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Shifting Cultivation in Thailand:

Its current situation and dynamics in the context of highland development

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Thailand

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Copies of this report may be obtained from the Faculty of Agriculture of Chiang Mai University (where the report is also available in Thai) or from the International Institute for Environment in Development. Copies of companion reports for Laos and Vietnam, and the Regional Overview report, may be obtained from IIED.

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PREFACE

This report presents the results of a study of the dynamics of shifting agriculture and alternative land use systems in the context of highland development in Thailand. The study was conducted in order to provide up-to-date information relating to land use in the mountains to policymakers. Specifically, it sets out to:

- review the current status of land use in the mountains, especially focusing on changes that have taken place in the last 30 years;
- examine national policy on highland land use, the implementation of various policy emphases and their impact on local communities and their shifting agriculture, and the effectiveness of policy in meeting national goals;
- examine patterns of resource use by highland communities; and
- evaluate effects of government policy on land use patterns.

Shifting agriculture has long been an important component of the mountain ecosystem of northern Thailand as well as an essential component of the livelihood system of a sizeable population. But major changes have taken place since the publication of reports of shifting agriculture systems in the late 1970s. To provide an up-to-date analysis of the current situation, this report builds on more recent, unpublished data, as well as the results of fieldwork undertaken over one year. Following rapid appraisals in a number of villages, fieldwork focused on those that appeared to be the most 'successful' in terms of the productivity, stability and potential sustainability of the agricultural systems. In this way, information was obtained on how highland farmers are adapting to pressure on their land use systems, leading to potential strategies for increasing the sustainability of land use in the highlands.

The study shows that in northern Thailand, the various pressures on land use systems have led to nearly all shifting agriculture systems becoming involved, to some extent, in the mainstream economy. Emerging national and regional issues include the competition between highland and lowland areas for limited water resources, the impact of forest conservation and development schemes on indigenous agricultural systems, and the loss of comparative advantage of northern Thailand (to neighbouring countries) for production of temperate crops. Such pressures were found to have led to rapid changes in the land use systems of traditional shifting agriculturalists, such that the study found very little evidence of 'pure' subsistence shifting cultivation.

This study is one of three inter-linked national studies of shifting agriculture in south east Asia, which make up the IIED-coordinated project 'Shifting cultivation in Thailand, Laos and Vietnam: its social, economic and environmental values relative to alternative land uses'. The purpose of the overall project was to examine the current situation of shifting agriculture in each country, with particular regard to the social, economic and environmental values. The overall study also aimed to examine some of the alternative land use systems developed in areas of shifting agriculture, and to make recommendations to policymakers. National research teams developed a set of issues on which to focus, in terms of what was most relevant to the particular country.

During the study, issues, methodologies and results were developed and discussed between the three national teams and with the Forestry and Land Use programme of IIED. The whole project was financed by the Netherlands Ministry of Foreign Affairs. Companion reports present results of the study from Vietnam and Lao PDR, and a regional overview report draws together the outcomes of the three national studies to make overall policy recommendations. All reports are available from IIED.

This study is commended to policymakers and planners, and all those active in development and natural resource management activities in northern Thailand. Data generated from this study has already been used in discussions at national and regional policy seminars, namely, those held by the United Nations International Drug Control Programme (UNDCP) and the Thai Office of Narcotic Control Board (ONCB):

- Highland development and drug control: lessons learned, outstanding issues and future directions, 20-22 June 1994; and
- Sub-regional technical exchange on highland development and drug control, 22-24 August 1994.

More specifically, results generated from this study have been used in discussions and consultations in Chiang Mai province's ongoing process to develop a master plan for highland development. This is a pilot project of the National Security Council, which oversees the national master plan. Kanok Rerkasem is advisor to the project, by request of the Governor's office of Chiang Mai University. If successful, the Chiang Mai Highland Development Model, which aims to integrate implementation of various government offices, will be used in highland development in other provinces.

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- Rampaipan Apichartpongchai, Department of Agricultural Extension, CMU (assistance during field studies)
- Apinan Jamu, Thai-German Highland Development Programme
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Kanok Rerkasem and Benjavan Rerkasem
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SECTION I: BACKGROUND

CHAPTER 1: THE NORTHERN HIGHLANDS

Shifting agriculture in Thailand is practised almost entirely in mountainous areas of the Northern region (Figure 1.1). The regional subdivision into Upper North and Lower North is convenient in this study because the Upper North covers virtually 90% of the shifting agriculture area.

1.1 Organizational structure

1.1.1 Administrative organization

Under the central government in Bangkok, Thailand is divided into five regions: Northern, Northeastern, Central, Southern and Bangkok. The Northern region is made up of 17 provinces. In the North, rural households normally cluster together. A village (*Moo Ban*) - the smallest administrative unit, headed by the village headman - comprises between one and a few such clusters (or more for highland villages with only a few houses in each). Several villages make up a subdistrict *(Tambon)*, headed by a *Kamnan*, who reports to the *Nai Amphur* or district officer, who in turn reports to the provincial governor. This line of administration is under the control of the Local Administration Department of the Ministry of Interior, which appoint governors and district officers.

The governor is generally the most senior of all public servants in a province. Although belonging to the Ministry of Interior, he/she oversees programmes and activities of various government ministries, e.g. education, health, transport, commerce, agriculture, etc.[1]

The *Tambon* Council, represented by all appointed village headmen and chaired by the *Kamnan* (subdistrict head) is the first level of administration that allows decisions to be made locally on public investment, especially on public work such as bridges, roads and irrigation facilities, with budget support from the central government in Bangkok as well as from local taxes. The effectiveness of this exercise in local participation in development in the whole of Thailand, however, is still in question (Suvanamongkol 1986).

Through the national integration policy (Nationality Act of 1965, section 7[3]) highland villages have been progressively brought under the central administration of the government in Bangkok through the Local Administration Department of the Ministry of Interior (see above). By 1993 a total of 3,154 highland communities had been

[1] Formerly women were prevented from becoming district officers and governors by an Interior Ministry ruling against women officers at certain of its organizational levels which are prerequisite to becoming district officer and governor. The first and only female governor was appointed in 1993. Female village and subdistrict heads are fairly common in the whole of Thailand, but unknown in the highlands.

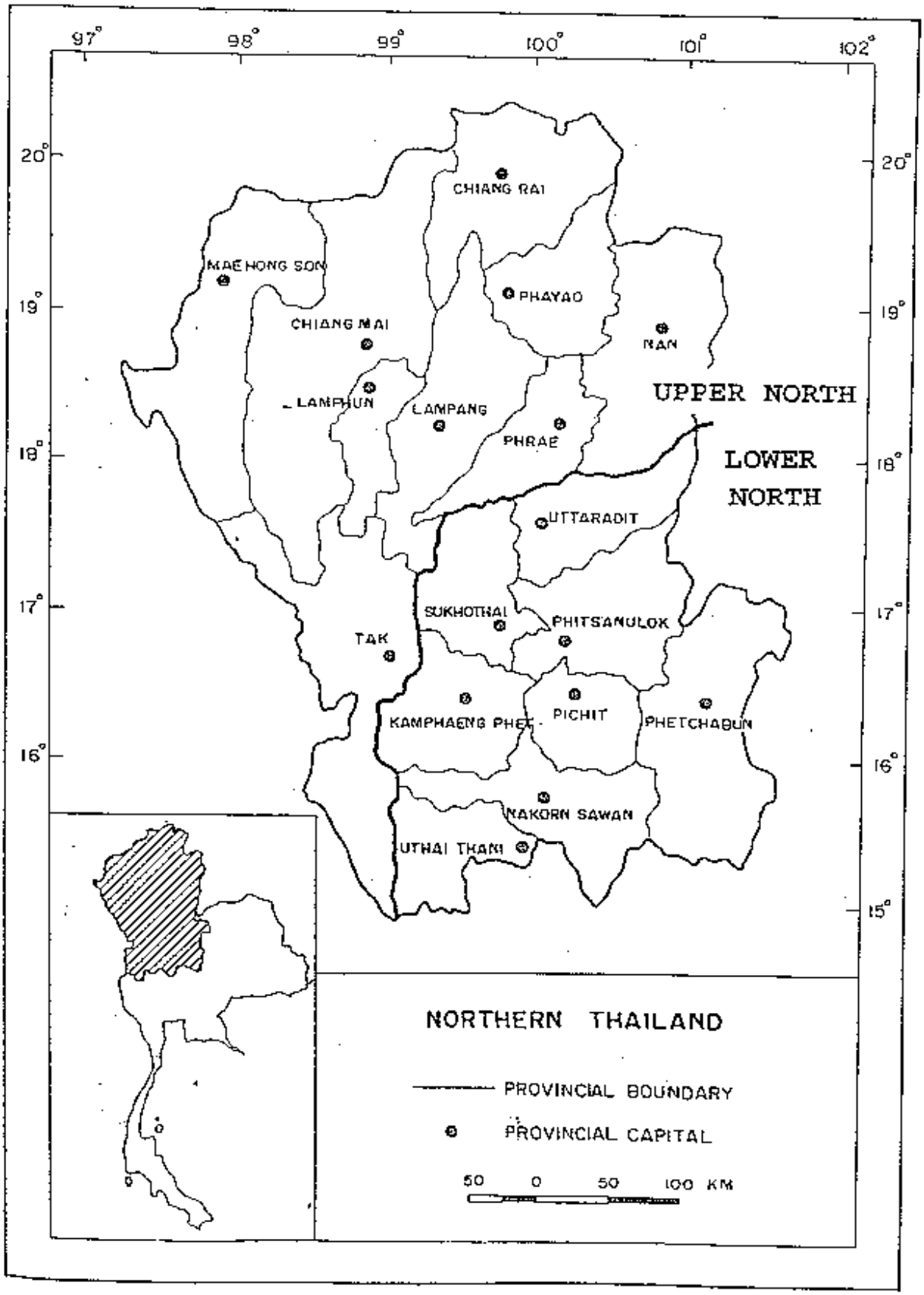

Figure 1.1 Northern Thailand

acknowledged as permanent settlements (NSC/NESDB 1993). Of these, 1,059 were official villages, established legally with an announcement in the Royal Gazette. The remaining 2,095 communities are recognized satellites of the official villages.

In addition to the Local Administration Department, the Hilltribe Welfare Division, Department of Public Welfare, Ministry of Labor and Social Welfare (until recently the Ministry of Interior), has a specific mandate to provide assistance to the hilltribes. The department has a centre in all provinces with a substantial hilltribe population, e.g. Chiang Mai, Chiang Rai, Nan, Mae Hong Son. The centres supervise work of field officers who are stationed at Zone and Unit offices located in villages. In many areas of the highlands still not covered by regular government services such as education, health and agricultural extension, an officer of the Public Welfare Department provides the only channel of communication and information.

1.1.2 Communal organization

The basic highland community is a cluster of houses belonging to people generally of the same ethnic group. A household may be small with 5-7 members, or large with an extended family that may number from 30-40 to one hundred (in the case of Hmong). The recorded number of households in a community ranges from 3 to 685, with an average of 43 households (NSC/NESDB 1993). The average size of highland communities has not changed much from that of the 1950s, when Young (1962) reported that an average community comprised about 40 households.

Communities vary a great deal in the level of communal organization that exists to deal with various issues of common resource management. Success or failure in the management of rotational shifting agriculture may be attributed to the effectiveness of the community's organization (Kunstadter 1978). This indigenous institution offered the only control mechanism over resource management above that at the household level for highland villages, most of which were isolated until recently.

1.2 Population

1.2.1 Distribution

The hilltribe population, traditionally dependent on shifting agriculture, accounts for only about 6% of the Northern region's total population of 11 million (Table 1.1). Some provinces, however, have large hilltribe populations. These include Chiang Mai (where hilltribes comprise 17% of the total provincial population), Mae Hong Son (41%), Chiang Rai (11%), Nan (16%) and Tak (23%). In some districts of Chiang Rai, Chiang Mai and Mae Hong Son, the hilltribes are actually the majority.

The total population in each province does not include hilltribe people who still do not have Thai citizenship. Only some of those without Thai citizenship were taken into account in the estimation of the total provincial hilltribe population.

Table 1.1 Provincial population, total and mountain, Northern Thailand.

	Total (1991)[1]	Hilltribe number (1993)[2]	% with Thai citizenship (1985)[3]
Upper North			
Chiang Mai	1,382,136	258,251	61.5
Lamphun	419,633	27,442	99.1
Lampang	775,812	11,073	81.0
Mae Hong Son	174,777	107,156	17.9
Tak	356,342	91,296	54.2
Chiang Rai	1,043,423	119,559	28.2
Phayao	505,359	14,729	10.0
Phrae	494,129	10,813	69.6
Nan	451,485	74,198	77.8
Lower North			
Phitsanulok	791,279	5,727	4.2
Uttaradit	461,722	0	-
Sukhothai	593,689	3,809	90.4
Pichit	559,823	0	-
Kamphaeng Phet	672,698	9,474	n/a
Petchabun	958,615	10,262	90.5
Nakorn Sawan	1,088,289	0	-
Uthai Thani	305,853	5,564	n/a
Total	11,035,069	749,353	49.9

[1] NESDB 1992
[2] NSC/NESDB 1993
[3] NSO 1987

1.2.2 Growth

The earliest and most often cited estimate of the hilltribe population in Northern Thailand was 217,000 in 1960 (Young 1961) and 284,500 in 1973 (Young 1967). Kunstadter (1983), combining data from several sources, arrived at a number of 331,305 in 2,266 communities in 1973-77. A census in 1985-87 gave the total population at 548,271 (NSO 1987), while the number of 749,353 was obtained in the village/community census of 1993 (NSC/NESDB 1993). While the accuracy of these numbers could be improved, the trend of rapid population growth in the highlands indicated is supported by observations in the field. In addition to a very high natural growth rate, compared with the average growth rate of 1.1% for the whole Northern region between 1987 and 1991 (NESDB 1992), illegal immigration from neighbouring countries is generally believed to be very common.

1.3 The minority groups

1.3.1 A brief background

Six major ethnic groups account for most of the population practising shifting agriculture in Thailand: Karen, Lahu, Akha, Hmong, Lisu and Yao (table 1.2). The remaining population is made up of smaller groups (Lua, Khamu, H'tin, Shan, Haw Chinese) and some lowland Thais who have migrated into the mountains. By far the largest group is the Karen, which accounts for more than 55% of the villages. One group, the H'tin, is numerous in Nan province.

Table 1.2 *Provincial distribution of minority groups* (numbers represent numbers of villages or hamlets)

Province	Karen	Lahu	Hmong	Lisu	Yao	Akha	H'tin
Upper North							
Chiang Mai	732	147	63	63			
Lamphun	64						
Lampang	21				26		
Mae Hong Son	505	25					
Tak	447		26				
Chiang Rai		144					
Phayao			8		32		
Phrae	14						
Nan			26		36		166
Lower North							
Phitsanulok			10				
Sukhothai					6		
Kamphaeng Phet	6		7		13		
Petchabun			16				
Uthai Thani	24						

Source: compiled from NSC/NESDB 1993

Much bigger populations of all the larger groups currently exist in neighbouring countries. For example, the number of Karen in Myanmar is about 10 times that in Thailand and there are about 75 times as many Hmong in China as in Thailand. Anthropologists are still debating about where the Karen originated from. The Lahu,

Akha, Lisu and Hmong, are however, generally accepted as having moved into Thailand relatively recently (McKinnon and Bhruksasri 1983).

1.3.2 National representation and rights

Historically, members of the ethnic minority groups were not considered Thai citizens. This was changed by the Nationality Act of 1965, section 7(3). By 1987, about half of the population had been granted Thai citizenship (see Table 1.1) (NSO 1987). Various efforts have since been initiated by the Local Administration Department, in collaboration with the Department of Public Welfare and the Border Patrol Police, to speed up the nationalization process. However, the problem of influx of illegal immigrants from Myanmar, Laos and even China is causing officials to be more critical in granting citizenship, and this in turn makes the granting of citizenship a very long and tedious process, even for people with legitimate claims.

A headman is appointed to each of the official 1,059 villages, and sits on the *Tambon* Council. The remaining 2,095 communities, which are satellites of the official villages, have no direct representation or participation in decision making on allocation of public investment projects. In addition, there are a fair number of highland communities whose existence has not even been recognized by the Local Administration Department. Tissa, one of the villages studies under this project (Chapter 7), is one of these.

1.3.3 Assistance programmes under the Highland Development Master Plan

Since 1970 numerous "development" projects have been implemented in the highlands. Many of these received funding assistance from foreign governments and international organizations. Table 1.3 lists some of these projects and the funds spent. The level of assistance provided varied a great deal, even within the same village. Obviously, a lot of this money was spent on project administration, which contributed to the institutionalization and learning process within the Thai bureaucracy, but never actually reached the village. Nevertheless, in Table 1.4 are some examples of funds that have actually become available at the village level, in the form of credit with a very low rate of interest. These figures may be examined against the *Tambon* Council budget (Table 1.5) which indicates the level of funding available for locally controlled development for the whole of Thailand.

Table 1.5: Tambon Council revenue for Thailand (1984)

Level of revenue (US$)	*Tambon* Councils Number	%
< 2,000	3,875	66.3
2,000-4,000	1,365	23.5
4,000-6,000	235	4.0
6,000-8,000	154	2.7
> 8,000	199	3.5

Note: One *Tambon* is normally made up of 10-15 villages.
Source: Adapted from Suvanamongkol 1986

Table 1.3: Some examples of highland development projects' funding assistance.

Project (duration)	Estimated cost per village (US$)	Number of villages assisted
Mae Chaem Watershed (1981-89)	67,917	240
Thai-Australia (1982-92)	33,333	306
Thai-German (1985-94)	174,231	104
Thai-Norwegian Church Aid (1985-89)	167,725	43
Thai-UN (1985-91)	100,986	198

Note: Total number of villages assisted 901, with a total population of 152,450.
Source: Mae Chaem Watershed (unpublished), TA-HASD (1987), Van der Valk (1984), ONCB/DTEC (1986), Thai/UN-WP (1987), Thai/UN-SM (1987), Backhaus et al (1989), RTG/NCA/UNFDAC (1987), ONCB (1982), UNFDAC (1987) and UN/UNFDAC (1986)

Table 1.4: Village revolving funds in 16 villages in the Thai-Australia Highland Agricultural and Social Development Project.

Village	Province	Total value (US$)	On loan (US$)
Pa Moob	Chiang Rai	2,278	1,221
Ja Noo	Chiang Rai	841	821
Ob Seua Waen	Chiang Rai	510	510
Huay Lu	Chiang Rai	1,840	1,840
Lau Fu	Chiang Rai	428	428
Mae Salap	Chiang Rai	2,383	1,869
Yang Klang	Chiang Rai	2,822	2,822
Huay Papao	Chiang Rai	1,484	1,374
Mae Hang Nua	Lampang	640	480
Yang Klang	Lampang	517	517
Pa Rai	Nan	3,616	3,616
Pang Gorm	Nan	2,320	2,138
Mae Rid Pagae	Mae Hong Son	2,455	2,403
Hua Mae Tho	Mae Hong Son	888	888
Lo Pa Krai	Chiang Mai	454	420
Mae Muang Noi	Chiang Mai	6,152	6,152

Source: Jones (1993)

1.3.4 The opium issue

Of the nine ethnic groups, five (Akha, Hmong, Lahu, Lisu and Yao) were traditionally opium growers. In addition, some Karen villages have become dependent on opium as

wage labour for richer opium growing villages (Crooker 1986, UNFDAC 1988). Now there are many Karen opium growing villages. The best opium lands are located between 1000 m and 1500 m. altitude. According to the Office of Narcotic Control Board (ONCB, 1988), prior to 1980 a highland population of some 200,000, in about 1,000 villages, were dependent on opium for a major proportion of their income. Almost all the production area and output were in three provinces: Chiang Rai and Mae Hong Son accounted for 40% each and Chiang Mai, 10%. In the early 1980s the area under production fluctuated between 30,000 to 50,000 *rai* (1 *rai* = 0.16 ha), with yields of about 1 kg/*rai* (ONCB/UNFDAC 1983; ONCB/UNFDAC 1988).

The first criminal code against opium addiction was established in Thailand in 1360 (ONCB/UNFDAC 1983). A further ban on the use and sale of opium was introduced in 1839. This prohibition proving ineffective against increasing demand and illegal trafficking, the Thai government changed its strategies in 1851 in an attempt to impose a measure of control on the trade by legalizing the use of opium for the Chinese minority. The opium smokers were required to register and smoking dens were licensed by the government. This arrangement remained in force until 1958 when legislation prohibiting the use of opium for non-medicinal purposes was enacted. The Narcotic Control Acts of 1976 and 1979 further established control over all phases of production, trade and consumption of opium and its derivatives, i.e. heroin and morphine.

A direct effect of the various narcotic control laws on the hilltribes was the strict enforcement of the laws against opium poppy growing since 1985. Soldiers from the Third Army (of the Northern region) were sent up to destroy the crop, mostly by slashing at about flowering time. The ONCB reported a decline in production area of some 200,000 *rai* as an indirect as well as direct effect of the Third Army's opium slashing operations. Anecdotal observations at village level, however, indicate that opium cultivation is still an important source of cash for many highland farmers even at the start of 1990s (e.g. see Salzer 1993). In one area - with a total population of 72,050 in 358 villages - which has been receiving development assistance from a UN project since the late 1980s, some 883 ha of opium was still found planted in 1993 (Unpublished data from project file).

1.4 National services from the Northern mountain land.

The enacting of National Reserve Forest Act of 1964 was accompanied by the following note:

> "Much of the land of the northern provinces was once densely forested hills. Over the course of years, swidden agriculture, unregulated logging, and fires have destroyed a vast area of forest, which is one of the nation's most valuable natural resources. Swidden cultivation is therefore regarded by law as harmful to the economy of the nation and is indirectly prohibited. It is the government's policy to keep half of its territory as forest. It is believed that the destruction of forest will cause a shortage of natural water supply during the dry season. This will result in losses to the agriculture and economy of the nation".

Thus swidden agriculture is officially regarded as being harmful to the economy and partially responsible for the loss of forests.

1.4.1 Water and electricity

The Northern highland is Thailand's primary watershed. It includes the sources of the Ping, Wang, Yom, Nan, and Pasak, five major tributaries of the Chao Phya, the country's premier river. The western part of the highlands drains into the Salween, which runs for a short distance along the border with Myanmar before entering Myanmar itself. The northern end of the region drains into the Mae Kok (and Mae Lao, its major tributary) which joins the Mekong near Chiang Saen (Table 1.6).

Table 1.6 Watersheds of Northern Thailand

Major system	Watershed	area (km^2)	annual flow (m^3)
1. Chao Phya	Ping	33,321	8,116
	Wang	10,791	1,429
	Yom	23,646	1,430
	Nan	33,171	9,581
	Pasak	16,547	2,708
	Sakaekrang	5,191	519
2. Salween	Mei	17,920	8,156
3. Mekong	Kok (+Lao)	7,895	5,119
Total		148,482	37,058

Source: NESDB 1992

Three major dams, the Bhumipol, Sirikit and Kewlom, have been built on the Ping, Wang and Nan (after it was joined by the Yom), respectively. There are also numerous small and very small irrigation facilities. Annually, some 23,556 million m^3 is stored or diverted, sufficient to irrigate 5.1 million ha. in the lowlands, in the Central Plain as well as in the North.

The two major dams, Bhumipol and Sirikit, also have hydroelectric generation capacity, with a total capacity of 900 megawatt. With a lignite fueled operation in Lampang plus smaller gas fueled operation in Lan Krabue, the Northern region has a total capacity of 2,800 megawatt. Some 40% of this is used within the region, 44% is sent to the Central region and 16% goes to the Northeast. There are also 66 small, micro-hydro and mini-hydro, electric facilities in the region, generating a total of 34,039 kilowatt for local use.

1.4.2 The land resource

Forest as watershed. In 1989 the Northern region had 8 million hectares of forest. Its forest cover of 47% percent compares favourably with the national average of 26%. The

Upper North, with 6.3 million hectares of forest (62% of the total land area) is in an even better position, compared with the national target of 40% forest cover.

However, the national importance of the Northern highlands as Thailand's watershed demands a much higher forest cover especially in some provinces of the Upper North. The most critical watersheds are the Ping, Wang, Yom and Nan. These four river systems cover an area of 10.64 million hectares. Of this total area, 2.86 million hectares is Watershed Class[2] 1 forest, but only 2.0 million hectare (18.8% of the whole watershed) of this is still well forested. According to the Royal Forestry Department, the desirable level of forest cover in the watershed is 28% (RFT[3] 1993).

However, in Thailand it is still yet to be made clear how "forest cover" is defined, and how different types of vegetation, e.g. primary, secondary forest, fallow fields at different ages, etc affect water yield (annual yield, seasonal flow) from a watershed. Most relevant to this study is the relative efficiency of various types of land use in the highland, e.g. wetland rice paddy, irrigated crops, fruit trees and forestry with various timber species (deciduous vs evergreen, natural forest vs plantation, single species stands vs multiple species and agroforestry), compared with shifting agriculture.

Timber and wood production. Northern Thailand used to be the country's primary timber producing area. An inventory of different forest types for 1962 is shown in Table 1.7.

Table 1.7 Types of forest in Northern Thailand, 1962.

Forest type	Area (km^2)
Evergreen (Lower Montane)	17,497
Mixed Deciduous	41,329
Dry Dipterocarp	53,144
Tropical Coniferous	1,340
Scrub	1,913
Teak plantations	57
Other tree plantations	10

Source: Banijbatana 1978

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[2] Watershed classification for Thailand (National Environment Board, 1985):
Class: physiography
1 Prime watersheds
1A Protected forest and headwaters area, high elevation and steep slopes
1B Similar to 1A but cultivated or destroyed
2 Similar to 1 but landforms are less erosive
3 Upland areas with steep slopes and less erosive landforms
4 Gently sloping lands (<25%)
5 Gentle slopes to flat (0-25%)

[3] RFT is the Thai acronym for the Forest Protection and Accelerated Watershed Rehabilitation Project.

The mixed deciduous forests are the primary habitat of teak and many other valuable timber species. The dry dipterocarp forests have fewer valuable timber species, but their ability to coppice freely makes them relatively easy to manage on a sustainable basis for fuel wood production (Smitinand et al 1978).

The annual output of teak from the Northern highlands during the period before the second world war, from 1934 to 1938, was 184,000 m^3, 82,000 m^3 of which was exported annually. After the war the annual output increased to 215,000 m^3, but only 65,000 m^3 were exported (Banijbatana 1978). However, national timber output has been declining (Figure 1.2). The average annual output of teak from the region was declining even before the massive landslide in the South in 1989, which precipitated a total ban on logging in the whole country since then.

Biodiversity. The first national park in Thailand was declared in 1962. Since then a total of 881,206 ha of forest land in the region has been set aside as national park and another 937,645 ha as wildlife sanctuaries (unpublished data from National Park Section, Royal Forestry Department).

1.4.3 Landscape and tourism

Tourism now contributes 15.4% of the Gross Regional Product of the Upper North. Some 5 million tourists visited Northern Thailand in 1991, just under 1 million from outside the country. Although no data is available, there is no doubt about the role of the mountain landscape, as an "attraction" for local as well as foreign tourists. Evidence of this can be seen from the increasing popularity of destinations such as Mae Hong Son and Chiang Rai as well as trekking tours.

1.4.4 Legal ownership of mountain land

By the provision of the Land Code of 1954, the Ministry of Interior has declared that all mountain land and land within 40 m of the foot of a mountain must not be damaged, destroyed or taken possession of by anyone (Ratanakhon 1978). The Forest Act and the National Reserve Forest Act provided further provisions to protect the forest from the people. Although the hilltribe population and their shifting agriculture has been more less "tolerated" over the years, there is little evidence that legal rights to the land will be granted in the mountains.

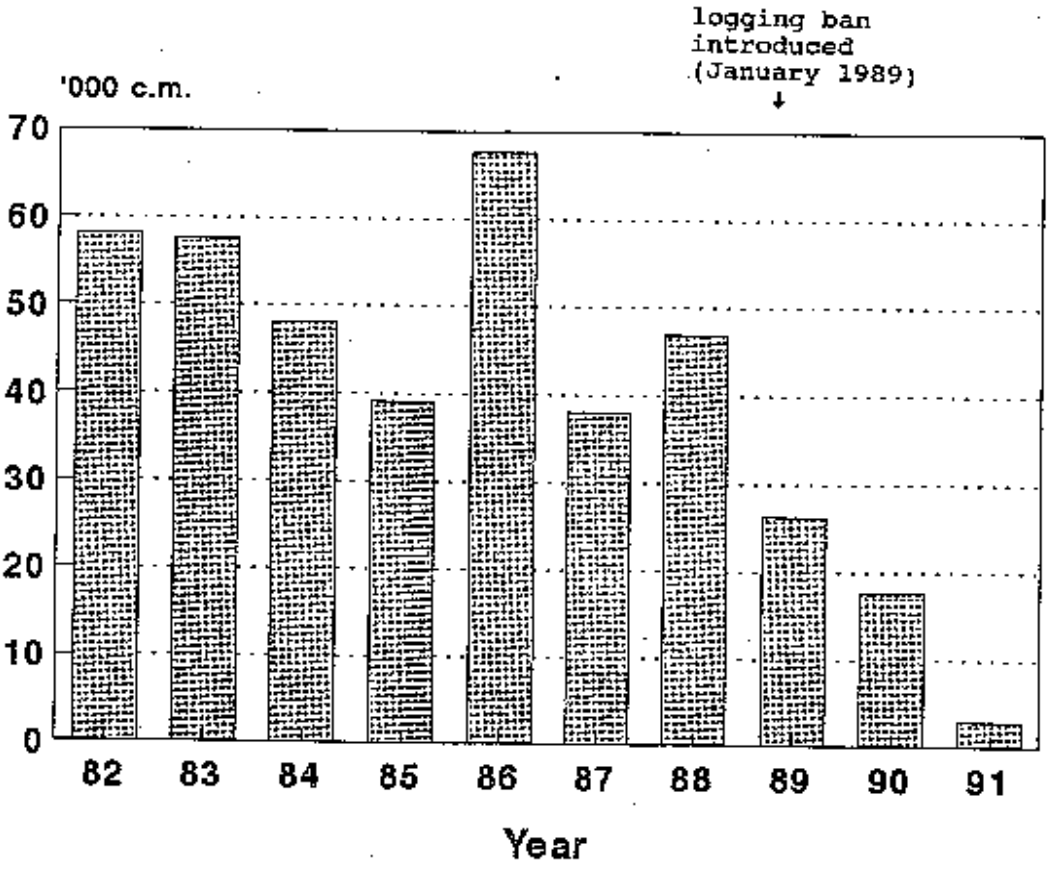
1.5 Land use

1.5.1 The highlands in the Northern regional economy

Agriculture used to account for almost all production in the regional economy. In 1989 it contributed just 25% of the gross regional product of the Upper North (Table 1.8).

Of crucial importance in recent development, especially in the Upper North, is the role of tourism (included in services) and its associated handicraft trades.

(a) Teak production



(b) Total timber production

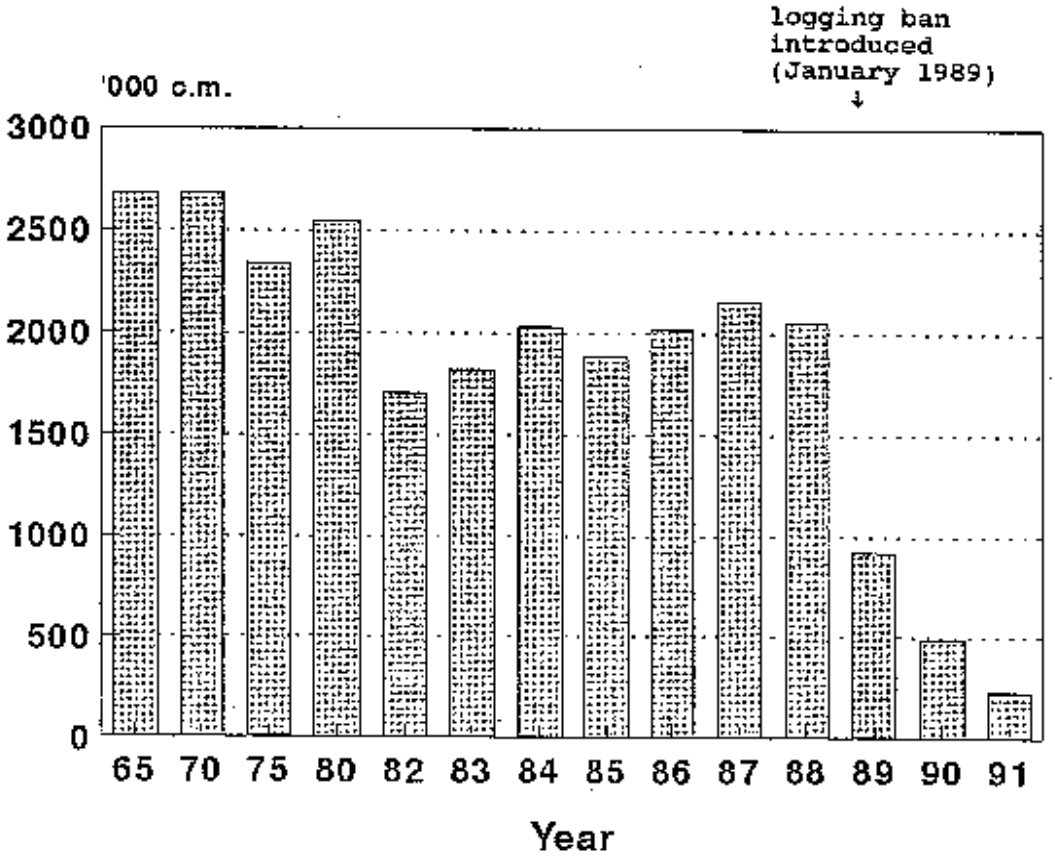


Figure 1.2 Declining timber output in Thailand

Sources: OAE 1992 and RFD 1988

Table 1.8 Economic structure of the Northern region 1989.

Source	National	NORTH (%)		
		Upper	Lower	Total
Agriculture	15.0	25.4	36.6	30.9
Mining/quarrying	3.4	5.4	5.7	5.5
Industry	25.5	6.2	8.8	7.5
Construction	6.3	7.1	4.4	5.8
Retail/wholesale trade	15.4	18.0	16.9	17.5
Services	13.3	15.4	12.6	9.8
Others*	21.1	22.5	18.1	20.2

* Include public sector and defence spending

Source: Northern Development Centre, National Economic and Social Development Board.

The economic structure of the highlands is not so well documented. Available data nevertheless indicate that it differs greatly from this regional picture (NSO 1987, Phruaksignanont et al 1987). In general, agriculture is still the major income earner. Until quite recently, the traditional practice of shifting agriculture was the most common mode of production.

1.5.2 Traditional highland livelihood activities

Before 1960, highland communities were largely subsistence, and even opium growers grew virtually all of their own food (Keen 1978). In addition to shifting agriculture, wetland rice cultivation is a preferred mode of production for almost everyone who can afford the investment to develop or buy paddy land, regardless of ethnic group. Since the 1960s, many villages of Hmong, Lahu and Lisu have bought paddy land and settled permanently. Gathering minor forest products, livestock and handicrafts provided substantial sources of food and income. From the accounts of most older villagers, hunting was an important source of protein for most ethnic groups. Hunting skills such as trap and snare setting are still found in most villages. Similarly, crafts such as spinning and weaving, basketry and bamboo/woodwork are part of the livelihood skills in all villages. No quantitative data is available on the contribution of these "minor" activities.

1.5.3 Traditional shifting agriculture

1.5.3.1 Types

Two basic types of shifting agriculture were identified in studies of indigenous highland agriculture in the North before 1970: pioneer and rotational types (e.g. Kunstadter 1978, Grandstaff 1980).

Note: It is important to recognize that this classification is useful for distinguishing characteristics unique to each type. In practice, with rapid land use changes occurring in

the highlands even since the 1960s, it is difficult to identify any particular ethnic group or even village with a particular type of shifting agriculture. For example, even in the 1960s some rotation was already practised by many villages of pioneer shifting cultivators such as Hmong and Lahu (Keen 1978, Walker 1976).

Pioneer shifting agriculture was attributed to the Hmong, Lahu, Lisu, Akha and Yao. In this system, a piece of forest, primary if possible, was cleared, burned and cropped, often intensively, with two crops (maize and opium) in one year. After a few years the field was abandoned. The village was moved to a new site after 8 - 10 years.

Soil fertility exhaustion and increasing weed problems were generally believed by researchers to be the causes of field abandonment and village relocation (e.g. Kunstadter and Chapman 1978, Grandstaff 1980, Suthi 1985), but there is little concrete evidence. The hilltribes themselves told of misfortunes ("bad spirits"), sickness and conflicts with other people as the reasons for moving the village (Srisawad 1949).

Major crops grown were upland rice, maize and opium. The rice, maize and opium swiddens (fields where these crops are grown) are often intercropped with various domesticated species. The "intercrops", including chillies, eggplants, beans, cucurbits, yams and taros, mustard greens, various edibles, herbs and spices, medicinal and ceremonial plants, commonly number more than 30 kinds in a given field. The Hmong especially were famous for the productivity of their swiddens, which efficiently provided year round supply for the kitchen from the combined harvests from the maize, rice and opium swiddens (Suthi 1985).

After several years of clean cultivation the forest regenerates relatively slowly when the field is abandoned. Intensive soil cultivation tend to encourage soil erosion, and this form of shifting agriculture is generally considered to be an unsustainable form of land use (e.g. see Keen 1978).

