



**Forestry Department**

**Food and Agriculture Organization of the United Nations**

**FIELD DOCUMENTATION OF  
FOREST COVER CHANGES  
FOR  
THE GLOBAL FOREST  
RESOURCES ASSESSMENT 2000**

Rome, 2000



## The Forest Resources Assessment Programme

Forests are crucial for the well-being of humanity. They provide foundations for life on earth through ecological functions, by regulating the climate and water resources, and by serving as habitats for plants and animals. Forests also furnish a wide range of essential goods such as wood, food, fodder and medicines, in addition to opportunities for recreation, spiritual renewal and other services.

Today, forests are under pressure from expanding human populations, which frequently leads to the conversion or degradation of forests into unsustainable forms of land use. When forests are lost or severely degraded, their capacity to function as regulators of the environment is also lost, increasing flood and erosion hazards, reducing soil fertility, and contributing to the loss of plant and animal life. As a result, the sustainable provision of goods and services from forests is jeopardized.

FAO, at the request of the member nations and the world community, regularly monitors the world's forests through the Forest Resources Assessment Programme. The next report, the Global Forest Resources Assessment 2000 (FRA 2000), will review the forest situation by the end of the millennium. FRA 2000 will include country-level information based on existing forest inventory data, regional investigations of land-cover change processes, and a number of global studies focusing on the interaction between people and forests. The FRA 2000 report will be made public and distributed on the world wide web in the year 2000.

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## Abbreviations

DBH	Diameter of tree at breast-height (1.3 m above ground level)
FAO	Food and Agricultural Organization of the United Nations
FORIS	Forest Resources Information System
FRA	Forest Resources Assessment
GIS	Geographical Information System
GPS	Global Positioning System
NGO	Non Governmental Organization
RECOFTC	Regional Community Forestry Training Centre
RFD	Royal Forest Department
RSS	Remote Sensing Survey
T2, T3	Satellite images with acquisition date 1991 respectively 1998, used in the remote sensing study and covering the study areas.
Rai	Unit for area measurement (40m x 40 m, 1 ha = 6.25 rai)
Baht	Currency of Thailand, May 2000 (37 Bath = 1 USD)
Fallow	In the Remote Sensing Survey, the term fallow is used for land where shifting cultivation is the dominating land use.
Change polygon	An area where the RSS land cover class has changed between the acquisition dates of T2 and T3.
Shifting cultivation	A traditional method of agriculture characterized by the rotation of fields rather than crops, the use of short cropping periods and long fallow periods, and the maintenance of fertility by allowing natural vegetation to regenerate on fallow land. Clearing of new or previously cropped land is often accomplished by cutting and burning vegetation. Also known as slash-and-burn or swidden agriculture.

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A general thanks to all the farmers and villagers at the three sites that were willing to share their knowledge and thoughts with us, is also appropriate.

# 1 Introduction

FAO, at the request of member nations and the world community, regularly monitors the world's forests through the Forest Resources Assessment Programme. The next report, the Global Forest Resources Assessment 2000 (FRA 2000), will review the forest situation by the end of the millennium. FRA 2000 will include country-level information based on existing forest inventory data, regional investigations of land-cover change processes, and a number of global studies focusing on the interaction between people and forests. The FRA 2000 report is made public at the end of the year. Findings will be distributed on the World Wide Web in the year 2000.

One component of FRA 2000 is a survey of forest cover changes using satellite remote sensing. The survey is based on a pan-tropical sample of 117 Landsat TM images from three points in time during the period 1980-2000. The images are interpreted as to observable changes in the forest cover, and will provide objective estimates on a regional level. This working paper documents both quantitatively and qualitatively three observed forest cover changes in the northeastern part of Thailand.

The objectives and methodology of the RSS are described in detail in the Forest Resources Assessment Working Paper number eight.

