will have land sharing from their relatives or reallocated from those who no longer farm. So, every household in the village has access to land to grow upland rice to meet their subsistence needs. For the Karen group, it is said that if they have enough rice to eat, the other foods can be collected from the rice field and also from the natural forest.

The management of forest areas is strongly governed by the villagers' belief system which is based on the power of spirits. Whereas, agricultural practices are associated with nature especially the rain, which make the farmers take good care for their forest resources, and belief that water runs from forest, and the association between crop yield and regeneration of the fallow forest. Therefore, the community takes good care and conserve both natural forests, especially the headwater forest surrounding their water source at the waterfall and the fallow area. For this purpose a village committee has been set up to take care of the forests, and the prevention of forest fires as well as the setting up of regulations for natural resources usage.

In conclusion, this study has found that farmers who practice subsistence farming may possess indigenous technology that enable them to maintain crop productivity while contributing to conservation of agricultural and natural biological diversity as well as forest cover.

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