

Dynamics of Upland Utilization and Forest Land Management : A Case Study in Yasothon Province, Northeast Thailand

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Abstract

In Northeast Thailand, upland is a place of conflict between upland field expansion and forest conservation, and between land suitability and external market demand. This paper highlights the dynamic process of upland utilization and forest land management during the last several decades through a case study of upland in an area dominated by paddy fields in Yasothon province, and discusses the impacts of commercial cultivation on land resources management. Upland utilization showed dynamic changes according to individual villagers' demands for upland crop cultivation, and forest land management was also affected by this demand. Nevertheless, upland utilization was, as a whole, well balanced between upland field expansion and forest conservation. Diversification of villagers' income sources is found to be a key issue in flexible and proper land resources management.

I Introduction

Land resources in Northeast Thailand mainly consist of lowland and upland. Lowland is located along the tributaries of the Mae Khong river such as the Mun river and the Chi river, while upland occurs as scattered patches in the lowland and as large upland areas in the western and the southern periphery of the region and in the Phu Phan mountains. Available land resources differ from area to area and from village to village according to the combination of lowland and upland. It reflects the differences in the history of human settlement and the variations in farming practices among the villages.

Lowland is suitable for rice cultivation and has a long history of development. Villagers in the lower reach of the Chi river reported that their ancestors started living and cultivating rice there around 300 years ago, while such development began around 150 years ago in the middle reach [Fukui 1993: 59–60]. The present rice land has been cultivated continuously at least since this time, and evidence of even older rice cultivation is provided by the several ruins of human settlement with carbonized rice that have been found by archaeologists [Nitta 1991: 229]. The expansion of

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rice land was a one-way process driven by increasing demand for rice mainly for home consumption [Kono 1991a: 512]. Consequently, the land use in lowland is stable, and its pattern is well accepted by the people and well suited to the natural environment.

On the other hand, the land use pattern in upland changed from time to time and is still changing. Disputes frequently arise among villagers as well as government agencies and researchers on the appropriate use of upland. Land resource management of upland is much more difficult than that of lowland, for two reasons. First, upland is the place for cash crop cultivation, and farming systems, including the kind of crops to be cultivated, are restricted by the external market demand. So, suitability to the natural environment is not the unique criterion for selecting the farming system. The second difficulty is the environmental aspect. It is in upland that competition arises in land use between agriculture and forest, in other words, between profitability and environmental conservation. In lowland, the necessity of rice is so strongly recognized that it is quite difficult to promote forest recovery, not only for government agencies but also for the village community, even though the rice cultivator does not hold the higher level of land ownership.

Hence, this paper aims to clarify the dynamic process of upland use, as a preliminary step for consensus-making on the land resource management of upland in Northeast Thailand. The major points of discussion are the dynamics of upland utilization and the impacts of commercial cultivation on forest land management.

Necessary information was collected through interpretation of aerial photographs and satellite images, field observation and interview with villagers and officials. Upland in Kham Khuan Kaeo district, Yasothon province was selected for the present study, because a preliminary survey revealed that this land has a comparatively long history of upland crop cultivation and various kinds of forest land management by the villagers as well as the government agency, and that a complicated process of upland utilization and forest land management is expected to be observed. Field survey was conducted several times during March to May of 1993 [Sijapati 1993].

II Study Area

Upland in the Northeast is roughly categorized into two types from the viewpoint of natural setting and utilization history, namely, scattered uplands in areas of lowland, and large areas in the periphery of the region and in the mountains. The former is surrounded by paddy fields and is accessible to the rice cultivators. Hence, it was utilized both for upland fields and forest even before the introduction of commercial upland crops. On the other hand, the latter type of upland has been considered as no-man's land until recently. It might have been utilized for pasturing or hunting and gathering, but still it was a world of wild animals and dense forest. However, the introduction of labor-extensive upland crops and agricultural machinery are causing changes in the use of this type of land.

In Yasothon province, located in the southeastern part of Northeast Thailand and on the lower reach of the Chi river, both types of upland can be observed. The northern part of the province has a large area of upland connecting with the Phu Phan mountains. Upland crop cultivation started

about 30 years ago with the introduction of kenaf cultivation and expanded rapidly after cassava was introduced, whereas rice cultivation in small tracts along the streams dates back to antiquity. Some farmers in the area migrated there, not only from nearby districts but also from other provinces. It is not uncommon, therefore, to find a farmer who does not have even a single paddy field and relies totally on upland crop cultivation. This means that upland cropping is not supplementary but the primary source of cash income for the majority of the farmers.

On the other hand, in the central and southern parts of the province, paddy land prevails on the lowland on both banks of the Chi river, and is said to have been gradually reclaimed since about 300 years ago. Within the lowland are scattered uplands that are encircled by a chain of villages. Transportation is much better in these parts. The main road connecting Yasothon town with Ubon Ratchathani passes through the area and most of the villages have been accessible by pick-up truck for many years. Hence, rice cultivation is the primary source of income for the villagers, and upland cropping is a kind of the supplementary occupation, like animal and poultry breeding, cloth and bamboo basket weaving, and working away from the village. Some villagers, however, do not have upland fields in the nearby area [Kono and Nagata 1992].

The upland chosen for the present study lies in Kham Khuan Kaeo district (Fig. 1), in the southern part of the province, and covers an area of about 80 sq. km. It is surrounded by paddy land, and 36 villages are located inside or at the boundary of the area. Settlement of the old villages is believed to have occurred some 200 years ago, but exploration of the historical setting of the villages revealed that they have been dynamic. Epidemic diseases caused total or partial abandon-

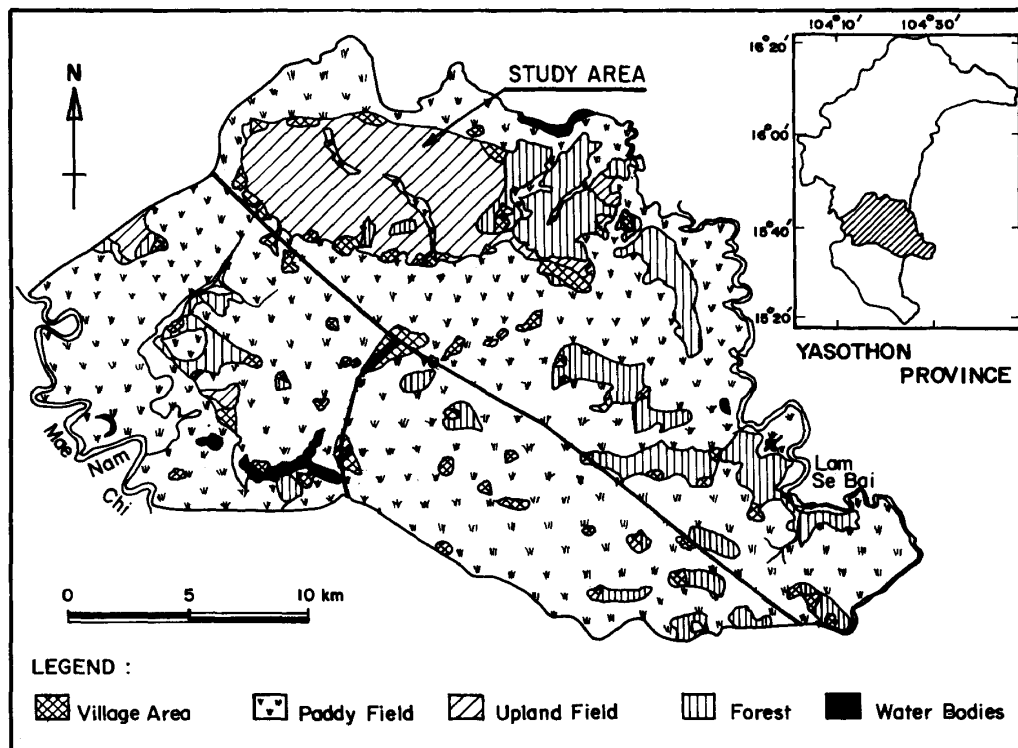


Fig. 1 Present Land Use in Kham Khuan Kaeo District, Yasothon Province

ment of villages, as villagers sought new land in other areas. Some villages split as a result of population growth or conflict in leadership. Small villages tended to merge together as they grew. Nevertheless, rice cultivation has continued to be the primary activity in all the villages.

The rainy season normally commences in May. Maximum monthly rainfall occurs during July to September, and the season is over by the middle of October. The average annual rainfall is around 1,600 mm. Rice as well as upland crops are cultivated during the rainy season under rainfed conditions except in a few cases of dry-season cultivation. The upland has a dome-shaped topography with a longer axis in the east-west direction. The top of the upland is about 40 m higher than the surrounding paddy land, which is almost flat. Two soil types are dominant in the upland, the Yasothon series and the Korat series, in the western to central parts and the eastern parts of the area, respectively.¹⁾ The former is more fertile and suitable for upland cropping than the latter.

III Upland Farming and Land Use Patterns

Upland farming in the study area has changed mainly because of the introduction of new kinds of cash crops. Simultaneous changes in land use can also be observed, both of which seem to be closely related. Hence, the relationships between changes in upland farming and changes in land use in the whole study area were first examined. Information on changes in upland farming were obtained through interviews with the villagers, and information on past and present land use was mainly documented by interpretation of aerial photographs and satellite images. The period from the 1920s to the present is taken for discussion, as earlier information is almost impossible to obtain from the villagers or from the oldest available aerial photographs, which are from 1954. Based on the dominant crop at each time, the total period has been divided into four periods, namely, the subsistence farming period, the cotton period, the kenaf period and the cassava period.

1. *Subsistence Farming Period*

Before commercial cultivation of cotton was introduced in the 1940s, upland was used for shifting cultivation of subsistence crops such as beans, cucumbers and melons. Cotton and mulberry were also cultivated, but only for home consumption and for barter with nearby villages for basic commodities such as rice, salt and fish. Thus the size of cultivation was limited to between 1 *ngan* (4 *ngan* = 1 *rai* = 0.16 ha) and 2 *rai* per household. Once fields had been cultivated, they were left fallow for 3 to 6 years. As a result, a significant area of grass or bush land must have developed after cultivation, even though the area actually planted was small.

Villagers reported that, during this period, there were large areas of forest land which they could reclaim for cultivation whenever and wherever they needed without obtaining any kind of permission, and so they chose suitable land for cultivation of various crops. Thus a villager cultivated cotton in one area, cucumber, water melon and cow pea in another area, and peanuts in a

1) The Yasothon series and the Korat series are classified as Typic Haplustoxs and Oxic Paleustults by the Department of Agriculture, the United States, and Red-yellow Latosols and Grey Podzolic Soils by the Department of Land Development, Kingdom of Thailand, respectively.

third. It is said that a hard worker cleared dense forest with tall trees but a lazy man cleared forest with short trees, because dense forest with tall trees indicated fertile soil and good harvest but, at the same time, required harder work for reclamation.