Rotational shifting agriculture, characterised by long fallow periods, was formerly practised by Karen and Lua who lived in permanent settlements. After one season of cropping the field was "fallowed" (the forest allowed and encouraged to regenerate) for 8-9 years before being cleared, by "slash and burn", for cropping once more. These people also had the skill for growing wetland rice. Where possible (soil, topography and water supply permitting) paddies, sometimes with irrigation, were developed, often on sediment fans deposited at the base of slopes resulting from long cultivation on the upper slopes. Although settlements were permanent, Lua and Karen villages "moved" in another way. As the population of a village grew too large families and clans would split off to establish a new village. Although some of these villages have been in one place for more than one hundred years, the average number of households in highland communities has remained about 40 since the 1950s (see Young 1962 in comparison with NSC/NESDB 1993).

Because fields were cropped for only one year, the forest regenerated quickly after the crop season (Nakano 1978, Zinke et al 1978). Nakano (1978) also comments on the rapid regeneration of fallow species from fire resistant underground roots and stems. When well managed, e.g. at Pa Pae, a Lua village south of Chiang Mai studied in detail

in 1960s (Kunstadter 1978, Zinke et al 1978), this is a system of land use that remained productive for a long time without requiring external inputs.

However, it must be emphasized that this "classical" and successful rotational shifting agriculture was not practised by all Karen villages. At the same time that the Pa Pae study was carried out Kunstadter (1978) also looked at the rotational shifting agriculture of a neighbouring village of Laykawkey, which was found to be much less successful. The author attributed the relative success of the two villages to the much stronger communal organization of the Lua at Pa Pae, which he believed to be essential in the management of the fallow, especially in land allocation and fire control.

1.5.3.2 Values

As an agricultural production system. Kunstadter (1978) made a case that the productivity of shifting agriculture should be evaluated on the basis of the most limiting resource. In the case of the Lua and Karen villages he studied, the rotational shifting agriculture was as productive as irrigated agriculture in terms of rice produced per unit labour, although yield per unit area from shifting agriculture was only about half of that from irrigated agriculture (Table 1.9).

Table 1.9 Comparison of productivity of rice from rotational shifting agriculture and irrigated agriculture: data from two villages in 1967/68.

Basis of productivity in rice harvested	Pa Pae (Lua)		Laykawkey (Karen)	
	Rotational shifting agriculture	Irrigated	Rotational shifting agriculture	Irrigated
kg/ha	1,032	2,193	955	1,483
kg/worker	49.15	48.04	39.08	37.22
kg/ kg seed	10.26	27.73	10.41	20.23
Land use/worker[1]	5.9	0.24	5.1	0.27

[1] assuming 10-year fallow cycle, i.e. 1 year crop, 9 year fallow.
Source: Adapted from Kunstadter 1978.

Highland farmers are, however, aware of the higher productivity of irrigated agriculture, as well as its lower susceptibility to fluctuations from year to year. There is, however, only a limited amount of land in the highlands that can be developed into irrigated paddy fields. A land use survey of 16 villages in five provinces, undertaken by the Thai-Australia Highland Agricultural and Social Development Project in 1990/91, found that virtually all land with slopes of 0-15% has been long developed into paddy land by the farmers themselves.

Upland rice, maize and opium are the major crops of shifting agriculture. The rice is entirely for home use, maize is grown primarily as pig feed, and opium for cash, but is also commonly used as a medication. Other traditional cash crops include chillies and sesame.

In addition to the major crops, the land used for shifting agriculture also provides farmers with other harvests which provide a degree of nutritional diversity and security. These may come from the many domesticated species intercropped among the major crops during the cropping cycle or semi-domesticated and wild species in the fallow fields (Table 1.10). However, the diversity of plant types used from the forest and wild places and from the village and home gardens are also impressive.

Table 1.10 Comparison of kinds and uses of plants from shifting agriculture, from other cultivated land and wild plants by a Lua village of Pa Pae

	Kinds, used for					
	Food	Feed	Other[1] uses	Not used	Unknown	Total
Land under shifting agriculture crop fields						
cultivated	70	3	33	0	0	84
uncultivated	4	1	8	10	5	21
fallow fields	110	27	169	57	122	482
Other cultivated land						
irrigated fields	5	2	8	0	0	10
gardens	94	3	103	32	4	188
fish ponds	1	0	0	0	0	1
field margins	11	0	8	3	0	16
Forest and wild places						
forest	110	15	130	100	38	319
stream beds	22	3	18	7	1	44
Unknown source	29	7	54	75	13	153
Bought	3	0	11	0	0	13
Total	295	44	402	280	162	967

[1] other uses included medicinal, dyes, construction, decoration and worship, fuel, poison, fencing, insect repellent, etc.

Source: adapted from Kunstadter 1978.

Other values. Apart from the agricultural production value, so far there have been few assessments of the values of land use systems in the mountains in relation to the increasing national demands on the highlands as described in section 1.4 above. Available data indicates that some form of traditional land use systems, i.e. rotational shifting agriculture, may actually contribute more towards some of the services required at the national level, than do other land use systems.

For example, there appears to be a much greater degree of "biodiversity" under rotational shifting agriculture than in natural forests. An inventory of species in the rotational

shifting agriculture fields of the Lua village of Pa Pae showed the lowest number of species (25) found in old forests, whereas fallow fields contained 56 species in the second year after cutting for cultivation, 152 species in the fourth year and 136 species in the seventh year (Sabhasri 1978). By the tenth year, when the field was ready for cropping once more, the number of species was 223.

Agricultural intensification, i.e. irrigated agriculture and development and expansion of paddy land for wet rice cultivation, encouraged as alternatives to shifting agriculture, is also likely to increase water consumption within the watershed at the expense of downstream users.

Control of forest fires is another service "provided" by highland communities that has rarely been acknowledged. Forest fires are common in Northern Thailand during the hot, dry months from late February to early May. Evidence of the natural occurrence of frequent forest fires can be seen in the presence of many native species which have evolved mechanisms that enable them to regenerate from underground stems and roots after burning. Communities living in the forested mountains, out of necessity for survival, practise fire control to varying extents. Those practising rotational shifting agriculture, i.e. Lua and Karen, have developed effective systems of communal organization to control accidental fires as well as to minimize the risk of accidental burning of fallow forests before they are ready to be cropped again.

Possibilities of inevitable trade-offs among these various services from the use of mountain land have also been largely ignored.

CHAPTER 2: CURRENT SITUATION AND PROBLEM

2.1 Land use changes

The last thirty years, which have seen much change in the Thai economy as a whole, have also seen major changes in the land use pattern in the mountains, described below:

- *The virtual ending of voluntary village relocation.* By 1990 voluntary village relocation and the setting up of new villages had become very rare. Notable exceptions were forced relocations made by the government, especially in the name of national security during the years of active communist insurgency from the mid 1960's till the end of the 1970's.

- *Intensification of land use.* Pioneer shifting cultivation has now largely disappeared. Rotational shifting agriculture can still be found. The extensive area where the majority of villages are still largely dependent on rotational shifting agriculture covers three provinces: Chiang Mai, Mae Hong Son and Tak (Figure 2.1). The fallow period is often shortened by increased population pressure and restrictions placed on the use of forest land by the Royal Forestry Department. Many fields are permanently cropped, some even grow two, or sometimes three crops a year.

- *Technology adoption.* Along with intensification of land use, technology for increasing productivity adopted include irrigation, and the use of fertilizers and pesticides. Irrigation for wetland rice paddies, which has expanded to cover dry season soybean which follows the rice, has come from the Karen and lowland Thais. Sprinkler irrigation for fruit trees and vegetables has become widespread in the last ten years or so. Chemical fertilizers, especially nitrogen and phosphorus, and pesticides, for controlling weeds as well as insects, are routinely applied to cash crops.

- *Commercialization.* From a largely subsistence production, commercial production (of vegetables, soybeans, fruits, red kidney bean, purple rice, lablab bean, adzuki bean, barley, potatoes, etc.) has spread widely in the highlands in the last ten years. Following closely are a whole range of marketing and credit arrangements offered by buyers. Collecting forest products for sale has become an important income earning activity. The most widespread and largest in scale are bamboo shoots and broom grass, but other products (a spice with the local name 'makwaen' *[Xanthophylla lemonia]*, wild nuts [*Castanopsis sp.*], rattan shoots, palm fruit, kindling [native *Pinus spp.*], wild orchids, various wild mushrooms and honey, etc) are important in specific areas. Livestock (cattle and pigs), formerly raised for ceremonial purposes, have become an important income earning activity in quite a number of villages.

- *Cultural and ethnic differences*, long the focus of research on highland land use, no longer appear to be the major determinant of land use patterns. Many well-off villages of Hmong, Lahu and Lisu, many former opium growers, pioneer

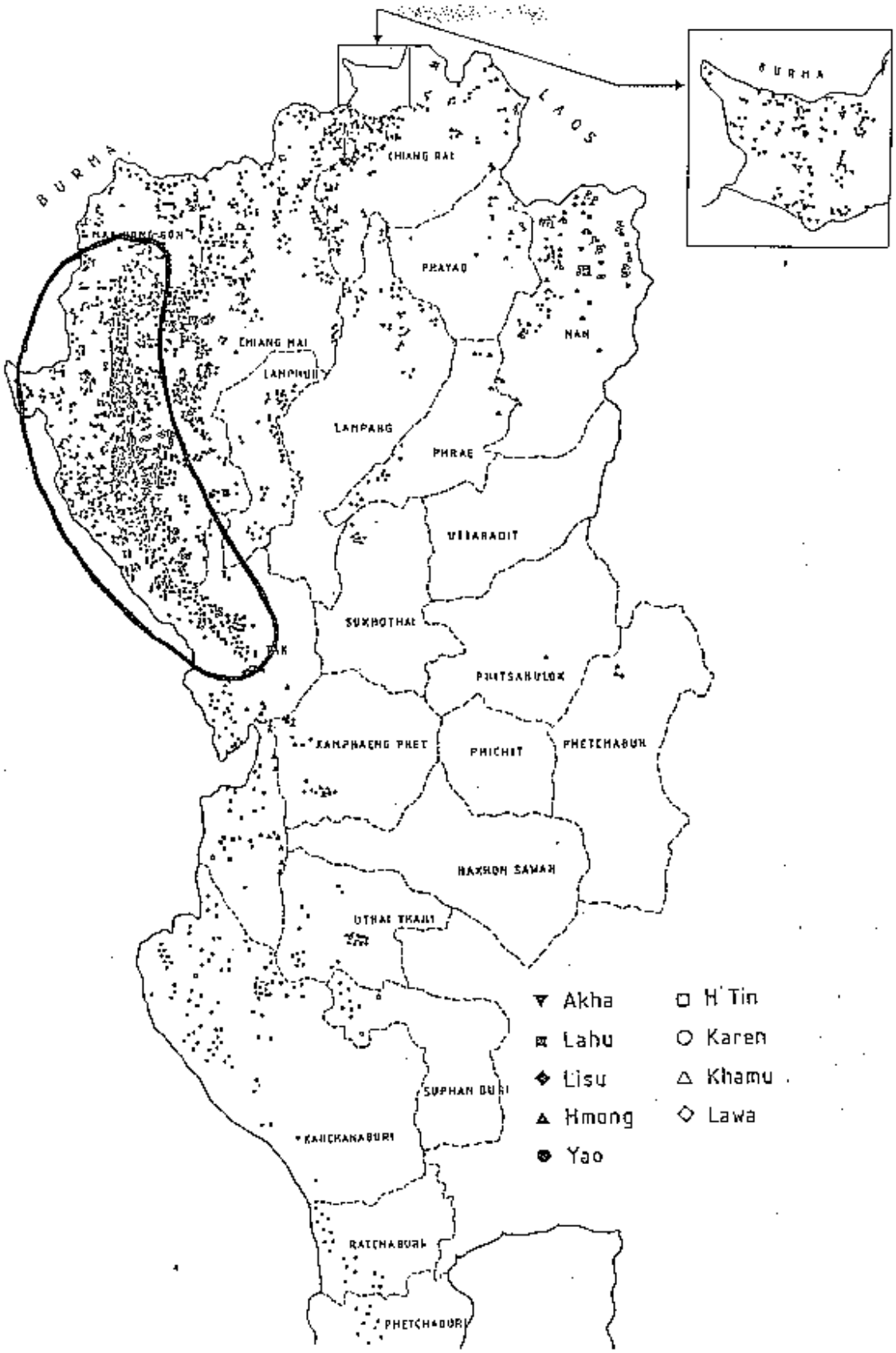


Figure 2.1 Existing area of rotational shifting agriculture in Thailand

swiddeners, had started to acquire paddy land as part of the process of settling down more than 30 years ago. The Karen, who were considered to be extremely subsistence minded, have taken up commercial production on a widespread scale.

- *Mobility and off-farm employment.* Many young men and women from highland villages have found employment in Chiang Rai, Chiang Mai, Phitsanulok or even Bangkok. Income from tourism, including production of handicrafts, tour operations, elephants hire etc is also beginning to reach down to former shifting cultivators in some areas. However, only those hilltribes who have been granted Thai citizenship are better able to take advantage of off-farm employment opportunities.

2.2 Forces causing change

Forces causing rapid changes in the mountainous area of northern Thailand can be summarized as follows:

(A) "Internally" driven forces

- Increased population
- Farmers' felt need to increase productivity and to improve the stability of their production.

(B) Forces related to government policy

- The effects of nationalization and integration policy (Department of Local Administration)
- Enforcement of forest and watershed conservation and afforestation schemes (Royal Forestry Department)
- Strict law enforcement on illicit opium cultivation (The Office of Narcotic Control Board with cooperation from the Third Army).
- Improved access and transportation, and therefore market opportunities to increase productivity (various development projects, often with assistance from foreign governments and international agencies).

The real reason behind this major change is probably a combination of several forces above. When asked why they have settled down, former pioneer shifting agriculture, opium growing, farmers invariably answered that they simply ran out of new forests to clear. This indicates the dominant effect of population growth exerting pressure on the land. Khunsa Nai (Chiang Mai: Hmong), Lao Fu (Chiang Rai: Lisu), Lo Pah Krai (Chiang Mai: Lahu), Pang Gorm (Nan: Hmong), and Mae Salap (Chiang Rai: Akha), are among example villages we have visited of former pioneer shifting cultivators which had acquired paddy land and settled down to grow wetland rice some thirty years ago (see figure 2.2).

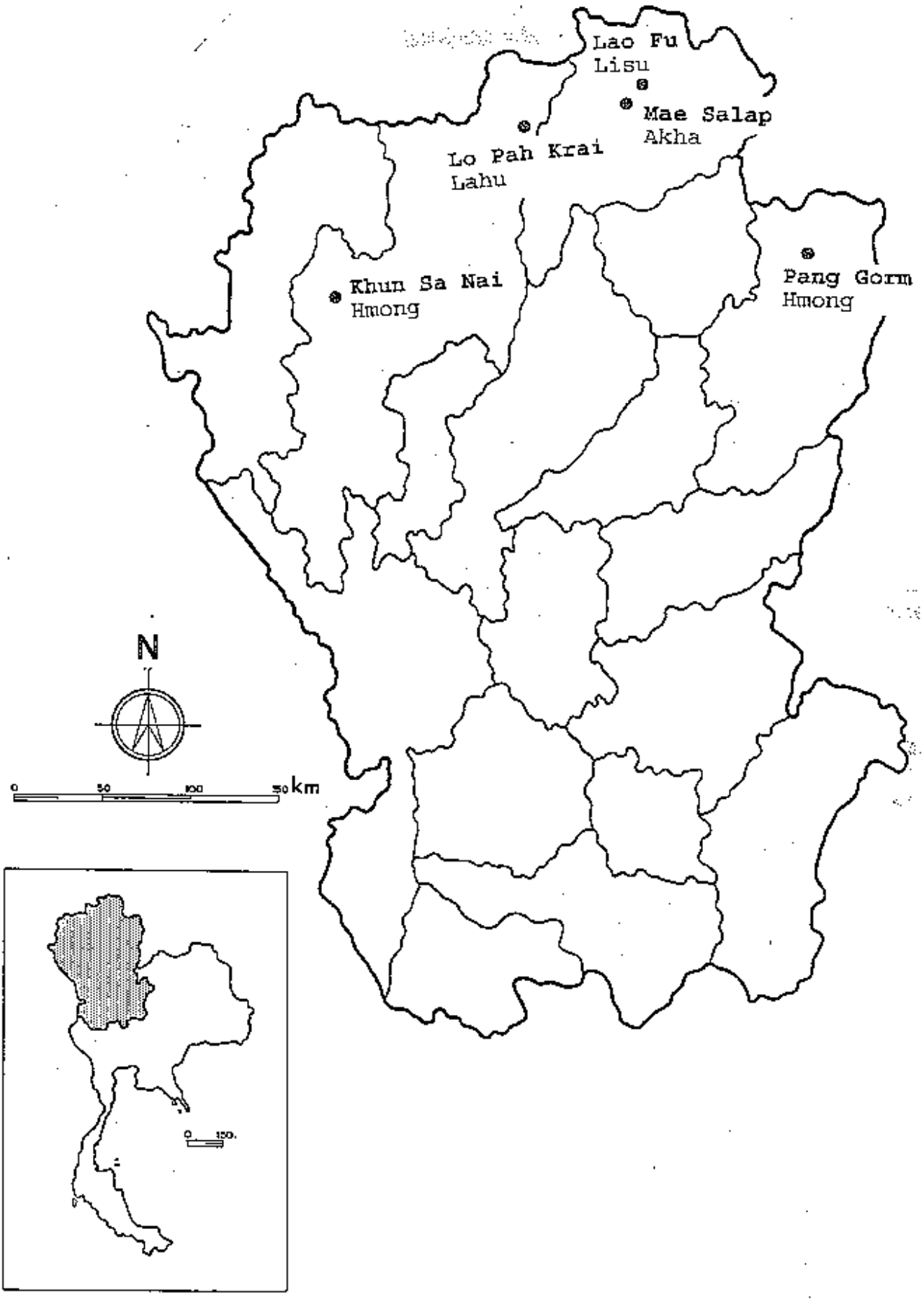


Figure 2.2 Location of examples of former pioneer shifting agriculture villages which have acquired paddy land and settled down

For those farmers who are still dependent on rotational shifting agriculture, the population pressure is very real. The Lua and Karen have adapted to this pressure in two ways:

- Wherever possible, paddies for wetland rice are developed. Often this takes place at the base of the slopes, where erosion from upslope has resulted in a fan deposition of sufficient size (Zinke et al 1978).

- Most villagers invariably complain about the need to clear more land as the village population grows. Even in the old days, when the population of a Lua or Karen village grew too large to be accommodated by the existing land, a group of families would move off to settle a new village. Karen have lived in the mountainous area of Northern Thailand for more than one hundred years. The Lua are supposed to predate the Kingdom of Lana Thai, which celebrates its 700th anniversary in 1996. But there are only a few Karen or Lua villages with a population of more than 100-200. A new village, expected to grow to a population of about 150 will require a territory of some 100 ha for rotational shifting agriculture with 9-10 years rotation. It has now become virtually impossible to find new land on which to locate a new village.

In certain areas near the borders, illegal migration added to the rate of population growth. The problem is aggravated by restrictions on land use imposed by Royal Forestry Department (discussed in section 2.3.2.1).

Even among those farmers who were practising the "sustainable" rotational shifting agriculture, opportunities for more intensive cropping are often perceived, in terms of productivity against the same amount of effort and resource, as a vast improvement over their traditional practices.

Many development projects and programmes claim to have "replaced" opium with alternative crops. However, the decline in opium planting did not take place until the Third Army started to send units up to physically destroy the crop on substantial scale in 1985. The 1970s and 1980s also saw substantial road construction into the mountain areas throughout the North. Most of the roads through the villages are unpaved, but even these seasonal roads have been instrumental in commercializing many former subsistence activities, i.e. cash cropping, and also selling of various forest products such as bamboo shoots and broom grass for cash. The network of surfaced roads linking major towns and districts in the region, e.g. Chiang Mai, Fang, Chiang Rai, Nan, and Mae Sariang, Pai and Mae Hong Son, together with the link to Bangkok, has also been built up from 1970s through 1980s (figure 2.3). Several roads had been conceived and/or built for "strategic" reasons during the period of real threats from communist insurgencies.

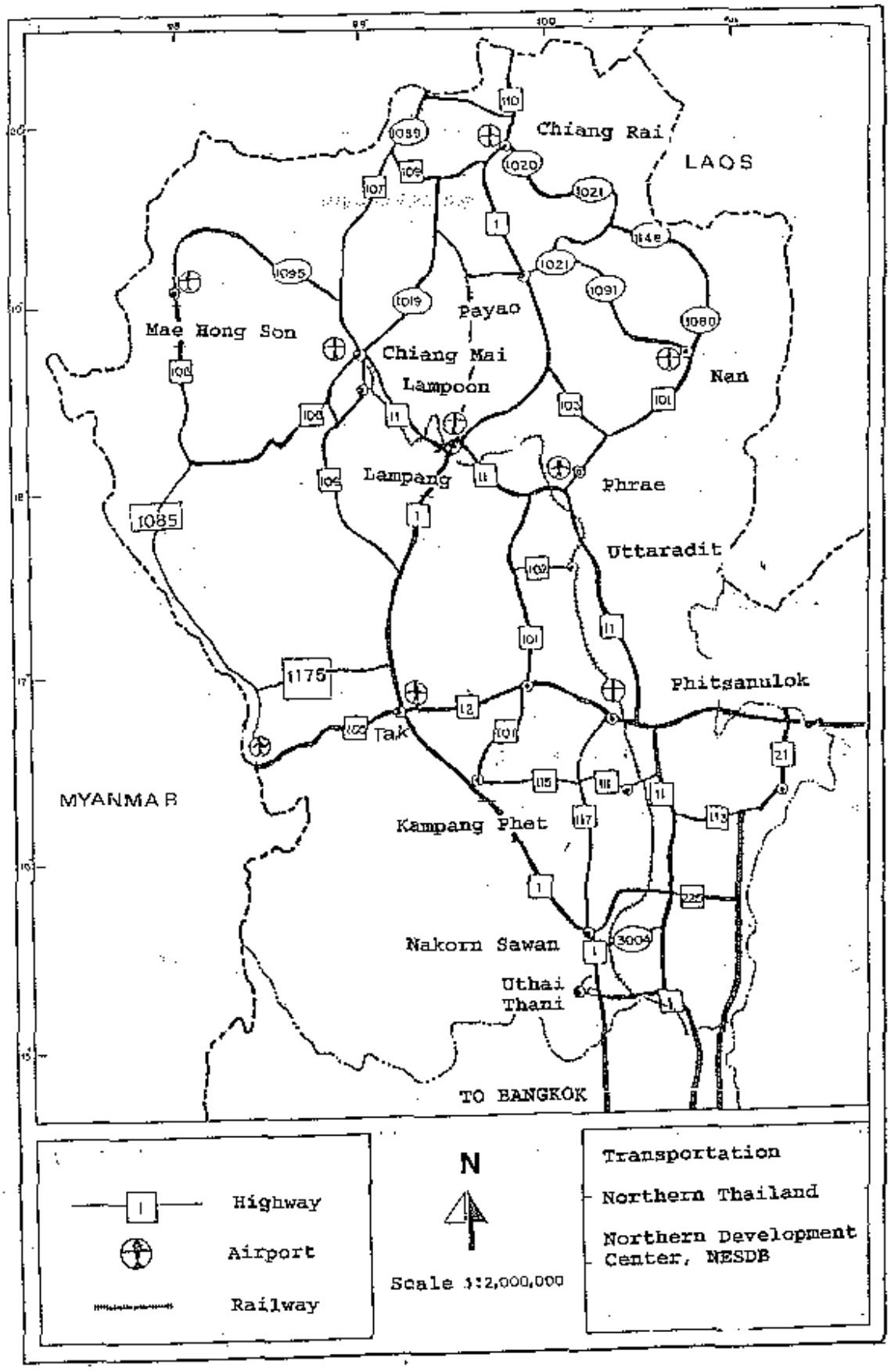


Figure 2.3 Network of major roads in Northern Thailand

2.3 National policy process

2.3.1 Policy cycles

2.3.1.1 Highland development policy.

The National Security Council (NSC), chaired by the Prime Minister, is the major government body responsible for highland development policy. Historically, the two main concerns of the NSC were:

(i) national security, i.e. dealing with communist insurgencies and illegal migration, and
(ii) opium cultivation and drug trafficking.

Concern about socio-economic development and social integration of ethnic minority groups led to the establishment of the Department of Hilltribe Public Welfare in 1959, and later the passing of the Nationality Act of 1965, which granted Thai citizenship to people belonging to one of the ethnic minority groups who were born in the kingdom. The opium eradication objective led to the establishment of the Office of Narcotic Control Board (ONCB).

With the cooperation of the Social Research Institute, Chiang Mai University, and the assistance of United Nations Fund for Drug Abuse Control (UNFDAC), the ONCB was instrumental in the preparation of a Master Plan for Development of the Opium Poppy Cultivation Regions of Northern Thailand. This Master Plan was considered the official Thai government policy with respect to the highlands, and was part of the Fifth National Economic and Social Development Plan for 1982-1986. This was followed by the Second Master Plan, of a similar nature. Based on these master plans, the ONCB, which is attached to the office of the Prime Minister, has been the implementing agency of development activities with financial and technical support mobilized by UNFDAC (the United Nations Fund for Drug Abuse Control) and other bilateral assistance (e.g. Australian International Development Assistance Bureau, United States Agency for International Development (USAID), Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Norwegian Church Aid, and the Governments of Canada and Sweden.

As part of the master plan, a social integration policy was implemented by the Department of Local Administration, of the Ministry of Interior, through granting of citizenship and setting up of official villages, and household registration, which are regular procedures for all Thais. Economic and social development policy was implemented on the basis of individual projects. Each project attempted to integrate the work of 4 major ministries: agriculture, education, health and interior. Each project had its own monitoring system, and reported to ONCB and the National Security Council. Occasional monitoring was carried out, on *ad hoc* basis, by various departments, e.g. a survey of hilltribe settlements, location and access by the Remote Sensing Division of the National Research Council (NRC 1987), a survey of hilltribe population (number, education, health, family planning, citizenship etc) by province, of the National Statistical Office (NSO 1985-87), and the 1993 Directory of Highland Communities and Population

(village location, village official status, number of households, population) (NSC/NESDB 1993).

It is important to note that so far, only about 1,000 villages have been covered in these various projects of the master plans: just one third of all highland communities in the north. The remaining two thirds are yet still to be reached.

2.3.1.2 *The national forest policy.*

In addition to the Highland Development Master Plan, virtually all the mountain areas in Thailand come under another separate policy: the national forest policy. This is implemented by the Royal Forestry Department. This started with the Royal Forest Act of 1941 and National Reserve Forest Act of 1964, both with forest protection as their basic aim. Since 1972 a number of national parks and wildlife reserves have been established by legislation, providing a legal basis for severe land use restriction for the purpose of biodiversity conservation. At present, these reserves and parks in the North cover about 2 million hectares, out of the regional total land area of 17 million hectares. In 1984 a watershed classification scheme was designed by academics with support and consultancy services from IUCN (IUCN 1984 and Woolridge et al 1985)[4]. The scheme was recommended to the government by the National Environment Board and passed as a Cabinet Resolution to become part of the national forest policy. The Royal Forestry Department implements this through its watershed development and protection units.

In March 1993 the Cabinet approved a new classification of forest reserves land by the Royal Forestry Department. Basically the land has been divided into "E" (available for economic development) and "C" (conservation use only). Distribution of the land in each category, for the whole country, according to the Thai Forestry Sector Master Plan of the Royal Forestry Department is shown in Table 2.1.

The Thai Forestry Sector Master Plan also recommends that Watershed Class 1, most of which is in the Northern highlands, should be in permanent forest. Watershed Class 2 could be developed into commercial plantations, if soils are suitable and soil conservation measures are observed. Watershed Class 3 could be used for fruit trees and other commercial plantations, with soil conservation measures.

2.3.2 Policy issues and changes of policy emphasis

2.3.2.1 Conflicts between highland development policy and forest policy and their implementation.

Unlike implementation of the development policy which has so far effectively covered, to varying degrees, only one third of the more than 3,000 mountain villages, all highland communities are directly affected by the national forest policy. At the village level, this policy discrepancy translates into enforcement of land use restriction without redress to any social and economic assistance. As all the mountain land essentially "belongs" to the

[4] for details of the Watershed Classification system, see footnote in section 1.4.2

Table 2.1 Zoning and Forest Cover of the National Forest Reserves.

Zone	million ha	% of land in Thailand
National Forest Reserves	23.57	45.9
Conservation Forests ("C")	14.12	27.5
Condition of forest		
- Good	11.45	22.3
- For rehabilitation	1.26	2.4
- Other land uses	1.41	2.8
Economic Forests ("E")	8.30	16.2
Condition of forest		
- Good	1.41	2.8
- For rehabilitation	2.47	4.8
- Other land uses	4.42	8.6
Areas for land reform (i.e. for allocation to farmers)	1.16	2.2
Condition of forest		
- Good	0.03	0.0
- For rehabilitation	0.01	0.0
- Other land uses	1.12	2.2

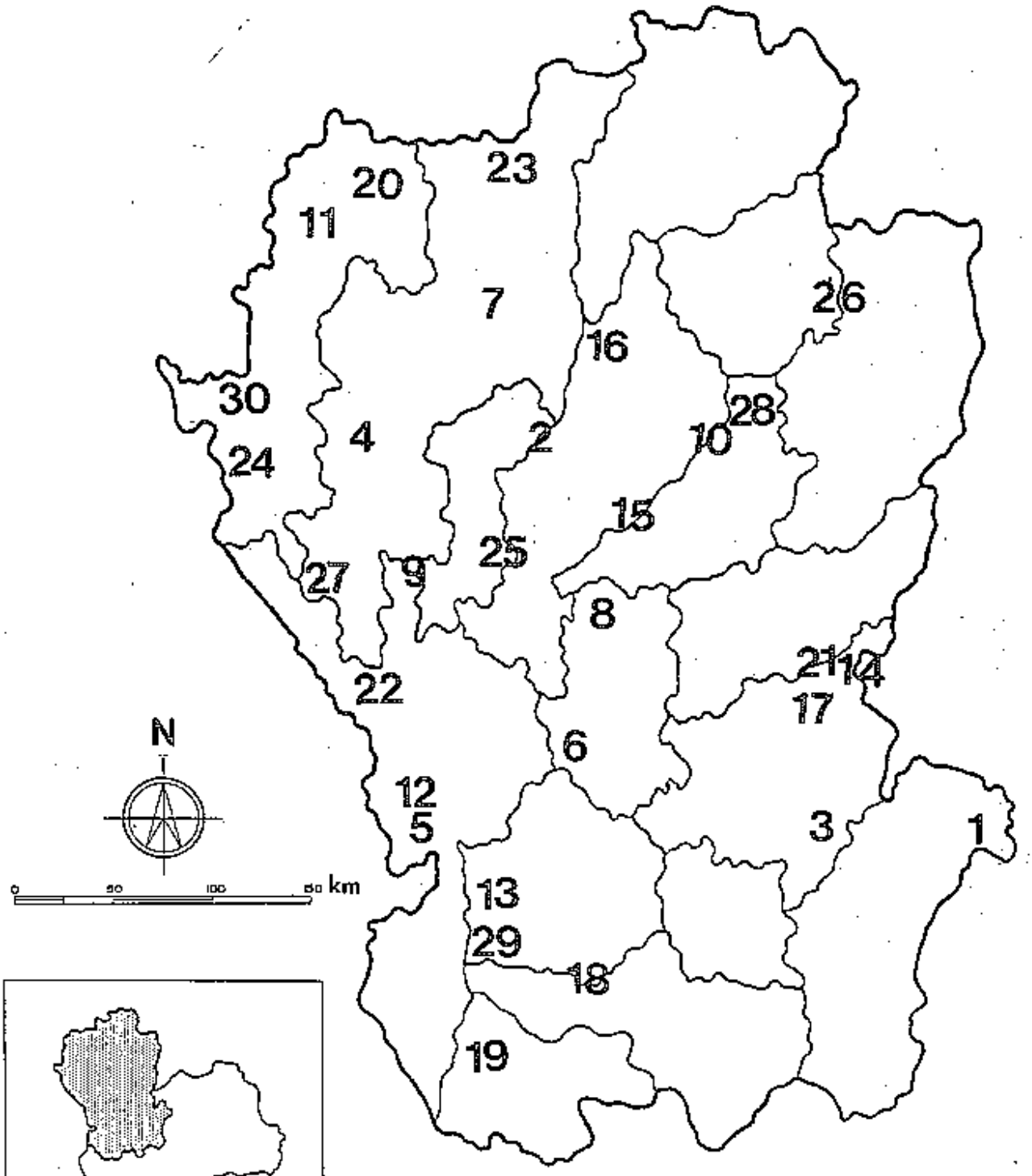
Source: Thai Forestry Sector Master Plan, Draft Sub-sectoral Plan Production and Utilization, Royal Forestry Department, July 1993.

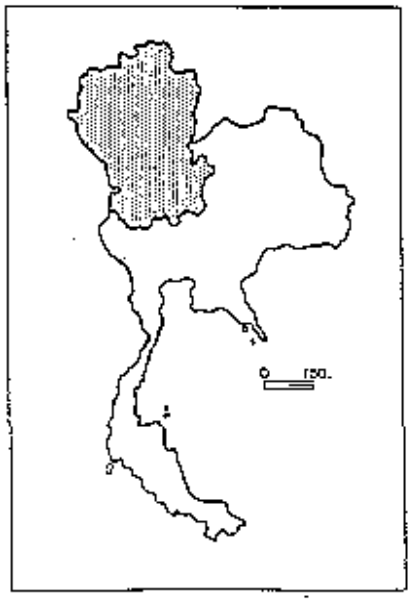
Royal Forestry Department, the highland villager's right to land use can be revoked by a forestry officer at any time. It is a common, though distressing, sight to see farmers' newly planted upland rice being "reclaimed" for the "government" by being overplanted with tree seedlings of a reforestation programme.

In numerous cases, villages legally recognised (with announcement in the Royal Gazette) by the Department of Local Administration have suddenly found themselves within the recently drawn boundary of the new national park or wildlife reserve (for example see figure 2.4). Furthermore, many of these villages had actually gone through the "development" process as implemented by the various projects under highland development policy. Agricultural practices recommended as "sustainable" by the projects have been adopted. Nevertheless, some of these have been targeted for relocation outside the boundaries of the new reserves and parks. All past efforts, private as well as public, have just simply been wasted.

The experience of the Lahu village of Lo Pah Krai, north of Chiang Mai, shows that farmers' land use rights can be insecure even if it is in the area classified "E" for economic development (see 2.3.1.2 above). In accordance with the national forestry master plan, a large tract of "E" land in the area has been awarded by the Royal Forestry Department in Bangkok to the Forestry Industry Organization (a government owned

Figure 2.4 National parks and wildlife reserves in Northern Thailand





National Parks (ha)

1 Nam Nao (99,000)
2 Doi Khun Tarn (19,256)
3 Tung Slang Luang (126,255)
4 Doi Inthanond (49,640)
5 Lan Sang (10,400)
6 Ram Kamhaeng (34,100)
7 Doi Suthep Pui (16,200)
8 Sri Satchanalai (21,320)
9 Mae Ping (100,300)
10 Wiang Kosai (41,000)
11 Mae Surin Falls (39,660)
12 Ton Krabarg Yai (15,000)
13 Khlong Lan (30,000)
14 Pu Hin Rong Kla (30,700)
15 Mae Yom (45,475)
16 Chae Sorn Falls (59,200)
17 Chart Trakarn Falls (54,300)
18 Mae Wong (89,400)

Wildlife Reserves (ha)

19 Huai Kha Kaeng (257,464)
20 Pai Watershed (117,951)
21 Phumiang/Phutong (54,500)
22 Mae Tuen (117,300)
23 Doi Chiang Dao (52,100)
24 Salween (87,500)
25 Doi Pah Muang (58,320)
26 Doi Pah Chang (57,110)
27 Omkoi (122,400)
28 Doi Luang (9,620)
29 Kao Sanam Priew (10,100)
30 Mae Yom (29,200)

company) to develop a Eucalyptus plantation. Ten of the village's households lost a total of 25 hectares of crop land to the plantation as the demarcation line between "E" and "C" (for conservation) passed through the village. The rest of the village land was "saved" because it happened to be in the "C" area (Figure 2.5).

The Thai Forest Sector Master Plan, for the national objective of watershed conservation, appears to have made a major assumption that tree cover is positively related to water yield. A critical question is raised here on effects of different types of trees on water yield from a watershed. That is, how do the following compare in terms of water use efficiency, and therefore potential water yield: evergreen species (including pines and Eucalyptus) vs native deciduous species, natural forest including fallow forests of shifting agriculture vs irrigated fruit orchards. It should be noted that dry dipterocarpus and deciduous forests, i.e. with major tree species shedding their leaves and using less water in dry season, represent more than 80% of the natural forests of the Northern mountain areas (1962 figures; see 1.4.2 and Table 1.7).

2.3.2.2 Policy emphasis and changes.

National highland policy has generally covered the following issues:

(i) illicit opium production
(ii) cross-border migration
(iii) border security
(iv) citizenship and social integration
(v) poverty and inaccessibility to services (education, health, electricity, transportation, etc)
(vi) forest degradation
(vii) environmental degradation
(viii) watershed degradation

Emphases, seen from the activities of relevant Thai government agencies and foreign governments' assistance programmes, however, have changed with time, and are still changing with continuing shifts in national focus.

Until after the end of the Vietnam war and the final decline of communist insurgency activities in Thailand by early 1980s, national security was the primary emphasis of highland policy that overrode all other concerns. Hilltribe villages were forcibly relocated to remove them from communist influence. Vast tracts of mountain land that are even now still completely devoid of trees (e.g. in Nan, Phitsanulok and Phetchabun provinces), had been cleared in 1970s to deny cover for the guerrillas.