## 1.1 Objectives

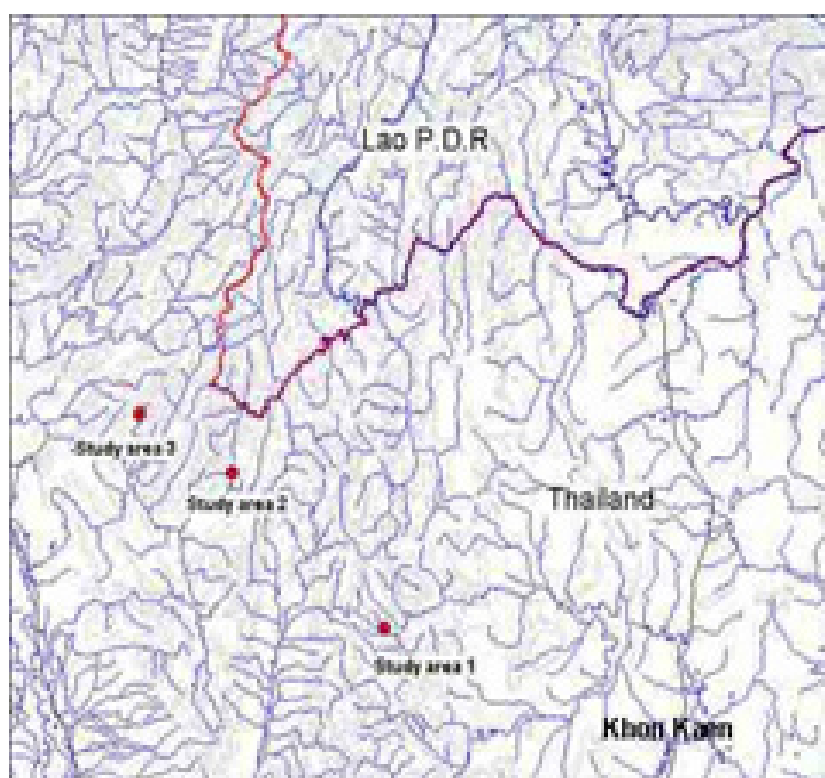
- To verify the satellite image interpretation on the ground;
- to make a comprehensive documentation of the site, related both to the state and management of the forest and other land, and to the socio-economic situation affecting the management of the land;
- to investigate the causes of recent changes and to provide an outlook for the future;
- to provide an in-depth case study section to the report from the remote sensing survey.

The fieldwork also included developing and testing methodologies for a future systematic field sampling. This task relates to a proposed extension of the current remote sensing survey into a World Forest Survey (WFS) to be carried out under the leadership of FAO. WFS would include a field component with the general objective to assess the supply and demand situation for forest products and services on a global basis.

## 2 Methodology

### 2.1 Preparations

The criteria for the site selection was that a negative change of forest cover was found in the RSS and that it had taken place during the period between the acquisition dates of the T2 (1991) and T3 (1998). The study areas were set to be 1 km x 1 km. Three areas were selected, and their centre points were defined as points on the boundaries of the change polygons.



*Figure 1. Map of the study areas.*

The fieldwork was undertaken in Petchabun, Loei and Phitsanulok Provinces of the mid-north of Thailand. For technical assistance, local knowledge and for translation, Letters of Agreement on collaboration were made with RECOFTC and the Forest Resources Assessment Division of the RFD. RFD and RECOFTC provided the aerial photos for detailed area analysis. The RFD provided analogue satellite image dated January 2000. The geo-referenced digital T3 image was purchased from the National Research Council of Thailand.

Co-ordinates were first retrieved from the geo-referenced satellite image. They were later corrected in the field after a local adjustment of the geographic registration of the image based on GPS readings. It is important to note that although the co-ordinates changed in the course of preparation due to improvement of image registration, the actual location of the sites remained fixed.

The centre points were stored in a laptop computer and in the GPS receiver as waypoints (co-ordinates that the receiver can use for navigation as destinations or part of routes). Since the projection of the image was UTM (Universal Transverse Mercator), this was also the projection used in the GPS receiver.

**Table 1. List of equipment used**

GPS (Garmin 12 CX)
Camera (Kodak DC290 digital zoom)
Analogue cameras
Laptop with navigation software, GIS and a digital satellite image (T3)
Aerial photographs (recent 1995/96 and historic 1975/82)
Topographic maps (1:50,000 & 1:250,000)
Forest survey equipment (clinometer, calliper, loggers tape)

Before going to the sites, the closest village was identified on a 1:50.000 scale topographic map. This map was then used to reach the village. When navigating to the centre point in the study area, both GPS and aerial photographs were used. The final location of the site was determined by GPS alone.

## 2.2 Field measurements and observations

Fifty systematic sample plots (circular, 10 m in radius representing a sampling intensity of 1,6%) were laid out for measurement at the first site. The diameter of all trees (more than 10-cm dbh), height of the tree with the largest DBH on the plot and diameters of stumps were measured. Notes were taken on each plot on availability of wood supply, the land cover class, observations on felling and removals, disturbance, species group and erosion risk (see FRA 2000 Working Paper 1 for definitions). Twenty-five of these plots were surveyed in a systematic grid covering half of the 1 km x 1-km study area (fig.2). Measurements of trees and photo-documentation were made on every second plot.