In the late 1920s, the local government announced that the total area under cultivation must be registered in the name of individual cultivators and the remaining land would be declared as national forest. At that time, villagers were not familiar with official procedures and they were also afraid of having to pay a lot of land tax. In most villages they simply ignored the announcement, but in some they complied. In Song village (serial No. 34 and 35 in Fig. 6), a meeting of villagers was called and it was decided to choose three representatives of the village who would claim ownership of the upland fields for the whole village. The district office issued these three villagers each with a paper declaring them to be owner of 30 *rai*. The location of the fields, however, was not specified. The other villagers continued to cultivate their upland fields and the three representatives collected money from all cultivators to pay the land tax.

This information indicates that the area of forest land remaining during this period was extensive, a significant amount of cleared upland remained uncultivated, and the villagers did not feel the need to be authorized by the government to cultivate upland.

2. Cotton Period

The virtual exclusion of cotton imports during World War II gave a great boost to commercial cultivation of cotton in many parts of Thailand [Ingram 1971: 121]. Cotton cultivation in the study area started in the early 1940s and was fully expanded in the mid-1940s. It was cultivated by shifting cultivation, which prevailed because a large amount of suitable land still remained uncultivated and shifting cultivation gave higher yields than continuous cropping. The area of cultivation varied from 1 to 5 *rai* per household. After the war, cultivation decreased gradually and finally disappeared in the mid-1960s. During this period, shifting cultivation of subsistence crops continued over a substantial area.

The introduction of commercial cultivation of cotton caused a shortage of upland fields to some extent. The shortage might not have been substantial and to a large extent only foreseen, but the villagers' attitude towards land ownership changed. They started to mark trees as a sign of ownership and tried to claim land for themselves that did not have a previous cultivator. In the late 1940s, seven more villagers from Song village went to the district office and obtained certificates called *bai chong*.²⁾ In the following year, a big group of Song villagers went to the district office for the same purpose. The district office sent an official to the village, who ruled that each household would get 10 to 20 *rai* depending on the location of field and the size of family, and asked the village headman to prepare a list of the villagers and the amount of land each should get. The list was signed by the official. Similar procedures were also reported from Ku Chan village (serial No. 21 and 22 in Fig. 6), Som Saat village (serial No. 14) and Thung Mon village (serial No. 31 and 32). In

2) The villagers called the certificate "*bai chong*." But *bai chong* is a kind of land title for private land under the Land Code 1954 [Onchan 1990: 64].

Ku Chan village, the sub-district headman (*kamnan*) and the village headman measured the upland fields using a long tape and prepared a list.

This information indicates that, by the late 1940s, most of the suitable land had been claimed for cultivation in the near future. The land use map in the mid-1950s (Fig. 2) reinforces this view. Even in the central part of the study area, only a small area of forest remained. In the eastern part, a large patch of forest existed where cotton cultivation had been discontinued because of low yields due to unsuitable soil. Villagers here went to the central part to cultivate cotton. A further point is that, even though the area of upland fields was large, most of it was not cultivated land but grass or bush land after cultivation. It is very difficult to distinguish planted land from grass or bush land in the aerial photographs, but the total planted area is estimated to be only 15 to 20% of the total

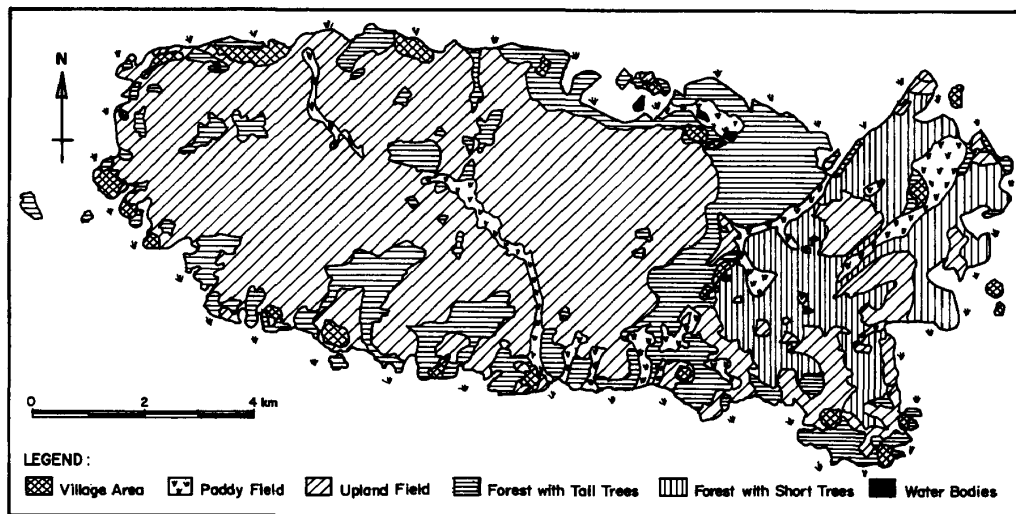


Fig.2 Land Use in the Mid-1950s
Prepared from aerial photographs taken in Jan. 1954

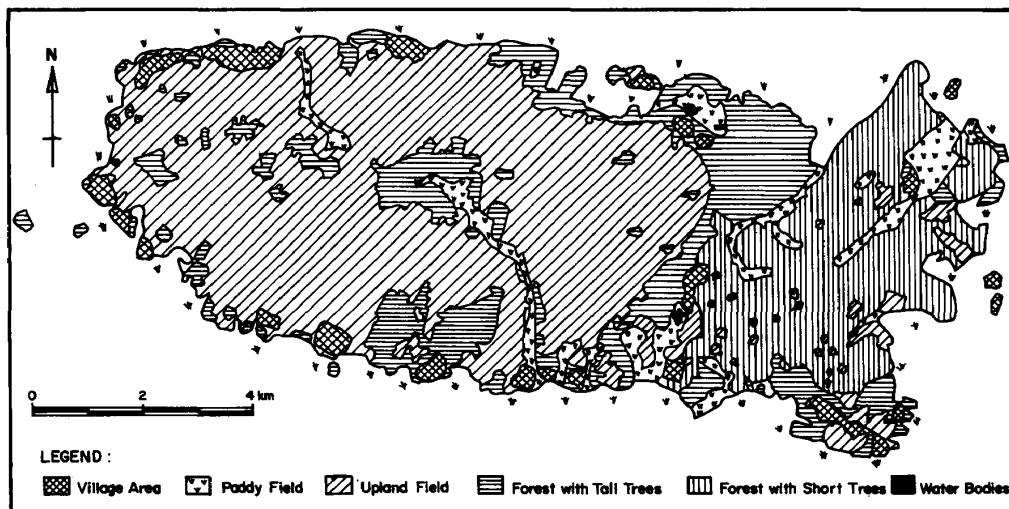


Fig. 3 Land Use in the Mid-1970s
Prepared from aerial photographs taken in Oct. 1975

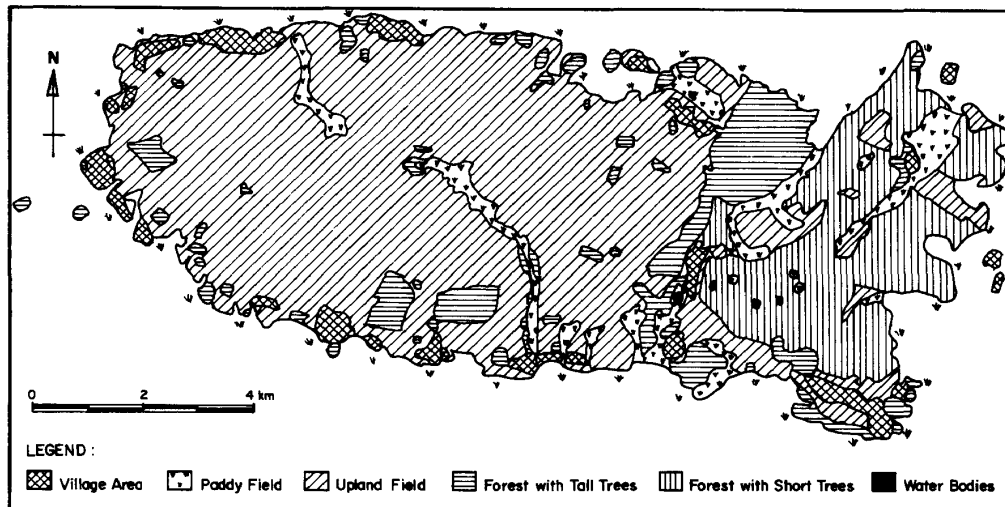


Fig. 4 Land Use in the Early 1990s

Prepared on the basis of data from satellite imagery: LANDSAT-5TM (127-49) dated 13 Feb. 1988, and MOS-1 (40-98E) dated 31 Dec. 1988 and 19 Jun. 1989, and modified in the light of information gathered through field survey, 1993

upland fields shown in Fig. 2. This means that upland fields were cultivated again after 3 to 5 years of fallow.

3. *Kenaf Period*

In the late 1950s, a decline in jute exports from Bangladesh (then East Pakistan) caused an increase in the demand for kenaf as a substitute for jute [Fukui 1993: 242]. This resulted in rapid expansion of kenaf cultivation in Northeast Thailand. The total area of kenaf cultivation in the Northeast was only 0.05 million *rai* in the early 1950s and 0.1 million *rai* in the late 1950s, but it increased to 1 million *rai* in the early 1960s and 2.6 million *rai* in the late 1960s. The total upland field area in the Northeast in the mid-1960s is estimated to be about 4 million *rai* [Kono 1991b: 37]. Hence about half of the total upland field area in the Northeast was occupied by kenaf at that time.

In the study area, kenaf cultivation started in the mid-1950s in most villages, and through the early 1960s, both cotton and kenaf were cultivated as important cash crops. Kenaf finally replaced cotton in the mid-1960s in most villages. Though this was the general process in the study area, some differences are observed from village to village. In some villages the replacement occurred more rapidly because ponds for retting the harvested kenaf were easily accessible, but in others kenaf cultivation was introduced later and was soon discontinued because of unsuitable soil conditions.