The 1970s, saw a rise in concern, driven partly from outside the country, for social integration, illicit opium cultivation and poverty and access to various social services. Concrete results of this can be seen in major changes in the highlands such as permanent settlements, the granting of citizenship, decline in opium cultivation and improved access to a large number of highland villages. At the same time, access to land, especially the extensive use for shifting agriculture, has been increasingly restricted by the Royal Forestry Department. The agency has been charged with implementation of national forest

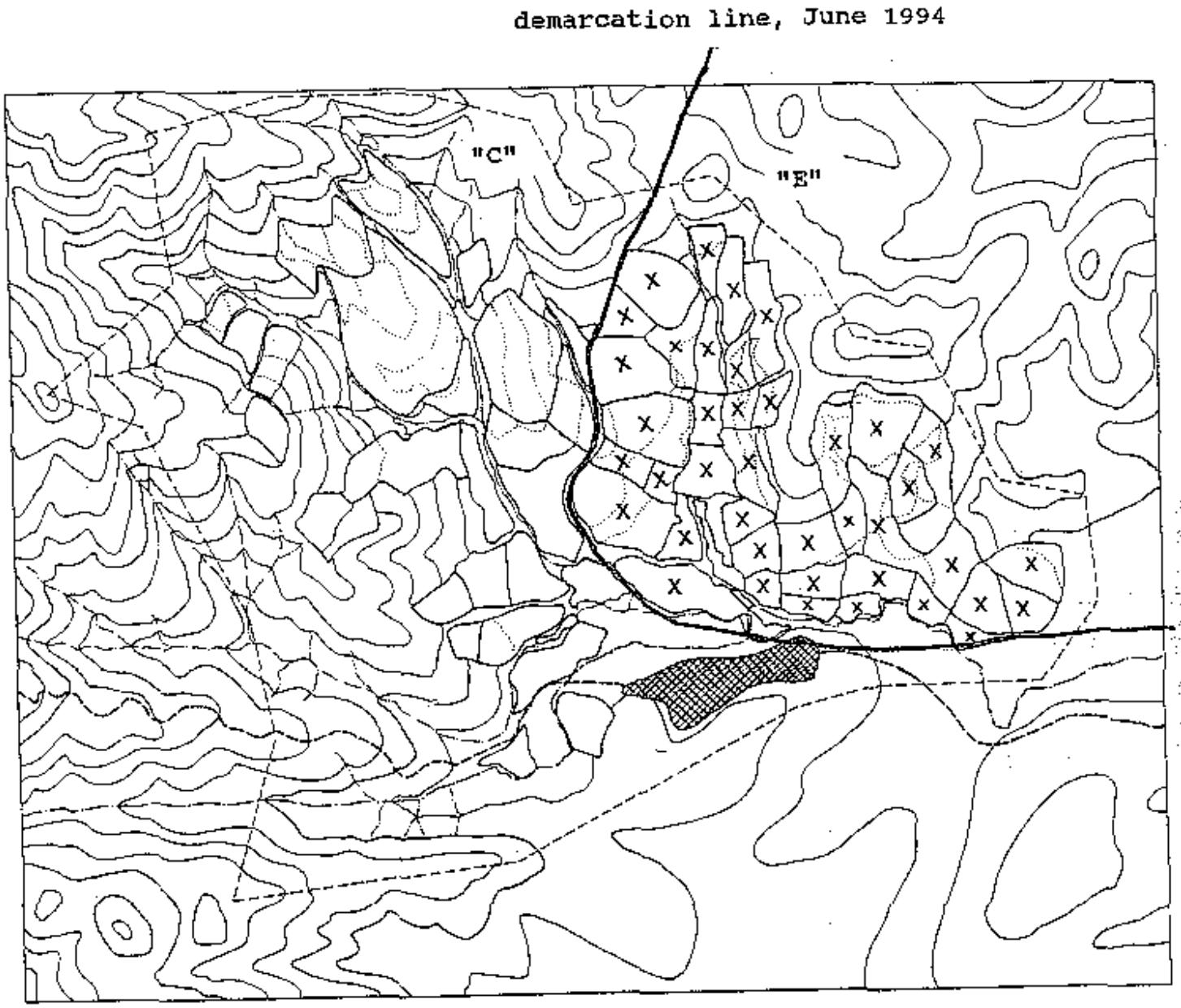


Figure 2.5 Effect of Royal Forestry Department land use classification in a Lahu village of Po Pah Krai. (X's mark farmers' fields lost to Forestry Industry Organization 's *Eucalyptus* plantation.

protection policy, through its various projects on reforestation and creation and enlargement of national parks and wildlife reserves. Commercialization of agricultural production, replacing original subsistence production, is probably one of the most obvious outcomes of the combined effects of these policy emphases. The cash crops, most of which are temperate fruits, vegetables and flowers for increasingly richer cities, have been offered as the most effective ways to raise productivity of the increasingly limited land. Central to the success of cash cropping is the development of irrigation in the highlands; this has significantly increased water consumption.

The 1980s, with growing global concern for "the environment", brought conservation as a new emphasis of national highland policy. Watershed classification has been applied to all mountain land, as part of the effort to protect the forest for accelerating watershed improvement. Conflicts are emerging between agricultural activities and conservation requirements. Some cash crops, especially trees, are considered "environmentally friendly". Others such as vegetables (especially cabbages) are blamed for soil erosion and pollution of rivers and streams with pesticides.

A number of governmental actions on conservation, such as the watershed classification and establishment of national parks and wildlife sanctuaries, have generally taken place without much attention to social issues. At implementation level, despite some regrettable exceptions, people's needs are often dealt with sensitively, by government agencies and projects. For example, the majority of villages whose land has been classified for strict conservation purposes only (i.e. watershed class A1 or national park or wildlife sanctuary) still remain in place. The RFD is beginning to take action in projects involving local participation in land use planning. But in Mae Hong Son province, the governor's edict that all burning must stop - it is perceived as a 'threat' to the 'natural' environment - is causing concern in rotational shifting agriculture villages where no alternative technology is yet available to replace burning which plays several essential roles in the maintenance of the system.

The watershed is likely soon to become a critical issue of 1990s, with emphasis being shifted to actual yield of water from the watersheds. The last few years seem to have been "dry years" in northern Thailand, with ever decreasing water levels in the two major dams that are fed by drainage from the northern mountains, the Bhumiphol and Sirikit dams. At stake are a significant part of the national electricity supply and water for irrigation of the national "rice bowl" of the Central Plain. Conflicts of interest are inevitable, as questions are beginning to be raised publicly on the costs and alternative benefits from the water. A case study by Thailand Development and Research Institute (TDRI) is already under way to look at the cost and benefits from alternative uses of water yield from the Mae Tang watershed, with irrigated agriculture singled out as one of the possible causes of a decline in water yield.

2.4 National and regional context for mountain development

The development of communities of ethnic minority groups in the mountains cannot be considered independently of the national and regional context of which they are a part. The growth and development of major northern towns such as Chiang Mai, Chiang Rai

are of particular significance. Furthermore, the emerging development of cross-border interactions with China, Myanmar, Laos and Vietnam will affect the mountain communities directly and indirectly.

It is common to see in the popular news media, and even in technical studies, the blame for the loss of Thailand's forest cover being placed on farming by mountain communities, i.e. shifting agriculture. In the next section the correlations between forest loss and provincial populations, total and hilltribes, are examined. The potential impacts from emerging cross-border interactions are then examined. Profiles of Chiang Mai, Chiang Rai and Mae Hong Son, three provinces with large hilltribe populations, are given in Annex I.

2.4.1 Correlation between forest loss and population.

In the seven years from 1982 to 1989, the loss of forest cover in the Northern region averaged over 100,000 hectares per year. This is equivalent to losing an area twice the size of Doi Inthanond National Park every year, six and a half times the area of Doi Suthep-Pui National Park every year, or twice the size of Huai Kha Khaeng World Heritage Reserve every five years.

The following correlations strongly indicate that the forest loss cannot be attributed solely to the ethnic minority groups and their practice of shifting agriculture (Table 2.2)

The annual average loss of forest cover in each province from 1982 to 1989 (RFD Planning Section, unpublished) correlates more strongly with the annual population increase in that province, i.e. the total, largely lowland, population ($R^2 = 0.83$), than with the size of the provincial hilltribe population in 1986 ($R^2 = 0.37$) or 1993 ($R^2 = 0.51$), or the average annual increase in the hilltribe population in each province between 1986 and 1993 ($R^2 = 0.65$).

Nakhon Sawan and Uttaradit have no hilltribe population, yet still lost 30-40 km^2 of forest a year. Chiang Mai, Chiang Rai, Mae Hong Son and Tak together represented more than 75% of the total hilltribe population in the Northern region, but account for only 37% of the 1982-89 forest loss. Petchaboon, Lampang, Phayao and Kamphaeng Phet, on the other hand, with only 6-7% of the hilltribe population, were responsible for 34% of the 1982-89 forest loss. Phetchaboon and Kamphaeng Phet, especially, are noted for their expansion of crop land into the mountains by lowland Thais during this period.

2.4.2 Beyond the borders

Some impact of the emerging cross-border trade can already be seen in the market in Chiang Mai in the form of temperate crops. These can be produced much more cheaply, because of biophysical advantages (lower temperatures, due to higher altitudes and latitudes) as well as cheaper labour, north of the border (Table 2.3).

Table 2.2 *Forest loss and populations in Northern Thailand.*

Province	Forest loss (km^2/year)	Provincial hilltribe population			
		population increase	1986	1993	Annual increase
	(1982-89)	(1982-89)			(1986-93)
Chiang Mai	218.86	48,126	139,965	258,251	16,898
Mae Hong Son	56.43	4,573	82,967	107,156	3,456
Chiang Rai	75.43	11,637	98,105	119,559	3,065
Phayao	73.57	3,779	10,912	14,729	545
Lamphun	25.00	6,504	21,259	27,442	883
Lampang	96.14	13,444	9,573	11,073	214
Phrae	28.00	5,064	8,397	10,813	345
Nan	72.29	7,068	55,147	74,198	2,722
Tak	37.29	7,967	69,448	91,296	3,121
Kampaengpet	78.57	10,476	7,441	9,474	290
Petchaboon	115.86	18,655	8,446	10,262	259
Phitsanulok	39.00	8,981	5,099	5,757	94
Sukhothai	44.43	6,390	2,734	3,809	154
Uthai Thani	22.57	4,166	2,455	5,546	442
Nakornsawan	31.29	11,558	0	0	
Uttaradit	44.43	2,263	0	0	0
Total	1,059.15	170,653	521,948	749,365	32,488

Source: forest loss, Planning Division, RFD; hilltribe population, NSC/NESDB 1993; provincial population, Directory of 73 provinces

2.5 A summary of problems and opportunities

2.5.1 Productivity decline with shorter fallows.

With shorter fallows, but without appropriate changes in management practices (e.g. fertilizer application to compensate for soil fertility-building effects of long fallow), productivity of traditional crops such as upland rice and corn declines as the problems with weeds and pests increase. So far technology generated and extended by the national agricultural research and extension system and various projects has not been sufficiently appropriate to be incorporated into the farming system.

Table 2.3 *Comparison of prices of temperate fruits and flowers in Yunnan, China and Northern Thailand.*

Crop	Price	
	Northern Thailand[1]	Yunnan[2]
Fruits (Baht/kg)		
Pears	14	6-12
Persimmons	20	6-9
Flowers		
Gypsophylla (Baht/kg)	280	45-75
Statice (Baht/kg)	450	18-60
Carnation (Baht/bloom)	2-5	0.45-0.75
Gladiolus (Baht/spray)	5-10	0.6-1.5
Chrysanthemum (Baht/bloom)	7-10	0.75-1.5

1 Prices paid to farmers by Royal Project in 1992

2 Retail prices in Kunming market, variations represent seasonal fluctuations in Kunming and different grades in Thailand; based on conversion rate of 1 Yuan = 3 Baht.

Sources: Survey data

2.5.2 Increasing productivity with cash cropping.

The innovation of cash cropping has provided opportunities to overcome the problem of productivity decline. In contrast to subsistence crops, which almost never receive fertilizer application, cash crops get all the inputs necessary for high yields: irrigation, fertilizers, and pest control. The increase in productivity per unit land has also led to a significant decrease in land required for production. At the extreme, the Royal Project's scheme for flower cultivation in a plastic house has reduced the land need to 50 m^2 per head (compared to 6 ha or 60,000 m^2 needed per head for a rotational shifting cultivation with 10 year cycle).

2.5.3 Instability of cash cropping.

Cash crop production in the highlands is subject to stability and sustainability problems related to both the market and production.

2.5.3.1 Production sustainability.

Without conservation measures, bare soil cultivation under most vegetables and field crops (not unlike the traditional practice for opium) on slopes over 15% is likely to lead to severe soil losses. For a number of intensively cultivated vegetables and flowers, a decline is already beginning to show from heavy use of fertilizers and pesticides. Heavy use of fertilizer in plastic houses for flowers, for example, quickly acidifies the soil and brings out critical nutritional imbalances. Dosage of chemical insecticides used on cabbages tends to increase with time, as the insects become resistant and predators are

killed off, markedly increasing the cost of production. These basically technical problems, however, could be cost effectively solved with appropriate research inputs. For example integrated pest management could be and should be introduced. Strategic research on plant nutrition and soil chemistry could help establish sustainable soil management in the plastic houses.

2.5.3.2 Stability of income from cash crops.

Prices for vegetables such as cabbages and tomatoes can fluctuate wildly. Cut flowers, with a smaller market, fluctuate even more. In 1992, when this project commenced, there was a crash in the price of both tomatoes and cabbages. For a few weeks, tomatoes from Wawi (a crowded highland area in Chiang Rai that has gone heavily into cash cropping) could not even sell at the lowest price. The effect of alternate bearing in lychee, not an uncommon problem in the lowlands, was being keenly felt in many highland villages in the last two seasons.

2.5.4 Nutritional diversity and security

The need to raise productivity of the increasingly limited land has often overridden another important service from shifting agriculture, that is as a source for nutritional diversity and security. The Hmong's shifting agriculture system has been especially famous for its productivity and diversity. It was said that year round food supply could be had from the combined harvests from the opium, upland rice and maize swiddens. This service from shifting agriculture was used by all highland peoples, although their systems may not be as diverse as those of the Hmong. The rush to cash cropping and monocultures has resulted in the loss of this important nutritional service (see case of Khun Klang, Chapter 4 and Annex II). Households and villages which became dependent on just a single crop suffered badly when its price crashed. In addition, an increase in income does not necessarily always translate into improved nutrition, especially for women and children.

2.5.5 The future: long term prospects of cash cropping and irrigated agriculture in the highlands

In the long run, sustainable development in the highlands may be drastically affected by two major events that are taking place in the region.

Firstly, increasing demand for water in the lowlands, especially if the drought continues, will lead to a more critical demand for watershed conservation and "water yield" for the lowlands. Sustainability of irrigated agriculture in the highlands will undoubtedly be at risk, especially as the sprinkler irrigation and wetland rice cultivation, the two major methods used, are considered heavy users of water.

The second event is the growth of border trades in the "golden quadrangle", with China. Agricultural technology for the highlands was developed in the years where the borders were relatively closed. It was based largely on the comparative advantage of the highlands over the rest of the country in the production of temperate crops. This comparative advantage will largely disappear with border trades. Southwestern China has

both the physical advantage in the production of temperate fruits, flowers and vegetables because of its location at higher latitudes as well as altitudes, and the economic advantages of lower wages and costs. The problem is already evident in Hanoi, where the market is flooded with apples, pears etc from Yunnan. Production advantage for tropical crops, e.g. mangoes, longans, pineapples, melons etc, will be in areas south of the borders. Unfortunately for the highlands, they are marginal for these tropicals, and with the borders opening they will also become marginal for the temperates.

CHAPTER 3: METHODOLOGY

3.1 Objectives of the study

Shifting agriculture has long been an important component of the mountain ecosystem of Northern Thailand as well as an essential component of the livelihood system of a sizeable population. This study was conducted in order to provide information relating to land use in the mountains to policymakers. Specifically, the study set out to:

- review the current status of land use in the mountains, especially focusing on changes that have taken place in the last 30 years;
- examine national policy on highland land use, the implementation of various policy emphases and their impact on local communities and their shifting agriculture, and effectiveness of policy in meeting national goals;
- examine patterns of resource use by highland communities; and
- evaluate effects of government policy on land use pattern.

3.2 Conceptualization: agroecosystem perspective

Agriculture is undoubtedly the primary livelihood activity of the highland population. Land use decisions made by a highland farmer invariably encompass more than just the economic and agronomic processes. Ecological as well as social and political relationships often feature strongly in these decisions. However, compared with lowland agriculture, the agricultural system of the highlands is less well defined in terms of these ecological, social and economic components and relationships. Understanding of traditional shifting agriculture requires a broader perspective of agriculture that includes a

> "new complex agro-socio-economic-ecological system, bounded in several dimensions, that we call an **agroecosystem**" (Conway and Barbier 1990).

The village's communal organization plays a crucial role in resource management. Relationships with neighbouring communities and beyond, at the national, regional and global level, are becoming increasingly important. This is a result of the mountain area growing more crowded, increasing communication, transportation and trade, and growing demand from the rest of the country for the increasingly scarce resources of land and water. In addition there is the growing national and international awareness and demand to protect the environment, to conserve resources and natural heritage for posterity. We consider the agroecosystem in its **hierarchical** structure and organization:

crop
cropping system
farming system
community/village
small watershed
large watershed/district or province
national system
regional system
global system

This allows an analysis that is flexible and adaptive. Functional relationships can be followed to any level that is necessary. Analytical constraint of single focus on a particular hierarchical level can be overcome.

The fact that fields in fallow are an integral part of shifting agriculture has long been definitively reported (e.g. see Nye and Greenland 1960; Zinke et al 1978). Yet, agricultural development efforts in the mountains of Northern Thailand rarely, if ever, consider the land in fallow when assessing land use. The focus has largely been on the field that is cropped in the current year. The "crop" focus has also generally neglected all other domesticated species that are grown in association with the major crops of rice, maize or opium. The "agriculture only" focus has also led to the neglect of other land use activities which are important to people's livelihood and may have significant impact on the environment and conservation, e.g. gathering of minor forest products.

Political and social processes at the community or village level have always played a crucial role in land management in shifting agriculture. Economic, political and social linkages with the more densely populated lowlands, i.e. the rest of Thailand, are increasing with better communications and transport. The boundary of the system in which ecological processes are important is being broadened by intensification of resource use in the lowlands and in the mountains. Ultimately, there is the link into the global market and international concern over drugs and forest and biodiversity conservation. For Northern Thailand, however, there is an immediate prospect of the impact of the emerging "Golden Quadrangle", the area that covers the Yunnan province of China, upper Myanmar, Laos and Northern Thailand. In addition to more trades, the increasing cross-border traffic in this region will also mean increasing social and ecological interaction.

3.3 Review of literature and official records and documents

Since 1978 and "Farmers in the Forest" (Kunstadter et al 1978) and a few other papers that came out about the same time (e.g. Nakano 1978) there have been very few definitive published reports about shifting agriculture in Northern Thailand. Major changes that have taken place since then have made some of these earlier accounts rather out of date. Nevertheless, some of the studies have remained the only definitive accounts of ecological, economic and social processes in shifting agriculture in Northern Thailand.

However, much data and information has been gathered by various projects and government agencies since then. These are largely unpublished, and normally recorded in Thai. Documents from projects were produced in limited number and with limited circulation. Some of the changes recorded in this study have come from analysis of these file data. We have tried to document the source of such information as far as possible.

File data that have been used in this study includes that from:

Department of Public Welfare
Royal Forestry Department
Thai-Australia Highland Agricultural and Social Development Project
Thai-German Highland Development Project

United Nations Highland Development Projects
Northern Development Centre, National Economic and Social Development Board
Royal Project

3.4 Description of field research

To meet the four objectives listed in section 3.1 above, the field research activities focused on two different levels.

3.4.1 A reconnaissance survey using Rapid Rural Appraisal (RRA)

To cover the diverse range of highland communities (different ethnic groups, population density, altitudes, transportation and market access, cropping systems, leadership, external support) Rapid Appraisal surveys of a total of 14 villages in five provinces were conducted over 12 months. (In brackets are the village's ethnic groups)

Chiang Mai Province
- Pah Poo Chom (Hmong)
- Lo Pah Krai (Lahu)
- Khun Klang (Hmong)
- Yang Sarn (Karen)

Lampang Province
- Ban Mae Sarn, Pah Daeng (Yao)
- Mae Hang Nua (Karen)
- Yang Klang (Karen)

Nan Province
- Nam Sod (H'tin)

Mae Hong Son Province
- Mae Rid Pagae (Karen)
- Pang Kam Noi (Lahu)
- La Oop (Lua)
- Tissa (Karen)
- Mae Ngan Luang (Karen)

Chiang Rai Province
- Mae Salap (Akha)

For each village, the current agricultural systems, and implementation of various emphases of government policy were described against the background of the original shifting agriculture, where possible. Assessment of the system's success was made in discussion with:
- villagers, partly by comparison with past experience;
- government and project field workers;
- relevant local government agencies.

Fields were examined wherever possible. In this assessment we focused on:

- the system's **productivity**
- its physical and economic **stability**
- its potential **sustainability**

3.4.2 Agroecosystem analysis (AEA) of four highland villages

From the 14 villages above, four villages were chosen deliberately for detailed study. Two of these were identified as the most "successful", thus also most likely to give answers to the questions:

- How may this "success" be defined?
- What are the major factors related to the "success" and problems?
- What policy elements have had positive and negative effects on the "success"?

The two most "successful" villages were:

- Pah Poo Chom (Hmong - originally opium growing, pioneer shifting cultivator) was chosen partly because of its long documented history which, significantly, included a 1970s prediction of its sustainability problem and potential collapse.

- Mae Rid Pagae (Karen - original rotational shifting cultivator) has combined cash cropping with subsistence rice production which has given rise to a production system that is both productive and relatively stable, in spite of the fluctuation of cabbage prices.

Two villages studied were still practising rotational shifting agriculture:

- Tissa (Karen - rotational shifting agriculture primary livelihood activity), is facing pressure on the land.

- La Oop (Lua - rotational shifting agriculture supplemented by a diverse range of livelihood activities including wetland rice), able to maintain traditional rotational practice, including long fallow period.

In addition to the above rapid survey, detailed study of agricultural systems in the four villages included:

- more rapid appraisals on
  - land use, agricultural and conservation practices by individual farmers
  - communal land management and conservation

- structured questionnaires for selected farmers to assess
  - sources of income
  - land use, agricultural and conservation practices

- discussions with groups of farmers on
  - communal aspects of land management and conservation

- detailed study of specific processes related to sustainable land management, e.g.
  - contour vegetative strips
  - crop rotation and cropping systems
  - irrigation management
  - pest control
  - local organization.

SECTION II: ANALYSIS OF RESULTS

CHAPTER 4: OVERVIEW OF MOUNTAIN VILLAGES

A total of 14 villages are described below (Figure 4.1). The people's livelihood and their use of resource are influenced by national policy in different ways. Most significant were discrepancies and antagonistic effects of Highland Development Policy on the one hand and Forest Protection Policy on the other (Table 4.1).

Table 4.1 *A summary of major village land use features and the implementation of national highland development and forest policy in 14 mountain villages.*

Province/Village	**Features/Policy implementation**
Chiang Mai province (Figure 4.2)	
Pah Poo Chom	Agriculture development (intensification, irrigation) and soil and forest conservation, the only village in this study with a legal basis for right to land use.
Lo Pah Krai	Agriculture development (intensification, irrigation and soil conservation, but lost a sizeable tract of land, as land use right was revoked by RFD for section of village land classified as "E" (i.e. suitable for economic development) in a concession for *Eucalyptus* plantation given to state owned Forestry Industry Organization.
Khun Klang	Agricultural development (highly intensive), subsidized production and marketing, presence in Inthanond national park "tolerated" by RFD, but with extremely restricted land use.
Yang Sarn	No public development assistance, but land use restricted by RFD, responded to pressure on land by intensification of land use (permanent cropping, or very short fallow) and commercialization with soybean as cash crop.
Mae Ngan Luang	Traditional rotational shifting agriculture village that had for many years adopted opium poppy growing technology from the Hmong. In response to strict law enforcement on illicit cultivation village has stopped growing opium since 1990. The village had been in this location for 160 years, population pressure has also forced groups of families to split off and form three more villages.
Lampang province (Figure 4.3)	
Ban Mae Sarn/ Pha Daeng	Agricultural development, "sustainable" fruit trees and coffee, but has since been enclosed in boundary of new national park, targeted for relocation at a very poor site.

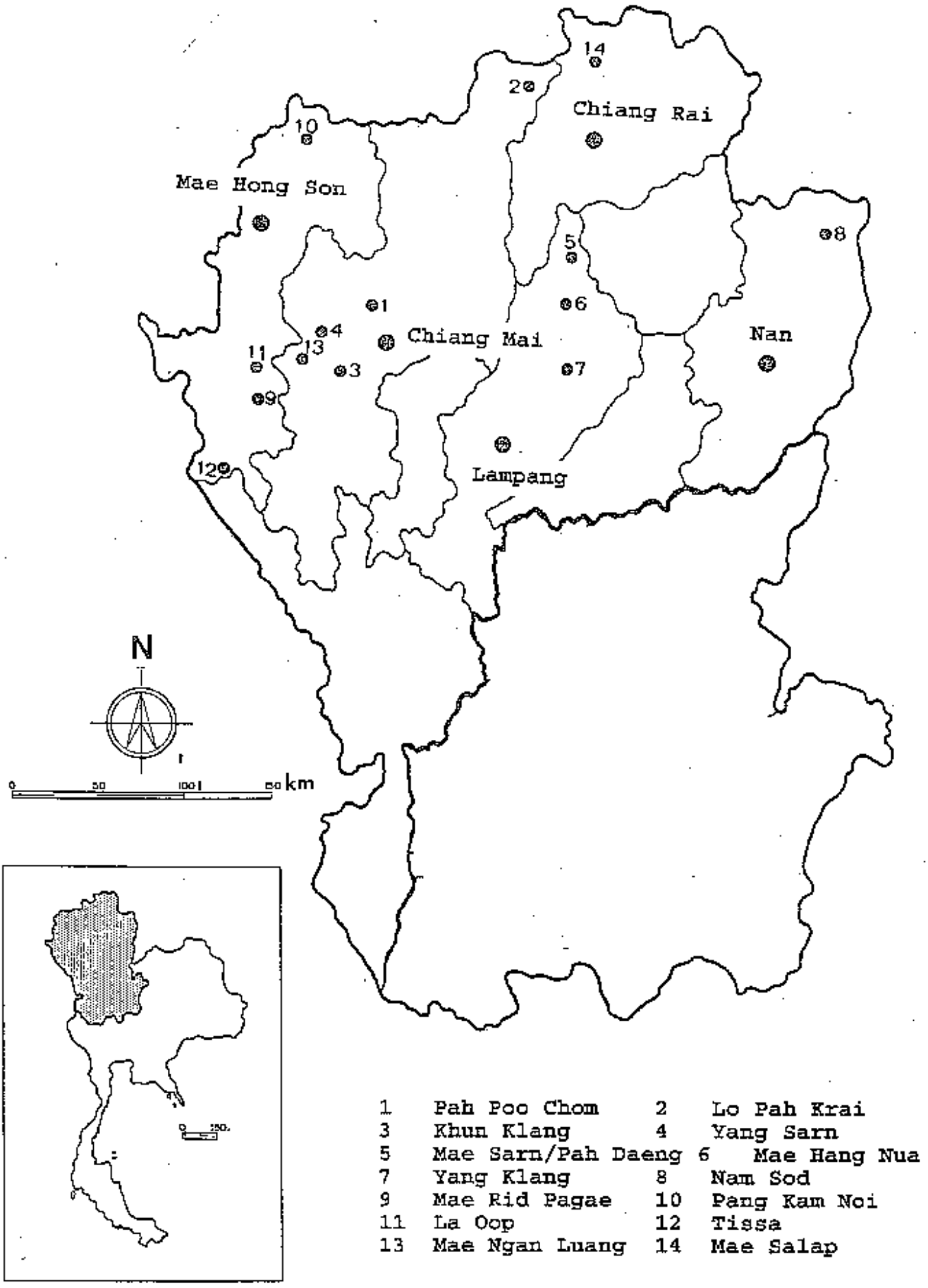


Figure 4.1 Location of 14 villages surveyed for the mountain villages overview

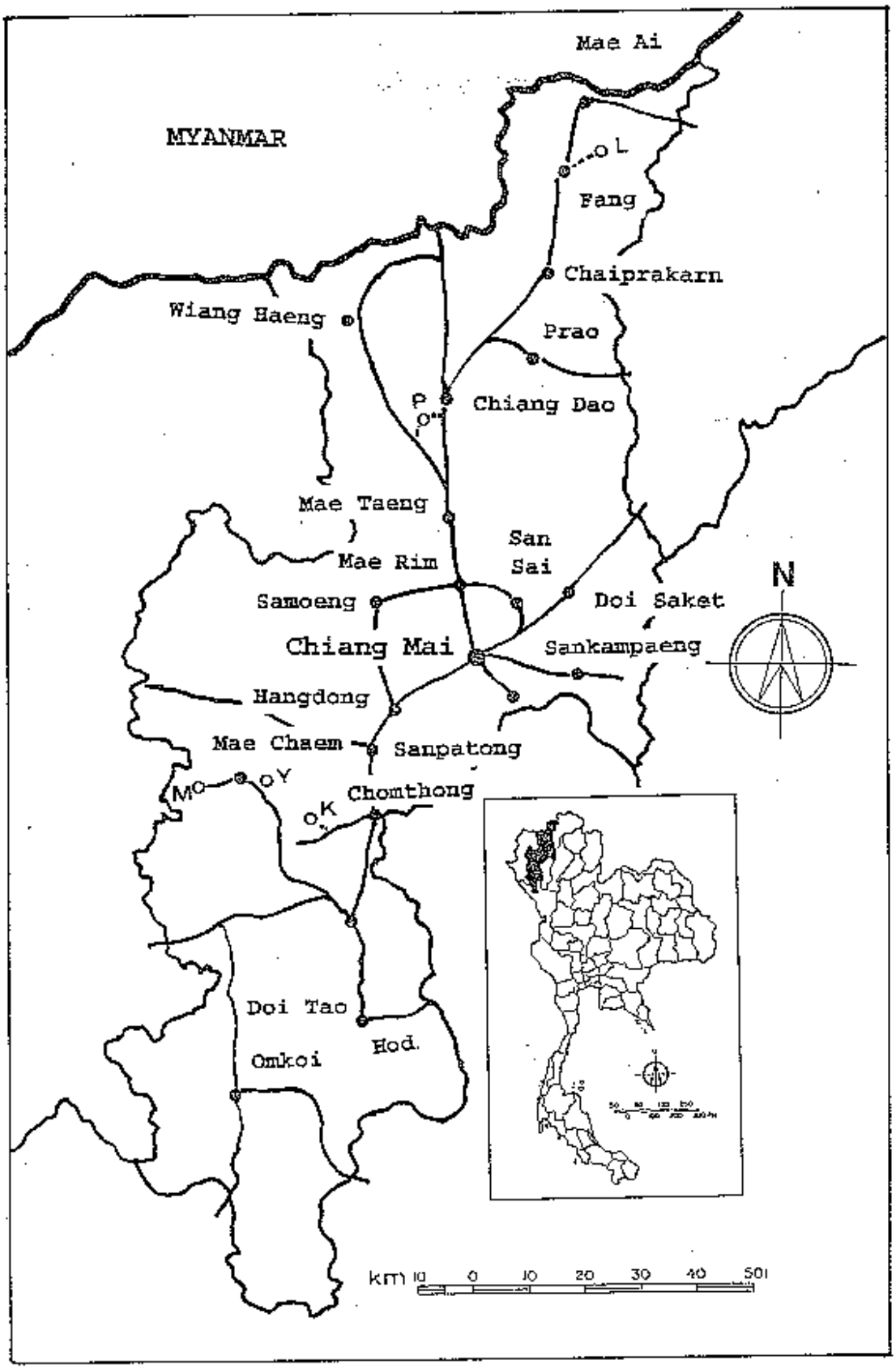


Figure 4.2 Location of five study villages in Chiang Mai Province (L = Lo Pah Krai, P = Pah Poo Chom, K = Khun Klang, Y = Yang Sarn, M = Mae Ngan Luang)

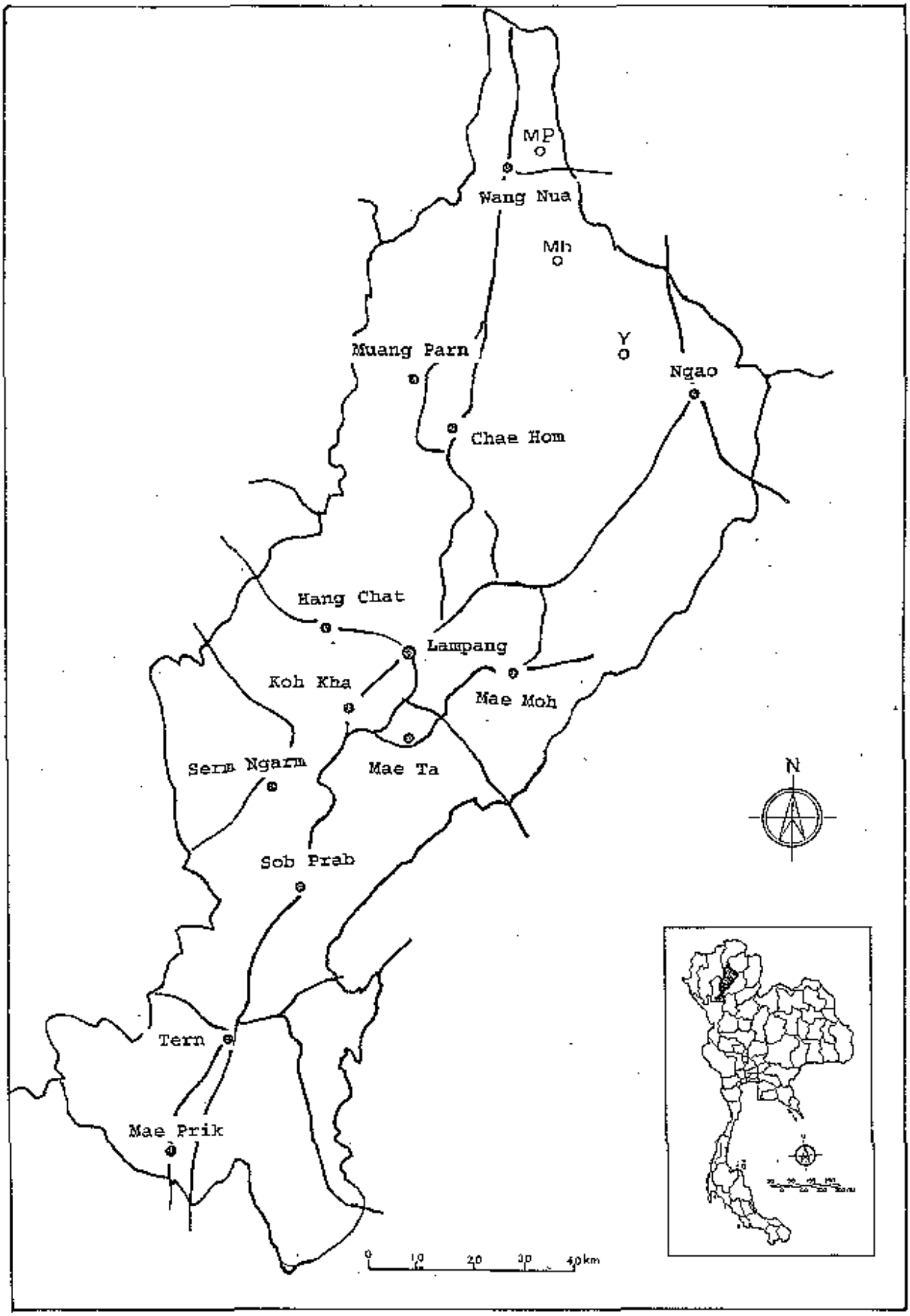


Figure 4.3 Location of three study villages in Lampang Province: Mae Sarn/Pha Daeng (MP), Mae Hang Nua (Mh) and Yang Klang (Y)

Mae Hang Nua	Agricultural development, practices soil conservation and planted tree crops on steep slopes, but village located in area classed "C" by RFD, i.e. legally no use allowed.
Yang Klang	Little development assistance, poor with only one alternative source of income from gathering bamboo shoots for sale, but this use of forest is restricted by RFD.

Nan province (Figure 4.4)

Nam Sod	Agricultural development, but coffee as cash crop started to bear when price was low. Restriction on land use appeared to be minimal.

Mae Hong Son province (Figure 4.5)

Mae Rid Pagae	Agricultural development (intensification with multiple cropping, irrigation, soil conservation practices including communal land use planning); village land in "E" (within legal limit for appropriate economic development), in the process to secure long term lease from RFD.
Pang Kam Noi	Self developed alternative agriculture (livestock) to supplement income from shifting agriculture. Located in Wildlife Reserve, land use restricted, but its presence so far "tolerated". Institutional "failure" in the absence of legal basis of land ownership highlighted in conflicts over land use right with neighbouring villages with complicated historical, political and economic connections.
La Oop	Traditional rotational shifting agriculture village, with 8-9 year rotational cycle still maintained with substantial paddy land, large village by highland standards, with highly diverse livelihood activities. No development assistance. Lost 1,000 *rai* (160 ha) of village common forested land to a new Hmong settlement in 1970s.
Tissa	Traditional rotation shifting agriculture village, rotation cycle shortened to 3-5 years, very little paddy land. Minimum development assistance, strong communal management of common forest resource which provides significant contribution to income from sale of forest products and food. "Ban on burning" proclaimed by Governor of Mae Hong Son interpreted as "ban on shifting agriculture".