Kenaf was mainly cultivated by continuous cropping. It was planted in March to May and harvested in September to November. After that the field was kept fallow during dry season and again planted at the beginning of the rainy season. Traditional varieties like Po Thung and Po Kau were used initially, but later modern varieties like Po Kracha and Po Cuba were cultivated. The maximum area of kenaf cultivation per household was slightly bigger than that of cotton. Furthermore, since the villagers had to transport harvested kenaf to ponds in the lowland for retting,

upland fields near the lowland were more convenient for kenaf cultivation. These were the reasons why continuous cropping was introduced.

The change from shifting cultivation of cotton to continuous cropping of kenaf affected the land use pattern in the study area. Comparison of the land use map in the mid-1970s (Fig. 3) with that in the mid-1950s (Fig. 2) reveals that in the western and the central parts, forest area near the lowland decreased while the forest area in the center of the upland increased. This means that the area near the lowland was cultivated more intensively, while the area far from the lowland was abandoned. In the eastern parts, where soil is unsuitable both for cotton and kenaf cultivation, upland fields decreased and forest land expanded during this period. This change is thought to be related not to a change in the kind of cash crop but to other factors such as increased rice yields and greater off-farm job opportunities due to the paving in the early 1960s of the highway that passes near the study area, which resulted in greater movements from the villages.

4. *Cassava Period*

Cassava cultivation has rapidly expanded in Northeast Thailand since the 1970s. The area under cassava cultivation in the Northeast was less than 0.1 million *rai* in the late 1960s, but this grew to about 1 million *rai* in the early 1970s, 3 million *rai* in the early 1980s, and reached 5 million *rai* in the late 1980s. The product is processed as animal feed and is supplied mainly to overseas markets. The rapid expansion of cassava cultivation was supported not only by high profitability and land suitability but also by the spread of the tractor for plowing and transportation, especially since the 1980s. As a result, more than 50 *rai* of upland fields can be cultivated by a household employing temporary labor for weeding and harvesting.

In the study area, as in the other parts of Northeast Thailand, the boom of cassava cultivation started in the early 1970s. In most villages, continuous cropping of cassava replaced kenaf very rapidly, and by the mid-1970s kenaf had disappeared. Only in some villages where ponds for kenaf retting are easily accessible has kenaf cultivation continued.

The introduction of cassava and the spread of the tractor brought new changes in the land use pattern. Comparison of the land use map in the early 1990s (Fig. 4) with that in the mid-1970s (Fig. 3) reveals the major changes during this period. First, the forests in the center of the upland disappeared. This indicates that the distance between field and the village or the lowland ceased to be a constraint upon upland field expansion. Second, upland fields have expanded into the forest land in the eastern part where cotton and kenaf cultivation was discontinued. This is so because cassava can be cultivated in less fertile soil than cotton and kenaf. The third point is that the forest area near the lowland decreased in size and became regular in shape. This change implies the implementation of effective forest land management.

5. *Changes in Land Use Patterns*

Table 1 summarizes the changes in land use during the past 40 years. Major land uses are forest land and upland fields, while paddy fields, village areas and water bodies occupy small parts of the area. As mentioned above, the upland field area in this table includes grass land left fallow after

Table 1 Changes in Land Use Pattern

Land use category	1954	1975	1993
Forest land			
with tall trees	15 (%)	16 (%)	11 (%)
with short trees	14	14	13
plotted forest	6	5	4
sub-total	35	35	28
Upland field	57	57	63
Paddy field	6	6	6
Village area	2	2	3
Total	100	100	100

Data sources are Fig. 2, Fig. 3 and Fig. 4. Plotted forests are not shown in the figures because they are too small to be presented in a map of that scale.

cultivation, because upland fields actually cultivated and grass land after cultivation could not be clearly distinguished on the aerial photographs. However, it is apparent that the proportion of upland fields actually planted has increased, since grass land after cultivation is presently observed only in a few parts. Similarly, the areas of forest with short trees and plotted forest in this table include young forests regenerated after several years' fallow and orchards. Orchards of cashew and mango have been expanding recently in the study area, but their area is still negligibly small.

It is clear from the table, first of all, that there have been no drastic changes in land use in the study area during the last 40 years. Neither, however, has the land use pattern been static. There were dynamic changes from forest land to upland fields and from upland fields to forest land as mentioned above. Second, changes can be observed during the last 20 years from forest land with tall trees to upland fields, but the area of forest land with short trees shows only a slight decrease. This indicates that upland fields have mostly been expanded into the area suitable for upland crop cultivation, because the forests with short trees are located in the eastern parts of the study area, where soil fertility is lower. A further point is the conversion from shifting cultivation to continuous cropping. It can be concluded that the villagers have selected suitable land for upland field expansion and utilized it intensively. As a result, deforestation in the study area was not as severe as has been observed in other areas.³⁾ But these dynamic process are different from village to village. This point will be discussed later more in detail through intensive case studies.

At the same time, changes in quality of the forest are also reported by the villagers. The amount of natural food like wild birds and animals has decreased since the 1950s. Even though hunting and gathering of edible and non-edible forest products are still important post-harvest activities, they now involve longer time and greater distances. The collection of forest products by women and young children now requires them to travel deeper into the forest. Though this is an

3) According to the Royal Forest Department, the forest area in the whole country has decreased to less than half of what it was 40 years ago.

important aspect of changes in forest resources, it is very difficult to obtain the precise information on this aspect, for example, through aerial photographs. Hence the evaluation of forest quality is largely neglected in the later discussions.

IV Management Classification and Distribution of Forest Land

The ownership of upland fields rests on mutual understanding among villagers, irrespective of the legal land title that the cultivator holds. Inheritance and sale of land are likewise basically managed at the villagers' own responsibility, though land prices may be affected by the kind of legal land title held. Forest land, on the other hand, can be categorized into several types on the basis of its management. Hence, the management types and the spatial distribution of different types of forest land in the study area are discussed before looking into individual cases.

1. Types of Forest Land Management

On the basis of mutual understanding among villagers about forest land management, the forests in the study area can be classified into three categories: national reserve forests, community forests, and private forests. Because management and utilization of land resources do not always follow the government registration, the villagers' understanding is emphasized in the following discussion.

The national reserve forest is a forest declared by the Royal Forest Department as government property (*pa sanguan haeng chat*). In 1990, the Royal Forest Department classified the total national reserve forest into three categories: A, C and E type. The A type, or agricultural forest, is forest that is designated for distribution to villagers for agricultural purposes. The C type, or conservation forest, is forest that is protected for the sake of environment, soil, water, plants and wildlife; for flood and soil erosion protection; and for study, research and recreation. Finally the E type, or economic forest, is forest that is considered to be primarily a source of wood and other forest products. All the national reserve forests in the study area belong to the E type.

The community forest is one that is understood to be community property and managed by the villagers. Some of the forests are registered as public land (*thi satarana prayot*) in the name of the sub-district (*tambon*). They are further distinguished by the villagers into different types on the basis of their utility and implication. Sacred forest for the village guardian spirit (*dong puta*) is forest which the villagers offered to the guardian spirit [Hayashi 1993: 656]. The villagers believe that when the first settlers arrive in a village they must set aside some land for this type of forest. The villagers have deep respect for the guardian spirit and at annual ceremonies in the forest, most villagers gather to pray to the guardian spirit.

Cremation forest (*pa cha*) is forest used for cremation. Villagers distinguish two types of cremation forest: one for adults and the other for infants. After death, the usual procedure is to burn the body in the case of a normal death, e.g., due to illness, but to bury it in the case of an abnormal death, e.g., due to accident. The old practice of cremation in the cremation forest has now largely been supplanted by the use of a crematorium in a Buddhist temple. Although most cremation forests thus no longer serve their original purpose, they are nevertheless conserved

because of villagers' beliefs and fears.

Another type of community forest is communal forest (*pa satarana*), which is conserved for non-specific uses and is generally located near the village. Villagers use this type of forest for gathering forest products, hunting wild animals, grazing animals livestock, collecting fodder and so on. The concept of this type of forest appears to have been unfamiliar to villagers before the 1940s, when abundant forest was accessible. But since the 1950s, the government has also encouraged villages to have this type of forest.

Forest Buddhist temples (*wat pa*) also play an important role in the management of community forest. The monks in the conventional village Buddhist temple (*wat ban*) were accused of being materialistic, and the concept that monks should be less materialistic and should stay in the forest recently began to gain acceptance. The monks take care of the forest, plant new trees and do not allow anyone to cut green trees or kill wild animals or birds. In most cases, forest temples are located in other kinds of community forest, in areas taken over by the monks and presently being conserved by them.

Private forest may be forest having legal individual ownership or forest in the national reserve forest area that is recognized by villagers as private property. Even though these are generally small plots scattered over the area, they are sometimes concentrated in one area. Most private forest areas are thought to have been at least once cleared for cultivation, because they are generally poorer than the nearby sacred forests and cremation forests.

At present, the actual forest area in the study area is about 14,300 *rai*. Of this, about 30% each is occupied by community forests and national reserve forests in the area marked by the Royal Forest Department (Table 2). Considerable parts of the remaining forest are also supposed to be national reserve forest, though they are located outside the marked area. The total national reserve forest area is thus estimated to be more than the half of the total forest area, because most of the private forests are categorized as plotted forest (Table 1).

Table 2 Existing Forest Area

Classification		Existing area (<i>rai</i>)
Community forest	Sacred forest for the village guardian spirit	350
	Cremation forest	450
	Communal forest	3,550
National reserve forest	In the marked area	4,410 ¹⁾
	Outside the marked area	5,540
Private forest and orchard		
Total		14,300

1) This value includes the mutually accepted private forest area but does not include the community forest area within the national reserve forest area.

2. National Reserve Forest

Two areas were marked as national reserve forest in the location maps attached to the ministerial ordinances of 1985. Known as Pa Nong Daeng and Pa Maphrik, they are located in the central and eastern parts of the study area, respectively (Fig. 5). Even though these ordinances are the first document to specify these areas as national reserve forest, the areas have long been understood to be government property. This can be inferred not only from interviews with villagers but also from the fact that no legal land ownership papers were issued to individual villagers in these areas even before the period. As well as in these areas, sign boards indicating national reserve forest have been installed by the government agency near some forests outside the marked areas, especially in the eastern end of the study area, and the villagers also recognized them as national reserve forest. The actual area of national reserve forest must, therefore, be larger than the marked area. But only the area marked in the official documents is highlighted in the following discussion because the location of the additional areas could not be specified.