Chiang Rai Province (Figure 4.6)

Mae Salap	Newly settled twin village, recipient of several waves of recent migration, in response to political disturbances, commercialization and government conservation activities. Rather crowded.

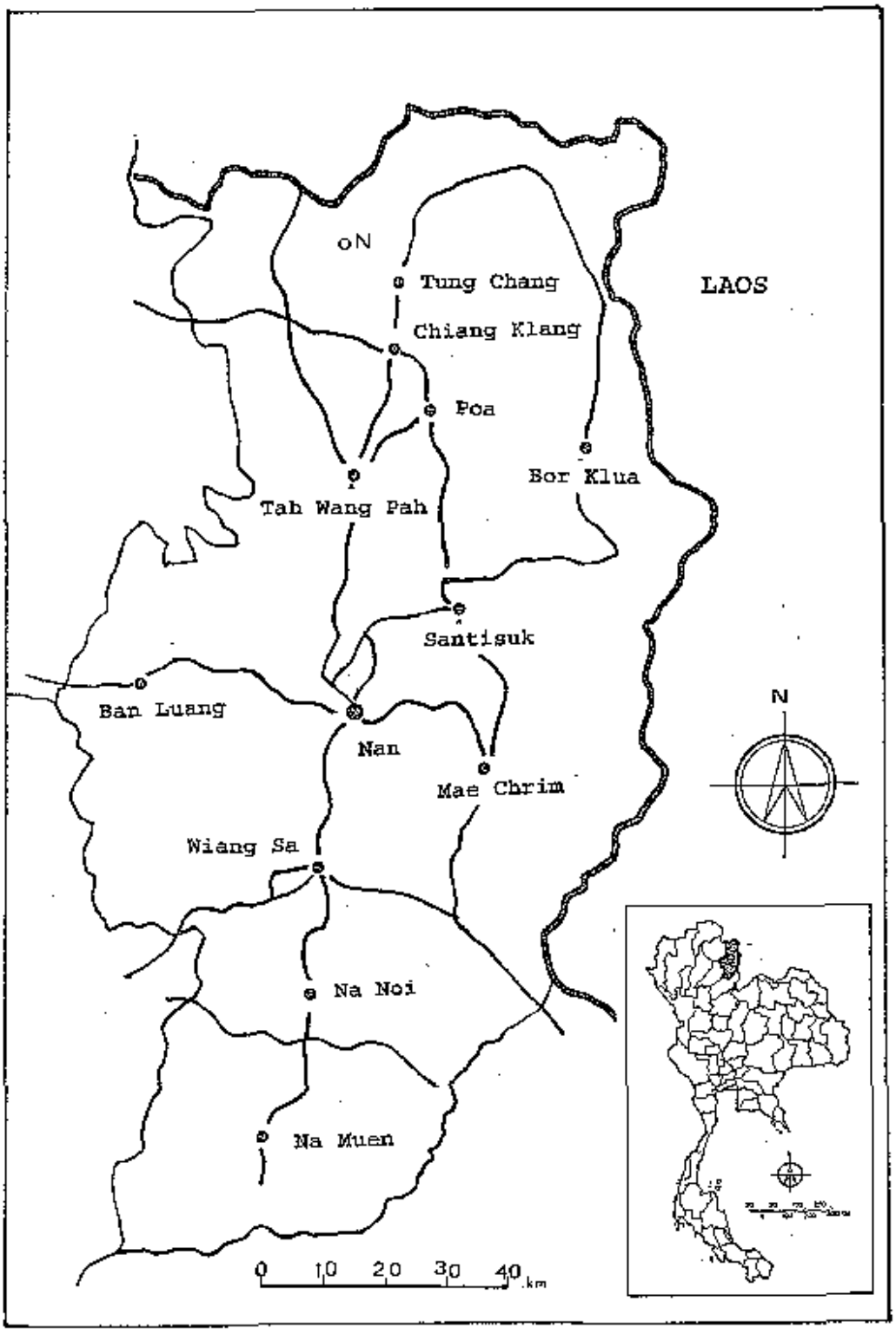


Figure 4.4 Location of Nam Sod (oN), the study village in Nan Province

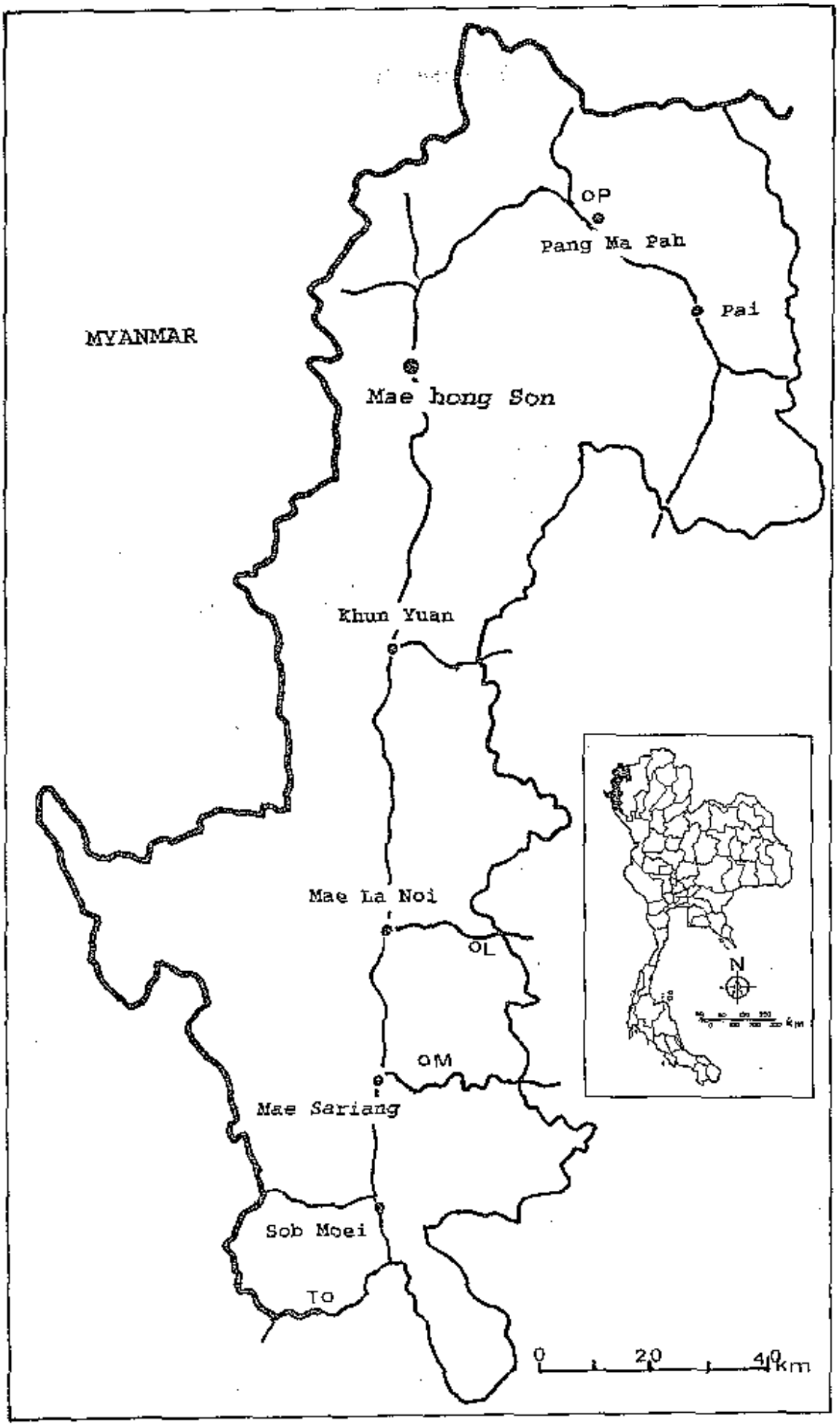


Figure 4.5 Location of four study villages in Mae Hong Son Province (M = Mae Rid Pagae, P = Pang Kam Noi, L = La Oop, T = Tissa)

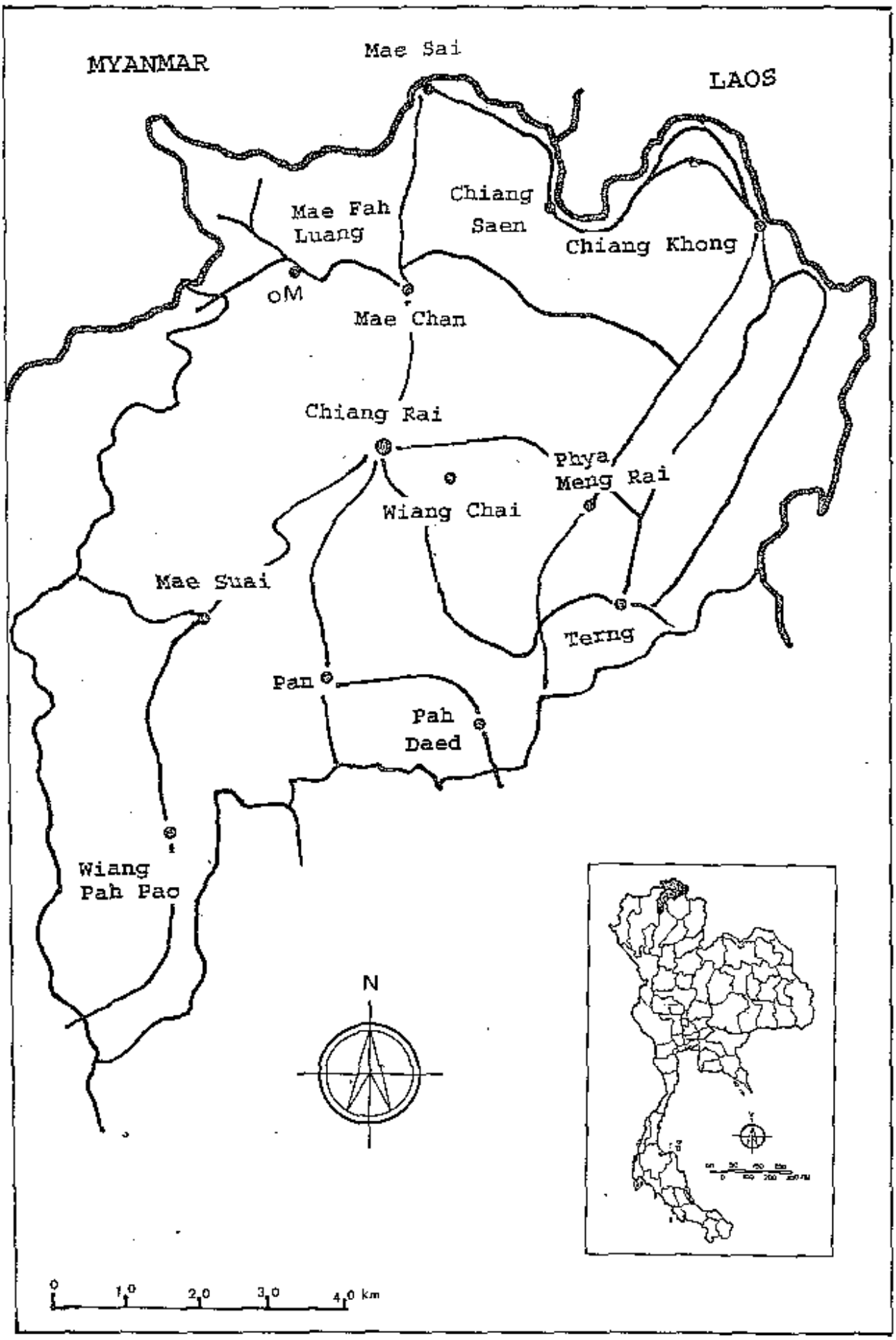


Figure 4.6 Location of the study village of Mae Salap (M) in Chiang Rai Province

Beginning to go into cash cropping with ginger which is extremely short-lived as a production system, due to disease build up. Large section of population dependent on off-village employment.

More detailed descriptions of the fourteen villages, including the production systems and impacts of policy, are given in Annex II.

CHAPTER 5: VILLAGE AGROECOSYSTEM ANALYSIS - MAE RID PAGAE

5.1 Context

5.1.1 Historical background

This Skaw Karen village settled at this location some 50 years ago. The search for new land was the reason for this relocation. Before 1980 they practised rotational agriculture, developed paddies for wetland rice along the Mae Rid river and were involved in opium production. A number of older men in their 40s and 50s, including the current village head, admitted to having been opium addicts in their youth. In comparison with the current relative prosperity, villagers said of the old days: "Life was hard. Every few years the rice crop did not produce enough. When this happened we had to walk into Mae Sariang (nearest district town) to find work". The current production system has been in operation for about ten years, and is summarised in Annex II.9.

5.1.2 Social and economic context

5.1.2.1 Administrative organization and assistance

The village of Mae Rid Pagae is a recognized satellite of the official village no. 1 of Mae Hoh subdistrict, Mae Sariang District, Mae Hong Son Province.

The Public Welfare Department of the Ministry of Interior set up its Zone office in the village in 1979. Mae Rid Pagae was included in the Thai-Australia Highland Agricultural and Social Development Project (TA-HASD) from 1989. The assistance translated into improved access to government support and services such as schools, health services, roads, transportation, agricultural extension and, for four years from 1989, access to inputs and credit at low rate of interest, and in 1993 investment in an irrigation facility. Direct assistance to farmers in terms of agricultural inputs and the irrigation system made up a total of $11,635 over four years (Table 5.1).

5.1.2.2 Population

Mae Sariang district, to which Mae Rid Pagae belongs, has an area of 2,587 km^2 and a total population of 46,963 (1993), including a hilltribe population of 16,415. The Mae Hoh subdistrict has a hilltribe population of 4,675 in 48 communities, all except one Karen, with a total land area of about one tenth of Mae Sariang, i.e. overall average of 5.5 ha/head. According to Kunstadter (1978) rotational shifting agriculture with full ten year cycle requires about 3 ha/head for the total population.

5.1.2.3 Market linkages

Mae Rid Pagae is connected to a paved road by 15 km of dirt road which is sufficiently wide to accommodate pickup trucks and is passable in the dry season. The trucks are fitted with chains during the wet season, from May to September. By means of these small trucks, and sometimes motorcycles, cabbages carried from the field on farmer's

Table 5.1 *Assistance from TA-HASD project to Mae Rid Pagae Village from 1989 to 1993.*

Support	Baht	
Seedlings	85,638	
Fruit trees	61,856	
Bamboo	18,832	
Coffee	3,750	
Tea	1,200	
Fertilizer and seed	135,251	
Wet rice	16,074	
Upland rice	48,880	
Corn	9,688	
Cabbages	28,200	
Bell pepper	24,780	
Coffee	7,629	
Irrigation	70,000	
Total	290,881	(US$ 11,635)

Source: TA-HASD Project File

back to the dirt road are assembled at points along the paved road. These small truck assemblers are normally local buyers, sometimes from another hilltribe village, often Hmong. From the assembly point on the paved road, cabbages are loaded onto large ten-wheel trucks for shipment to Bangkok and beyond. The large buyers may come from *Chiang Mai or Bangkok.*

The buyers, large and small, are normally the most effective in bringing market information and accompanying technology to the village. Cabbages were introduced to Mae Rid Pagae by a buyer who interested two farmers in a "trial". After the first success, the crop was soon taken up by the whole village. The introduction of bell pepper or capsicum was similar. The crop was brought to the village by *Che Noi*, a buyer from one major growing area in the lowland for one farmer to try in 1992. The success of this farmer in the very first year was reputed to earn him 50,000 baht ($2,000) per *rai*. By 1994 the crop was grown by many farmers in the village.

For inputs such as fertilizer, seed and pesticides farmers may buy from visiting salespeople who regularly visit the villages. They may also go into Mae Sariang, the nearest district town for supply. One enterprising Mae Rid Pagae villager, Modi, has set up a store at a junction just outside the village selling agricultural supplies as well as household items.

Recently, specialized buyers for a processing factory which export to Japan have become active in the village, buying larger cabbages which are normally rejected by local

markets. For farmers, this is highly favourable, as more larger cabbages means higher yield per hectare. The buyers, however, have placed a strict requirement that the cabbages must be free of insecticides in order to meet health regulations in Japan.

5.1.3 Ecological context

Mae Rid Pagae is situated in the watershed of Mae Rid River, which is a tributary of Mae Sariang river. The Mae Sariang is in turn part of the Mae Yuam, which joins the Moei, a larger river which runs along the border with Myanmar. All these are part of the watershed of the Salween, one of Myanmar's primary rivers. (Figure 5.1) The Mae Rid, Mae Sariang and Mae Yuam all make significant contributions to wetland rice agriculture in villages within their reach in Mae Hong Son. As dry season irrigation is discovered along these rivers competition for water will intensify. The fact that this is part of Myanmar's watershed tends to lessen pressure for watershed conservation.

5.2 Patterns and processes

5.2.1 Physical characteristics

The village is situated at 1,200 m altitude, almost at the top of Mae Rid watershed. It has long claimed and developed 160 *rai* (25.6 ha) of flat land along the Mae Rid river for wetland rice. More than half of the village upland fields are on slopes over 35%. Soils on the village slopes differ from most highland soils in Northern Thailand in that they have good natural structure, i.e. crumbly when dry with very good internal drainage. A detailed monitoring of erosion on a similar soil at a nearby village of Mae Sawan Noi by the Thai-Australia Highland Agricultural and Social Development Project showed that much less surface runoff and erosion occur on this soil (TA-HASD 1992). A recent land use map shows that the village is still surrounded by relatively intact forest. A communal irrigation system serves the paddy land, for rice in the wet season and cabbage in the dry season. A new irrigation system has been developed for land on the slopes for dry season production of vegetables.

5.2.2 Livelihood activities

Cultivation of rice and cabbages are the major income earning activities in the village. Each household is dependent on at least three income earning activities (Table 5.2).

All households are engaged in raising small livestock (pigs and chickens) and gathering minor forest products. The latter include firewood for fuel, timber and bamboo for construction and other uses and seasonal products for food such as bamboo shoots, mushrooms, greens and herbs. Households engaged in weaving are usually those with young women in the family.

5.2.3 Activity calendar

The year starts with "slash and burning" before the rains (Figure 5.2). Upland rice and maize with accompanying crops of beans, gourds, etc. are planted from April to May.

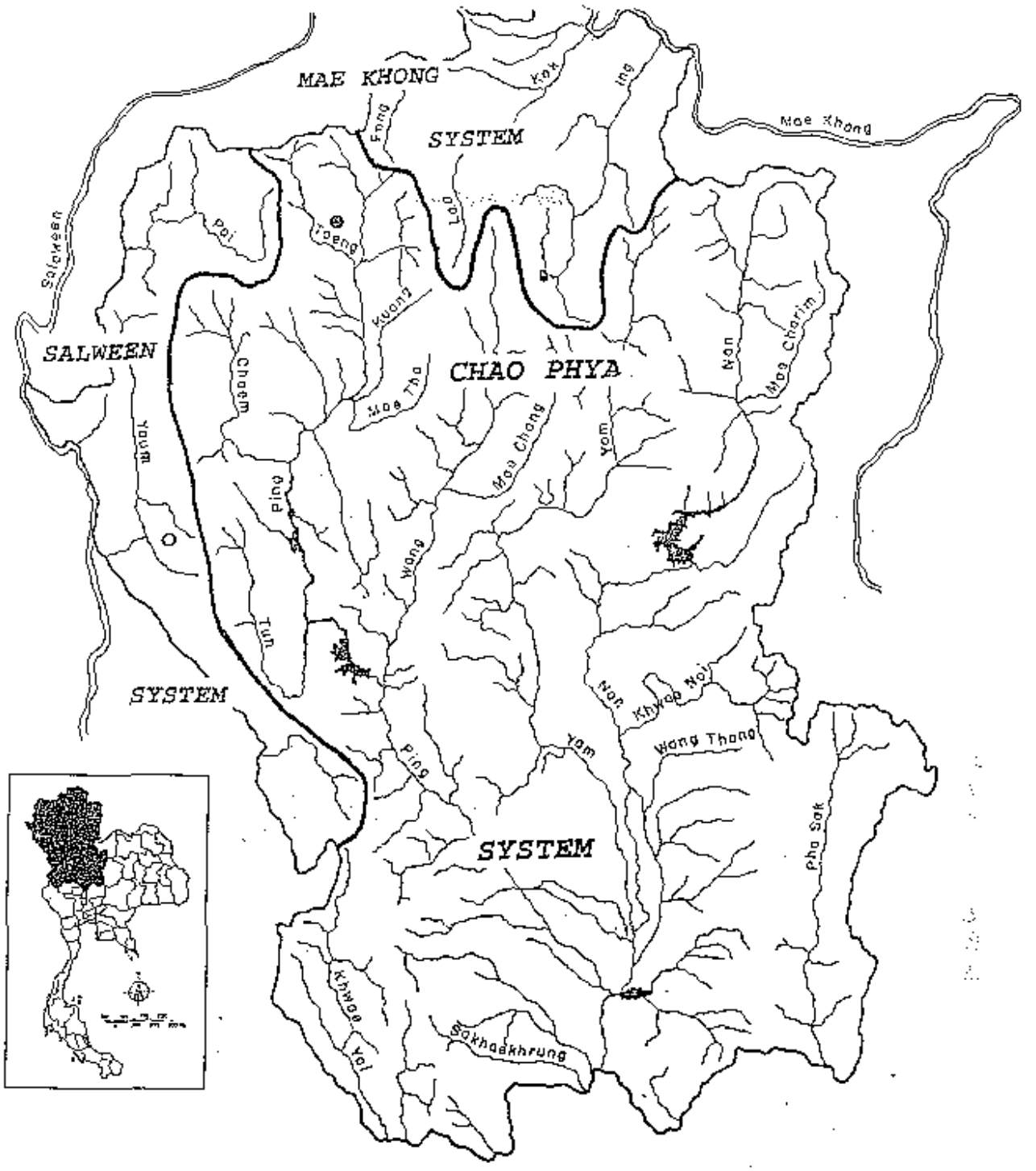


Figure 5.1 The Chao Phya Drainage System, with location of Pah Poo Chom (e) in Mae Taeng Watershed, and Mae Rid Pagae (o) in Salween Drainage System

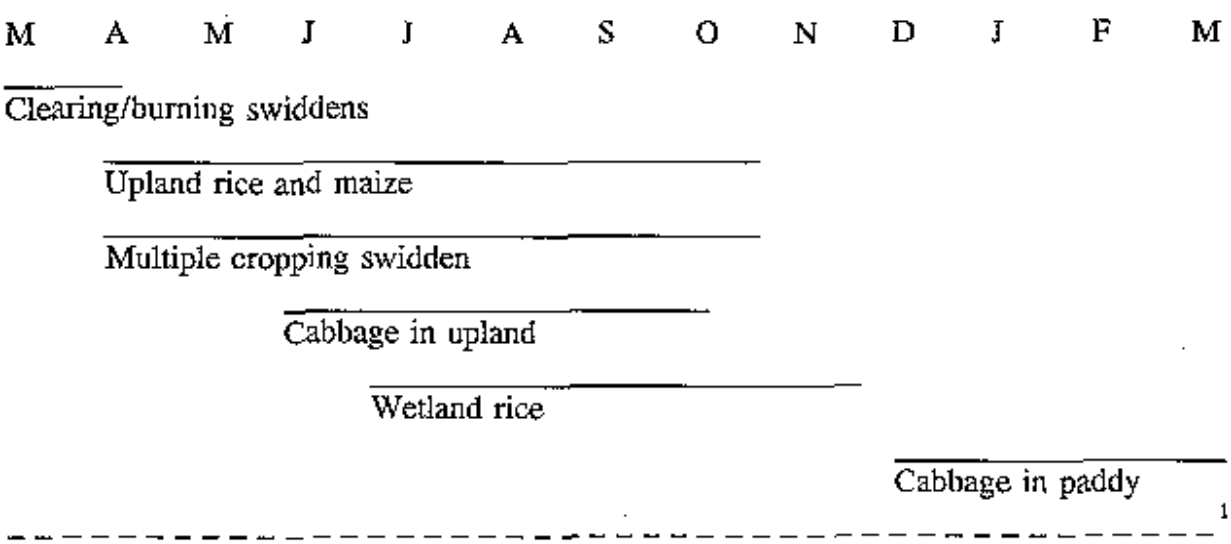
Table 5.2 Livelihood activities of villagers in Mae Rid Pagae.

Activity	% households involved	% contribution to income
Cabbages	90	20-50
Wetland rice	70	30-70
Upland rice	70	20-50
Multiple cropping in swiddens	70	nd[1]
Maize/pigs/chickens	100	20-35
Cattle	50	20-40
Weaving	60	10-20
Forest minor products including firewood	100	nd[1]

[1] not determined
Source: Survey 1993.

The harvest from these start to be gathered for food within 2 months and may continue to be harvested for the kitchen long into dry season after the end of the year. In years of good prices there may be some early cabbages in the upland after the rains have started, or they may be delayed until July/August. Land preparation for upland rice begins in June, seedlings are transplanted in July to August. After the rice is harvested in November/December some of the paddies are prepared for dry season cabbage. Gathering of firewood is done once every few days. Weaving and raising of small livestock are women's work and young women carried out whenever there is some "spare time".

Figure 5.2 Activity calendar of farming activities in Mae Rid Pagae.



[1] intermittently throughout the year
Source: Survey 1993.

5.2.4 Land use

For a population of 174, Mae Rid Pagae has about 800 *rai* (128 ha) under cultivation, 20% of which has been levelled and developed for wetland rice (Figure 5.3). The paddies are worked privately, there is not even labour exchange, which is common in the lowlands. The village now has more than 10 walking tractors which are used in land preparation. The village also has access to a nearby forest area of 3,020 *rai* (483 ha), some of which is regrowth from old fallow.

5.2.5 Cropping systems

Two major systems have evolved since the village adopted permanent cropping. In both systems, different crops are grown in rotation on one piece of land, one of the crops being rice and other crops are mainly cash crops.

(i) In upland fields on slopes, cabbages and upland rice are grown in alternate years. Bell peppers are now also grown in place of cabbages. Traditional swidden crops are also grown with upland rice.

With assistance from the Thai-Australia Highland Agricultural and Social Development (TA-HASD) project, in the form of tree seedlings and inputs, and on the advice of TA-HASD project staff as a soil/water conservation effort, since 1991 farmers began to put in fruit trees and bamboo (for bamboo shoots) on the steeper slopes (>35%) of their uplands and place contour strips of grasses and wild plants which were allowed to grow have been placed across the slopes.

Upland rice and cash crops of cabbages and bell peppers are now grown between these young trees and bamboos. After cabbages and bell peppers, which are kept weed free, there is very little litter. Because of this, and also because of the trees, in these fields farmers now rarely burn before the rice crop. Some "shifting agriculture" is, however, still practised by those households with a lot of land. In these cases certain parcels are left in fallow for a few years before they are cleared, burned and cropped again.

The cabbages and bell peppers are heavily fertilized, with a formulated fertilizer (N-P_2O_5-K_2O at 16-20-0%) and ammonium sulphate, whereas the upland rice is never fertilized.

(ii) In the paddy, wetland rice is grown in the wet season, followed by irrigated cabbages in the dry season. In addition to chemical fertilizers of the same formulae as the uplands, cabbages in the paddy also receive farmyard manure which must be brought in from the lowlands.

Farmers reported that their rice in either systems never received any fertilizer. This is in spite of the project's record of fertilizer worth 48,880 baht having been distributed at farmers' request for their upland rice and another 16,074 baht worth for the wetland rice (see Table 5.1, above). In the village it was explained that, following cabbages the rice crop now yields twice or even three times what they used to. "Obviously the rice gets enough fertilizer left over from cabbages, there is no need to give it anymore." Evidence of extremely good growth and yields can be seen in the field during or even after harvest.

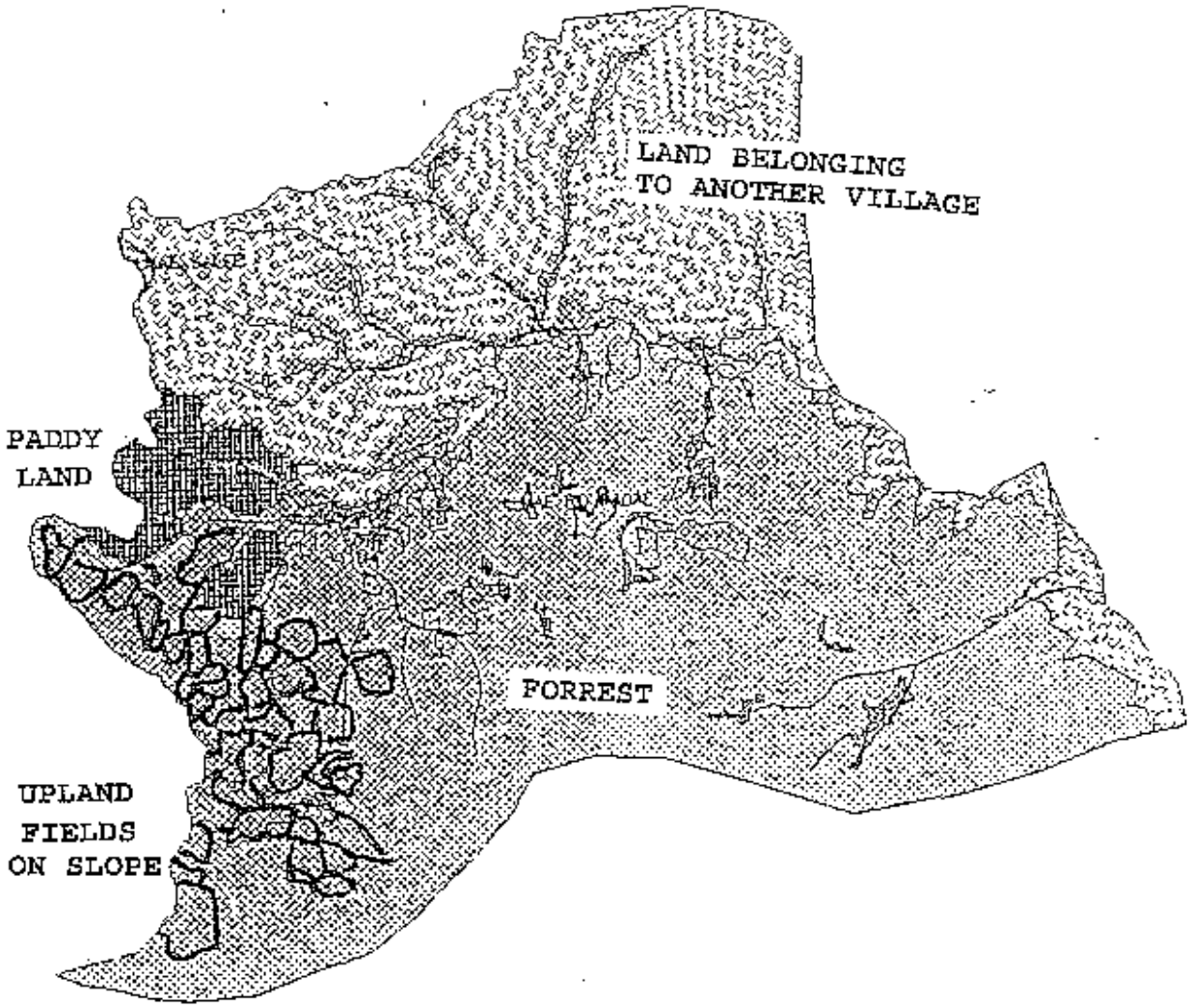


Figure 5.3 Land use map of Mae Rid Pagae

All farmers interviewed reported that their rice yields now are twice or triple what they used to be before cabbages were introduced.

5.3 Organization and management

5.3.1 Household organization and economics

The average household in Mae Rid Pagae has 4.8 members, which is basically just the nuclear family. Certain tasks are gender specific, e.g. cooking, looking after small livestock, weaving and milling of rice (still done manually) are jobs for women, while ploughing the field, woodwork and bamboo crafts including house building and repair are jobs for men.

All of the rice, wetland and upland, is grown for home use. Some maize is grown for livestock. Although access to town is now relatively easy, most food consumed daily is still produced in the village or comes from the nearby forest.

Beans, pumpkins, gourds, chillies, yams, as well as herbs and spices, etc. are harvested from the swiddens from early in the wet season right to the end of the year, many are stored until next year. Mushrooms, bamboo shoots and young shoots of wild species are collected with the first rains. Cabbages are used for food, especially the small buds that develop after the main head has been harvested which are used both fresh and preserved by first pickling and then drying.

Labour for the cash crops still comes entirely from the household. When counting "profit" from the cash crops, farmers generally consider return against just the cash input, not including household labour. The general perception in Mae Rid Pagae is that, without hired labour the cost of production of cabbages in about 0.5 baht/kg, whereas if hired labour is used the cost of production rises to about 1.2 baht/kg. On the other hand, labour supply in the village appeared to be rather limited, from outside as well as within the village.

5.3.2 Communal institutions and resource management

In the old days, this Karen village did not organize the management of their rotational shifting agriculture communally as did the Lua described by Kunstadter (1978). According to the village headman, "we cleared and cropped where and when according to our individual need and ability". In this way, Mae Rid Pagae resembles Kunstadter's Karen village of Laykawkey, another Skaw Karen. Nevertheless, there was an unwritten and rarely spoken of communal code for land management that covered traditional rights to land use within the village as well as with neighbouring villages and the management of the irrigation system for the paddy land.

The wetland rice fields are privately owned. The right to land that has been under shifting agriculture is recognized within the village, including pieces of land currently not cultivated. The right to use a piece of land is still commonly shared with those who need it. For example, land within the command area of the new irrigation system has been

communally "redistributed" to accommodate the needs of those whose land was outside the area.

TA-HASD provided seedlings of tree crops, fertilizers and seeds to farmers who agreed to adopt soil and water conservation practices. From 13 households in the first two years, every household in the village is now involved. The value of these inputs were entered as a loan into each farmer's account in the Village Revolving Fund. For short term crops, i.e. cabbages and rice, the loans were repaid after harvest and/or sale with a small interest of 3% over the crop season. The money accumulates as a "village revolving fund", is managed by a village committee, and is available for loan within the village, but with a relatively high interest of 20% over about 5 months. Most of the loans are used to buy inputs for the cash crops.

The village has a communal irrigation system that is already functional for the irrigated wetland rice. The new introduction of piped domestic water and an irrigation system for the uplands are testing the communal management skills of the village council. Domestic water supply consists of a number of common taps at a few points in the village, supplied by gravity from a mountain stream. The village headman complained about the lack of "care" by users: most taps could no longer be turned off. Questions are also being raised about who would benefit from the new irrigation system for dry season cabbages and bell peppers in the upland.

Now that cash cropping an important economic activity, control of the village's 55 head of cattle and buffaloes is an important communal organizational matter. The simple rules are as follows: during the day, the responsibility rests with owners of the crops to protect their own with fencing, etc. At night, when the animals are brought in and kept at home, their owners are responsible if they break loose and destroy other people's crops.

5.3.3 Technology and indigenous knowledge

Agricultural technology now used in the village is a blend of some new ideas and traditional knowledge:

(i) Plants. The rice varieties grown in both the wetland and upland are still traditional varieties. Traditional species grown in association with upland rice include the legumes, cucurbits, chillies, taro, eggplants, Job's tears, sesame and maize. The seeds are in the care of the women of the house. They are kept in the rack above the fireplace in the kitchen, protected against the damp and insects by the heat and smoke. As pumpkins, gourds, cucumbers etc. are eaten, their seeds are collected in a basket, allowed to dry for next year's sowing. Most notable are the legumes. Each household commonly has 4-5 kinds of cowpeas (Vigna unguiculata), a rice bean (Vigna umbellata), sometimes beans (Phaseolus vulgaris) are found in the collection. The cowpeas and beans are used as green pods, mature but still fresh seed and dry seeds. The rice bean is used as dry bean. The village does not have much of a homegarden. There are only a few trees near the houses. For a village still with access to timber from the forest, there was quite some excitement in the village when one farmer made a considerable sum by selling, to a buyer from outside the village, a jack fruit tree (normally grown for fruit) that was made into planks. It should be noted that selling timber from the forest is illegal and now highly

risky. There were also 5-6 herb species collected from the forest drying in bunches that we had not been able to identify.

Cabbages and bell pepper are imported modern hybrids bought in cans. Coffee, bamboo and various fruit trees are all recent introductions.

(ii) Crop management. The old "opium technology" has been transferred to cabbages and bell pepper to some extent. One difference was that opium was sown directly , whereas cabbages and peppers are transplanted. And unlike opium, the two new cash crops are also largely grown unmixed with other edible species. Once they are established, both cabbages and peppers receive the same clean cultivation that characterized opium fields. Cabbage fields are rotated in an attempt to minimize disease build up. This piece of information as well as know-how for fertilizer management and chemical pest control came with the seeds from buyers.

Contrary to the general belief in the lowlands, the management of pesticides shows some understanding about insect ecology and pesticide toxicity. All farmers interviewed noted that wet season cabbages are less severely infested with insect pests than dry season crops. This is reflected in spraying schedules. Nobody likes spraying, because of "the smell which makes you ill". Farmers generally wait until they see "a number of some particular kinds of insects" before starting to spray. Less well established is the recognition of development of insect resistance to pesticides. Mixing different pesticides and increasing doses are common practices when spraying begins to look ineffective. This seems an ideal ground for extension of integrated pest management methods.