The marked areas cover about 7,700 *rai* and 15,400 *rai* respectively, and nearly the half of these areas are declared as national reserve forest by the same document [Royal Forest Department 1988: 5] (Table 3). Thus the areas of national reserve forest are distributed in the marked areas,

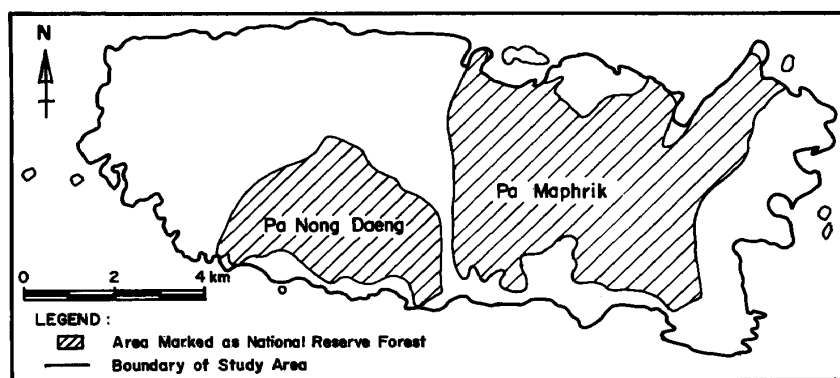


Fig. 5 Area Marked as National Reserve Forest

Table 3 Changes in Actual Forest Area in the National Reserve Forest Area

Name of forest		Pa Nong Daeng	Pa Maphrik
Total area marked ¹⁾ (<i>rai</i>)		7,660	15,390
Reserve forest area ²⁾ (<i>rai</i>)		3,190 (100)	7,856 (100)
	1954	1,750 (55)	6,620 (84)
Actual forest area ³⁾ (<i>rai</i>)	1975	1,720 (54)	6,970 (89)
	1993	890 (28)	5,870 (75)

1) These values are obtained from the map prepared by the Royal Forest Department.

2) Data source is Royal Forest Department [1988: 5].

3) Data sources are Fig. 2, Fig. 3 and Fig. 4 "Actual forest area" means area covered with trees.

but their exact locations cannot be identified from the available information. Actually, there are some community forests and mutually recognized private forests as well as large patches of upland fields in these areas.

According to our estimations, the actual forest area including all types of forest in both areas showed no change from the mid-1950s to the mid-1970s but decreased after that (Table 3). The rate of decrease in forest cover during the last 20 years is about 50% in Pa Nong Daeng and 15% in Pa Maphrik, while it is about 20% in the whole study area (Table 1). On the other hand, the Royal Forest Department reported that the actual forest area in 1985 was 0 *rai* in Pa Nong Daeng and 781 *rai* in Pa Maphrik [Royal Forest Department 1988: 5]. The significant differences between these values and our estimations may partly be because our estimation includes all kinds of forest in the areas, while the Royal Forest Department figures exclude some of the community forests. The other possible reason is the difference in the definition of forest land. The Royal Forest Department regards it as the area of valuable forest for conservation, while forest land in our estimation is defined as land which has not been cultivated recently and is covered with trees. In either estimation, the effectiveness of the government's declaration of forest preservation is not clear. One reason for this may be that little management work is done beyond the installation of sign boards indicating national reserve forest by the government agency.

The proportions of remaining forest area are quite different in Pa Nong Daeng and Pa Maphrik. This is mainly due to the difference in soil conditions between them.

3. *Community Forest*

Some of the community forests are managed by an administrative village and some are cooperatively managed by several administrative villages. Thus, the village community from the viewpoint of community forest management does not coincide with the administrative village. All the community forests in the study area and their inter-village sharing were, therefore, surveyed by means of interviews with village headmen and interpretation of aerial photographs, and the results are summarized in Table 4. The forest land of the forest temples are categorized in their original kinds of community forest in this table. Of the 36 administrative villages in the study area, 8 villages have their own sacred forest and/or cremation forest and others shared them with one to three nearby villages. The 36 administrative villages can be divided into 18 village groups on the basis of community forest sharing. The spatial distribution of village groups is shown in Fig. 6 with the name of core village. In all village groups, the member villages belong to the same sub-district. The size of village group varies widely from 73 to 509 households. Thus it seems that village grouping is derived from the historical setting of settlement.

Most of village groups have their own sacred forest, cremation forest and communal forest. The exceptions are two, three and four village groups which do not have sacred forest, cremation forest and communal forest, respectively. Hence, it appears that a set of community forest types is a kind of prerequisite for a village community. The areas of these vary from one village group to another, however, and it is difficult to specify the minimum requirement for the size of each type. The area of community forests per household also ranges from 0.1 to 7.1 *rai*, while the average for

Table 4 Area of the Present Community Forest by Village Group

Administrative village		Village group		Community forest (rai)				
Serial no.	Name of village	Core village	No. of households	Sacred forest	Cremation forest	Communal forest	Total	Per household
1	Don Du	Yo	509	9	15	42 ²⁾ + 312	378	0.7
2	Yo (2) ¹⁾							
3	Yo (1)							
4	Kham Klang							
5	Nong Saeng	Nong Saeng	93	1	— ³⁾	46	47	0.5
6	Kham Laem	Kham Laem	76	15	17	—	32	0.4
7	Dong (11)	Dong	388	19	14	356	389	1.0
8	Dong (5)							
9	Dong (9)							
10	Phon Phon Suk							
11	Laeng Nu	Laeng Nu	200	12	7	330	349	1.7
12	Khilek	Khilek	258	5	100	73 ⁴⁾ + 30 ⁵⁾	208	0.8
13	Rong Kham							
14	Som Saat							
15	Chata Yanon	Lao Hai	273	—	20	50 ⁶⁾ + 400 ⁷⁾	470	1.7
16	Nong Waeng							
17	Lao Hai							
18	Nong Kop (4)	Nong Kop	196	41	80	363 + 72	556	2.8
19	Nong Kop (8)							
20	Sombun Phatthana	Ku Chan	333	25	19	38 + 52 + 269 ⁸⁾	403	1.2
21	Ku Chan (2)							
22	Ku Chan (1)							
23	Ngiu	Ngiu	73	8	28	484	520	7.1
24	Chai Mong Kon	Nong Siao	121	18	21	100	139	1.1
25	Nong Siao							
26	Lao Hung	Lao Hung	97	40	16	245	301	3.1
27	Kut Peng	Kut Peng	168	81	—	422	503	3.0
28	Du	Maphrik	251	15	21	—	36	0.1
29	Maphrik							
30	Phon Sim	Phon Sim	116	32	—	52	84	0.7
31	Thung Mon (7)	Thung Mon	315	25	35	—	60	0.2
32	Thung Mon (3)							
33	Lao Po	Song	365	1	45	85	131	0.4
34	Song (1)							
35	Song (11)							
36	Sawang	Sawang	140	—	7	—	7	0.1
Total			3,972	347	445	3,821	4,613	1.2

1) The number in parenthesis is the village number in each sub-district.

2) This is only for Yo (1) and Yo (2).

3) “—” means non-existent.

4)~7) It is not clear whether this belongs to the whole village group or one village, that is Khilek in 4), Som Saat in 5), Chata Yanon in 6) and Lao Hai in 7).

8) This is for both Ku Chan village group and Ngiu village, and is located outside the study area.

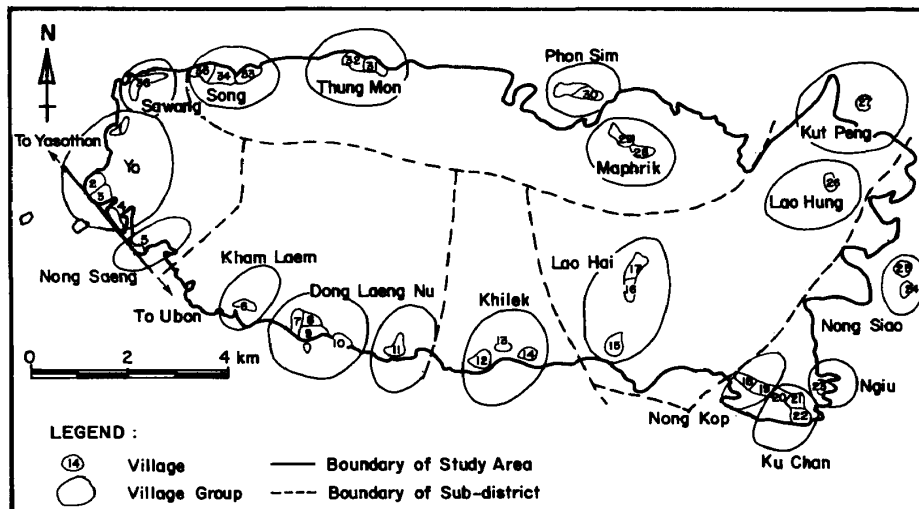


Fig. 6 Distribution and Grouping of Villages
Village numbers coincide with the serial numbers in Table 4

the whole study area is 1.2 *rai*.

These differences in area of community forest among village groups can be clearly explained in terms of the land suitability for upland crop cultivation. The village groups located in the eastern part of the study area have comparatively larger community forests not only in terms of communal forest but also sacred forest and cremation forest. The total community forest area owned by the six village groups at the eastern end of the study area (Nong Kop, Ku Chan, Ngiu, Nong Siao, Lao Hung and Kut Peng) accounts for more than the half of the community forest area in the study area, even though these groups have only about one quarter of the total number of households. On the other hand, the soil in this part is comparatively infertile and not suitable for upland crop cultivation. Consequently, the average sizes of upland fields per household in these village groups are mostly less than the average in the whole area. At the same time, the villagers in these six groups have much better access to national reserve forest than the villagers elsewhere (Table 5). In terms of utility, national reserve forest can substitute for communal forest, which occupies a major part of the area of community forest, and in this sense, these villages require smaller areas of communal forest. This implies that the area of community forest is more strongly affected by the land suitability for upland crop cultivation than by the villagers' requirement.