(iii) Soil and water conservation. Soil and water conservation practices are new for the village. Simple ideas of planting strips of grasses across slopes to slow down surface runoff and to leave extremely steep land out of production were first introduced in 1991. Farmers admitted that they first took these up because of persuasion and incentives from the Thai-Australia Highland Agricultural and Social Development Project. Now these have been adopted by all households, with some little "indigenous" innovations.

For example, Chromolaena spp., common weeds of shifting agriculture, has been allowed to develop into several contour strips. In the first 1-2 years, it does not grow in as dense a stand as some grasses introduced by TA-HASD project for contour strips. Therefore it may not be as quick in slowing surface runoff and soil movement. After a few years, it can become quite effective as thrash and other weeds quickly builds up behind and in the strip. Farmers everywhere in the highlands complain about the grass Ruzi (Brachiaria ruziziensis), that the project first introduced for this purpose, that it spread too quickly as it seems to be flowering and seeding all the time. An advantage of Chromolaena is that it flowers only once a year, making control of its spreading by seed dispersion a simple matter. Once cut, farmers also consider its biomass "good fertilizer".

5.3.4 Relationships with neighbouring communities

Mae Rid Pagae shares the Mae Rid river with many other villages downstream. Immediately downstream from Mae Rid Pagae's paddy land is an extensive paddy land belonging to Mae Salee, the village next door. Some villagers reported concern by

neighbouring villages about the "possibility" of pesticide toxicity and stream pollution. The terrains and waterways provide a natural boundary to the north. In the neighbouring forest area communities seem to have a clear idea of which is common land open to all-comers and which pieces "belong" to which village, including clumps of valuable bamboo species along the watercourses.

These arrangements and understandings between villages are rarely openly articulated in any way to outsiders. At the end of 1992, a government unit which was "helping villagers" to add some structures to the school brought the village into confrontation with a neighbouring village, which claimed ownership of the timber that was "instructed" to be cut by the soldiers. Throughout the highlands, this little incident is by no means an isolated case. Many of these well-meaning efforts to help by outsiders, governmental and nongovernmental, could be much more effective and cause fewer problems, with some true participation by the community itself.

As more and more highland farmers discover irrigation, competition for dry season water will increase.

5.4 System's performance indicators

5.4.1 Productivity

With a population of 174, Mae Rid Pagae now (1994) lives reasonably well on a total land area of 800 *rai* (128 ha). Of its 160 *rai* paddy land, we estimate that about 20% is double cropped, with rice in wet season and cabbages in dry season. As rice is grown just for consumption, production is determined by household demand. In general, village households now produce enough rice for their own annual requirement. Not all paddy land is suitable for dry season cabbages, mainly because of poor drainage. Farmers also feel that rotation of cabbage fields is essential for disease control. However, internal labour supply and the village's caution in using wage labour are the main factors limiting cash crop production.

The recent development of an irrigation system for upland fields, which will make it possible to grow cabbages or other high value crops on the slopes in the dry season, is believed to increase productivity of dry season cabbages, for two reasons. Firstly, the substantial cost of farmyard manure, considered essential for cabbages in the paddy, will be removed. Secondly, sprinkler irrigation in the upland fields will remove the problem of poor drainage associated with cabbages in the paddy.

5.4.2 Yield and price fluctuation

Most of the village households rarely need to buy rice to meet their household annual requirement. Only one farmer reported that his yield was so low that it was necessary to buy some to supplement the family need for that year, because the crop lodged badly.

Productivity of the cabbages and bell peppers have so far been quite stable. The wild fluctuation of cabbage prices is well known. Planted area of cabbages in the village was

noticeably reduced in the wet season of 1993, reflecting extremely low prices in the preceding season. The 1993 crop of bell peppers, which succeeded the first trial crop with extremely good returns, earned quite a good price as expected. However, as a relatively perishable crop with a much more limited market than cabbages, a price crash as the result of over production might be expected, as is the case of highland tomatoes.

Villagers have so far not reported decline in any of their traditional supplementary food sources, such as the crops from swidden or wild species from the forest or other customary harvests from the forest such as bamboo and wood for construction, fencing and firewood.

5.4.3 Equity

The fact that all households in the village have access to land for crop production, with nobody working as wage labour, and some communal land re-allocation for those without access to land for certain purposes, such as irrigable fields for off-season cabbage, indicates a reasonable degree of equitable distribution of resources among its households. Some villagers are openly complaining about distribution of benefits from new development and government assistance, e.g. irrigation system.

5.4.4 Autonomy

Being at the top of the watershed the village's water supply is not under the influence of land use activities of any other villages. Farmers in Mae Rid Pagae reported that neighbouring villages downstream have started to mention the possibility that their pest control measures for cabbages may pollute the stream.

Mae Rid Pagae is at present self sufficient in rice. This self sufficiency, however, has been made possible by the higher productivity due to the input of fertilizers and weed control for the cabbages.

5.4.5 Long term trends and prospects

5.4.5.1 Bio-physical sustainability of the production system.

There is little evidence of soil erosion in the upland fields, even on those slopes over 30%. The village soils appear to be quite "tolerant" to erosion. Nevertheless, it may be useful for the village to monitor the problem by placing a few marked stakes driven into a few spots on the uplands. The lowlands experience of the Chiang Mai Valley indicates that intensification of the cropping system may lead to fertility decline, including acidification.

Weed, insect and disease build up is another threat with increasing intensification. In the case of cotton in other parts of the north, for a given area, the crop remains profitable for only a few years. Production is shifted to a new area after insect pests build up so that control becomes too costly. Ginger provides an example of disease build up in the soil that has led to production decline in many parts of the highlands. Weeds, on the other hand, have long been a major problem for crop production. They are one of the major

reasons for productivity decline in traditional shifting agriculture. Use of chemical herbicides is increasing.

5.4.5.2 Long term economic viability

In addition to the question of increasing maintenance cost, economic viability of the cash crops at Mae Rid Pagae will depend on market demand for the cash crops within Thailand and competition from other sources of supply.

Competition for the market will intensify as more highland villages move into irrigated vegetables, including those across the border in Laos as well as Myanmar where buyers are already beginning to establish contacts with growers. For temperate fruits, which are encouraged partly as a conservation measure for slopes over 35% and altitudes over 800m, competition from Yunnan could be detrimental.

5.4.5.3 Interactions with the environment and neighbouring communities.

Downstream villages in Northern Thailand have sometimes complained about water pollution by pesticides by some vegetable growing hilltribe villages, for example in Chom Thong, a district south of Chiang Mai. Although these allegations have yet to be substantiated by water analysis, the conflicts they have generated between communities were at times serious. In Mae Rid Pagae, other possible causes of future conflict with neighbouring communities are water for irrigation and the use of the forest and forest land.

5.4.5.4 Impact of national policy

Mae Rid Pagae is in the National Forest Reserve classed "E" by Royal Forestry Department, whereby development for "economic" forest is possible, in contrast to National Reserve Forest land classified "C" for conservation which strictly cannot be used. This implies a possibility for the establishment of a legal basis for the village's land use. However, the example from Lo Pah Krai, the Lahu village north of Chiang Mai showed that the opposite could happen in reality. Lo Pah Krai lost all of its "E" land, which was allocated to the Forestry Industry Organization by Royal Forestry Department for afforestation, and could "save" all of its remaining agricultural land only because they are classed "C".

CHAPTER 6: VILLAGE AGROECOSYSTEM ANALYSIS - PAH POO CHOM

6.1 Context

6.1.1 Historical background (information from Oughton and Imong 1970, except where indicated)

Pah Poo Chom is Blue Hmong village, which was settled in 1963 on a flat ridge at 940 m. altitude. In 1970 it was a village of 116 people in 20 households. After 7 years of settlement, most of the surrounding forests had been cleared and cropped with rice, opium and maize. There was also increasing competition for land from neighbouring villages of Thai, Lahu and Lisu. In 1970 the village grew 35 *rai* of opium, but yield was very low. According to Oughton and Imong (1970) the village was in a state of extreme poverty, and more than 55% of the total adult population was addicted to opium to some degree. Among the opium addicts were women and young men as well as elders: addicts accounted for 80% of the adult male population. Cooper (1984), who conducted a study of the village about this time, noted that some of the villagers had sought employment at a nearby tea plantation to supplement their inadequately productive shifting agriculture. According to Cooper (1984), this is "a movement towards increased poverty".

Now in 1993, it is a relatively prosperous village with a population of 217, in 32 households. (A summary is given in Annex II.1). Although nineteen people in the village are still listed as opium/heroine addicts, the village has changed much for the better. The development of an effective system of agriculture is no doubt the key to this success.

6.1.2 Social and economic context

6.1.2.1 Administrative organization and assistance

Pah Poo Chom is part of village number 2, in Gued Chang, a subdistrict of Mae Tang, which is a district of Chiang Mai (Figure 4.1).

By the Land-for-Living Act of 1968, the Hill Tribe Land Settlement *(Nikhom)* Projects were set up and implemented by the Department of Public Welfare, Ministry of Interior to provide a legal basis for land use by hilltribe villages in certain areas (Ratanakhon 1978). The village of Pah Poo Chom is in one such settlements, *Nikhom* Doi Chiang Dao, some 60 km north of Chiang Mai city. One practical implication of this is that a "document of title" has been awarded to agricultural land in the village, but not individual ownership title.

The village has received assistance from Department of Public Welfare since the inception of the *Nikhom* Doi Chiang Dao. From 1984 a World Bank funded project introduced fruit trees and assisted in the development of more than one hundred *rai* of paddy land for wetland rice. From 1989 further assistance came from Thai-Australia Highland Agricultural and Social Development Project and Office of Narcotic Control Board. Assistance in the form of inputs (fertilizer, seed and seedlings) that began to accumulate as credit in the Village Revolving Fund from the end of 1980s totalled 62,004 baht in 1993.

6.1.2.2 Population and pressure on the land.

Mae Taeng district, to which Pah Poo Chom belongs, is more or less a suburb of Chiang Mai. With an area of 1,363 km^2, the district has a total population of 70,497, including a hilltribe population of 10,122. Pah Poo Chom is part of the Gued Chang subdistrict, which has a total population of about 3,000 in 24 communities of Karen, Akha, Hmong, Lahu, and Lisu.

With just 0.82 *rai*/head (0.13 ha/head) Pah Poo Chom has very little land compared with an average village in Mae Hoh, e.g. Mae Rid Pagae. Pah Poo Chom is one of 24 hilltribe villages of *Tambon* Gued Chang, with a total hilltribe population of 3,035 (Table 6.1). These are relatively small villages, 13 villages with fewer than 20 households. On the other hand, this *Tambon* is dominated by five large lowland Thai villages with a total population of about 3,530. Pah Poo Chom is a satellite of Ban Lakorn, an official Thai village number 2.

Table 6.1 Population and land in Mae Taeng, Gued Chang and Pah Poo Chom.

	Villages/ communities[1]	Households	Population	Area (ha)
Mae Taeng District				136,278
Official	111	18,833	70,497	
Hilltribe	71	1,943	10,122	
Gued Chang Subdistrict				
Official	7	na	3,530	
Hilltribe	24	506	3,035	
Pah Poo Chom Village		32	217	

[1] Villages = official villages, in case of hilltribes the numbers refer to communities, several of which are satellites of one official village

Source: Compiled from NSC/NESDB (1993) and other sources

Within the village, the population of 217 recorded at the census of 1993 represented an annual increase of some 3% since 1971, when the population was recorded at 116. In 1991 48% of the total population (107 people) was 15 years or younger.

Similar to the situation at Mae Rid Pagae, the pressure on the land of this almost doubling of the population in 20 years has largely been alleviated by intensification of land use and increased land productivity.

6.1.2.3 Market linkages

Pah Poo Chom is an easily accessible distance from the major district town of Mae Taeng, 40 km on a good road to Chiang Mai. Farmers may buy and sell at Mae Taeng or other nearby trading centres, or deal with numerous traders who regular visit the

village. Contractual arrangements varied from credit for inputs, to certain patronage relationships.

6.1.3 Ecological context

Pah Poo Chom is located in Mae Taeng Watershed. The Mae Taeng is important to Chiang Mai as well as the Central Plain and Bangkok.

The Mae Taeng Irrigation System, with a diversion dam just above Chiang Mai city, irrigates 144,000 *rai* (23,000 ha) of paddy land in the Chiang Mai Valley during the main rice season, about two thirds of this in the dry season. The main canal which forms the western boundary of the valley now also provides a significant portion of domestic water supply to Chiang Mai city.

The Mae Taeng is a major tributary of the Mae Ping, which is in turn one of the four main tributaries of Chao Phya River, Thailand's primary river and source of water. The Bhumipol Dam, across the Ping at Tak, to the south of Chiang Mai, is a major source of hydro-electricity for industrializing Thailand. It is also part of a system that irrigates the Central Plain, where almost 2 million ha of rice is grown in the wet season and another half a million ha in the dry season.

6.2 Patterns and processes

6.2.1 Physical characteristics

The present village site and most of its crop land are now on relatively flat land, at below 900 m, below the original village site, which was situated above the watercourse. The village relocation below the water source has made possible the development of water supply by gravitation, for domestic use and for agriculture, now irrigated with sprinklers.

Some 70% of the slopes surrounding the village are now under forest regrowth, with some bamboo. The soil is of a light loamy texture, with good internal drainage. The village now has no paddy for wetland rice.

6.2.2 Livelihood activities

Major sources of livelihood are cabbages, lychee, collecting bamboo shoots (Dendrocalamus sp.) from the forest for sale and upland rice. Although the village must buy most of its rice, most farmers who can, still grow some upland rice, enough to meet 1-2 months of household need. Collecting bamboo shoots from the forest now earns almost every able-bodied member of the village 100-300 baht/day (enough to buy 20-60 kg of rice) for about two months during the wet season. Older men make baskets for sale from bamboos they harvest from wild stands. This activity has become important as part of the development of cash crops, especially lychees and cabbages which need bamboo baskets for transport.

Table 6.2 Livelihood activities of villages in Pah Poo Chom

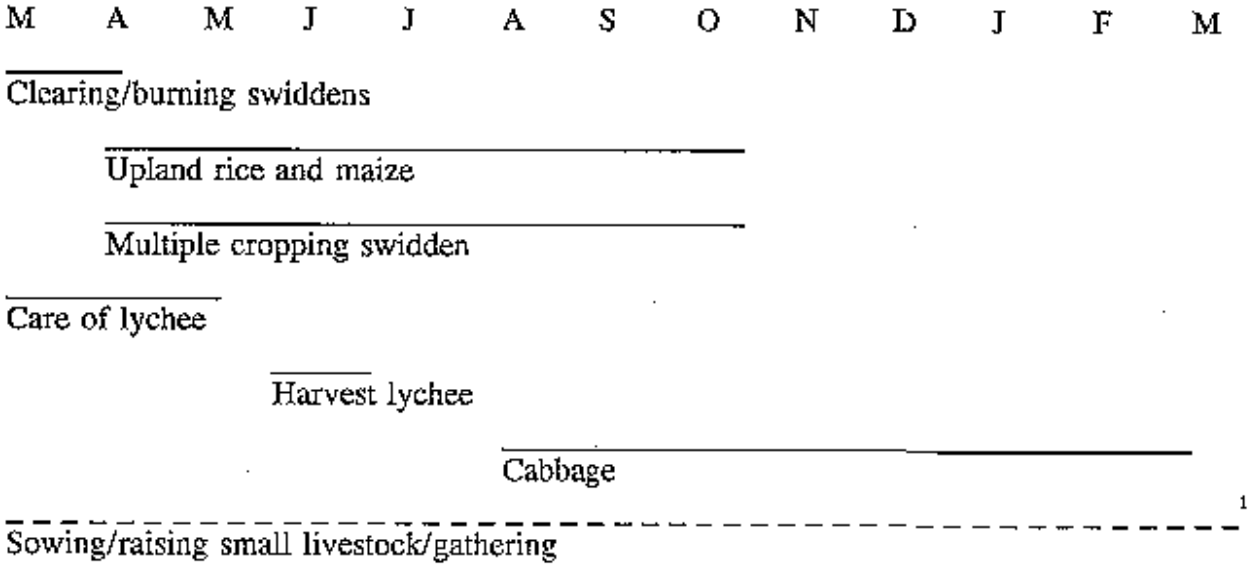
Activity	% households involved	% contribution to income
Cabbages	70	20-60
Lychee	80	10-40
Upland rice	70	10-25
Multiple cropping in swiddens	100	nd[1]
Maize/pig	100	5-20
Growing bananas	40	10-20
Sewing/embroidery	60	10-25
Bamboo shoots from forest	80	10-30
Other wild food	100	nd
Basketry/bamboo work	10	10-20
Red Kidney Bean	10	5-10
Other vegetables	10	10-25

[1] not determined

6.2.3 Activity calendar

Field preparation for upland rice and maize begins in March, sowing by the end of April to early May. In May the lychee is harvested. Beans, squash, etc. are also sown with upland rice or maize. In July bamboo collecting begins and goes on till the end of August. Cabbage planting begins in August and continues into the new year.

Figure 6.1 Activity calendar in Pah Poo Chom.



[1] intermittently throughout the year
Source: Survey 1993.

6.2.4 Land use

Some time during 1970s, with support from an assistance project, the village developed more than 100 *rai* (16 ha) of paddies. The cultivation of wetland rice, however, never took off. The major limiting factor was water. Supply from the stream was not sufficient to keep water in the bays with an extremely well drained soil.

The village now has 80 *rai* (12.8 ha) flat land and 100 *rai* (16 ha) on slopes (Figure 6.2). It also shares a nearby forest area for gathering bamboo shoots for sale, an important income earning activity. Four families have been granted the right to grow upland rice between young trees in a nearby RFD plantation.

The first lychee trees were planted at Pah Poo Chom about ten years ago, about 40% of the trees are now productive. The majority of land planted with lychee trees since then is still intercropped with cabbages. The cabbages are irrigated by a sprinkler system fed by gravitation from the stream above the village. Lychee trees are believed to be also fed by water and fertilizer applied to the cabbages.

Although farmers admit that upland rice is not as productive as cabbages or lychees, most farmers still grow a small amount of upland rice each, enough to meet family needs for 1-2 months. On some of these fields maize for pigs are also grown. In addition, there are a number of fields of rotational shifting agriculture on the slopes. Two of these have contour strips of pigeon peas as a conservation measure. The usual swidden companion species such as cucurbits, legumes and chillies are also grown with the upland rice or maize. The field for upland rice is cleared before the first rain in March, and sown by April or May. Cabbages are not planted out until August.

6.2.5 Cropping systems

Pah Poo Chom has two major cropping systems: rainfed and irrigated.

The rainfed system. Some of the village's fields are above the water source (about 900 m), and this has placed them outside the command area of the new irrigation system fed by gravitation. Crops that are dependent on the rain include lychee orchards at the old village site (940 m) and upland rice and maize fields on the upper slopes.

The irrigated system. The major cropping system at Pah Poo Chom is an irrigated mixed cropping of fruit tree (lychee) intercropped with cabbages, which are occasionally rotated with upland rice or maize. Some minor crops grown are red kidney bean and other vegetables.

6.3 Organization and management

6.3.1 Household organization and economic

Pah Poo Chom has an average household size of 6.5. Some households are still large with an extended family which is typical of the Hmong. Production is largely for the

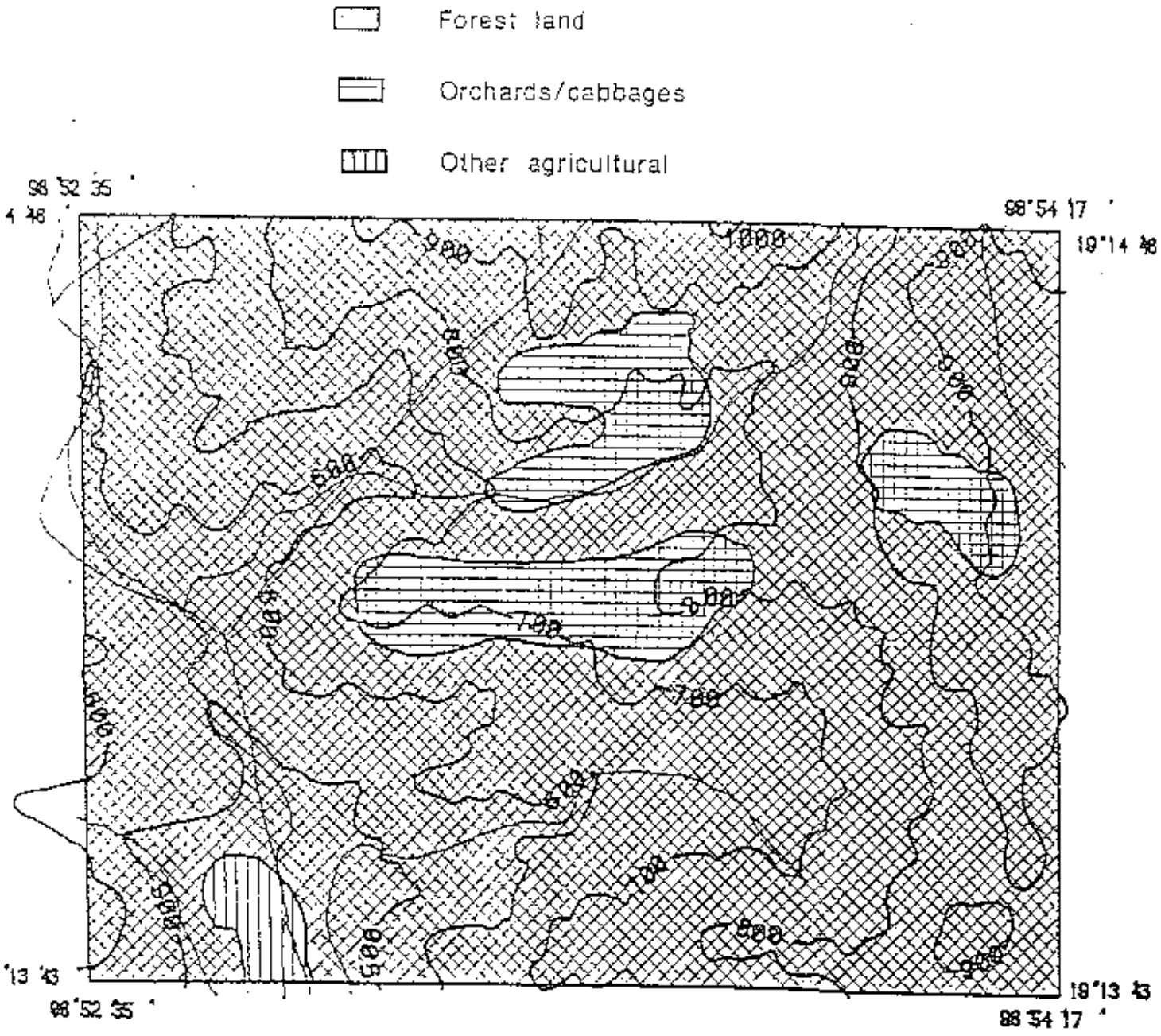


Figure 6.2 Land use map of Pah Poo Chom

market. Most of the rice is bought, but the majority of farmers still grow some upland rice, enough to meet household need for 1-2 months. Earning from collecting bamboo shoots amount to 100-300 Baht/day, enough to buy 20-60 kg of rice. Many households own sewing machines, and embroidery and sewing provide regular income for women. Older men make bamboo baskets which are used for transportation of cabbages and lychee.

Crop land is privately owned and operated. Farmers commonly hire extra labour from within the village to work on cabbage or lychees. Apart from the rice which is bought, most other food still comes from within the village or from the forest.

6.3.2 Communal institutions and resource management

Land. The land on the slopes, not allocated by the *Nikhom*, is communally managed. There is a general consensus within the village that forests on the slopes, especially those above the village watersource, are important to the water flow. Old swidden fields from the days of opium growing have been allowed to regenerate. Some new swiddens were allowed to be cut and cropped in 1993, most likely as a response to the poor lychee harvest.

The collecting of bamboo shoots, carried out in a "common" forest shared with other villages, is not regulated. A "natural" regulation may have been brought about by two separate processes. Collecting tends to level off by the end of July, as 1) price declines as the main bamboo shoot crop for the whole region comes on the market, 2) labour demand rises as preparation for cabbage starts at the end of July for planting out in August.

Irrigation. Pah Poo Chom had no experience in communal management of irrigation, since all of their previous crop production had been rainfed. In ten years after cabbages were introduced to the village, an effective communal system of sprinkler irrigation now serves the cabbage/lychee system. The system consists of a concrete tank, serving as a reservoir, at the water source above the village; a one and a half inch polyethylene pipe serving as the main bringing the water to the village; and a network of one inch pipes to deliver water to individual fields. Each farmer irrigates by means of a mobile unit of plastic hose connecting a sprinkler to the pipe, which is moved to various parts of the field dictated by the irrigation schedule.

A critical problem of water shortage soon rose after the system was in full service, i.e. used by all farmers who were growing cabbages. The cause of this soon became obvious within the village: the whole system focused on water delivery, but with no control on the flow. When a farmer completed irrigation of a field, the water simply continued to flow and was lost. There was no way to turn the water off. A consensus was quickly reached that every farmer would be responsible for putting a valve at the junction that brings water to his field from the main and to make sure that it is closed when the field no longer needs to be irrigated.

Officers of the Department of Hilltribe Public Welfare generally consider Pah Poo Chom a problem village because of the perceived difficulty related to their social organization.

The village is made up of three large clans, which do not always get along. Among field workers in the highlands, the Hmong are also generally considered to be less civic minded than other groups such as the Karen. That the village now has a functioning common irrigation system is a testimony that :

- a culture of common resource management is not necessary essential for development of an effective local organization to manage a common resource,
- an effective leadership and equity in participation are equally important.

Conservation. The consensus within the village on the importance of this irrigation system on their livelihood is clear. The association that villagers place between the water flow and forest conservation is probably the reason for more effective conservation than any imposed from outside. The three components that are important to the robustness of the organizational structure of this communal resource management are

- economic importance of the resource,
- equity of participation, and
- effective leadership.

These indicate that the system should be able to cope with further problems that could develop, e.g. future water shortage, which would require more regulation of use by individual farmers.

6.3.3 Technology and indigenous knowledge

The World Bank phase of the highland development project implemented by the Department of Hilltribe Public Welfare brought fruit trees to the village in 1984. A wild range of species of fruits and other tree crops (e.g. mangoes, tamarind, jack fruit, lychees, rubber, etc) can still be found around the Pah Poo Chom Unit office. Propagation methods such as air-layering and bud grafting were taught to farmers. Thus the villagers have an easy access to a range of germplasm of tree crops should they wish to grow them.

Cabbages came to the village privately, through one or two villagers who had returned to the village from working with relatives in another mountain area where commercial cabbage production had been established. The know-how for growing cabbages, from the production of seedlings in nurseries to care of the crop (including transplanting, fertilizer management and insect and weed control) were transferred from these two farmers to the whole village after one season. The use of sprinkler irrigation was another indigenous innovation that came naturally (i.e. via farmer to farmer transfer) from other cabbage growing areas in the highlands. Other production technologies, e.g. use of Bacillus sprays instead of stronger chemical insecticides for insect control, new seeds and new crops, continue to flow to the village through the commercial channels of agricultural supply shops in nearby commercial centres such as Mae Tang, Mae Malai, Mae Rim or even in town in Chiang Mai itself, as well as travelling salespeople who bring their products to the village, often with offers of credits and sometimes also contracts to buy the product at the end of the season.

The upland rice and maize swiddens have diminished in relative importance. However, the range of domesticated species grown with them are maintained and continue to provide a degree of nutritional diversity and security. The use of Mimosa invisa for soil improvement illustrates an indigenous innovation to incorporate locally available plant germplasm, to improve crop production.

As in other parts of northern Thailand, the wet season starts from the end of April. In Pah Poo Chom, however, cabbage production does not start until August. From the time of the first rains in April to the start of preparation for cabbages, fields are left covered with Mimosa invisa, a "weed" in most other situations. The Mimosa, a prolific nitrogen fixing legume, is believed to improve the soil. Its aggressive growth habit is also likely to help keep out other weeds. Before or while cabbage seedlings are prepared in the nursery in July to early August, the Mimosa is cut and rolled up into piles which are generally burnt. As Mimosa does not normally flower until October, the cutting and burning in August tends to lead to a decline of stands. To ensure good stand cover in the following season, farmers may actually sow this "weed" in fields designated for cabbage in the next season.

Another important indigenous species is Pai Hok (Dendrocalamus sp.), which is harvested for bamboo shoots from wild stands. This harvesting is done on "common" forest areas shared by other villages. There are also considerable skills in the use of various other wild species, e.g. Pterocarpus for timber for certain types of wood working, various bamboos for basketry and so on. These uses, however, take the form of simple harvesting from the forest. No indication of management or conservation was encountered.

6.4 System's performance indicators

6.4.1 Productivity

Evidence that agricultural productivity per unit land in Pah Poo Chom has increased from the 1970s can be seen from the fact that the amount of land cultivated is less now despite the population having almost doubled. From the village site, areas of regenerating forests can be seen all around on mountainsides. Village income from collecting bamboo shoots in 1992 was recorded at 123,900 baht, enough to buy about 30 tons of rice. The village now owns 4-5 pick up trucks, 12-14 motorcycles, and various other consumer goods, i.e. sewing machines, rice cookers, refrigerators, televisions and radios. This level of productivity has been attained when only 40% of the lychee trees planted are bearing; further increase could be expected when all trees become productive.

6.4.2 Yield and price fluctuations

Upland rice yield has always been poor. 1992 and 1993 saw very poor fruit set in lychee. Productivity of bamboo shoots does not appear to fluctuate much, nor was the village's harvest affected by outside forces such as competition from other villages or restriction by the Royal Forestry Department. Farmers reported that they avoid planting cabbages at "difficult" times, when the risk of yield loss is high, e.g. early wet season

and at the height of summer.

Price of bamboo shoots varies more within season than from year to year. The price is extremely high at the beginning of season, and drops very low from the middle of the wet season, as the bulk of the crop comes on the market. Fortunately for Pah Poo Chom, their bamboo harvest usually stops just before price has dropped to low, since the cabbages have to be started about July or before August. In general cabbage prices also fluctuate rather wildly. The 1993 dry season crop in Pah Poo Chom remained unharvested because prices were too low even just to pay harvesting wages.

The village derives a considerable degree of security of income from their varied livelihood activities. Some of these, like handicrafts, are relatively secure though not so well paid. Shifting agriculture has sometimes been "allowed" on the slopes above the village as a safety valve at times when regular income from cabbages, lychees, etc. suffers a downturn. There is, however, a perception within the village that this practice can lead to a decline in the stream flow which is essential for dry season cropping.

6.4.3 Equity

Of the village's 32 households, 17% "own" no land, half cultivate less than one hectare, 20% have between 1 to 2 hectares, 11% have more than 2 hectares. Irrigation water is freely distributed to all farmers with land within the system's command area. Access to gathering in the forest for bamboo shoots and other products is not controlled from within the village.

6.4.4 Autonomy

Pah Poo Chom is not yet an "official" village, for administrative matters it must still refer to the official village head at village number 2, Gued Chang subdistrict. The Pah Poo Chom village leader, who is assistant to the official head, however, takes care of most village matters including resource management. For example, the village "council" consisting of representatives from all three major clans deliberated and took action to regulate the use of irrigation water by getting all water users to install a valve at their water outlet so that the water flow can be closed off when irrigation is completed.

Pah Poo Chom is part of Doi Nikhom Chiang Dao, a hilltribe settlement set up under the Land-for-Living Act of 1968, under jurisdiction of the Department of Public Welfare. This is implemented through the Nikhom office which oversees development activities. Under this act, the currently cultivated land appears to be "safe" from the implementation of forest protection policy of the Royal Forestry Department. The RFD, however, may still restrict land use in other ways, for example, in the expansion of shifting agriculture into new areas, claiming of new forest land for planting new lychee orchards. Bamboo shoot gathering may also be easily curtailed, as is commonly done in other parts of the highlands, by simply closing access roads.

As there are no other water users higher up on the same watershed, Pah Poo Chom does not have to worry about forest degradation by other villages such as in the case of Lo Pah Krai (see II.2). However, being in the Mae Taeng watershed means that the village's

irrigated agriculture will eventually be part of the inevitable future debate on lowland/highland competition for dry season water. In addition, the question about pesticide pollution of streams is likely to be raised as highland agriculture in the whole of Mae Taeng watershed intensifies.

6.4.5 Long term trends and prospects

6.4.5.1 Bio-physical sustainability of the production system

The long term prospects of the major part of the production system in Pah Poo Chom, lychees and cabbages, appear to be secure. For lychees there is no indication of any problem with the system's maintenance with respect to three major factors: irrigation, soil, and pest control. Despite year to year fluctuations in productivity in other major lychee growing areas of the north, e.g. Chiang Rai and Fang (north of Chiang Mai) many lychee orchards have been productive for more than 20 years with no indication of decline.

With cabbages there is a real concern about increasing use of pesticides, which may lead to development of pesticide tolerance and increasing cost of control, which can eventually lead to economic collapse. However, the fact that there are farmers who are actually using biological control, with Bacillus, and a beginning of an understanding about Integrated Pest Management (IPM), together with the higher costs of pest control in terms of higher wage cost for spraying highly toxic chemicals, brings hope that more ecologically sound pest control practices may eventually help to sustain this production system. However, it must be pointed out that the adoption of IPM cannot be expected to happen in highland villages "naturally".

To be effective, the IPM technology has to be practised by all farmers in the same area. The existing communal organization could help to facilitate cooperation. The current Pah Poo Chom village leader is one of the few people who appreciates the benefit of biological control of cabbages pests and also has a good understanding of some basic principles of IPM. However, there still many farmers in the village who prefer the more potent chemicals, and more troubling still is the common practice of mixing several chemicals into a "cocktail" when one chemical loses its effectiveness as pesticide tolerance develops. Therefore, it may be too much to expect the existing indigenous village organization alone to cope with the problem. Unless there is an effective market mechanism to encourage minimal use of pesticides, such as is happening in Mae Rid Pagae, external support and encouragement will be essential.

Another concern is the bamboo shoot harvest. Very little is now known about the rate of harvest of this important source of income for many farmers in this area. The crucial question: is the current harvest of bamboo shoots by other villages in the area as well as Pah Poo Chom below or above "maximum sustained yield"? If the maximum sustained yield is already exceeded, are there any communal management measures that could be instituted to reverse the trend?

6.4.5.2 Long term economic viability

Without detailed market analysis it can only be postulated that on the demand side lychees, cabbages and bamboo shoots are all likely to get reasonable prices in the foreseeable future. In addition to the continually growing fresh market, processing factories in Chiang Mai, small and large, provide substantial outlets for lychees and bamboo shoots. The relative cost and difficulty of transportation will determine the seriousness of competition from areas north of the border, especially for bulky products like bamboo shoots and cabbages.

There are also potential problems on the supply side. All three cases of biophysical sustainability of the production system discussed above are actually basically implying economic viability. The production of cabbages in Pah Poo Chom will collapse when insect control pushes costs of production above the sale receipts. Bamboo shoots will no longer be an economically viable livelihood activity when a farmer can earn less than the basic wage in the area, currently at 50-60 Baht/day. In other mountain areas near Chiang Mai, e.g. Doi Saket and Lampoon, bamboos have been so over-harvested that only very small and uneconomic yields are obtained from one day collecting.

6.4.5.2 Impact on the environment and relationship with neighbouring communities.

Since the village's agricultural land has been granted a "document of title" with the establishment of *Nikhom* Doi Chiang Dao, land ownership in Pah Poo Chom has a much better legal basis than most other highland villages. There is as yet no indication of conflict with neighbouring communities regarding the use of two common resources: water for irrigation and bamboo shoot collection from the natural forest.

6.4.5.3 Impact of national policy

Indigenous innovation has played a most significant part the in Pah Poo Chom's recovery from its decline in 1970s. However, it must be admitted that an enormous amount of public resources has been invested in this village. Even some development efforts which have failed to bear intended results, like the development of 100 *rai* of paddy land, had provided income in wages at the time when there were real needs. The establishment of Doi Nikhom Chiang Dao has provided a degree of land security that is unknown in other parts of the highland. The success of agricultural development has enabled the village to allow forest regeneration on much of the old shifting agriculture land on the slopes above the village.

Economic success, however, inevitably induces a desire for expansion. Villagers are trying to negotiate with RFD officials to enable them to expand their lychee orchards. At the time of this study, this was still unresolved.

CHAPTER 7: VILLAGE AGROECOSYSTEM ANALYSIS OF ROTATIONAL SHIFTING AGRICULTURE VILLAGES - TISSA AND LA OOP

This chapter reports on the general state of rotational shifting agriculture in Northern Thailand, with specific results from two villages: Tissa (Karen) in Sob Moei district and La Oop (Lua) in Mae Lanoi district in Mae Hong Son (Figure 4.5). Both are still actively engaged in rotational shifting agriculture. La Oop has diversified into other livelihood activities, Tissa has much more limited options. Summaries of both villages are given in Annex II.11 and II.12.

Note that a few villages in this area have largely moved into permanent cropping of cash crops. Chapter 5 on a Karen village at Mae Rid Pagae provides an example of such a community.

7.1 Context

7.1.1 Historical background

The Karen and Lua are two ethnic groups with a tradition of rotational shifting agriculture in Northern Thailand. A much larger Karen population can be found across the border in Myanmar. There has always been much movement of villagers across the border, with the flux into Thailand increasing each time fighting breaks out in Myanmar, either among the ethnic groups or with the central government. The Lua, in much smaller number, are generally believed to be the remnant of an original people who lived in this area before they were overtaken by the rise of the Kingdom of Lanna Thai some 700 years ago.

Rotational shifting agriculture villages are now concentrated in the western part of northern Thailand, covering a total area of about one and a quarter million hectares of three adjoining provinces: Omkoi district of Chiang Mai, the southern half of Mae Hong Son and the northern tip of Tak (Figure 2.1). In 1993 there were about 1,200 communities, with a total population of a quarter of a million. This represents one third of the total population in the mountainous area of northern Thailand.

7.1.2 Social and economic context

7.1.2.1 Administrative organization and assistance

Some recorded evidence indicates that, in former days, some old Karen and Lua villages held allegiance with the northern princes, rulers of Chiang Mai and other northern principalities. However, most of them have always been isolated. At present this is still, on the whole, one of the remotest parts of Thailand. A large number of villages are still inaccessible except by foot. About one third of the communities are officially appointed through the Royal Gazette (Table 7.1). In the more remote areas it is common to find official villages with several (5-8) satellite communities.

Table 7.1 Number of hilltribe communities in the rotational shifting agriculture area.

Area	Number of hilltribe villages	Number of official villages	Proportion official/ total
Mae Hong Son Province			
Sob Moei	128	39	0.30
Mae La Noi	65	59	0.91
Mae Sariang	157	47	0.30
Khun Yuam	69	35	0.51
Chiang Mai Province			
Om Koi	236	84	0.36
Tak Province			
Tha Song Yang	118	28	0.24
Mae Ramart	212	48	0.23
Total	985	340	0.35

Source: NSC/NESDB 1993

While other areas of the highlands have had various assistance projects under the Highland Development Master Plan since 1970s, this area has had very little outside assistance. Only since late 1980s has it begun to see some isolated NGO activities, and a Thai/UN Pae Por Project was initiated in the area only in July 1987. The Pae Por project which has been implemented by the Local Administration Department of the Ministry of Interior has emphasized social integration activities such as village registration and granting of citizenship.

Of the two villages that were studied in detail, Tissa was not recorded in the Directory of Hilltribe Communities and Population (NSC/NESDB 1993). La Oop, on the other hand, was officially set up with an announcement in the Royal Gazette. At La Oop there is a village headman who has been appointed by the Ministry of Interior, through the provincial governor and the district officer and who sits on the Tambon (Subdistrict) council, in this case Tambon Hui Hom.

7.1.2.2 Population

In this area of 1.6 million hectares, a hilltribe population of almost one quarter of a million was determined in 1993 (NSC/NESDB 1993). Based on the 1985 estimate that only 18% of the hilltribe population in Mae Hong Son had Thai citizenship, we estimate the total population of this area (Thai plus hilltribe) at about 400,000.

Table 7.2 *Population and land in rotational shifting agriculture area of Northern Thailand.*

Area	Hilltribe population	Villages	Thai population	Total land (ha)
Mae Hong Son Province				
Sob Moei	23,982	128	20,110	141,269
Mae La Noi	23,020	65	29,282	145,664
Mae Sariang	16,415	157	46,963	258,742
Khun Yuam	13,394	69	18,619	169,831
Chiang Mai Province				
Om Koi	57,597	236	29,271	209,383
Mae Chaem	54,592	248	55,149	336,115
Tak Province				
Tha Song Yang	30,581	118	23,512	192,039
Mae Ramart	13,998	212	34,909	147,554
Total	233,579	1,233	257,815	1,600,597

Source: Compiled from the Directory of Highland Communities and Population, National Security Council, 1993

7.1.2.3 Market linkages

While some villages in this area have become relatively accessible to the market, many of these communities are largely inaccessible. In this particular area - the Pae Por project area - virtually all of the 194 communities are reached only by foot tracks. Road construction was not in the project design of Pae Por.

The market linkages of Mae Rid Pagae (chapter 5) provide an example of those few more accessible villages. With access, some richer farmers in the villages, often the village headmen, may own trucks and operate as local buyers. A farmer at La Oop, a Lua rotational shifting agriculture village in Mae La Noi, owns one small pick-up truck for local buying and selling and one six-wheeler with which he takes cabbages down to Bangkok.

7.1.3 Ecological context

The whole of this extensive rotational shifting agriculture area covers two major watersheds. Both Tissa and La Oop are in the the Mae Yuam watershed which drains into the Salween of Myanmar. The eastern half of this area, marked by the provincial boundary between Chiang Mai and Mae Hong Son, is in the watershed of the Ping river just before the Bhumipol Dam.

7.2 Patterns and processes

7.2.1 Physical characteristics

Descriptions of sustainable rotational shifting agriculture villages (e.g. see Kunstadter 1978, Nakano 1978) painted a picture of quick forest generation and good forest cover in the fallow fields. The landscape in this rotational shifting area of Chiang Mai/Tak/Mae Hong Son contrasts sharply with this picture. Forests with good sized trees are small, few and scattered. They are poorer in appearance compared with the forest at the Hmong village at Pah Poo Chom which has been naturally recovering with less extensive land use (Chapter 6). Farmers in the area emphasized the importance of soil type instead of the length of the fallow in the capacity for fertility regeneration after a fallow period, "it depends on the soil, some soils you can leave for 15 years and they are still no good, some soils you can come back (to a good crop) after only a few years". The dry dipterocarps, indicating poor (leached and dry) soils, also appear to be the dominant forest type in certain areas.

7.2.2 Livelihood activities

(i) Tissa, Sob Moei district, Mae Hong Son.

This Karen village of 28 households depends largely on rotational shifting agriculture - which produces rice for consumption and chillies for sale - for their livelihood (Table 7.3). Also produced in the swiddens are cotton for spinning and weaving for home use plus various food plants that are grown in association with rice, chillies and cotton. Gathering wild products from the forest for sale provides a significant addition to the village income.

Table 7.3 Livelihood activities of villagers in Tissa.

Activity	% households involved	% contribution to income
Upland rice	95	20-50
Chillies	95	10-50
Minor forest products for sale	100	5-25
Multiple cropping in swiddens	100	nd[1]
Off-farm employment	20	5-30
Cotton and weaving	100	nd

[1] not determined

(ii) La Oop, Mae Lanoi district, Mae Hong Son.

This Lua village is large with a population of 935 in 156 households. Livelihood activities are varied. There are a number of richer families who own some paddy land, operate pick-up trucks for transportation and/or assembling of agricultural products from

local farmers, grow some cash crops at some distance away from the village. The village also has some skilled families who can work silver or iron. One particular family, considered rich in the village, has three members who work silver, and who earn about 8,000 baht per month. These households generally no longer practise shifting agriculture. The village in general, however, is still dependent on rotational shifting agriculture plus some cash cropping (Table 7.4). Off-farm employment and collecting and processing wild products (especially grass panicles for broom making) are important sources of income.

Table 7.4 Livelihood activities of average villagers in La Oop.

Activity	% households involved[1]	% contribution to income
Upland rice	100	20-80
Wetland rice	75	10-40
Multiple cropping in swiddens	100	nd[2]
Cabbages	50	5-20
Livestock	40	10-30
Earning wage	70	10-50
Collecting and processing wild products for sale	60	5-30

1 excluding richer households with other alternative employment
2 not determined

Opium was not grown in the above two villages, but it is still an important source of income and employment for some villages in this rotational shifting agriculture area. The presence of opium addicts - about 10% of whom are women - indicated that about one third of the villages in the area are still involved in opium production. Within the Pae Por project area there were 841 *rai* of opium planted in 1992/93 and 1,053 *rai* in the preceding year (Pae Por Project, unpublished). A 1984 survey of the area indicated that the area planted by one household to be about 1 *rai*, producing a rather high yield of 4.2 kg/*rai*, provided an income of 13,549 baht per household (SRI 1984). At the 1984 rice price, this much money was enough to buy about six tons of rice. At the average rice yield in this area of 227 kg/*rai*, it would require 26 *rai* to grow the same amount of rice.

Contrary of the classical story of opium being grown only by people who practise pioneer shifting agriculture, in this case all the villages reported to grow opium are Karen villages.

7.2.3 Land use

The rotation is still intact at both Tissa and La Oop, i.e. after one year of cropping the fields are left to fallow for a number of years.

Rotational shifting agriculture accounts for virtually all crop production in Tissa. Fallow periods are now only 3-5 years. The village has only a little wetland rice paddy worked

by one or two households. There is a water source that could be developed for irrigation, which would require bringing water from about 200 m away. The forests, including fallow, are used quite extensively. Farmers recognized and make use of several wild species in the village's conservation forest, e.g. wild mangoes, jack fruit, *Ma Fai* (Baccaurea sp.), *Pai Hok* (a valuable bamboo, Dendrocalamus sp.) etc.

At La Oop the system of land use is more diverse. Most farmers have some wetland rice paddies as well as the swiddens. There is no irrigation facility in the village. Cabbages are now grown rainfed amongst upland rice in shifting agriculture land. Some farmers travel about 25 km towards Mae Lanoi town where they grow soybean.

7.3 Communal organization and management

Rotational shifting agriculture in both Tissa and La Oop is still organized and managed communally as described in detail for a Lua village at Pa Pae (Kunstadter 1978). In a given year, the whole village clears and burns the swiddens together on one piece of land. Crop management, from sowing the upland rice to harvest, is done individually.

In both villages, the community exerts strong control over use of common land such as the community forest and the head water forest. At Tissa, there is a communal rule restricting collection of bamboo shoots for sale. There is also an effective organization for fire control. Construction of firebreaks is a communal affair which is carried out each year. Everyone helps, regardless of the time of day, when a fire breaks out. Anyone caught as the cause of an unnecessary fire will be fined.

This communal control, however, does not extend to coping with external threats. Tissa complains about outsiders, claiming to be officials, demanding the right to hunt for wildlife and game in the village's community forest. About 20 years ago La Oop lost about 1,000 *rai* to a Hmong village which moved in to plant opium.

7.4 System's performance indicators

7.4.1 Productivity

Data from the Pae Por project area provides an example of productivity of rotational shifting agriculture (from Pae Por Project unpublished file data). For a population of 23,601, the area has 19,769 *rai* of upland rice plus 3,583 *rai* of paddy for wetland rice, totalling 23,352 *rai*, i.e. the average rice land is about one *rai* per head. Average rice yield over the project area in 1990 was 227 kg/*rai*, less than half the annual requirement of 500 kg/head estimated for the Chiang Mai Valley (MCP 1980).

At Tissa, nobody leaves the village for employment. At La Oop, an interview of 26 farmers gave the following results (Table 7.5).

Table 7.5 Wage earning employment to supplement farm income by 32 farmers at La Oop.

Place of employment and duration of work	Number of farmers
Within the village	
1-2 months a year	8
several months a year	16
Outside village	
1-2 months a year	4
several months a year	6
Not working off-farm	0
Total number questioned	32[1]

[1] total not equal to 32 because some work for a few months both inside and outside village.

7.4.2 Long term trends and prospects

7.4.2.1 Carrying capacity under the current land use system.

A simple calculation of the total land area per head gives a figure of 4 ha/head for this general area of rotational shifting agriculture. Kunstadter's (1978) estimate for a full cycle rotational shifting agriculture from Pa Pae village was 6 ha/head. The figure of 4 ha/head was based on a total population of 400,000, some 60% of which are lowland Thais with a much more intensive and more productive use of land per unit area. However, in certain areas, the land/person ratio is close to 3 ha/head. Omkoi district of Chiang Mai, has a hilltribe population of close to 60,000, with total land area of 209,383 ha. This already gives the ratio of 3.6 ha/head, but the district also supports a lowland population of 23,000.

Other evidence from the villages of the difficulty of the current agricultural production system in meeting the needs of the population include:

- the ever shorter fallow periods, reduced area under older fallow with more larger trees, resulting in
- the relatively poor state of forests in the area, and
- increasing encroachment and destruction of primary forests,
- increasing dependence on off-village, off-farm employment,
- persistence of opium as an important source of income.

7.4.2.2 Impact of government policy

The most obvious impact of highland development policy and the Highland Development Master Plan is its conspicuous absence in most of this extensive rotational shifting agriculture area. The Pae Por Project, implemented by the Local Administration Department of the Ministry of Interior, granted Thai citizenship to 96% of the population in the project area who were eligible according to their paternal right (father was born in Thailand). But Pae Por, with a population of some 14,000, represents only 6% of the mountain population in the area. Outside this project area, long established villages such as La Oop are officially recognized and the population has been granted Thai citizenship. People in most other mountain villages, however, still do not have the Thai citizenship. A survey in 1987 recorded that only 18% of the mountain population in Mae Hong Son province had the legal status as Thai citizens (NSO 1987). Except for Pae Por, the situation has not changed much in the last 7-8 years. None of the people in Tissa has Thai citizenship. Continual movement of villages across the border with Myanmar, each time fighting breaks up, adds to the difficulty in determining the real legitimacy of citizenship claims.

Apart from Pae Por and accessible villages such as Mae Rid Pagae (Chapter 5), most villages in this area have received no development assistance. Sometimes "assistance" that reached the village was poorly conceived and has harmed rather than helped. For example, Pa Pae, the Lua village described by Kunstadter (1978) lost some of its conservation forest to an assistance project trying to encourage farmers to plant coffee. The concept of rotational shifting agriculture seems to be poorly understood by most field workers carrying out "agricultural development".

Despite the virtual absence of any impact of highland development policy, the impact of forest protection policy is being strongly felt in the area. The very basic requirement of rotational shifting agriculture in allowing fields to fallow for 8-9 years before cropping is being threatened by the Royal Forestry Department. Farmers reported that RFD officials prohibit cutting swidden in forests which are more than 5 years old. Those who cut swiddens in mature fallow fields are reported to have been arrested. Despite the fact that this area is poorly accessible, some farmers suggested that they were perhaps better off without roads: "Roads would only bring motorcars, and that would mean RFD officials".

Strict enforcement of forest protection policy has been announced by the provincial governors of Tak and Mae Hong Son. Mae Hong Son especially has announced a "ban on forest burning". To most mountain farmers in the area this is equivalent to a "ban on shifting cultivation".

SECTION III: CONCLUSIONS

CHAPTER 8: SHIFTING AGRICULTURE AND MOUNTAIN DEVELOPMENT

In conclusion, the issues related to the role of shifting agriculture in sustainable development in the mountains are summarized as follows.

8.1 Population pressure

The mountain area of Northern Thailand, with its population approaching one million in 1993, is becoming crowded. That the mountain population in the Chiang Mai province has increased at an annual rate of 12% between 1986 and 1993 certainly needs further investigation.

Those practising pioneer shifting agriculture, with their more extensive land use, had felt the pressure of population on land even in the 1960s. The rotational shifting agriculture villages of Karen and Lua have also had to respond to population pressure. Perhaps, because of the ecological sustainability of their shifting agriculture practice, but most likely also because of their command of the more land intensive wet rice technology, the rotational shifting agriculture villages were able to live with the increasing pressure on the land until recently.

Traditionally shifting agriculture villages adapted to population increases in three ways:

8.1.1 Claiming more land.

Villages recognize the need to cultivate a bit more land each year to accommodate the growing population. When population of a village grew too large for the available land, further expansion of land use during the cropping phase would threaten the integrity of the whole system. A group would split off to settle and claim land at a new site. As a result of this, although the Karen have settled in the mountain area for more than 100 years, and the Lua even longer, there are only a few villages with a population of more than one or two hundred. Several of these new Karen villages were encountered in the rotational shifting agriculture area (figure 2.1) during the reconnaissance survey (Mae Ngan Luang).

8.1.2 Diversification of livelihood activities.

A diversity of domesticated species in cropping systems of shifting agriculture, pioneer as well as rotational, is well known. The forest has long been the alternative source of livelihood. It has provided a degree of nutritional security and diversity, and is still the only source of fuel. In many villages we have seen that it has now become a substantial source of income (e.g. Pah Poo Chom). Some villages have added livestock enterprises (Pang Kam Noi), and others have commercialized their handicrafts (Pah Poo Chom, Mae Rid Pagae). Some villages have even diversified away from agriculture to a certain extent (e.g. La Oop).

8.1.3 Intensification of land use.

Paddies for wet rice were developed where possible within shifting agriculture systems, often after soil erosion on the upper slopes created a sufficiently large soil deposition fan at their bases (Zinke et al 1978). Some former opium growers who have made substantial savings were able to invest in paddy development, often buying them from others. Commercialization has enabled some farmers to buy inputs such as fertilizers and pest and weed control measures to replace the need for more land. Thus pioneer shifting agriculture villages with savings, possibly from the opium crop, had bought paddy land and adopted wet rice cultivation in 1960s.

Despite these adaptations, the current situation appears that many villages are no longer able to cope with the pressure. Symptoms of this failure can be seen in the shortening of the rotational cycle to an unsustainable 3-5 years (Tissa), ineffective or misuse of purchased chemical inputs (pesticides problem in cabbages, increasing weed problem in soybean cash crop in Yang Sarn), ecological problems such as losses of surface soils (everywhere), collapse of production systems due to disease build-up (ginger in Chiang Rai, tomatoes in Hod and Mae Sariang), or economic failures as the result of commercialization (beans in Pang Kam Noi, tomatoes in Wawi).

An already bad situation is made worse by restrictions imposed by the implementation of the national Forest Protection Policy by the Royal Forestry Department. The problem is further aggravated by rising expectations and demand for better economic life by farmers themselves.

8.2 Land ownership

The lack of any legal basis for land ownership for some 135,000 households which operate as so many mountain "farming units" and over 3,000 communities is a critical problem for development. In a similar situation of lawlessness during the opening up of the Chao Phya Delta (near Bangkok) at the close of the 19th century, Takaya (1987) recorded:

> "...land disputes became increasingly common. Soon organized crime stepped in, and violence and killings became everyday happenings. Once caught up in a dispute, peasants without strong patrons were frequently forced to abandon the lands they had worked so hard to open up and to flee for their lives. .. Crime was growing apace with development."

Most fortunately, the current situation in the mountains of Northern Thailand is not quite as bad. Nevertheless, the problem is causing three types of difficulties, which affect farmers themselves as well as national forest conservation efforts.

8.2.1 Revoking of user's right by the Royal Forestry Department.

The people's livelihood may be directly affected, i.e. through their rice supply for the coming year. A common sight in the mountains at the beginning of the wet season that

invokes a sense of injustice is that of a field of newly emerging upland rice that had been recently overplanted by tree seedlings of an RFD afforestation project. The implementation of the national Forest Protection Policy has also "taken the land back" from villagers to grant it to others (from the Lahu village of Lo Pah Krai to grant it to Forestry Industry Organization to develop a Eucalyptus plantation), to establish national parks (Khun Klang for Inthanond National Park, Mae Sarn/Pah Daeng for Doi Luang National Park) and wildlife reserves.

This may also have negated all other previous efforts in highland development and conservation. This includes private efforts by villagers themselves and the public cost of the implementation of Highland Development Policy and the Highland Development Master Plan (Lo Pah Krai, Mae Sarn/Pah Daeng).

8.2.2 Unlimited land claim by locally influential people, or in response to the market.

The lack of any legal basis for land ownership also means that anybody with enough local influence (over local government officials including RFD's) can lay claim to large tracts of land. In the course of the reconnaissance survey in Chiang Mai, Chiang Rai and Mae Hong Son, we encountered "farmers" (often village headmen) who have taken over hundreds of *rai* of mountain land as their own. Many of these have been turned into orchards (pears, persimmons near Mae Hae Royal Project; lychees in Mae Ai, Mae Chan). Other influential people from the lowlands have bought large tracts of the highlands from whole villages to develop plantations for tea, coffee, and orchards. Furthermore, economic successes, especially of those crops that are not constrained by limited resources, such as water for irrigation or sometimes labour, can just lead to expansion over whole mountains (e.g. cabbage over Inthanond and Mae Hoh, lychees in Mae Fah Luang, lychee in Pah Poo Chom, pears and persimmons in Mae Wang/Mae Win, tomatoes in Om Koi and Wawi, ginger all over Chiang Rai).

8.2.3 Lack of recognition for communal land use and conservation efforts.

Compared with the lawless Chao Phya Delta at the turn of the last century, local organization and social structure in the northern mountains is better established. Thus, even without the legal basis for land ownership, private users' rights appear to be well protected through the indigenous institution of commonly-recognized ownership. Disputes rarely occur when a piece of land is currently in use, i.e. something is grown on it. Fruit trees or other tree crops are commonly used to mark ownership. Recognition of rights over land in fallow and communal conservation forests, however, is a problem. The encroachment by pioneer shifting agriculture villages into fallow land of Karen or Lua is a common story in most areas of the highlands (e.g. the Lua of La Oop lost some forest to a Hmong village in 1970s, Kunstadter's Lua village of Pa Pae lost some of their conservation forest to a scheme to promote coffee). These examples illustrate how the village's ownership of common land, though well recognized within villages with good communal organization, is not readily understood or recognized by pioneer tribes as well as most government officials.

8.3 Agricultural technology

Three basic problems related to agricultural technology have been identified in the course of this study.

8.3.1 The lack of effective technological innovations for highland areas

In 1992, the Thai government budget allocated 1,766 million baht (US$ 70 million) to the Department of Agriculture, which is responsible for generating agricultural technology for Thailand. Another 3,037 million baht (US$ 192 million) went to the Department of Agricultural Extension, responsible for disseminating technology to farmers. Very few of these efforts have been directed at mountain agriculture. The Royal Project, which is partially funded by the government, has been the only institutional source of significant technology for highland agriculture. The project focuses specifically on temperate fruits, flowers and vegetables, with the objective that they may become economically viable alternatives to opium for the higher altitudes. The dilemma of these "opium replacement" crop schemes is the potential problem of mountain encroachment by lowlanders, which is positively correlated to the crops' economic success.

International agricultural research, particularly that under the auspices of the Consultative Group on International Agricultural Research (CGIAR), is now beginning to direct its attention to mountain agriculture. The Global Alternatives to Slash and Burn Project is being spearheaded by ICRAF (International Centre for Research in Agroforestry). There was a plan that research activities in Thailand (possibly through the Department of Forestry) will feature in the second phase of the project commencing in 1994.

The Upland Rice Consortium, aiming to solve major problems limiting productivity in the "upland rice ecosystem" is in its second phase of implementation by IRRI, the International Rice Research Institute. In Thailand, the project is implemented by the Thai Rice Research Institute, Department of Agriculture of the Ministry of Agriculture and Cooperatives.

Impressive as these international and global initiatives are, it will take quite some time before information that can be effectively used at the farm level can be generated, and some more time before the information reaches down to villages and farmers in the mountains.

In the meantime, a limited number of practices have simply been transferred from the lowlands, i.e. maize, soybean. But the extent of the transfer has been rather limited, because of significant ecological differences. A major feature of the mountain ecosystems that makes development and application of appropriate agricultural innovations difficult is the huge range of variations in microclimates and soils over even short distances, i.e. within one farm.

8.3.2 The need for economically viable technology that is also socially acceptable and ecologically sound.

Five issues related to the technological aspects of sustainable development of mountain agriculture in Northern Thailand have been identified as requiring the most immediate attention.

8.3.2.1 Pest control problem. Ecological conditions at high altitudes have given farmers in the mountains advantage over the lowlands in the production of many vegetables. Associated pesticide usage, however, is a concern both for the health of farmers themselves and for the environment. Integrated Pest Management (IPM) is an ecologically sound method that has been proven to be economically viable and feasible for extension among illiterate farmers, e.g. in Indonesia (Useem et al 1992). Potential for IPM to be successfully adopted by highland farmers is indicated by two separate developments in some cabbage growing villages:

- the beginning of adoption of various components of the IPM technology, e.g. use of biological control, observation of pest population dynamics and some assessment of the level of infestation before applying pesticides (Pah Poo Chom); and
- some market incentives for the production of chemical-free cabbages (Mae Rid Pagae).

The Indonesian case (Useem et al 1992) has demonstrated that informed decision-making by farmers and contingent incentives provided the organizational foundation of sustainable national change in agricultural methods. In mountain villages in Northern Thailand, some economic (dis)incentives already exist for farmers to use less pesticides, e.g. higher costs of spraying. There is also the communal organization that might be utilized for ecological effects of the control. Government support, however, will be essential to prepare highland farmers for the use of ecologically based IPM.

Experiences abound, both in Thailand and other countries, of sustainability problems of production systems which are dependent on chemical pest control, e.g. cotton. Ecological degradation of these systems leads to increasing cost of control which may eventually push the cost of production beyond the sale receipt, and/or development of pesticide resistance by the pest so that the control eventually breaks down. In the long run, sustainability of the highland vegetable production system could depend on how effectively IPM is delivered to farmers.

8.3.2.2 Soil conservation. Minimizing soil movement down the slope is the most basic requirement of sustainable agriculture in the mountains. Sabhasri (1978) and Zinke et al (1978) have both concluded that rotational shifting agriculture contributed to about 1 mm of soil erosion per 10 year cycle. As the rotation cycle becomes shorter or in permanently cropped fields, erosion increases. Increasing weed infestation and more frequent hoeing further accentuate the problem.

Many development resources have been invested in building terraces. But the terraces have generally failed to meet their objectives. The terraces were poorly constructed, such

that the relatively fertile topsoil has invariably been buried under the poorer subsoil which has been brought to the surface.

The placing of vegetative strips along the contour lines across slope surfaces is proving to be one of the more cost-effective ways to slow the flow of the run-off water down the slope and hence to reduce soil erosion. Various plant species have been introduced into the highlands by projects and various government and non-government agencies. Each group has its own favourite species that are rigorously promoted, often over other species: Leucaena leucocphala, Desmodium rensonii, Flamingia congesta, Vetiveria zizanioides (Vetivers), various grasses, such as Setaria, Brachiaria ruziziensis (Ruzi grass), etc. Debates over merits of each species are endless, but farmers who are beginning to appreciate the value of these strips are experimenting with different species, including local wild "weed" species such as Chromolaena, or even earthen or grass strips.

The ecological, social and economic conditions of agricultural systems in the mountains are so varied that no single species will be effective for all conditions. Efforts and resources could be better utilized in the organization of farmers' adoption of the technology rather than wasted in trying to prove which is the "super" species for vegetative strips.

Contour strips act as barriers to the flow of water down the slope. If there is no break in this barrier, some of the water will be forced to infiltrate down the soil profile, i.e. internal drainage instead of surface run-off. However, should there be a break in this barrier, all of the water collecting behind the contour strip will be channelled into this gap, called "water channelling". The result is a flow of much larger volume and velocity which could result in a more severe erosion (land slippage) or even a landslide. At present, this problem is recognized by very few field workers. The extension of the idea of contour strips is carried out largely on a piecemeal basis, to each farmer and each field. We have found no examples of the ecological process of erosion of the whole mountainside being considered, and the placing of contour strips organized accordingly. This effect of gaps in the contour line in causing massive land slippage was already seen in Lao Fu, a Lisu village in Chiang Rai. In the end, contour strips that are not tied together all around the slope surface, may be more dangerous than no strips at all. Furthermore, the more effective the strips are in slowing water run-off down the slope, the greater will become the possibility of water channelling and serious soil slippage.

8.3.2.3 Possible ecological and economic consequences of tree crops, the "sustainable alternatives". Tree crops (bamboo, lychees, pears, persimmons, etc) in the highlands, have been promoted as "more sustainable" alternatives to shifting agriculture and short-duration crops such as cabbages or upland rice. Evidence of farmers' acceptance of the economic potential of these can be seen in the spread of orchards (lychees, pears, persimmons, mangoes, etc) and plantations (coffee, tea, bamboo, etc) over large areas of the mountains, often whole mountains. In addition, there are plantations of pine, teak, and Eucalyptus established or commissioned by the Royal Forestry Department. It would be a serious mistake to assume that all these trees will automatically perform the same ecological functions as native species in natural forests or in naturally-regenerating fallow fields of shifting agriculture. Five basic ecological functions not met by some of these

popular tree species or their management are identified: water conservation, biodiversity conservation, soil anchoring, adaptation to fire, and nutrient cycling.

8.3.2.4 Soil fertility maintenance. In rotational shifting agriculture, after the cropping period the long fallow has served to restore soil fertility and suppress weeds (see 8.3.2.5, below, on weeds). As the fallow period becomes shorter, those who have adopted cash cropping have started to apply chemical fertilizers to maintain soil fertility. But there are problems related to soil fertility maintenance with those who use fertilizers, as well as those still practising subsistence production, and who cannot afford to buy fertilizer.

- *Cash cropping.* For those who have entered the market economy, fertilizer application is an economic decision which is often justified. Nitrogen and phosphorus are the two major nutrient elements applied to crops in the mountains. Preliminary studies at Chiang Mai University have shown that there is a potential for widespread deficiencies of other nutrient elements, including zinc, magnesium and boron. Another widespread problem is acid soil and acidification.

- *Subsistence production.* To maintain soil fertility with shorter or no fallow and no fertilizer is a difficult task. Legumes can provide large amounts of nitrogen by "fixing" it from the atmosphere. At Chiang Mai University we found that 100-200 kg N/ha could be easily obtained, with very low cost, by growing leguminous "weeds" such as Mimosa invisa or special green manure species such as Sesbania rostrata. However, all of the nitrogen cannot be used by the crop if some other nutrients, e.g. phosphorus, or calcium, are limiting. Indigenous innovations such as the use of Mimosa invisa at Pah Poo Chom (Chapter 6) might indicate ways to maintain soil fertility where chemical fertilizers are not available.

8.3.2.5 Weed control. When the fallow period becomes shorter or is disappearing altogether, in addition to a decline in soil fertility, highland farmers face the ever-increasing problem of weed infestation.

For high value crops, opium or cabbages, grown in relatively small areas, intensive control may be economically viable, but there is the ecological cost. Weeding by hand hoeing breaks down the soil crumbs, which lead to the break down and/or blocking of channels through which water drains. As internal drainage decreases, surface run-off increases, and hence erosion increases. Increasing weed infestation in the highlands therefore affects more than just crop yield and/or cost of weeding. Similarly, some farmers (e.g. growing soybean in Yang Sarn) are beginning to adopt chemical controls, of which there are also some ecological risks.

For upland rice, it has often become impossible for a household to cope with all the weeding demand. Before the whole crop has been hoed, the weeds in the fields that were first hoed may have grown sufficiently to require another weeding already.

An ecological approach to weed control, i.e. similar to the integrated pest management for insects, would contribute significantly to the sustainable crop production in the highlands.

8.3.3 The need for a "holistic" approach to land use research that covers ecological, social, economic as well as the agronomic processes in the agroecosystem.

There are three specific aspects of this holistic approach which are of relevance to research and development of mountain agroecosystems.

The traditional "technology" of shifting agriculture, either pioneer or rotational, was the result of long evolution under a set of ecological, social and economic conditions. Agricultural research aiming at "improving" or providing alternatives (e.g. the ICRAF's project on "alternatives to slash and burn agriculture") cannot be effective unless all of the relevant ecological, social and economic processes are considered.

The multi-dimensional nature of the function of these ecological, social and economic processes also requires a procedure of analysis that is flexible and adaptive, to allow the focus of the analysis to move over the different levels in the hierarchy of the agricultural system: crop/ cropping system/ field/ farm/ community/ watershed/ nation/ region etc. as necessary.

The dynamic nature of mountain agroecosystems, seasonal, year to year and long term, must be explicitly recognized in analysis.

8.4 Minor forest products: managing for maximum sustained yield

The extractive nature of the gathering of forest products was of little consequence when the population and economic pressure were low. The disappearance of large mammals from the forests of Northern Thailand (see for example Lekakul and McNeely 1977) since the 1950s has resulted partly from loss of habitat, but also from unsustainable harvesting of a common resource. A cause for concern for plants has been brought about through three related recent developments: (i) increased population pressure (see 8.1) and (ii) increasing demand for forest products in towns, which led to (iii) gathering of forest products on a commercial scale and for processing.

The Royal Forestry Department's answer to this has been the closing of access roads under its control. The whole RFD's total personnel, who must look after all management aspects of the Thailand's 13 million km^2 forests, numbered only 17,056 in 1992. The evidence that policing is inadequate can be seen in the continuing loss of large areas of national forest in each year. Bamboo shoots and broom grass in Chiang Mai, Lampang and Chiang Rai, rattan in Nan, and wild orchids in most places, have been gathered to virtual extinction.

On the other hand, *ad hoc* bans on gathering can cause real hardship through loss of needed income. Normally gathering of forest products offers the last livelihood option to the poorer part of the village population. In addition, regeneration of certain minor forest products may also be inadvertently interrupted by RFD's forest protection efforts. For example, annual fires are essential for certain valuable mushrooms (*Hed Tob)* which are fruiting bodies of mycorrhiza fungi associated with some deciduous trees; seeds of *ma*

kwaen (Xanthophylla lemonia, a valuable spice) does not germinate unless it has been "passed over" by a quick fire.

Sustainable management of these plant species that provide minor forest products would serve the purpose of biodiversity conservation (see 8.5 below) as well as providing some needed income for poor farmers. Consideration of biological, ecological, social and economic processes will be essential. Valuable lessons on communal management, under the current level of commercial, population and institutional pressure may be learned from the Karen village at Tissa. The example from bamboo shoots at Pah Poo Chom showed that "maximum sustained yield" might be naturally maintained under the right economic forces.

8.5 Community resource management, focus on biodiversity

As long as resources are common property, individual farmers would tend to be exploitative, unless constrained in some way.

A hilltribe villager who gathers wild orchids to sell in Chiang Mai commented that:

> "Last year I saw a really nice clump of orchids in the forest. It was in a remote spot, I was not afraid anyone else would find it. I did not take it, thinking I would go back for it this year. But when I went back, the forest fire had been through the area and the orchids were gone. I wish I had grabbed it while I still had a chance".

There is no question that agricultural intensification that increases land productivity would have a direct and positive effect on the conservation of forests and biodiversity by decreasing pressure on the land. However, the effect would remain positive only as long as everything else remains unchanged. In reality, however, economic viability quickly leads to profit maximization and attraction for investment that eventually results in further expansion and forest loss.

While Tissa provides an example of common resource management, it would be dangerous to assume that conservation of biodiversity can now be entrusted entirely to communities. Indeed the multiple forces that are now exerting their combined pressure on the land came into effect so recently that most communities have not developed the means to cope. Thus we have found that communal organization dealing with gathering is absent, and that the habit of largely extractive harvesting is a mechanism that was suited to low population density and a harvest rate much lower than the maximum sustained yield.

Communities cannot be expected to conserve resources without the "right" economic conditions. A decline in bamboo shoots price combined with increasing demand for labour to plant cabbages (higher returns) is keeping the bamboo harvest rate in Pah Poo Chom below the maximum sustained yield. A village of Tung Yao in Lampoon province has become famous for its community forest. This laudable conservation effort, however, was supported by an expansive paddy land for rice and nearby dry dipterocarp forest for

firewood (a neighbouring village actually complained). Finally, pressure on the land has been much lightened by the development of the Lampoon Industrial Estate which now provides employment for most of the younger generation.

In this age of increasing communication, old communal rules are also breaking down, even in remote highland villages. At Kunstadter's Lua village of Pa Pae, a number of villagers have converted to Christianity. This was an attempt to escape from the communal organization which is the central mechanism for the management of rotational shifting agriculture they felt to be too costly. In Tak, villagers sold a Buddhist temple, for a few million Baht, to be pulled down for the development of a zinc mine.

8.6 Water conservation

Most development projects in the highlands talk about promoting "soil and water conservation". However, the practices that are being extended to farmers generally concentrate on soil conservation, with little effort directed at water conservation.

No information on the hydrology of traditional shifting agriculture is available. It may differ only slightly from that in natural forest. Strategies of agricultural development extended within the framework of the Highland Development Master Plan are all, in fact, increasing water consumption in the mountains: paddy development, intensification with dry season cropping, irrigated agriculture, sprinkler irrigation, and planting of fruit trees. The only exception is contour vegetative strips, which generally increase water infiltration down the soil profile. In addition to decreasing soil erosion, this will increase recharging of the water table.

Very little information is available on the efficiency of water use in the mountains. Sprinkler irrigation is often blamed as a wasteful method of water application. In the highlands, water delivery from the water source, by gravitation, to the field is in fact quite efficient. Compared with water delivery via unlined ditches in the field in Chiang Mai Valley, the polythene ("Eslon") pipes used by highland farmers are much more efficient. Information on efficiency of water use between different crops (i.e. flood-irrigated soybean, splash irrigated onions and garlic, dry season rice in the lowlands and sprinkler irrigated cabbages, lettuces, lychees and pears in the highlands) will be essential in the inevitable future debates on upstream/downstream water sharing.

8.7 A regional perspective

Even before the recent emergence of the "golden quadrangle" and the envisioned cross-border interactions between China, Laos, Myanmar and Thailand, traffic and trade have long connected Northern Thailand with Laos, Shan State of Myanmar and Yunnan Province in China. The recent development in transport links (river and land) will increase exchanges even further. The surge in cross-border interaction is expected to involve the highlands in four ways:

8.7.1 Competition from production areas at higher altitudes and/or latitudes for temperate crops.

When cross-border trades were limited by poor transportation, the higher altitudes in Northern Thailand had the comparative advantage in the production of temperate crops (flowers, fruits and vegetables) that were quite competitive against expensive imports from Europe and the US. Many agricultural development programmes in the mountains were based on this assumption. With better transportation, biophysical advantages for temperate flowers, fruits and vegetables will now be transferred to areas of even higher latitudes (above 20° north) and altitudes (above 1,000 m) in northern Laos and Yunnan in China. Certainly in the latter, production costs are much lower.

8.7.2 Illegal migration.

For those areas near the border, local landless people have always had to live with cheaper labour from across the border. Now, share cropping by illegal Shan migrants is a common occurrence along the Myanmar border in Mae Hong Son.

In addition to its effect on labour supply, illegal migration is making it more difficult for people with an ethnic background who have legitimate claims to Thai citizenship. As a means to cope with recent migrants, some discussions have started among government officials that perhaps the status of "illegal alien" should be given to anyone belonging to an ethnic minority group who has not yet been granted the Thai citizenship. This will cover almost half of the current hilltribe population who do have a legitimate claim.