The other interesting point is that the villagers in the eastern end of the study area have significantly larger holdings of paddy fields than those elsewhere. The average holding of paddy fields of the same six village groups is about 17 *rai*, nearly twice that in the other parts (Table 5). Around the study area, commercial production of rice has rapidly expanded since the late 1970s or early 1980s, mainly due to an increase in rice yield caused by fertilizer application [Fukui 1990: 34]. The present rice yield is estimated to be 300 to 400 kg/*rai* in most villages in the study area [Kono and Nagata 1992: 254], which is almost equal to the annual consumption per capita. This larger holding of paddy fields affords these villages a surplus of rice production and considerable cash income from sale of the surplus. This, in turn, implies a close relationship between paddy fields,

Table 5 Availability of Different Land Resources

Village group (name of core village)	Average farm size per household (<i>rai</i>)			Distance to national reserve forest
	Paddy field	Upland field	Total	
Yo	8.6	5.8	14.4	far
Nong Saeng	12.5	10.2	22.7	far
Kham Laem	9.3	8.6	17.9	far
Dong	6.6	10.3	16.9	far
Laeng Nu	13.4	8.9	22.3	far
Khilek	15.2	6.5	21.7	far
Lao Hai	8.8	10.5	19.3	very near
Nong Kop	15.9	6.1	22.0	very near
Ku Chan	15.6	5.7	21.3	near
Ngiu	20.2	17.5	37.7	very near
Nong Siao	21.4	9.3	30.7	near
Lao Hung	20.8	5.8	26.6	very near
Kut Peng	15.2	1.8	17.0	very near
Maphrik	5.7	8.8	14.5	very near
Phon Sim	11.7	11.5	23.2	near
Thung Mon	7.3	10.7	18.0	far
Song	9.2	11.6	20.8	far
Sawang	7.3	11.6	18.9	far
Average	11.1	8.6	19.7	—

Average farm size per household was estimated from the farm size distribution among villagers as reported by village headmen of all the administrative villages. Farm sizes of 1, 8, 15, 25, 35, and 55 *rai* were assumed to be averages for the size classes of 1 to 5, 5 to 10, 10 to 20, 20 to 30, 30 to 50, and more than 50 *rai*, respectively, and the average farm size in each village group was calculated from the estimated total farm area and the number of households in each member village.

upland fields and forest land in the villagers' management of land resources.

V Community Forest Land Management

The above discussions indicate the strong impact of upland farming on forest land management. To examine this impact in detail, an intensive survey on community forest land management was conducted in the five village groups: Ku Chan, Laeng Nu, Yo, Dong and Thung Mon. These village groups have different natural settings and transportation conditions, so various processes of change are expected.

1. Ku Chan Village Group

The Ku Chan village group is located at the southeastern corner of the study area and consists of Ku Chan (1), Ku Chan (2) and Sombun Phatthana, which have the same origin. They share one sacred forest, one cremation forest and three plots of communal forest called Dong Yang, Dong Nong Kaeo

and Dong Lao Nam Tuam (Fig. 7). Dong Lao Nam Tuam is also shared with a nearby village. In addition, there is a large forest near Dong Nong Kaeo, parts of which are supposed to be national reserve forest, though located outside the marked area by the Royal Forest Department. Upland farming and forest land management in this village group are summarized in Table 6.

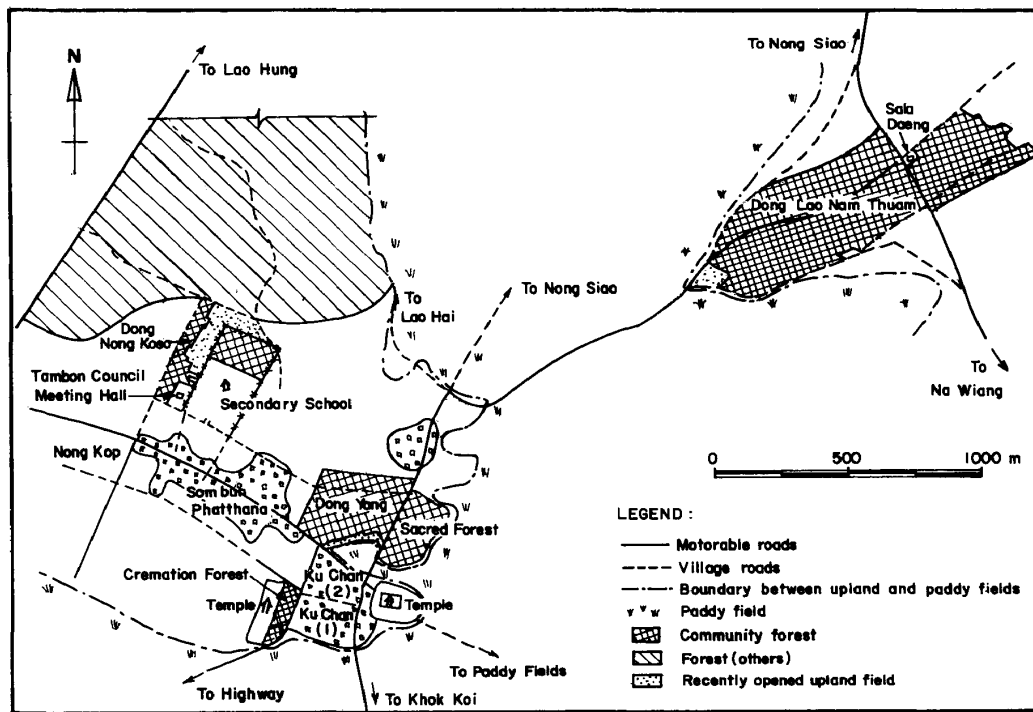


Fig. 7 Distribution of Forests Accessible to Ku Chan Village Group
Forests belonging to Ngiu village that are located inside the area of this figure are not shown

Farming in this village group is comparatively strongly rice-based. Presently, the average cultivated area of paddy fields per household is about 40% higher than that of the whole study area, while that of upland fields is only about 70% of the average (Table 5). The same tendency is observed in the past. During the subsistence farming period, upland around this village group was utilized for shifting cultivation of subsistence crops and mulberry cultivation. Resin for lighting was extracted from *yang* trees (*Dipterocarpus alatus*). With the introduction of cotton in the study area, cotton cultivation did not spread to this village group and subsistence farming continued. Cotton yields were very low in the nearby fields, and villagers went to villages such as Lao Hai (serial No. 17 in Fig. 6) to grow cotton. Kenaf cultivation was similar. Shifting cultivation of kenaf was tried, for example, in Dong Nong Kaeo. But because of the unsatisfactory yield of kenaf in the area due to poor soil conditions, the cultivators abandoned it. Logging of *yang* trees was formerly an important source of cash income. During the 1960s, there was a saw mill in Ku Chan village. Since the late 1970s, cassava cultivation has been introduced and expanded gradually. But it is still less popular than elsewhere in the study area. These findings show that upland crop cultivation has not been popular in this village group because of the unsuitable soil, though *yang* trees temporarily

Table 6 Upland Farming and Forest Land Management in Ku Chan Village Group

Year	Upland farming	Sacred forest	Cremation forest	Dong Yang	Dong Lao Nam Tuam	Dong Nong Kaeo	Others ¹⁾
1950	Mulberry and shifting cultivation of subsistence crops			Yang resin extraction		Mulberry culture in small area	
		28 <i>rai</i> ²⁾	50 <i>rai</i>	Yang logged for housing. 60 <i>rai</i> (trees scattered)	About 300 <i>rai</i>	A forest	
1960	Kenaf tried but discontinued			Yang logged for selling. Saw mill in the village		Kenaf tried but discontinued	
1970		26 <i>rai</i>	Divided into 2 parts 40 <i>rai</i>	60 <i>rai</i> (very few trees)	About 300 <i>rai</i>	Landless allowed to cultivate. 62 <i>rai</i>	<i>Dry Dipterocarpus</i> forest
1980	Cassava started						
	Cassava slowly expanded		Ku Chan part (26 <i>rai</i>) registered. Wat constructed in Sombun Phattana part	Registered (55 <i>rai</i>) ²⁾	Registered (296 <i>rai</i>). Encroachment by nearby villagers	School constructed (about half). Registered (45 <i>rai</i>)	
1990							
	Some cassava and very little kenaf	25 <i>rai</i> Very old and dense forest	19 <i>rai</i> Tall but scattered <i>yang</i> trees	52 <i>rai</i> Dense but young trees	269 <i>rai</i> Quite dense but short <i>Dry Dipterocarpus</i> forest	38 <i>rai</i> Landless allowed to cultivate	Shifting cultivation in small area

1) This forest is not marked on the Royal Forest Department map of national reserve forest, but a sign board located near the forest indicates that some parts of this forest are also considered as national reserve forest.

2) In Table 6 to Table 10, the areas in parenthesis were obtained through interviews, and those not in parenthesis were obtained from aerial photographs, satellite images and the ground survey.

yielded some cash income to the villagers through resin extraction and logging.

On the other hand, community forests are mostly well kept in this village group. The sacred forest has been slightly encroached upon by rice cultivation, but it is very dense with tall trees and a lot of monkeys. The cremation forest was not encroached upon by upland crop cultivation, though it was divided into two parts after the administrative separation of Sombun Phattana village from Ku Chan villages, and a village temple was constructed in the part belonging to Sombun Phattana village. The area of Dong Nong Kaeo has decreased from 62 *rai* to 38 *rai* during the last 20 years, mainly because of the construction of a secondary school. At the same time, in the early 1980s, six landless villagers were given permission by the sub-district headman to cultivate in this forest land. The number of such villagers increased as time went by, but none were allowed to cultivate an area

larger than 4 *rai*. This permission was given only to residents of this group of villages. Dong Lao Nam Tuam has also been well kept, although a small part was recently encroached upon by the residents of nearby villages. Only Dong Yang has shown drastic changes in terms of forest quality. It was dense *yang* forest before the 1950s. At that time the land was understood to be community property, but individual *yang* trees were recognized to belong to the villager who started extracting resin from them. Logging of *yang* trees began in the early 1950s for house construction in the villages, and it accelerated in the mid-1960s after the pavement of the highway, when the trunks of *yang* trees acquired commercial value. During that time, the villagers were very afraid of the local administration. To cut trees they had to obtain permission from the district office, but anyone who could establish a good relationship with officials in the district office could get permission. The profit from the *yang* harvest was shared between the resin extractor and the permit-holder. The aerial photograph of the mid-1950s shows scattered trees, but that of the mid-1970s shows that almost the whole forest had been cleared by this time. The present forest consists mainly of young trees which have grown since the late 1970s.

The area of community forests in this village group showed only a slight decrease during these periods, and this was mostly caused not by encroachment for cultivation but by the construction of village facilities such as a village temple and a school, or the allocation of the land to poor villagers. This is primarily so because the expansion of upland fields has been discouraged due to the unsuitable soil.

2. *Laeng Nu Village*

Laeng Nu is a single independent village, said to have been settled some 150 years ago. It has one sacred forest, one cremation forest and a communal forest called Dong Pa Kho (Fig. 8). Some forests which actually lie in the area marked as national reserve forest but presently recognized by the villagers as private forest can also be observed along the road from the village towards the center of the upland. Upland farming and forest land management in this village are summarized in Table 7.