8.7.3 Opium and drugs

The opium and drug traffickers have never had to concern themselves with borders. However, the improved roads mean easier transportation for illicit as well as legitimate trade. Strict law enforcement on opium cultivation in Thailand has only shifted production areas across the border. Opium has been successfully eradicated from some villages, by the slashing operation of the Third Army. Opium addiction in some of these villages, however, has only been replaced by a more pernicious addiction of heroin. Opium addiction, traditionally, was the privilege of older men; heroin addition, without any social constraints, has spread to even young children.

8.7.4 Watersheds of the Mekong and Salween

Hilltribe farmers in Mae Hong Son and Chiang Rai are often thought to be fortunate that they live in watersheds which are not part of Thailand's major river system, the Chao Phya. Perhaps for this reason, much mountain land in these watersheds has been classified as forest reserve class "E", and can be developed for economic purposes, i.e. Mae Rid Pagae in Mae Hong Son, part of Lo Pah Krai in Mae Ai, Chiang Mai.

However, as regional awareness increases, Thailand cannot ignore the fact that some of its land use system is affecting downstream ecosystems in other countries. A regional perspective on land and water use will be increasingly required of all countries that share the Mekong river: China, Laos, Thailand, Vietnam and Cambodia.

8.8 Summary of recommendations

In summary, recommendations for the sustainable development of the highlands of Thailand are listed below. These include recommendations concerning shifting agriculture and its 'alternatives'. They are addressed to all who are involved with policy, planning and natural resource management in the highlands.

- There is a need for a **"holistic" approach** to land use research; and the development of systems that take into account ecological, social, and economic as well as agronomic processes in the agroecosystem. Such an approach needs to be **flexible** and **adaptive** so that it can be applied at any level of the agricultural system; and it needs to recognise the **dynamic nature** of mountain agroecosystems.

- There is also a need for **incentives** to encourage the building or rebuilding of **community management approaches** for the management of common property resources. Communal resource management would enable a greater degree of, for example, conservation of biodiversity to be entrusted to local communities. Existing incentives tend to encourage individual farmers to exploit common property resources, and even if agricultural intensification increases productivity, the drive for profit maximisation tends to lead to further agricultural expansion and forest loss.

- Valuable **lessons on communal management**, under the current level of commercial, population and institutional pressure, may be learned from examples in this study. These demonstrate that **'sustained yield' of minor forest products** might be maintained under the right economic and policy conditions. Such sustainable management of minor forest products contributes to biodiversity conservation, as well as providing some needed income for poor farmers. Consideration of biological, ecological, social and economic processes will be essential in such management systems. These systems can be both shifting and permanent, depending on the conditions.

- The lack of legal basis for land ownership needs to be addressed. Currently, **insecurity of land tenure and ownership** means that farmers risk losing cropland to both state and private economic developments, or to state conservation schemes. In particular, communal land use and conservation efforts is rarely recognised outside the community.

- There is a need for **information on agricultural technology that can be effectively used at the farm level**, and for its dissemination to villages and farmers in the mountains. A major feature of mountain ecosystems that make development and application of appropriate agricultural innovations difficult is the huge range of variations in microclimates and soils, even within the area of one farm. Yet sustainable agricultural systems often depend on the conditions present in microenvironments and such variations need to be taken into account.

- There is a need to develop **agricultural technology which is ecologically sound, socially acceptable and economically viable**. Some key technical suggestions are:
  - government support is required to provide **incentives for the use of ecologically-based pest management**. Such support should build on existing incentives, and use or develop systems of communal organisation that might be used for ecological effects of the control. Delivery of such technology to farmers could determine the future sustainability of highland vegetable production;
  - **soil conservation measures** need to be developed at a **larger scale** - eg. contour strips at the scale of the whole mountainside rather than the present piecemeal approach. Emphasis should be put on assisting farmers to develop and maintain the strips, rather than on choice of species.
  - although promoted as sustainable alternatives and widely adopted, tree crops do not perform all the ecological functions of natural forests or naturally-regenerating fallow fields of shifting agriculture. The true **sustainability of tree crops** needs to be examined in terms of their **ecological functions**;
  - further research and innovation is required into the **maintenance of soil fertility** in subsistence production: this can build on indigenous innovations already observed. Where fertilisers are used, there is a need to address a broader range of deficiencies in soil fertility;
  - the **development of an ecological approach to weed control**, similar to that for pest control, is recommended. Such a system would contribute significantly to the sustainable crop production in the highlands.

- Information on the **efficiency of water use** of various highland crops will be necessary in the inevitable future debates on upstream/ downstream and urban/ rural water distribution. No information on the hydrology of traditional shifting agriculture is currently available, yet many 'alternative agricultural systems' developed for the highlands appear to be increasing water consumption in the mountains.

- There is a need to investigate the **rapid population increase** in parts of northern Thailand, as well as the extent to which strategies used to cope with such increases are still viable. Many villages show symptoms of failure to cope with the pressure.

- A **regional perspective** will be required for any future development, taking into account the following factors:
  - as cross-border traffic and trade increases, the **loss of comparative advantage** of northern Thailand to surrounding countries will threaten the viability of many agricultural development programmes which are based on permanent agriculture;
  - highland people may suffer negative impacts from land uses developed to provide **national and regional goods and services** (eg. dams)
  - **illegal immigration** to northern Thailand threatens the ease with which ethnic minority groups may be granted Thai citizenship, and thus their access to services and other government support;

- improved communications has meant **easier transportation of illicit drugs**, and whilst opium production in northern Thailand has been effectively controlled in some areas, heroin addiction is spreading;
- economic development in some watersheds is likely to lead to **downstream effects in neighbouring countries.**

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ACRONYMS

AEA	Agroecosystem analysis
CGIAR	Consultative Group on International Agricultural Research
CMU	Chiang Mai University
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit
ICRAF	International Centre for Research in Agroforestry
IIED	International Institute for Environment and Development
IPM	Integrated Pest Management
IUCN	International Union for Conservation of Nature and Natural Resources
NCA	Norwegian Church Aid
NESDB	National Economic and Social Development Board
NRC	National Research Council
NSC	National Security Council
NSO	National Statistical Office
OAE	Office of Agricultural Economics
ONCB	Office of Narcotic Control Board
RFD	Royal Forestry Department
RFT	Forest Protection and Accelerated Watershed Rehabilitation project (Thai acronym)
RRA	Rapid Rural Appraisal
RTG	Royal Thai Government
SRI	Social Research Institute
TA-HASD	Thai-Australia Highland Agricultural and Social Development Project
TDRI	Thailand Development and Research Institute
UNDCP	United Nations International Drug Control Programme
UNFDAC	United Nations Fund for Drug Abuse Control
USAID	United States Agency for International Development

ANNEX I: PROFILES OF 3 PROVINCES

Chiang Mai, Chiang Rai and Mae Hong Son are provinces in which the hilltribe population numbers more than 100,000 (1993 figures). Chiang Mai alone accounts for a hilltribe population of more than 250,000. In some districts of these provinces e.g. Sob Moei in Mae Hong Son and Omkoi in Chiang Mai, the ethnic groups are actually the majority.

Between 1986 and 1993, the hilltribe population in the whole of the North grew at 6% a year. In Chiang Mai province, hilltribe population grew at an astronomical rate of 12% a year, compared with 1.35% for the overall population growth of the province (ie. including lowland Thais). The natural growth rate of the hilltribe population is normally higher than in the lowlands. However, studies of villages where population records can be found show that the natural growth rate can account for only about 3% of the total growth. Undoubtedly, in-migration from neighbouring countries accounts for much of the very high growth rate. The question is, why did so many people migrate into Chiang Mai province, which accounted for half of the hilltribe population increase in the whole region.

I.1 Chiang Mai province

I.1.1 Population and economy.

Chiang Mai is Thailand's second city, after Bangkok. The city of Chiang Mai, however, has a population of only 250,000. The whole Chiang Mai province covers an area of 2 million hectares, with a total population of 1.38 million in 1993. (figure I.1) In addition to the Chiang Mai city, the province has nine other urban centres whose population exceeds 10,000 (Figure I.2). These, and numerous smaller centres with population between 5,000 to 10,000, throughout the province serve as market towns for neighbouring mountain areas. Through a system of relatively good roads, these towns are well connected with Chiang Mai. Local traders who assemble agricultural forest products may sell to Chiang Mai or directly to Bangkok, and some even export directly to Singapore, Hong Kong or Japan.

Chiang Mai city is well connected with all of the major towns of the North, by air as well as by road. There are several flights daily linking with Bangkok, and twice weekly flights with Kunming, in the Yunnan Province of China.

Apart from the public sector, which includes several tertiary educational institutions, agriculture has long been the major source of employment and income (Table I.1).

The contribution of agriculture, however, has recently been surpassed by the service sector, which includes tourism and related services. In 1991, Chiang Mai city welcomed a total of 3 million tourists, who stayed an average of four days and contributed 7,000 million Baht to the gross provincial product (Unpublished data of the Technical Section,

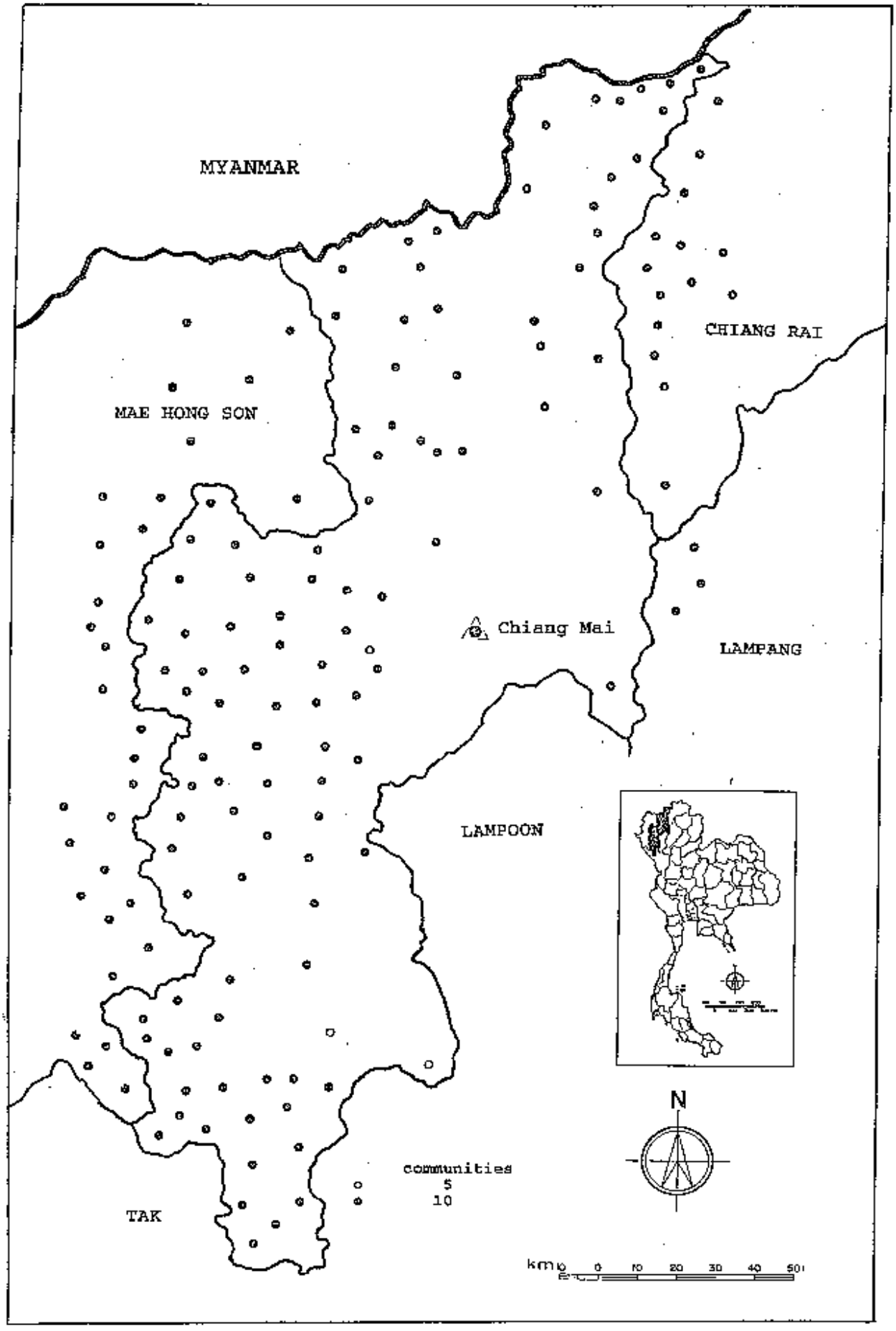

Figure I.1 Chiang Mai City and surrounding mountain villages

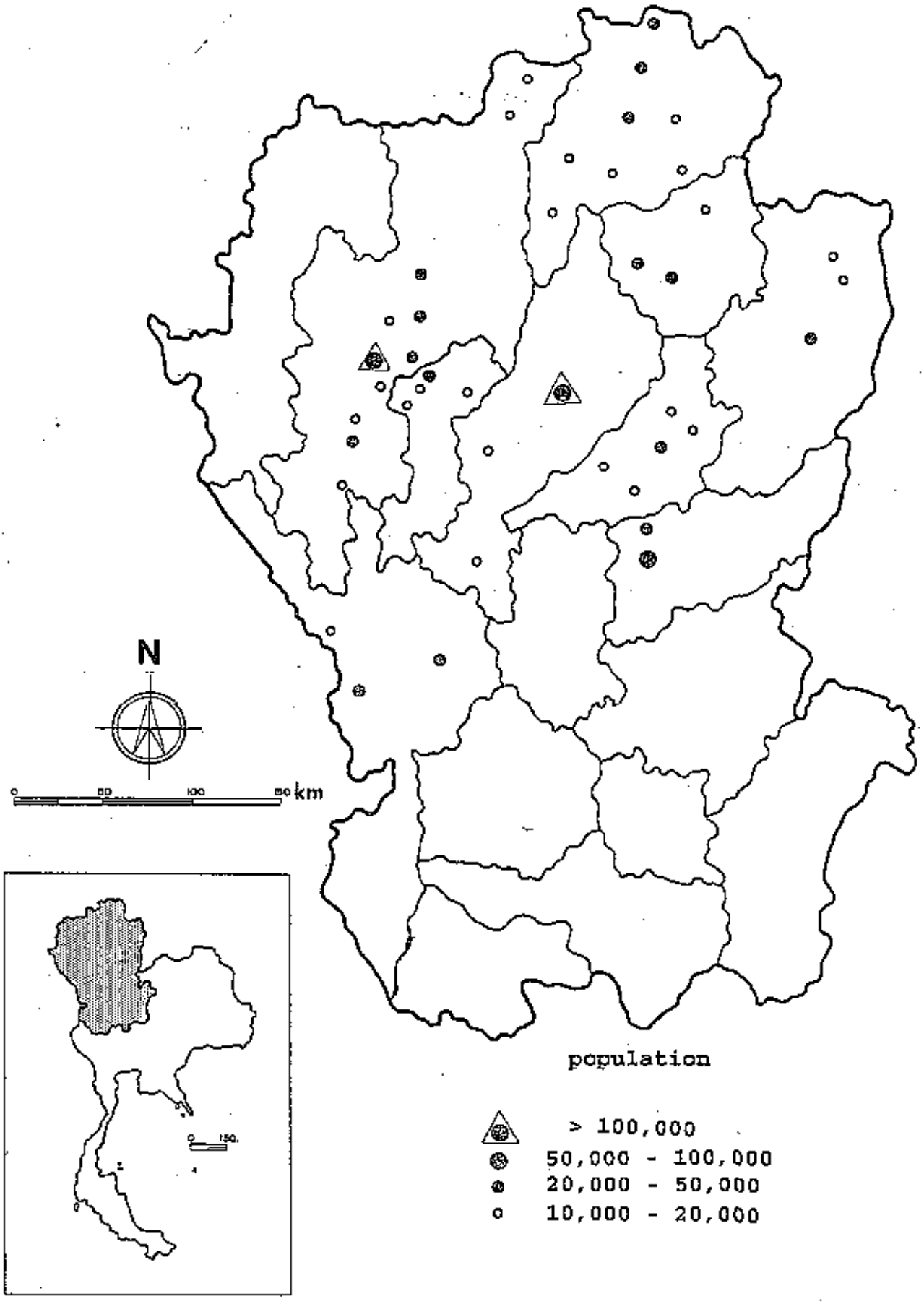

Figure I.2 Urban centres in Northern Thailand, Upper North provinces only

the Bank of Thailand, Northern Division). In the last few years tourism in Chiang Mai has been growing at about 10% per year.

Table I.1 Sources of gross provincial product in Chiang Mai, 1989.

Source		Value (million baht)	% of total
Agriculture		6,428	19.2
[of which Crops		4,614	13.8
Others		1,814	5.4]
Manufacturing		3,039	9.1
Construction		2,406	7.2
Services		7,562	22.6
Others, including the public sector and the military		14,046	41.9
Total		33,481	100.0
Population 1989	1,345,715		
Income/head (baht)	24,727		

Source: Northern Region Development Center, National Economic and Social Development Board.

I.1.2 Lowland and highland interactions.

Some 100,000 of the highland population of Chiang Mai province live within 100 km from the city centre (NSC/NESDB 1993). Another 40,000 of the highland population in neighbouring districts of the provinces of Mae Hong Son and 30,000 of Chiang Rai are also within this radius. Most of these villages are located in the watershed above the Chiang Mai Valley, a 160,000 ha alluvial plain, upon which the Chiang Mai city has been founded. The relationship between Chiang Mai lowlands and its surrounding mountain areas (Table I.2) is dominated by three major issues.

Table I.2 Some comparative lowland/highland information in Chiang Mai province.

	Highland	Province total
Area (km^2)	16,085[1]	20,107
Population (1993)	258,251	1,382,136
Agricultural land (ha)	na[2]	215,728
% irrigated	na	87
Dry season irrigated crops (ha)	na	100,000

[1] > 600 m above sea level
[2] not available

Source: Compiled from OAE 1992 and National Statistical Office data.

I.1.2.1 Dry season water. Chiang Mai agriculture is well served by irrigation, some 87% of its more than 200,000 ha agricultural land is irrigated (OAE 1992). Some of its major crops such as soybean, garlic, onions, shallots, vegetables, flowers and the longan and lychee orchards are dependent on dry season irrigation. This, in turn, is dependent on dry season flows from watersheds in the mountains. Furthermore, domestic water supply for Chiang Mai city comes from the highland watersheds, either through the surface flows of the Mae Ping and Mae Taeng or their underground discharges. So far, conflicts over dry season water, quality and quantity, between highland and lowland villages have already erupted in Chom Thong, and complaints are beginning to be heard in other lowland areas such as Ban Kard (Figure I.3).

I.1.2.2 Market opportunities. Chiang Mai city offers market opportunities for both agricultural products and handicrafts from the highlands. As a major tourist destination as well as the largest urban center in Northern Thailand, Chiang Mai city serves as the major market for temperate fruits, flowers and vegetables. Proximity to the Chiang Mai city and transportation advantage are probably two major reasons for the concentration of these high value crops in villages surrounding Chiang Mai (Figure I.4). Hilltribe handicrafts (Karen woven cotton, Hmong embroidery and hemp fabrics, etc), mountain agricultural products of fruits and flowers, as well as minor forest products (e.g. preserved wild peach and wild peach, brooms made from wild grass, wild honey) are popular items in the Chiang Mai Night Bazaar, the city's major tourist market, and other shops and markets through out the city.

I.1.2.3 Alternative employment opportunities. Many traders who assemble the products in the village and are responsible for transportation of goods into Chiang Mai, as well as many of the stall owners and tour operators, are themselves members of ethnic groups. With the growth of provincial economy at over 8% a year since 1986, and 9.9% growth in tourism (NESDB 1992), Chiang Mai has seen a marked growth in employment opportunities. Labour migration, seasonal or permanent, in search for work, on the scale common in the Northeast is still rare. A major exception was found in villages in Samuen Watershed area about 2 hours out of Chiang Mai. Strict land use control by the Royal Forestry Department Watershed Development Units has resulted in 50 people in a village of Namroo now working regularly for wages in Chiang Mai.

I.2 Chiang Rai province

I.2.1 Population and economy.

Although the total provincial population of Chiang Rai is three quarters of that of Chiang Mai, the Chiang Rai economy is only about half the size that of Chiang Mai. Apart from the public sector, agriculture is still the dominant sector (Table I.3). Contribution to the gross provincial production from manufacturing, construction and services combined is only about half of that from agriculture. Per capita income of the lowland population in Chiang Rai is also only 68% of that in Chiang Mai.

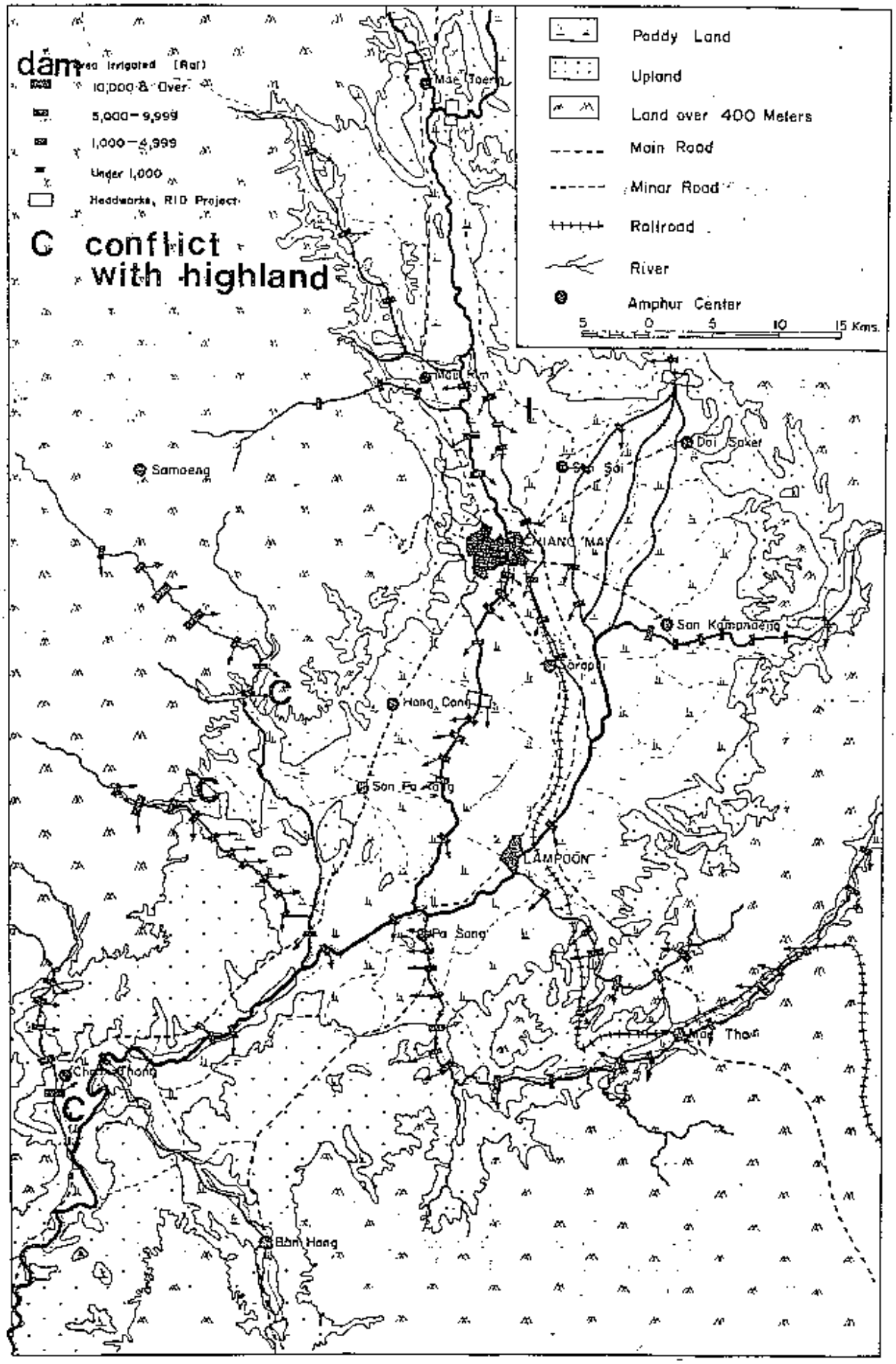

Figure I.3 Trouble points in lowland/highland competition for water in Chiang Mai Valley

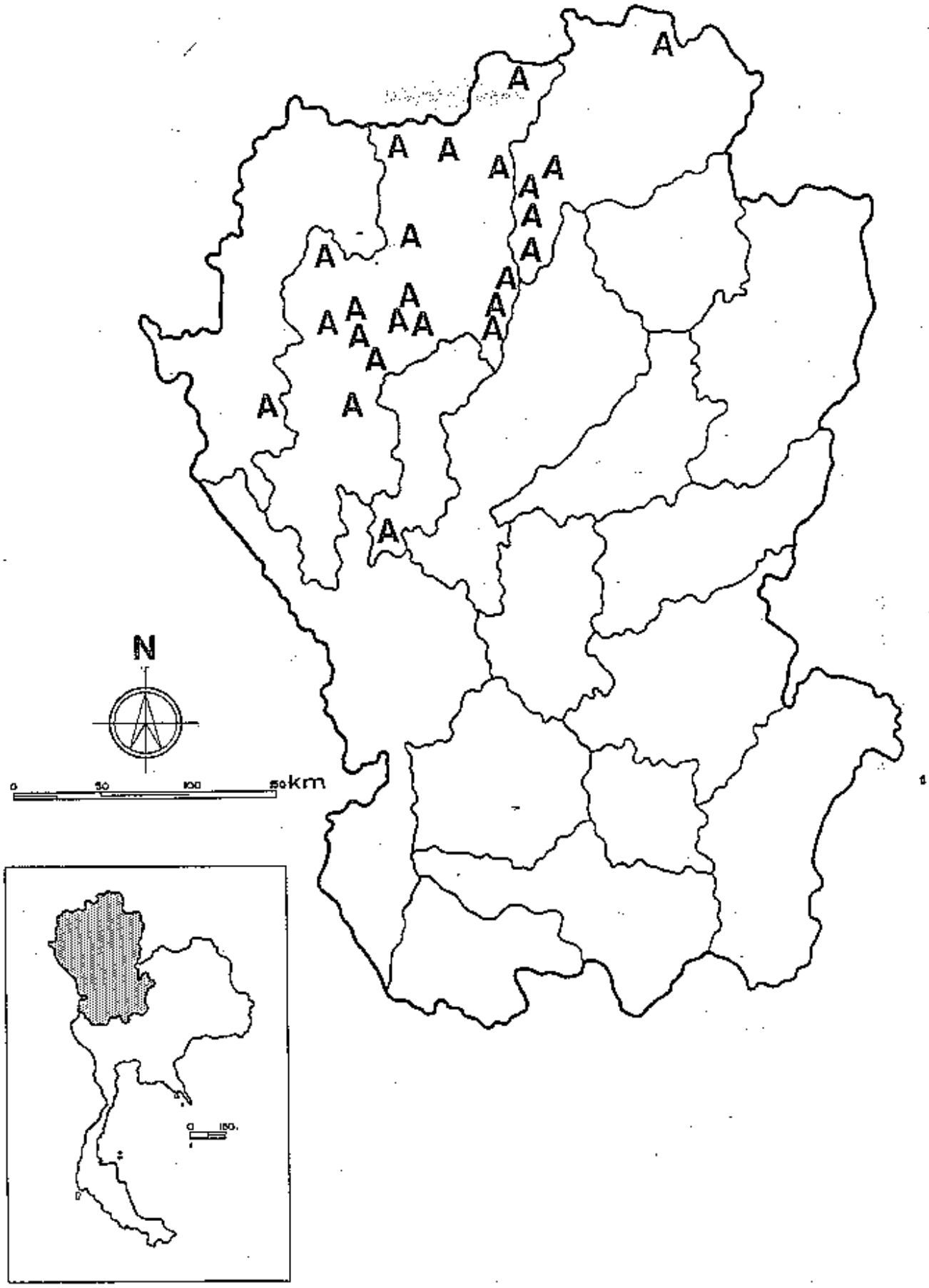

Figure I.4 Locations of centers of development for new crops by Royal Project (A)

Table I.3 Sources of gross provincial product in Chiang Rai, 1989.

Source	Value (million baht)	% of total
Agriculture	6,643	37.5
[of which Crops	5,159	30.1
Others	1,284	7.5]
Manufacturing	607	7.9
Construction	953	5.6
Services	2,008	7.9
Others, including the public sector and the military	7,154	41.7
Total	17,165	100.0
Population 1989	1,027,647	
Income/head (baht)	16,928	

Source: Northern Region Development Center, National Economic and Social Development Board.

I.2.2 Lowland and highland interaction.

Most of the highland villages are within 100 km of the provincial centre (Figure 4.6). The highland population density in Chiang Rai at 53 people/km^2 is much higher than that in Chiang Mai with 16 people/km^2. Some 80% of the land in Chiang Rai lies between 300 m and 600 m elevations, generally known as the "uplands" (Scholten 1974). In Chiang Rai, lowland farmers have moved into the uplands to grow upland crops (maize, cassava, peanuts) and fruit trees. These now cover about 70,000 ha. Some hilltribe villages are on the uplands. In the absence of any legal basis for land ownership conflicts over land, especially, relating to land under fallow, are common. On the other hand, the presence of lowland farmers in the uplands has meant faster spread of new crops and new practices into the highlands. In Chiang Rai, this has included new crops such as ginger, cabbages and tomatoes.

Irrigation is less important in Chiang Rai than in Chiang Mai (Table I.4). Most of the watersheds in Chiang Rai drain into Mae Kok and Mae Lao, tributaries of the Mekong River, which currently has only been marginally used within Thailand. Pressure for water conservation is less severe than in the watersheds of Chiang Mai.

Chiang Rai is the central point in Thailand in the emerging regional cross-border development that also involves southwestern China, the Shan State of Myanmar and northern Laos (Figure I.5). River traffic has already started on the Mekong between Simao and Jinghong in Yunnan Province of China, along the Myanmar and Laos border north of Thailand, to Chiang Saen and Chiang Khong, two river towns in Chiang Rai. Two overland routes connecting Chiang Rai and Yunnan, one through Laos and one through Myanmar, are also now in operation.

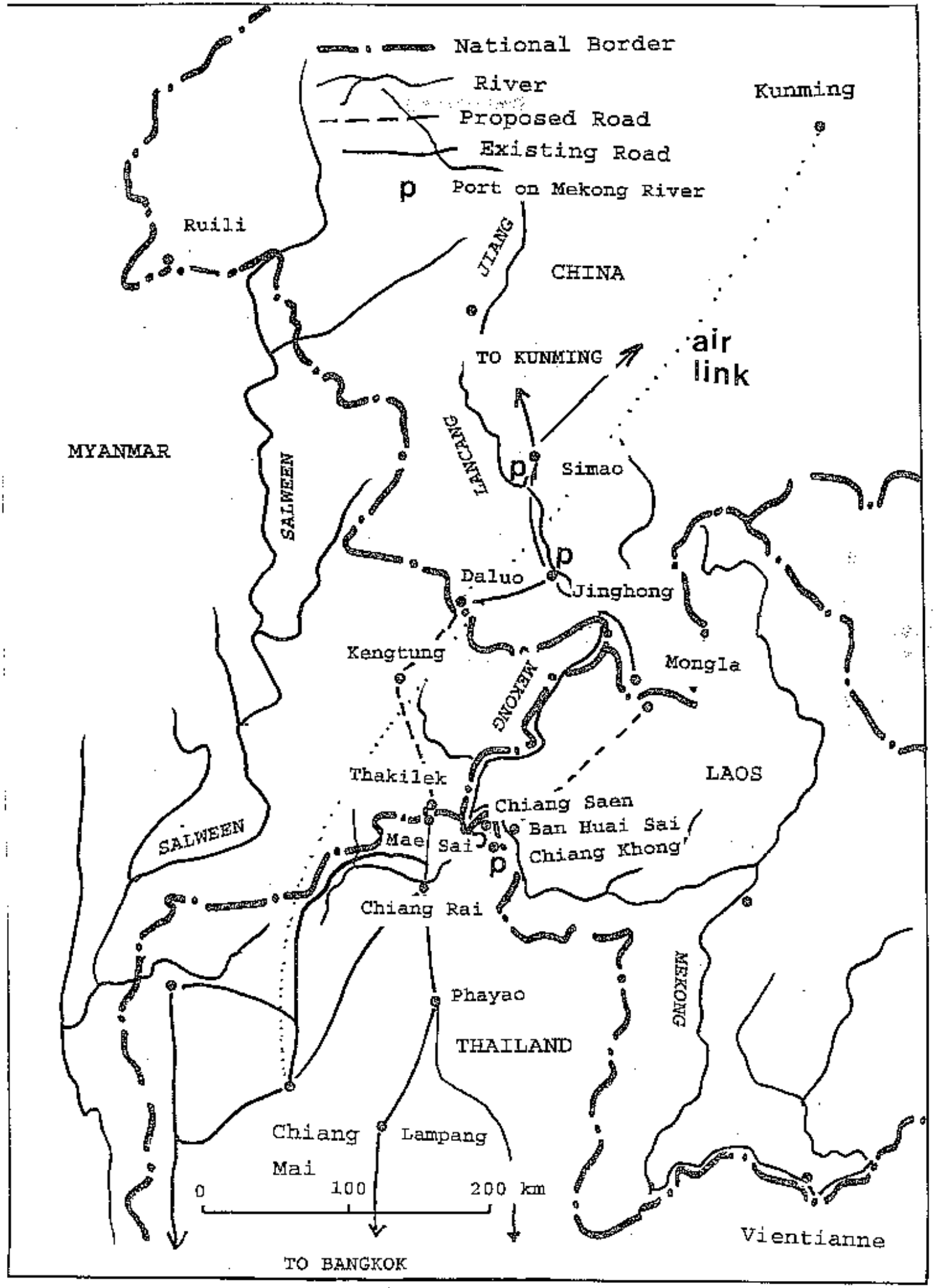

Figure I.5 The emerging "Golden Quadrangle", showing development of new air, road and river links

Table I.4 Some comparative lowland/highland information in Chiang Rai province.

	Highland	Province total
Area (km^2)	2,242[1]	11,678
Population (1993)	119,559	1,043,423
Agricultural land (ha)	na[2]	361,310
% irrigated	na	18
Dry season irrigated crops (ha)	na	11,373

[1] > 600 m above sea level
[2] not available

Source: Compiled from OAE 1992 and National Statistical Office data.

I.3 Mae Hong Son province

I.3.1 Population and economy.

Mae Hong Son is a small border province, with a total population of only 169,682. The Mae Hong Son town was inaccessible until recently. Now it can be reached from Chiang Mai from the north (route 1095) or the south (route 108). The economy is largely agricultural. Per capita income is about the same as Chiang Rai's, but the size of the economy is less than one sixth of Chiang Rai's.

Table I.5 Sources of gross provincial product in Mae Hong Son, 1989.

Source	Value (million baht)	% of total
Agriculture	889	32.5
[of which Crops	339	12.4
Others	550	20.1]
Manufacturing	99	3.6
Construction	286	10.4
Services	304	11.1
Others, including the public sector and the military	1,160	42.4
Total	2,738	100.0

Population 1989	169,682
Income/head (baht)	16,296

Source: Northern Region Development Center, National Economic and Social Development Board.

With its long border with Myanmar the province, together with Tak to the south, receives fluxes of Karen population each time fighting breaks out between the Myanmar government and local forces. Since the roads connecting with Chiang Mai have become passable (the southern route 108 is still being completed) Mae Hong Son, with its distinct culture and relatively intact forests, has become a tourist destination. The circular route from Chiang Mai with stopover in towns such as Pai, Pang Ma Pah, Khun Yuam and Mae Sariang, has now become popular with young travellers on motorcycles.

I.3.2 Lowland and highland interaction

The Mae Hong Son province has two urban centres. One is Mae Hong Son, the provincial seat. The other is Mae Sariang, situated half way between Mae Hong Son town and Chiang Mai. Most highland villages in Mae Hong Son are within 80 km radius of either town. However, unlike in Chiang Mai or Chiang Rai, accessibility is rather limited. Agricultural development in the highland has for the most part been in those villages with access to Chiang Mai, via district towns of Mae Sariang or Pai.

Irrigation is not so developed in Mae Hong Son (Table 1.6). Most of the province's watersheds drain eventually into the Salween, which flows through Myanmar.

Table 1.6 Some comparative lowland/highland information in Mae Hong Son province.

	Highland	Province total
Area (km^2)	9,536[1]	12,681
Population (1993)	107,156	174,777
Agricultural land (ha)	na[2]	33,813
% irrigated	na	2.6
Dry season irrigated crops (ha)	na	5,245

[1] > 600 m above sea level
[2] not available

Source: Compiled from OAE 1992 and National Statistical Office data.

Mae Hong Son is now promoted as a tourist attraction with "nature" as the main selling point. This can come into direct conflict with local land use, i.e. agriculture. The flowering *Bua Tong* (Tithonia diversifolia, Mexican sunflower weed), now promoted as an attraction to visit Mae Hong Son, is actually an exotic species and a weed which has gone rampant covering whole mountains. "Burning" is perceived as a threat to this "natural" environment. The governor's edict that all burning must stop is causing concern in rotational shifting agriculture villages where no alternative technology is yet available to replace burning which plays several essential roles in the maintenance of the system.

ANNEX II: DETAILED DESCRIPTIONS OF MOUNTAIN VILLAGES

Brief descriptions of the fourteen mountain villages surveyed are given in Chapter 4. Below, the results of reconnaissance survey using rapid rural appraisal are presented, and the impacts of policy upon the particular village assessed.