Farming in this village is characterized by kenaf cultivation, though the average cultivated areas per household of both paddy fields and upland fields are almost the same as that in the whole study area. Commercial cultivation started with cotton in the early 1940s. It was gradually replaced by kenaf cultivation from the mid-1950s. Even after the introduction of cassava, kenaf cultivation has remained dominant in this village. Consequently, there has been continuous demand for upland fields since the 1940s. Kenaf is more a labor-intensive crop than cassava, and availability of family labor limits the expansion of upland fields.

Community forests in this village have been well conserved. The sacred forest and the cremation forest were slightly encroached upon by cultivators of paddy fields in the adjacent area, and only a nominal decrease in the area of the communal forest has been observed in the last 40 years. In 1986, some villagers including the village headman attended an orientation and training program on forest conservation organized under the Community Development Program. They were impressed by the idea of conservation and, determined to apply it in the village, soon formed a

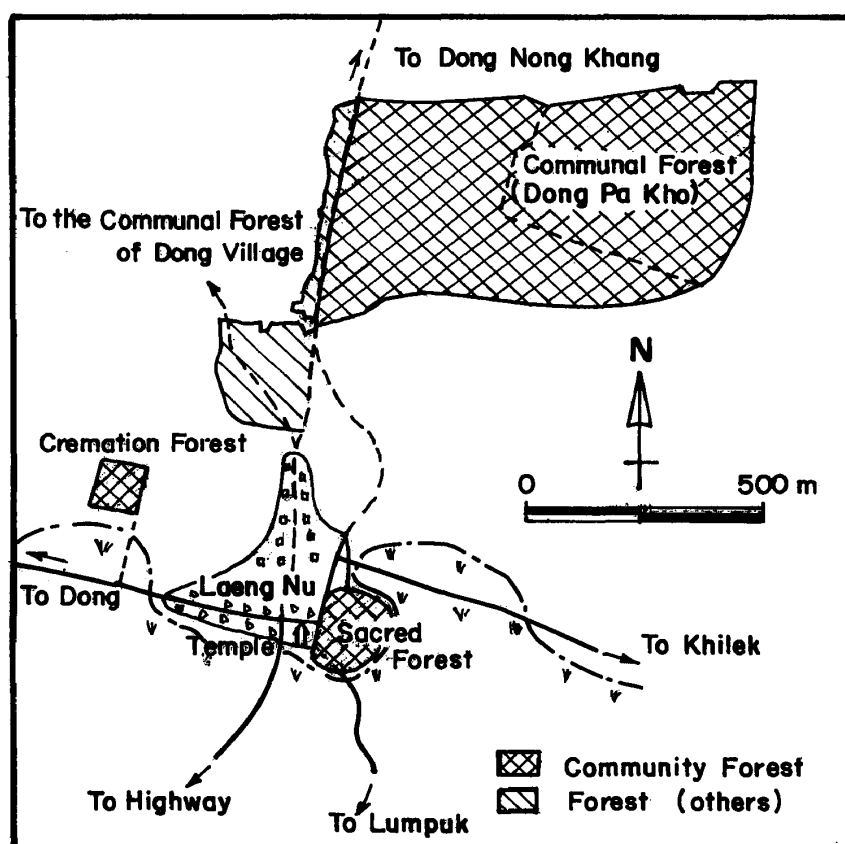


Fig. 8 Distribution of Forests Accessible to Laeng Nu Village

committee. The committee consisted of the village headman, two assistant village headmen, seven committee members and several village elders. Besides holding annual meetings in October, this committee also carries out walk-through surveys of the community forests at regular intervals. At the same time, a system of award and punishment was implemented. When someone reports a case of abuse of the forests, not only is the guilty person penalized with a fine of 500 *Baht* (25 *Baht* $\div$ \$1 U.S.) but the one who reports gets a reward of 200 *Baht*. Four incidents of reward and punishment have occurred since the formation of the committee, in one of which a villager was sentenced to punishment in front of his fellow villagers.

These findings indicate that the villagers are well aware of the need for forest conservation, and their efforts appear to be successful. This is primarily so because the demand for upland fields has been constantly moderate.

3. Yo Village Group

The Yo village group is located at the western end of the study area, along the highway connecting Yasothon with Ubon Ratchathani. It has the best transportation conditions among the villages in the study area, especially since the pavement of the highway in the early 1960s. It consists of Yo (1), Yo (2), Don Du and Kham Klang, which have the same origin. They share one sacred forest, one cremation forest and two plots of communal forest, though the one called Dong Ban Thong is

Table 7 Upland Farming and Forest Land Management in Laeng Nu Village

Year	Upland farming	Sacred forest	Cremation forest	Communal forest	Others
1950	Commercial cultivation of cotton			A large forest up to the central part of the study area called "Dong Pa Kho" except nearby the village area	
	Kenaf started and rapidly expanded. Cotton gradually decreased	16 <i>rai</i>	10 <i>rai</i>	330 <i>rai</i>	420 <i>rai</i>
1960	Kenaf fully expanded. Cotton disappeared				
1970	Cassava started	15 <i>rai</i>	10 <i>rai</i>	330 <i>rai</i>	260 <i>rai</i>
1980	Cassava slowly expanded	Road constructed across. Encroachment of rice cultivation		Registered. Committee established with written regulations	
1990	Mainly kenaf and some cassava	12 <i>rai</i> . Dense forest in part and scattered elsewhere	7 <i>rai</i> . Very old dense forest	330 <i>rai</i> . Forest with not so tall trees	40 <i>rai</i>

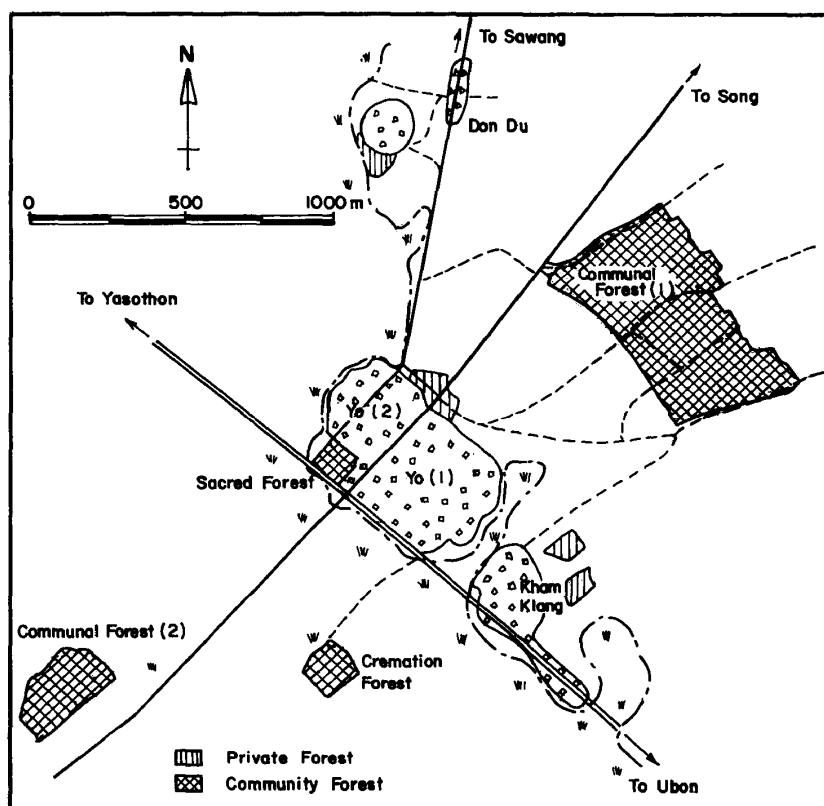
**Fig. 9** Distribution of Forests Accessible to Yo Village Group

Table 8 Upland Farming and Forest Land Management in Yo Village Group

Year	Upland farming	Sacred forest	Cremation forest	Communal forest (1)	Communal forest (2)	Private forest
1950	Commercial cultivation of cotton			Shifting cultivation	Gradual encroachment of rice cultivation	
	Kenaf started. Cotton continued	9 <i>rai</i>	17 <i>rai</i>	0 <i>rai</i> (shifting cultivation)	60 <i>rai</i>	200 <i>rai</i>
1960						
	Cotton disappeared	A few <i>yang</i> logged	Slight encroachment of rice cultivation.	Declared as communal forest	Gradual encroachment of rice cultivation continued	
1970						
	Cassava rapidly expanded. Kenaf disappeared	9 <i>rai</i>	16 <i>rai</i>	Encroachment resumed 190 <i>rai</i>	50 <i>rai</i>	100 <i>rai</i>
1980						
		A few <i>yang</i> logged	Slight encroachment of rice cultivation	No forest remained. Forest started to recover	Gradual encroachment of rice cultivation continued	
1990						
	Cassava only	9 <i>rai</i> Scattered <i>yang</i> forest	15 <i>rai</i> Dense forest	312 <i>rai</i> Scattered short trees	42 <i>rai</i> Dense forest	40 <i>rai</i>

recognized as a communal forest only for Yo (1) and Yo (2) (Fig. 9). Besides these forests, there are small patches of private forest near the villages. Upland farming and forest land management in this village group are summarized in Table 8.

Favorable transportation conditions provide the villagers with more opportunities for off-farm jobs both inside and outside the villages. The average cultivated areas of both paddy fields and upland fields per household are, consequently, smaller than the average in the study area. Commercial cultivation of upland crops was started with cotton in the early 1940s, and this continued until the mid-1960s. Kenaf was not so popular in this area because of the scarcity of nearby water bodies for retting. After the introduction of cassava in the early 1970s, upland fields expanded rapidly. Presently, with the exception of small orchards, most of the upland fields are occupied by cassava cultivation. Consequently, there were two booms in upland crop cultivation: cotton cultivation in the 1940s and cassava cultivation since the 1970s. Between these two periods, there were no popular upland crops.

Changes in community forest differ from one forest to another. The sacred forest is located at the entrance of Yo village and is surrounded by roads. It has very tall *yang* trees. Even though its area has not changed, the number of trees is decreasing because of cutting, and presently only about 40 old *yang* trees remain. With the general consensus of the villagers, the land is also being used

for other public purposes like the sub-district council meeting hall and the public rice mill, which were constructed in the late 1980s. The cremation forest and Dong Ban Thong are located in the south of the villages and are surrounded by paddy fields. The cremation forest is for the cremation of infants below the age of five, but is rarely used nowadays. Yet, except for few young boys who sometimes go there hunting for birds, most villagers do not dare to enter deep into the forest. In the area of Dong Ban Thong, there was settlement called Thong village about 100 years ago, but an epidemic caused everyone to abandon the village and settle in Yo village. Both the cremation forest and Dong Ban Thong have been encroached upon by paddy fields in the adjacent area.

The other communal forest, located in the northeast of the villages, has changed drastically. It lies in the upland area and was used for shifting cultivation up to the 1950s, like the nearby area. Aerial photographs of the mid-1950s show almost no trees in this area. The villagers felt the need for a forest for grazing their animals, as most of forest accessible to them had disappeared by that time, with the exception of patches of community forests. In the early 1960s, this area was selected as a communal forest, stated reason being that its soil is more sandy and less suitable for cultivation than that in other areas, and the forest cover gradually returned. Aerial photographs of the mid-1970s show 190 *rai* of forest consisting of young, short trees with bush. But encroachment started in the early 1970s, when cassava cultivation was introduced. At first, villagers cultivating the adjacent lands slowly started to encroach into the forest. Then landless people of Yo village started to cultivate in this area, and others followed. By the early 1980s, the whole area was being cultivated by villagers of the four villages without any legal documents.

In 1986, this issue of private use of community property was discussed at a village meeting, and most villagers expressed opposition to the cultivation. During the local election later in the same year, one candidate for sub-district headman took up this issue and promised the villagers that he would again reserve the area as communal forest. He was supported by many villagers. After winning the election, he took this matter to the district office and soon all the cultivators had to abandon the area. As a result, the whole area, which is more than 300 *rai*, is now covered with young trees, bush and grass, and the villagers use the land for grazing their animals.

During the 1950s, when cotton cultivation was in full expansion, the villagers could not establish an area of communal forest even though they may have felt it necessary. This materialized only after the boom, only to disappear again through encroachment during the next boom of upland crop cultivation. Now it is again returning to forest. This recent recovery seems to be supported not only by the strong leadership of the newly elected sub-district headman but also by the relative decrease in profitability of cassava cultivation and the rapid increase in off-farm job opportunities. This cyclic process indicates that the establishment or restoration of communal forest is very difficult when the demand for upland field is strong and is easy when the demand is decreasing, even though the communal forest is so small that the enlargement of the communal forest does not significantly affect the total area of upland fields. On the other hand, gradual encroachment throughout the period was observed in community forests located in paddy field areas. This reflects the continuous and strong demand for paddy fields among villagers as well as the difficulty of conserving community forests under such strong demand for land.

4. Dong Village Group

At present, Dong village is divided into three administrative units: Dong (5), Dong (9) and Dong (11). Together with Phon Phun Suk village, a new village settled by villagers of these three villagers, these four villages constitute the Dong village group. For their community forest, they share one sacred forest, one cremation forest and a communal forest which also includes a forest temple (Fig. 10). There are also a few forests which are presently recognized as private forest by the villagers, even though they are located in the national reserve forest area. Upland farming and forest land management in this village group are summarized in Table 9.

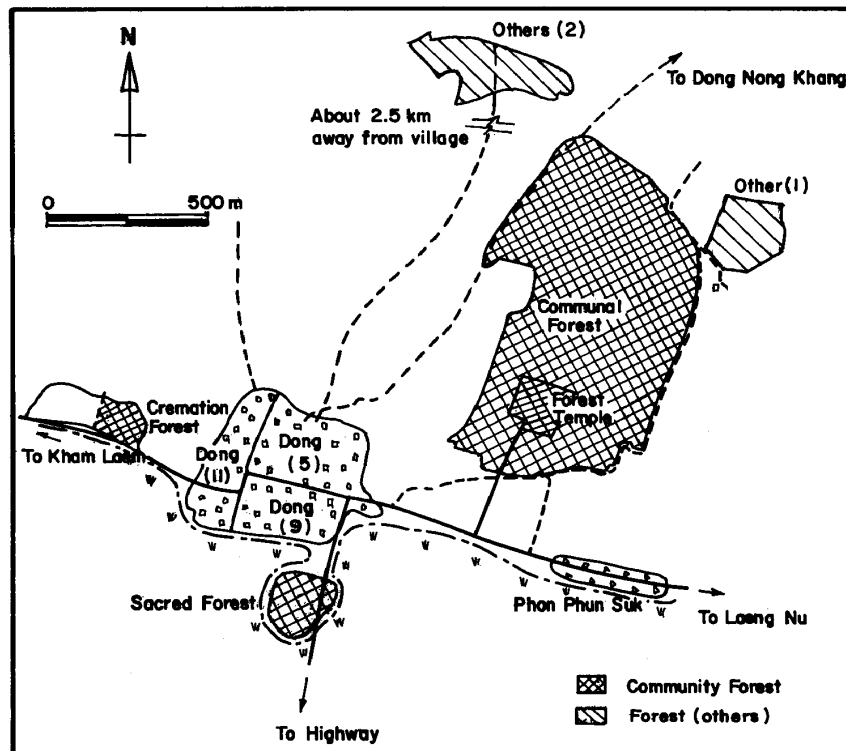


Fig. 10 Distribution of Forests Accessible to Dong Village Group

The process of change of upland farming in this village group is a combination of those seen in Laeng Nu village and the Yo village group. Upland fields extend from near the villages to the center of the upland. Near the villages, cotton cultivation expanded in the 1940s but was gradually replaced by kenaf in the 1950s. Kenaf cultivation continued after cassava was introduced in the 1970s, and both crops can still be observed, sometimes being cropped in rotation. Hence, commercial cultivation of upland crops has remained constantly popular since the 1940s, as was also observed in Laeng Nu village. Near the center of the upland, far from the villages, however, kenaf cultivation was not so popular. Between the booms of cotton and cassava there was a time lag, as was also observed in the Yo village group.

Community forest management in this village group shows changes similar to those in Laeng Nu village and the Yo village group. Throughout the period, the sacred forest, which is surrounded by

Table 9 Upland Farming and Forest Land Management in Dong Village Group

Year	Upland farming	Sacred forest	Cremation forest	Communal forest	Others (1)	Others (2)
1950	Commercial cultivation of cotton			A forest with small patches of shifting cultivation except near the village area		
	Kenaf started. Cotton gradually decreased	27 <i>rai</i>	18 <i>rai</i>	845 <i>rai</i> (shifting cultivation in some parts)		50 <i>rai</i> (shifting cultivation)
1960	Kenaf fully expanded. Cotton disappeared					
1970	Cassava started	25 <i>rai</i>	15 <i>rai</i>	360 <i>rai</i>	184 <i>rai</i>	600 <i>rai</i>
1980	Cassava gradually expanded	Registered (27 <i>rai</i>). Divided by road. Encroachment of rice cultivation		Forest temple established. No change in boundary		
1990	Kenaf and cassava. Rotation of both crops in some areas	19 <i>rai</i> Dense forest with tall trees	14 <i>rai</i> Dense forest	356 <i>rai</i> Well preserved dense forest	20 <i>rai</i>	40 <i>rai</i> Rapid encroachment of cassava

paddy fields, has been gradually encroached upon by rice cultivation, as have the cremation forest and Dong Ban Thong in the Yo village group. The communal forest is located close to the villages. The aerial photograph of the mid-1950s shows that it was then under shifting cultivation, even though there were large forests nearby, while that of the mid-1970s shows the present communal forest in place. Hence, this area must have been declared as communal forest during this interval, though it is not known whether this represented the first communal forest to be established or simply a move to the present location. Subsequently, this forest has been well conserved. In the early 1980s, a forest temple was established in the middle of the forest. The villagers are also quite conscious of forest conservation. In the late 1980s, a villager burned the forest. At first the villagers tried to stop him but he paid no attention to them, so the village headman had to report the matter to the police and the man was arrested. After this event, the villagers formed a committee consisting of seven representatives from each of the four villages, which meets to consider matters related to the community forests. The decisions of each meeting are written down and all villagers are informed. The committee's decisions must be followed by the villagers, and anyone who fails to comply is penalized.

Apart from community forest, there are two large private forests, one of which is located in the center of the upland. Though the details of management of this forest are not known, the changes

in area shows a trend similar to that of the northern communal forest in the Yo village group, i.e., almost no forest when upland crop cultivation booms, and forest recovery at other times.

5. *Thung Mon Village Group*

Thung Mon village is located in the northwest of the study area, about 7 km from Yo village where the highway passes. At present it consists of two administrative units, Tung Mon (3) and Thung Mon (7), which were originally one village. They share one cremation forest and one sacred forest, which includes a forest temple (Fig. 11). A large communal forest is also registered but presently no forest exists in the area. Upland farming and forest land management in this village group are summarized in Table 10.

This village group shows similar changes in upland crop cultivation and forest land management to the Yo village group. Previously, there was a large forest stretching from the south of the villages to the center of the upland. But in the boom of cotton cultivation in the 1940s, most of the forest land was cleared by cultivators from these villages and nearby villages such as Sogn village and Si Than village (about 6 km northeast of Thung Mon village). After the cotton boom, the forest recovered in some parts. But during the boom of cassava cultivation, most of the forest again disappeared, except for a few parts recognized by the villagers as private forest. The area was registered as communal forest in the 1980s, but the encroachment continued, and the communal