II.1 Pah Poo Chom, Mae Tang district, Chiang Mai Province

Ethnic group:	Hmong	Elevation:	920 m
Population:	217	Households:	32

Well off, sustainable, received substantial development assistance through implementation of Highland Development Master Plan. (More detail on Pah Poo Chom in Chapter 6)

II.1.1 The production system. The major part of village income now comes from sprinkler irrigated cabbages and lychees. The village has no paddy for wetland rice. The area under subsistence upland rice is relatively small and yields are low, but some 70% of the households still try to grow a little rice, which provides subsistence for only 2-3 months. For two months during the wet season (July/August) the whole village earns a substantial cash income (100 - 300 baht/person/day) from collecting bamboo shoots (Dendrocalamus sp.) from wild stands. Material evidence of productivity success in a village of 32 households is shown by motorcycles (almost every household has one), televisions, washing machines and sewing machines. No-one has been forced to seek employment outside the village, although the district town at Mae Tang and Chiang Mai are easily accessible.

The village did not appear, so far, to have suffered from the down cycle of cabbage prices. The gathering of bamboo shoots provides a substantial safety net. The failure of lychee trees to set fruit in the last two years, because of the common problem of alternate bearing, is a major cause for concern.

The village crop land is now largely on relatively flat land. Lychee trees have been planted on almost all of the land that can be irrigated with a sprinkler system, fed by gravitation from a stream just above the village. Cabbages are grown among the young lychees, but no evidence of soil erosion can be seen. According to farmers, water and fertilizer applied to cabbages also feed the lychees. The occasional upland rice in rotation with cabbages is also believed to benefit from the residual effects of cabbage fertilizer. Evidence of land released from shifting agriculture can be seen from extensive forest regeneration on most of the hillsides, covered with 5-6 year old forest regrowth and patches of bamboos. Plots of upland rice on the slopes have been planted with contour strips of pigeon peas as a soil conservation measure.

II.1.2 Impact of policy. The current productive and sustainable agricultural system of Pah Poo Chom might be said to be an outcome of the strict enforcement of opium eradication policy and forest conservation. (See village study for detail)

II.2 Lo Pah Krai, Mae Ai district, Chiang Mai Province.

Ethnic group:	Lahu	Elevation:	600 m
Population:	287	Households:	47

Reasonably well off, received assistance under Highland Development Master Plan, but lost significant portion of village land invested with soil conservation measures through implementation of national forest policy.

II.2.1 The production system. When it was settled more than 30 years ago this Lahu village secured a sizable tract of irrigated paddy to boost their rice production. Productivity was further enhanced by adoption of a double cropping system of rice-soybean in the last ten years. Along with this irrigated cropping system of rice-soybean, significant intensification also took place in the village's old swiddens. Short rotations of rainfed upland rice and maize have largely been replaced by permanent cropping, and often even by double cropping, with a grain legume as the second crop at the end of the wet season. Tree crops, fruits and bamboos, have been established in some of the old swiddens. A number of these fields near the village have actually been converted into homegardens with 30-40 domesticated species of plants. The innovation of homegardens, for a people who became sedentary only some 30 years ago, adds significantly to the household's food supply. Although ownership of these homegardens is recognized, their use is still rather communal. For example, a farmer commented on the popularity of Acacia pennata subsp. insuavis, a common lowland vegetable but new to the village, saying that neighbours like it so much that although he planted it himself in his own garden, he hardly ever got to pick it. Village children are allowed to pick any fruit and edibles they can find.

With an average of more than 1 rai of irrigated paddy land per head, plus some upland rice from the swiddens, the village's subsistence rice supply is relatively secure. The grain legumes which are grown as second crop in most of the village double cropping systems (soybean, adzuki bean, mung bean, lablab), although of less value per area than vegetables, are much more stable in their prices. Depletion of dry season water supply, which reduced the area under dry season irrigated soybean by two thirds in the last few years, is a major cause for concern in the village. Seed supply of adzuki bean, a relatively new crop for export to Japan, is still unreliable.

Encouraged by projects and government agencies, the need for conservation of forest, soil and water is recognized and measures such as fire control, land use planning and use of contour strips are being adopted. The village has quite a good coordinating relationship with downstream lowland villages such that they share dry season water for irrigation. A recent decline in dry season flow has been effectively dealt with to share out "permits" for dry season irrigated soybean. The village, however, is not able to cope with the problem of shared-watershed management with shifting agriculture (Akha) villages upstream. Farmers believe that water supply in streams is positively correlated with forest conservation. As Lo Pah Krai is situated in the lower part of a watershed, villagers expressed a feeling of futility in their conservation efforts: "What can we do,

our conservation efforts are useless if the Akha higher up in the watershed continue to cut the forest."

II.2.2 Impact of policy. Lo Pah Krai was directly hit by the major policy drive to increase national forest cover from its current 28% to the targeted 40%. The Royal Forestry Department, the agency charged with the implementation of this policy, has allocated some 150 rai (24 ha) of the village swidden land to Forestry Industry Organization, a state company, for reforestation with *Eucalyptus*. In a classic example of conflicting actions by different government implementing agencies answering to the same policy objective, much of the land has already been invested with conservation measures, i.e. contour grass strips and planting of tree crops, encouraged by Department of Hilltribe Public Welfare.

II.3 Khun Klang, Inthanond National Park, Chiang Mai.

Ethnic group:	Hmong	Elevation:	1,100 m
Population:	750	Households:	140

Very high pressure on land, sustained with heavy support and subsidy. Village officially established with announcement in Royal Gazette.

II.3.1 The production system. The basic formula for land productivity in this extremely intensive system is 200 m^2 of plastic shade house for a family of four for flower production. Less intensive systems also produce vegetables and fruit. Substantial technical advice, credit for input and market support are provided by the Royal Project. Due to limited resources and markets, however, this heavily subsidized system is insufficient to support the needs of all villagers. The traditional subsistence crops of upland rice and maize are still grown in the swiddens, but they have been surpassed in economic importance by cabbages. Some farmers, in response to the market, have adapted a cheaper version of the plastic house for off-season cultivation of carnations. "Uncontrolled" production has led to gluts that have driven prices down.

For those farmers who are directly supported by the Royal Project, fluctuations in prices are absorbed by the project. But the majority of farmers do not have this security. Inthanond area has been noted for the way villages have gone completely into commercial production. On the surface, it makes economic sense to grow crops that can take advantage of the higher altitudes and to buy rice that can be grown much more cheaply in the lowlands for consumption. However, this rush to cash cropping and then monoculture has led to a critical loss of a traditional system of subsistence production that has provided a measure of nutritional security as well as diversity.

Currently, the economic sustainability of this village is provided by support from the Royal Project. Physically, this level of intensity in cultivation practice requires a high input just for maintenance. For example, the heavy doses of fertilizers used are already creating acidification and other imbalances in the soil which has already reduced its ability to support high levels of productivity. A substantial research input on plant nutrition and soil chemistry would be essential to put the soil right again. Similar problems can develop with insects and diseases. Only a full cost/benefit analysis will ascertain the potential of this production system to be self-sustaining.

II.3.2 Impact of policy. Khun Klang is one of several villages within the boundary of Inthanond National Park. That the villages and their agriculture are allowed at all in the national park might be said to be a "socially sensitive" way in which the RFD is implementing its forest protection policy. On the other hand, the extremely fast conversion to monoculture cash cropping and the resultant loss in nutritional security and diversity from shifting cultivation are the direct effects of the RFD's restriction of forest use coupled with the focus on cash cropping in the agricultural extension process. Most importantly, long term sustainability of heavily subsidized villages such as this will depend on the willingness and ability of society to keep paying. The question of equitability between subsidized and unsubsidized villages will undoubtedly come into the discussion on the wisdom of "subsidized sustainability". (See also 1.3.3; tables 1.4, 1.5).

II.4 Yang Sarn, Mae Chaem District, Chiang Mai.

Ethnic group:	Karen		
Population:	243	Households:	51

High population density area, cash cropping with some sustainability problems.

II.4.1 The production system. The village rice production, from some paddy land and upland rice, produces just about half of the village annual subsistence requirement. The balance is made up by a cash crop of soybean, which is grown in rotation with upland rice. The land is used virtually permanently, occasionally fields are fallowed for one or two years. Farmers believe that rotation is one alternative method to overcome or at least modify problems arising from permanent cultivation: fertility decline, pests and weeds build up. As a cash crop soybean is fertilized, the upland rice that follows is believed to benefit from the residual effects of fertilizer. The problem of weeds is also increasing. Farmers have adopted uses of chemicals such as Paraquat or Grammoxone for weed control. From the women, we learned that the swiddens continue to provide additional "minor" harvests for food, herbs and medicines.

II.4.2 Impact of policy. Yang Sarn is an example of a village in which the impact of highland development policy has been nil. Yet it has had to cope with the full impact of forest policy in curbing forest use. Commercial soybean production has helped to an extent to reduce pressure on the land. The change in cropping system from the traditional rotation shifting agriculture to permanent cropping with soybean is clearly the result of restrictions on forest use by the RFD. Between 1987 and 1992 the village population increased from 205 to 247, an annual growth of 3.5%. In this five year period, the population increase would have required an additional 150 ha of land if rotational shifting agriculture were still the only mode of production. In fact the land area under cultivation has actually declined. Virtually all farmers interviewed reported that they now use less land than before. Two reasons were given: 1) higher productivity per area with new practices (soybean as new crop, use of fertilizers and pest control), and 2) restrictions imposed by RFD. The virgin forest *(Pa Dong)* at the top ridge above the village has remained intact (Figure II.1). The old shifting agriculture area between *Pa Dong* and the current permanent cropping area has been afforested by an RFD unit located in the village, and which provides an additional source of wages.

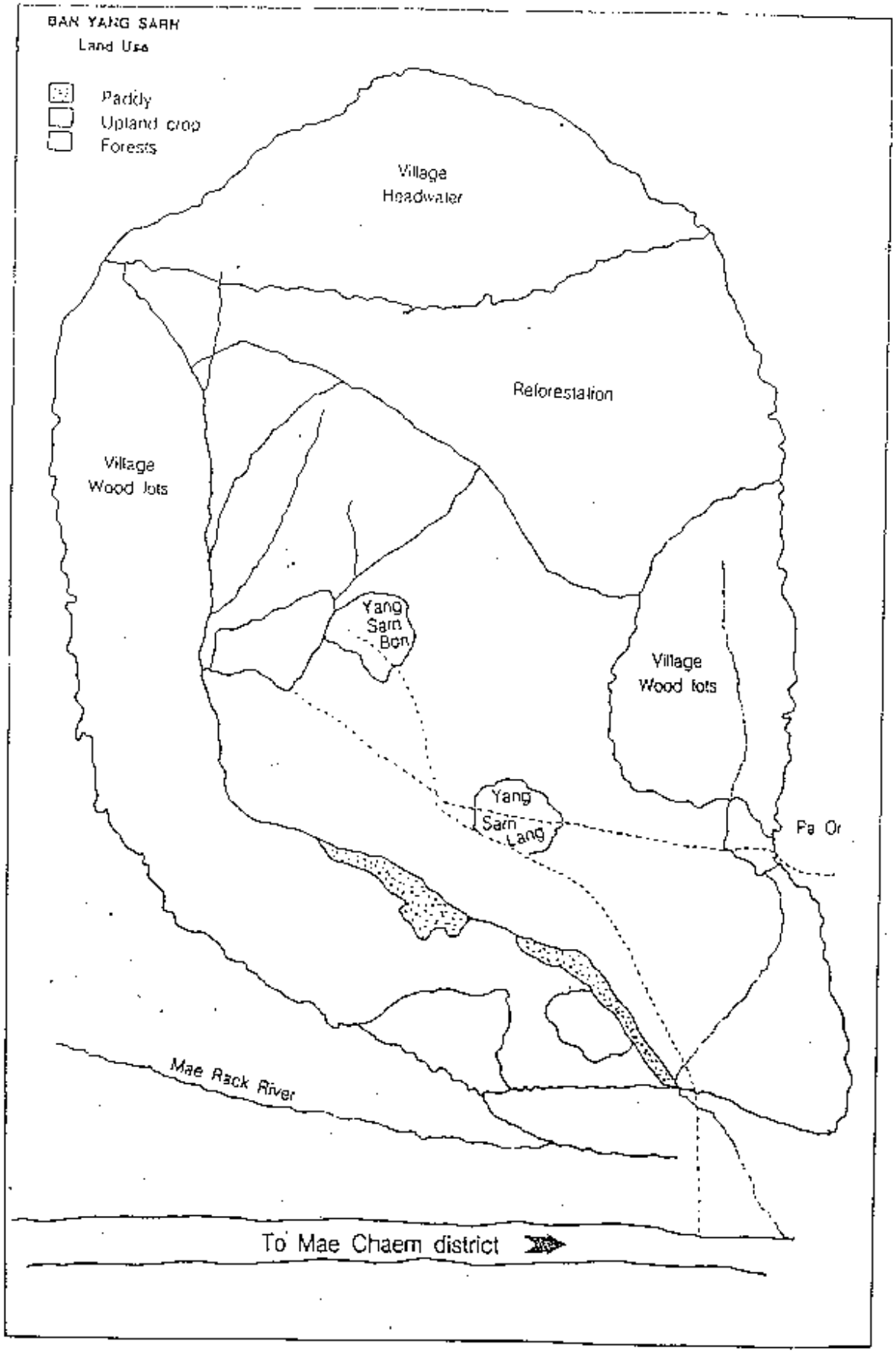

Figure II.1 Land use map in Yang Sarn, a Karen village

II.5 Ban Mae Sarn, Pah Daeng, Doi Luang National Park, Lampang.

Ethnic groups:	Yao		
Population:	339	Households:	47

Village with a productive and sustainable land use system, but targeted for relocation anyway.

II.5.1 The production system. Land use is dominated by tree crops (Japanese apricots, mangoes and Arabica coffee) established since 1970s. The tree crops which have been productive for a number of years now even provide employment to shifting cultivators from nearby villages. The village is prosperous, with substantial houses built (some costing more than 250,000 Baht) and many families owning modern amenities such as TVs, pickup trucks and motorcycles. As tree crops are considered most sustainable among the different land use alternatives for the highlands, it would seem that this is one of the few examples of successful "sustainable development" in the highlands, even with the current down cycle of coffee prices.

II.5.2 Impact of policy. Ban Mae Sarn was officially recognized as a legal village, complete with the village headman, who acts as a representative from the government, since 1972. The established tree crops originated from government and aid projects to encourage "conservation" agriculture and sustainable development, part of the implementation of the Highland Development Master Plan. However, when Doi Luang National Park was established in April 1990 villagers were told that they must be "regrouped", i.e. relocated, out the original site which is classified as A1 watershed. The site to which they have been allocated is already the site of an existing village, Ban Pa Kha (Thai for "village of the Imperata grass"). Potential for development of a productive and sustainable agricultural system at this site is somewhat doubtful. Ban Pa Kha does not grow enough even to meet the needs of its current population, and is actually the source of labour for work with fruit trees and coffee in Ban Mae Sarn. Regardless of all the past achievements on "sustainable development", the designation of National Park on the area is being strictly enforced by the RFD. The RFD has posted guards in the area, denying access to villagers to the "national park".

II.6 Mae Hang Nua, Ngao District, Lampang.

Ethnic group:	Karen	Elevation:	600 m
Population:	168	Households:	30

Well off, sustainable, but located in reserved forest classified "C", for conservation.

II.6.1 The production system. The village is well supplied with irrigated paddy land, some of which also grows soybean in the dry season. Two farmers have orchards of tamarinds and mangoes that were established since early 1980s, and which began to earn them a substantial income by 1990. This generated much interest among villagers to establish fruit trees on their steeper land, a practice which is also encouraged as a conservation measure. Many of the old swiddens have therefore been planted with fruit trees. But among these young fruit trees, upland rice, maize and annual cash crops such as barley, tobacco and vegetables, are planted.

II.6.2 Impact from policy. Despite its achievement of relative success, and apparent "sustainable development", the village's "C" status in the National Reserve forest is a cause for concern for most villagers. Being classed "C" means that uses are extremely restricted and must be approved by National Environment Board.

II.7 Yang Klang, Mae Moh District, Lampang.

Ethnic group:	Karen	Elevation:	475 m
Population:	216	Households:	41

Rather poor subsistence, supplementary livelihood from gathering bamboo shoots from wild stands for sale, but this activity faces restriction by RFD.

II.7.1 The production system. The village lives mainly one a subsistence crop of wetland rice, supplemented by very small amounts of shifting agriculture. A significant income supplement also comes from the gathering of bamboo shoots which lasts for about 3-4 months a year, and through which individuals (everybody, including children) may earn 100-150 Baht/day.

The subsistence wetland rice production, although not very high yielding, is quite stable. Farmers also reported little year to year fluctuation in the productivity of bamboo shoots from the wild stand, unlike cultivated bamboos which can be drastically affected by insect damage. Bamboo shoots are collected partly for the fresh market, but a large proportion of the annual harvest is also processed into acid pickles as cooked bamboo. Buyers set up collecting points near the village at the beginning of each season.

Wetland rice is one of the most sustainable crop production systems known. However, the yields are low and insufficient to meet the village's subsistence needs. This should serve as a reminder for those who are advocating paddy development in the mountains that wet rice does not always answer for all situations. Continuing harvesting of bamboo shoots might cause concern for long term survival of the stands, and hence sustainability of the system as an income generating activity. However, farmers point out that the harvest is intensive early in the season (July/August) when the price is high. As more harvest continues to accumulate, prices begin to level off in September. With lower price, gathering also slows down, thus allowing the late shoots to grow into bamboo stems, and so the stand is rejuvenated.

II.7.2 Impact from policy. At 475 m altitude, this Karen village is at the very low end of the highlands. With the major part of its livelihood coming from wetland rice paddies, Yang Klang is less likely to be adversely affected by forest and watershed conservation policy than most highland villages. RFD, however, sometimes clamps down on the harvest of bamboo shoots as part of its forest conservation measures.

II.8 Nam Sod, Tung Chang district, Nan province.

Ethnic group:	H'tin	Elevation:	375 m
Population:	180	Households:	60

Subsistence, moderate productivity, received some development assistance, effects of forestry policy implementation minimal.

II.8.1 The production system. The village still practises shifting cultivation with at least a few years fallow, and traditional subsistence upland rice and maize as major crops. The upland rice swiddens are diverse with quite a number of cultivated and domesticated wild species. Notable among these are a number of grain legumes (4-5 types of cowpeas, rice beans), cucurbits, Pterocarpus sp. (a leguminous timber tree), some rattan (for shoots and canes) and palms. The village has some wetland rice paddies. Some coffee trees planted a few years ago are just beginning to be harvested, but, most unfortunately, at the time of low local coffee price. Quite a number of young men from the village have actually left the village for employment in towns, e.g. Phitsanulok. Many older farmers reported that some of their fallowed swiddens have not been cropped now for lack of labour because the children have left for town.

II.8.2 Impact of policy. This was one of the villages that were relocated during the years of communist insurgency. Strategic roads built since then have greatly improved accessibility. Efforts have been made to encourage cash cropping, but so far maize has been the only major viable cash crop. After having visited some other project areas, farmers said they would like to get into cash cropping to improve productivity, but think that without irrigation facilities, the potential for improvement would be limited.

II.9 Mae Rid Pagae, Mae Sariang District, Mae Hong Son Province.

Ethnic group:	Karen	Elevation:	1,200 m
Population:	155	Households:	32

Well off, sustainable. Development assistance substantial, including a move towards land security by leasing from Royal Forestry Department. (More detail on Mae Rid Pagae in Chapter 5)

II.9.1 The production system. The village has access to irrigated wetland rice paddies at 0.78 rai per head, much of this is planted to cabbages in dry season. The swiddens have mostly been converted to permanent cropping of upland rice alternating with cabbages. Farmers reported that rice yields in both systems doubled or tripled since the introduction of cabbages. Residual effects of cabbage fertilizer is probably one reason, as well as improved weed control, especially for upland rice, from the clean cultivation for cabbages. Dry season cabbages after rice have some problem with insect control. Farmers are aware of the pesticide toxicity problem arising from insect control. In spite of common belief, there are fewer insects in the dry season crop. The village suffered from low cabbage prices in 1992, but a safety net is provided by the subsistence rice crops, both from the paddies and upland rice. The sustainability problem for cabbages-upland rice on the slopes is minimized by the adoption of contour vegetative strips and land use planning. The steepest slopes have been taken out of production and fruit trees established on land too steep for arable cultivation.

II.9.2 Impact of policy. Villagers admit that the RFD's activities have restricted their access to land. They are, however, appreciative of development efforts to establish permanent agriculture and soil conservation practices. The most significant activity in the development process is the establishment of land use planning in the community along with agricultural development within the framework of "Small Watershed Development". Assistance provided to the village to secure a lease of the village's agricultural land from the RFD is probably the most highly valued activity.

II.10 Pang Kam Noi, Pang Ma Pah District, Mae Hong Son Province.

Ethnic group:	Lahu	Elevation:	1,000 m
Population:	89	Households:	22

Well off, sustainable. Part of a project implementing the Highland Development Master Plan. Settled in 1983 in a wildlife reserve, but since it is in area of watershed of the Salween of Myanmar, land use restrictions by the Royal Forestry Department did not appear to be too severe.

II.10.1 The production system. Near the village site, each household has access to 25 *rai* (4 ha). On this land, which has been invested with soil conservation measures, farmers generally grow cash crops and have planted fruit trees. The villagers have also kept a large tract of land at their old village site, two hours walk away. At this old village site, shifting agriculture is still practised. Each household has 7-8 pieces of land on which crop fields are rotated, to grow upland rice, maize for the pigs and poultry, chilli and other food plants. The necessity of this long distance transportation explains the presence of a considerable number of pack horses in the village. In addition to these, the village also has access to an area of about 500 *rai* (80 ha), used as common grazing land for the village's 230 head of cattle as well as the pack horses. As in other highland villages, livestock had previously been kept mainly as accumulation of wealth and for religious purposes. Now, however, farmers in Pang Kam Noi are increasingly coming to see livestock as an economic enterprise. For example, chickens are caponized and fattened for the town market at 100 Baht a piece, cattle are commonly bought and sold. Nevertheless some old cultural values are still prevalent, e.g. farmers complained that their poor upland rice crop had made it necessary for them to sell some cattle to buy the rice: "It is not right that one cannot grow enough rice to feed the family. It is shameful to have to sell cattle to buy rice. (To hide this shame) we cannot buy our rice from fellow Lahu, and must buy from other people like Shan or Thais".

II.10.2 Impact from policy. Despite the current relatively low population density, pressure on the land is likely to increase in the future as a result of the government's Forest Protection Policy. The Pai Watershed Wildlife Reserve was established by the Proclamation of the National Revolutionary Council Number 341, dated December 13th, 1972. The status of a wildlife reserve means that settlement and agricultural activities are legally prohibited. By a Royal Decree dated August 7th, 1986, an area within the reserve was exempted from this rule. A number of hilltribe villages have been relocated into this area. Pang Kam Noi, as is the case of many other villages in the Nam Lang Watershed, is not in the exempted area. All ten farmers from the village who were interviewed reported that their access to land has decreased as the result of the restriction imposed by officers from the Royal Forestry Department.

Complications and conflicts over land in Pang Kam Noi exemplify the fundamental "institution failure" arising from the absence of a legal basis for land ownership in the mountain. Pang Kam Noi's claims to "ownership" of the shifting agriculture fields at their old village site of Ban Tong Pah, although lacking any legal or official sanction, is locally recognized. There are disputes, however, over the "ownership" of some land near

the present village, which is also claimed by farmers in villages of Pah Daeng (Lahu), Chaboe (Lahu) and Nam Hoo Pah Sua (Shan). The Shan village of Nam Hoo Pah Sua, which has settled in the area for much longer than most, claims that the whole of Pang Kam Noi village (the village site and all crop land near the village) originally belonged to them.

Cattle grazing rights are another source of conflict within the village and also with other villages sharing the same grazing land, e.g. from Pah Daeng, Pah Puak and Nam Hoo Pah Sua. Roaming cattle damaging cash crops is a common complaint. Assistance from agricultural development projects now provides funds to poorer farmers to buy cattle to raise, e.g. the village Heifer Fund. Better off farmers in neighbouring communities, e.g. the larger village at Mae Lana, also find investment by buying animals for local farmers to raise on a shared basis, are causing the cattle population in the area to increase rapidly. Competition for feed and overgrazing of the common grazing land could become a serious problem.

In times of conflicts and disputes historical claims to land becomes a critical issue. Further complications arise from political and economic connections among the villages. In one dispute, the cattle causing damage to cash crops in Pang Kam Noi were under the care of farmers from Nam Hoo Pah Sua, who raised the cattle on a share basis. The owner, however, happened to be the headman at Mae Lana, who claimed to have "given" the land, in 1983, to Pang Kam Noi to settle in the first place.

II.11 La Oop, Mae Lanoi District, Mae Hong Son Province.

Ethnic group:	Lua		
Population:	935	Households:	156

Traditional rotational shifting agriculture village, but have diversified. Well off, sustainable. Long established village, with announcement in Royal Gazette, but no other development assistance or implementation of Highland Development Master Plan. Restriction on forest use imposed by RFD.

II.11.1 The production system. Livelihood activities are varied. Some 75% of the village households own paddies for wetland rice. Most families are also engaged in the practice of shifting agriculture for upland rice production, which is still managed partly on the communal basis, as described for the village of Pa Pae by Kunstadter (1978). The more prosperous households own large tracts of paddy land, operate rice mills or pick up trucks which are used to assemble agricultural and minor forest products from local farmers and transport them to Chiang Mai or Bangkok. A few even grew cash crops at some distance from the village. The village has some skilled families who work silver or iron. The poorer households are dependent on shifting agriculture, off-farm employment and collecting and processing of wild products, especially collecting grasses and making them into brooms.

II.11.2 Impact of policy. Although La Oop has been officially established as a formal village with an announcement in the Royal Gazette it is still considered a "hilltribe" village, and therefore not covered by regular activities of public services. Neither has it received any development assistance under the Highland Development Master Plan. Land use for the traditional 8 year rotation has not been interfered with by Royal Forestry Department. However, expansion of this system to accommodate increased population has been restricted. On the other hand, the influence of the Forest Protection Policy had not extended far enough. It failed to protect 1,000 *rai* (160 ha) of the village communal forest which was taken over by a new Hmong settlement which had moved into the area and cleared the land to grow opium.

> "We, Lua or Hmong, are all breaking the law. Since you (Lua) are not using this forested land now, why should you deny us (Hmong) the use of it".

At the root of this problem is the absence of any legal basis for land ownership on the mountain.

II.12 Tissa, Sob Moei District, Mae Hong Son Province.

Ethnic group: Karen
Households: 28

Traditional rotation shifting agriculture, shortened fallow, dependent on gathering. Minimum assistance from outside, never had any impact of Highland Development Master Plan. Forest Protection Policy has restricted land use, and threatened to stop shifting agriculture and other forest uses, no livelihood alternative.

II.12.1 The production system. Rotational shifting agriculture is the primary source of village livelihood. The rotation is now, however, only 3-5 years. The swiddens grow upland rice for home consumption and chillies for sale. Cotton is also grown in the swiddens for spinning and weaving for home use. A significant portion of income, for subsistence needs as well as for cash, comes from gathering of wild products: mushrooms, wild honey (in Chiang Mai wild honey fetches 20-50% higher price than honey produced from domesticated bees), bamboo/bamboo shoots, yam, wild fruits and greens.

Communal organization plays an essential role both in the management of shifting agriculture and the management of the forest and harvesting of wild products.

II.12.2 Impact of policy. Tissa has seen virtually no impact of the highland development policy or the Highland Development Master Plan. The village is not even listed in the most recent Directory of Highland Population and Communities (NSC/NESDB 1993). Accessibility is poor, opportunities for commercialization or other alternative livelihood activities are limited. Yet the impact of the Forest Protection Policy is clear. Restriction on land use has reduced the rotation cycle to 3-5 years. The provincial governor has announced a ban on "forest burning" in Mae Hong Son. In the village this is interpreted as a ban on shifting agriculture.

II.13 Mae Ngan Luang, Mae Chaem District, Chiang Mai Province.

Ethnic group:	Karen	Elevation:	1,250 m
Population:	236	Households:	43

This Karen village has settled at a relatively high elevation of 1,250 m. They have been in this location for more than 160 years. Through the years, groups of families had split off to form new villages nearby (Figure II.2). These include the villages of Mae Ngan Noi (population 116), Mae Khom Nua (population 96) and Mae Khom Tai (population 94). In addition to part of the village splitting off to settle and claim new land, Mae Ngan Luang had, for a number of years, adopted opium cultivation. All of these indicated a response to increasing population pressure.

II.13.1 The production system. In response to strict law enforcement on illicit cultivation, the village has not grown opium since 1990. Upland rice in rotational shifting agriculture is still the main crop. However, the rotational cycle is now only 3-4 years, and the yield of upland rice has declined as a result of increased weeds and poor, depleted soil. The village has developed some 4 ha of paddy land. The village rice crop often suffers from poor grain set, a common complaint in rice above 1,000 m. Livestock provides another source of village income, with a total of 99 head of cattle and 37 head of buffaloes. An earlier survey (Smitinand 1992) has indicated quite a number of native species with potential for exploitation, but current usage appears to be rather limited. The influence of the highly commercialized nearby Hmong village of Ban Pui is quite prominent in a number of way. Some girls from Mae Ngan Luang have been married off to Hmong men from Ban Pui, often the "bride's price" was the Karen's family debt. Technology transfer from Ban Pui is also starting cash cropping of cabbages, red kidney beans and carrots in Mae Ngan Luang. There is currently a dispute between the two villages over some land belonging to Mae Ngan Luang, which the Hmong from Ban Pui claim as their ancestral burial ground.

II.13.2 Impact of policy. The most obvious impact from government policy is the eradication of opium. The presence of a Royal Forestry Department unit in the village added further pressure on the land.

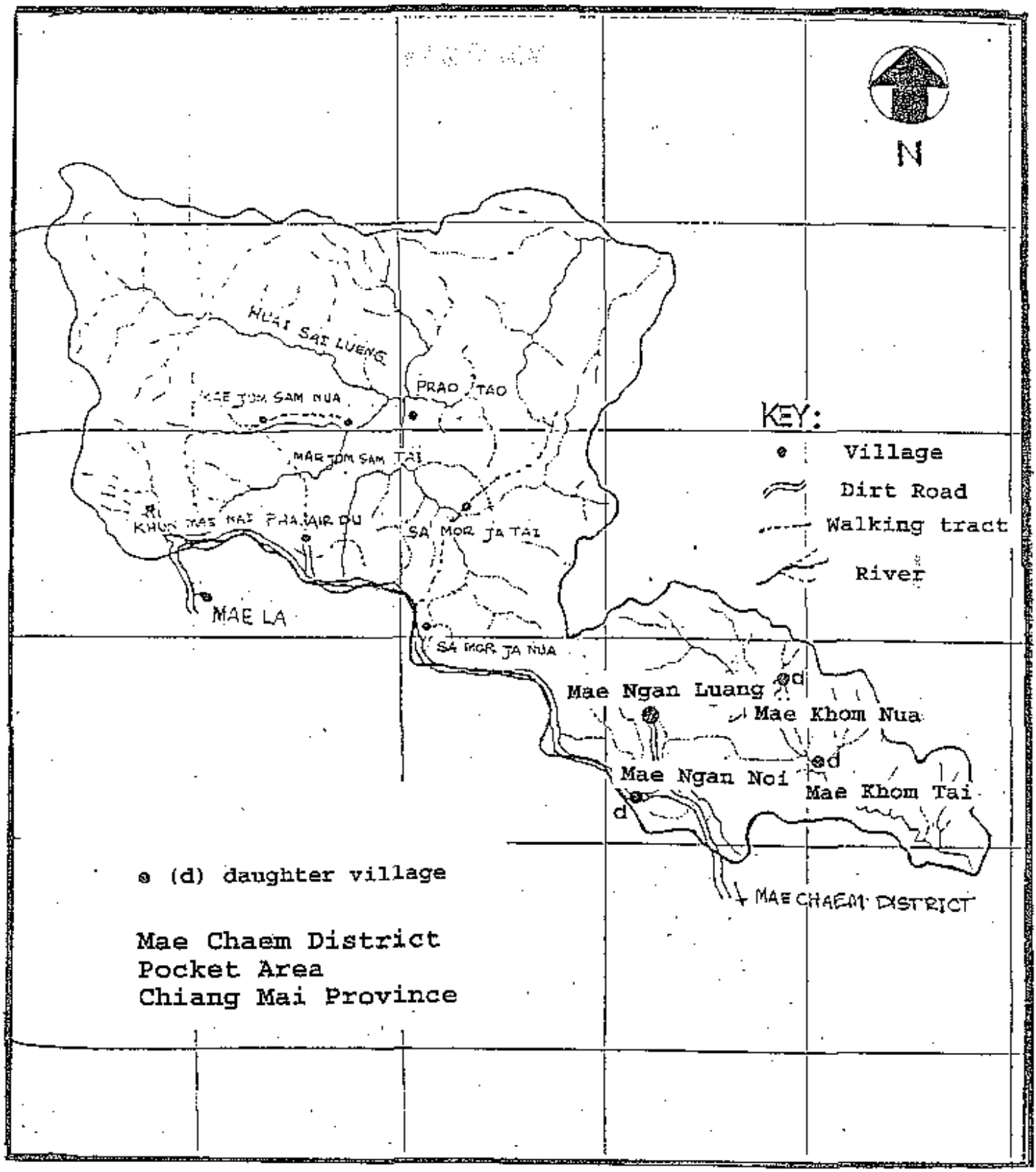

Figure II.2 The Karen village of Mae Ngan Luang and its three "daughter" villages (● d) settled by families that moved from the mother village

II.14 Mae Salap, Mae Fah Luang District, Chiang Rai Province.

Ethnic group:	Akha	Elevation:	760 m
Population:	442	Households:	74

Mae Salap is actually a twin village, comprising Mae Salap Bon (26 households) and Mae Salap Lang (48 households). These are relatively recent settlements, common in this area of Chiang Rai not far from the Myanmar border. Until recently (early 1980s) the area was quite openly dominated by armies of drug traffickers. In the early 1980s there were many disturbances in the area as the Thai Army battled with local warlords (e.g. see Belanger 1989). The fighting culminated in the control over Ban Hin Taek, a major stronghold of drug traffickers, by the Thai Army. Army units are still stationed in the area. The district seat at Mae Fah Luang, established as a district only recently, is dominated commercially and politically by the remnant of the Nationalist Chinese 93rd Army. Many of these people now have Thai citizenship, but ties with Taiwan are still very strong, and include transfers of agricultural technology such as cultivation of fruit trees and tea. Clear evidence of the influence of the Chinese on land use is the expansion tea gardens and fruit orchards over much of mountain land in the area.

The first five Akha families settled at Mae Salap Bon, in 1968. They were later joined by another 23 families. In 1980, 28 Akha families came to settle at Mae Salap Lang, about 10 minutes walk away. The last wave of settlers added 43 Akha families to Mae Salap Lang a few years later.

II.14.1 Production system. About one fifth of the households have some paddy land, but growing upland rice for consumption is the major livelihood activity. Except for the few households in Mae Salap Lang with one hectare or more of paddy land, everybody grows upland rice in a kind of rotation. Most households also grow maize which is sold as well as fed to pigs. Other major cash crops include peanuts, sesame and soybean. Many farmers have started to plant tree crops, which include tea, bamboo (for shoots) and lychee. One very rich farmer in Mae Salap Lang makes a good income by selling cuttings and seedlings. Mae Salap Lang also has quite a sizeable herd of cattle and buffaloes, and a number of packhorses. In about a quarter of the households, the women make small amounts of money, 1,000 - 2,000 Baht/household/year, from their embroidery.

In 1993, 14 farmers from Mae Salap started to grow ginger for processing factories in Chiang Rai. They are being joined by more farmers in 1994. At a price of 10 Baht/kg for fresh ginger, and yield of 1,250 kg/*rai*, all the farmers growing the crop recognize this as an extremely viable economic enterprise. An average household can easily plant 2 *rai* with just family labour. Buyers or factories, which export the processed roots to Japan, generally provide credit for inputs. With planted roots carefully mulched with rice straw, the soil surface is well protected against erosion. However, as farmers in other areas of Chiang Rai have found, for a given village this is probably one of the shortest lived production systems in the mountains. A devastating root disease of ginger quickly builds up in the soil after cropping, which makes it necessary for farmers to keep moving to new fields. Once infected the soil cannot be used for growing ginger again for

a very long time. None of the first ginger areas in Chiang Rai, which have stopped growing the crop for more than 10 years now has gone back to ginger. Fortunately, the disease is specific to ginger and does not attack other regular crops. Some 62 people from Mae Salap have to find employment outside the village. Four of these had gone to Taiwan and six, women who are known to have become prostitutes.

II.14.2 Impact of policy. Mae Fah Luang where Ma Salap is located is considered of strategic importance by the National Security Council. Many government supported development activities have been brought in after the army had reasserted Thai sovereignty over the area in 1982. Sometimes, however, these activities are not always well coordinated. Villagers in Mae Salap have in the past received free seedlings of tree crops from "nowhere". In other villages, farmers have told of being "ordered" to stop shifting agriculture by government officials only to find that promises of alternative employment were not kept. Mae Salap is an example of the impact of migration imposing pressure on the land. Our hypothesis is that such crowding is a combined result of three processes, 1) government forest conservation activities, 2) competition for land by expansion of tea gardens and fruit orchards on commercial scale, and 3) cross-border in-migration from Myanmar.