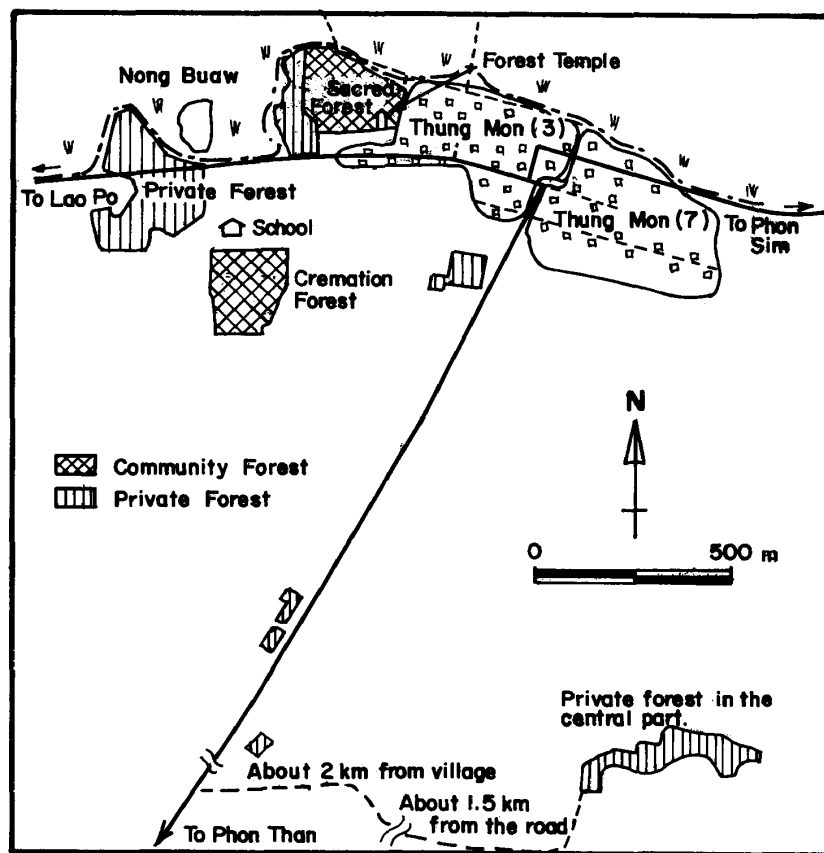


Fig. 11 Distribution of Forests Accessible to Thung Mon Village Group

Table 10 Upland Farming and Forest Land Management in Thung Mon Village Group

Year	Upland farming	Sacred forest	Cremation forest	Communal forest	Private forest
1950	Commercial cultivation of cotton			Shifting cultivation of cotton by people from various villages	
	Kenaf started. Cotton gradually decreased	120 <i>rai</i>	65 <i>rai</i>	380 <i>rai</i>	140 <i>rai</i>
1960	Cotton disappeared	Encroachment of housing area			
	Cassava started and rapidly expanded. Kenaf replaced	65 <i>rai</i>	School constructed. 35 <i>rai</i>	480 <i>rai</i>	120 <i>rai</i>
1970	Orchard increased replacing cassava and private forest	Encroachment of housing area		Cassava expanded	
				Registered (1,480 <i>rai</i>)	Changed to orchard
1980	Cassava very popular and kenaf rare	25 <i>rai</i> . Forest temple established. Well conserved dense forest	35 <i>rai</i> Old and very dense forest. Three sides fenced	0 <i>rai</i> Rapidly replaced by cassava	95 <i>rai</i> ¹⁾

1) This includes about 28 *rai* of forest which lies inside the communal forest land but is now considered to be private forest by the villagers.

forest has still not recovered. Consequently, the forest area was reduced by the two booms in upland crop cultivation and recovered in between, as was the case in the northern communal forest in the Yo village group. However, forest recovery after the cassava boom has not occurred yet in this village group. This may be a result of the difference in the transportation conditions. Namely, in Thung Mon village, off-farm job opportunities are less abundant than in the Yo village group, and the villagers still have a strong demand for upland fields. At the same time, the existence of cultivators from outside the village may be an obstacle to consensus on forest recovery.

The sacred forest is located very close to the villages. It was previously quite large, but encroachment by housing has reduced it to only about one fifth of that 40 years ago. In the early 1990s, a monk from the village conceived the idea of constructing a forest temple in this forest. So he went on a pilgrimage to Northern Thailand and collected enough funds for the purpose. He also got some villagers to contribute labor and constructed a big temple in the forest. The cremation forest is bordered by the primary school to the north and cashew and cassava fields on the other sides. It is fenced with barbed wire against the cashew and cassava fields, though there is no fence in the southern side. These findings indicate the concern of the villages for the community forest

land management.

6. *Dynamics of Community Forest Land*

Sacred forest and cremation forest have specific meaning for villagers and longer histories, while most of the communal forests seem to have been established for common use after the villagers foresaw a scarcity of accessible forest resources. These differences in the background of the forests are reflected in the dynamics of the forest lands.

Most of the sacred forests and the cremation forests are located at the boundary between lowland and upland and have been encroached upon mainly by rice cultivation. As a result, the area has gradually decreased by about 10 to 30% during the last 40 years. Public facilities such as schools and temples as well as private houses have also been constructed in some of these forest lands. Little encroachment of upland crop cultivation, however, was observed in the study area. Hence, from the viewpoint of upland utilization, these forests have not yet been influenced by the changes in upland crop cultivation, though they occupy less than 10% each of the total community forest land.

On the other hand, the area of communal forest shows different patterns of dynamics from village to village, and these are categorized into three types: the Ku Chan type, the Laeng Nu type and the Yo type (Fig. 12). The Ku Chan type dynamics involve a larger area and a gradual decrease throughout the period. The villagers' attitude toward community forest land management is characterized more by the raising of income than forest conservation. This type is predominant among the six villages in the eastern part of the study area, where soil is infertile and less suitable for upland crop cultivation. The Laeng Nu type dynamics show a sudden but small decrease at the beginning of commercial cultivation and a constantly large area afterwards. This type can be found in the kenaf growing area, where the soil is comparatively fertile and ponds for retting the harvested kenaf are readily accessible. In the Yo type dynamics, the communal forest area fluctuated over time. During a boom in upland crop cultivation, forest land was converted to upland fields. But after the boom, upland fields decreased and the forest recovered. In both the Laeng Nu type and the Yo type villages, villagers pay much more attention to the conservation of the community forest than do those in the Ku Chan type villages. In some villages they have established committees and called village meetings to encourage strict conservation. The forest temples recently constructed can also be thought to reflect the deep concern of the villagers for the forest. Effort have been successful in the Laneg Nu type villages, but not always so in the Yo type villages.

Although different patterns of dynamics were observed, the common principle behind them is that changes in the demand for upland fields constitute the predominant driving force in the dynamics of communal forest. Even when villagers desire to expand communal forest, this is difficult in the face of a strong demand for upland fields. On the other hand, communal forest tends to be well conserved when the demand is weak, even when villagers pay little attention to forest conservation.

Differences in various aspects of villagers' income-raising activities are also observed among the villages. Villagers in the Ku Chan type villages have larger holdings of paddy fields and get more cash income from selling rice than villagers elsewhere. The frequency of temporary absence for

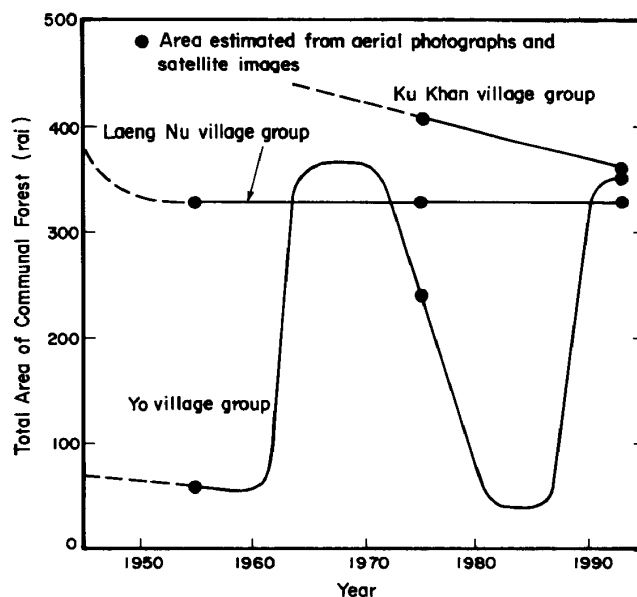


Fig. 12 Changes in Communal Forest Area

off-farm work also shows a clear difference between the Ku Chan type villages and the others. The average number of persons per household who leave the village temporarily for off-farm work is around 0.5 in the Laeng Nu, Yo and Dong village group and 1.1 in the Thung Mon village group, but 1.5 in the Ku Chan village group, and 1.8 in the six Ku Chan type village groups as a whole. Most people go to Bangkok or a suburb [Sijapati 1993: 52]. Even though temporary absence for off-farm work is one of the traditional methods of raising income for the farmers in Northeast Thailand, it has become more popular with the recent economic growth in Thailand.

These findings indicate that the villagers have several alternative sources of income, which include rice cultivation, upland crop cultivation, temporary off-farm jobs, as well as water buffalo and cattle breeding and fish culture.⁴⁾ Such diversified sources of income are thought to influence the changing demand for upland fields among the villagers. Villagers in the Ku Chan type villages have increased cash income by selling rice and taking off-farm jobs instead of upland crop cultivation, due to unsuitable soil for upland crop cultivation. Villagers in the Yo type villages have expanded and reduced upland crop cultivation at various times. Although these changes were caused by external market demand, the villagers were able to follow the changes because they had alternative sources of income.

VI Conclusions

The major findings of this paper are summarized as follows.

1) External market demand caused changes in upland farming in the study area during the last 50 years, which resulted in dynamic changes in land use not only from forest land to upland fields but

4) The detailed distributions of these kinds of income-raising activity in the whole province are shown in Kono and Nagata [1992].

also from upland fields to forest land. Through these processes, more suitable land for upland crop cultivation was selectively cultivated, and forest land was distributed in the remaining parts. At the same time, shifting cultivation was converted into continuous cropping, and cropping was intensified. As a result, the decrease in forest area was mitigated during the survey period.

2) Three types of forest land were observed in the study area in terms of management: national reserve forest, community forest, and private forest, even though the villagers' understanding does not always coincide with the official registration in some forests. The forest cover in the national reserve forests shows a significant decreasing trend, and the effect of the government's designation of these forests cannot be clearly observed. On the other hand, most of the villages have a set of community forest types consisting of sacred forest for the village guardian spirit, cremation forest and communal forest, which occupy on average 10%, 10% and 80% respectively. A set of community forest types is thought to be a prerequisite for human settlement in the study area. The total area of community forests differs from village to village and is affected by the land suitability for upland crop cultivation around each village.

3) Sacred and cremation forests show different dynamics from communal forest. The former have gradually been encroached upon by rice cultivation throughout the survey period, but little encroachment of upland crop cultivation was observed. On the other hand, the fluctuation of communal forest area was highly affected by changes in upland crop cultivation and showed different patterns of dynamics from village to village, mainly due to land suitability and transportation conditions. The villagers' need for forest was not clearly reflected in the actual area of communal forest, even though communal forest does have several uses for the villagers. Hence, during the last 50 years, land use of the upland has been decisively influenced by individual and market-oriented demand for farm land.

4) Upland utilization is nevertheless well balanced between upland field expansion and forest conservation. In other words, land resources have been flexibly and properly managed and utilized mainly by the villagers in accordance with their changing demand for cultivation. One reason for this is that, in study area, upland crop cultivation has been combined with paddy cultivation as well as various income-raising activities in each household economy. As a result, villagers do not need to rely on the expansion of upland fields or to continue cultivation to the critical point when the soil is exhausted and the profitability of cultivation becomes negligibly small. Such a tendency is strengthened by recent diversification of sources of income with the improvement of transportation conditions. This indicates a close relationship between land resource management and diversification of income sources.

Individual demand is the key factor in land resources management. Forest formerly provided a buffer for expansion of upland fields, and with the shift of income sources away from agriculture to non-agricultural sectors, the demand for upland fields moderated. The villagers' rational attitudes at house economy level toward mobilizing the available resources have resulted in proper upland utilization and flexible forest land management.

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