Initially, the plots were demarcated by use of measurement tape and compass. In order to speed up the survey this methodology was replaced with a combination of compass and GPS, where the GPS was used for measuring the distance from the first plot in the row.

This approach was time consuming, although part of the plot was on agricultural land. Heavy rain became a limiting factor to carry out the planned measurements. Therefore, in the following study area, fieldwork consisted of visual observations and photographic documentation.

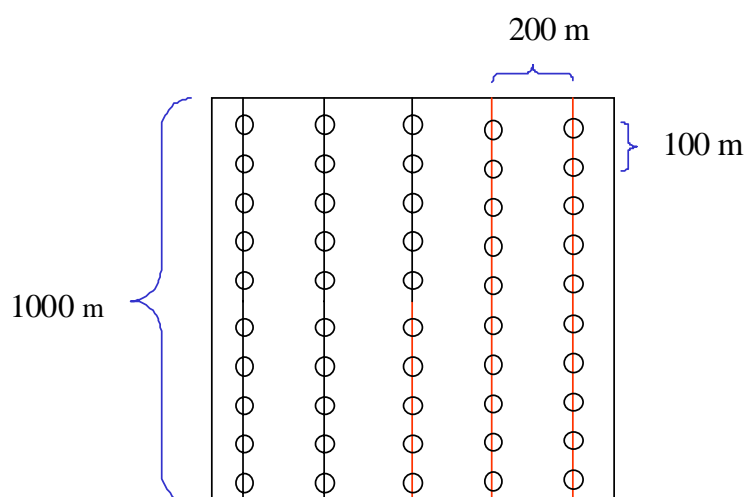


Figure 2. Survey pattern of the study areas. Only part of the first study area (red lines) were actually surveyed, due to constraints.

In the first study area, Ban Na Por Song in Phetchabun Province, the remaining part was covered by a traverse from the southern to the northern boundary. Study area two, Ban Khok in Loei Province, was covered by going to the centre point, while in the third study area, Ban Nam Chuan in Phitsanulok Province, it was only possible to reach the southern part of the study area.

At all sites, there were villagers accompanying the field team, advising on road or path selection as well as species and forest use based on their local knowledge.

### 2.3 Photo documentation

Predominantly digital, but also analogue photos were taken. For the digital photos, notes on time, GPS-position and picture-file order were made. Photos were taken in four directions, always starting heading North and turning 90 degrees clockwise. Photos were also taken in the village, during interview sessions.

### 2.4 Qualitative Data; Group discussions and transect walks

In order to address the socio-economic situation affecting the management of the land and to investigate the causes of recent changes and to provide an outlook for the future, qualitative research methods were applied. Open-ended key questions were prepared for interviewing focal groups. Rapid Rural Appraisal (RRA) tools, such as resource mapping, transect walk and activity schedules were used. Key informants were identified predominantly by the village headman. The interviews tended to be in small groups. Aerial photographs were used to discuss forest resources, and a community resource map was made only at the second site. Group discussions with women were held in all the sites.



*Figure 3. Villagers studying an aerial photograph (Ban Kok)*

The transect-walk consisted in walking to the centre point of the study area accompanied by villagers. The walk provided a good setting for addressing issues of tenure, vegetation, agricultural practises, change over time and future prospects. Several discussions went on simultaneously; however, the information was later cross-checked.

## 3 Findings

### 3.1 Literature overview

Thailand is a predominantly agricultural country with 78 percent of its population engaged in agriculture. Presently its major export crops are rice, maize, and cassava. During the 20<sup>th</sup> century the area of agricultural land has increased primarily at the expense of the area of forested land. This leads to shortages of wood, food and fuel materials and has caused environmental deterioration (Sutthisrisinn, 1998). It is estimated that 10 million out of approximately 59 million people are dependent on forest resources for livelihood in Thailand according to statistics from 1995 (Poffenberger, 1999).

The impressive economic growth has mainly been concentrated to Bangkok and the surrounding provinces. The average income per capita in Bangkok is still 12 times higher than the country's poorest region, the Northeast (ibid.).

Although extensive political measures for protecting the remaining forest area and reversing the trend have been enforced, the deforestation rate for the last century as a whole has been high in the whole country, especially in the Northeast Region. Sixty percent of the land area in this region was covered by forest in 1952, this figure decreased to 28 percent in 1973 and to 14 percent in 1988 (Saowakontha, 1994). Commercial timber exploitation combined with land clearing by both local and migrant farmers are commonly stated as reasons for deforestation. Public concern over disastrous flooding and landslides in southern Thailand triggered a national logging ban in 1989. This marked an important policy shift towards greater emphasis on the involvement of communities in forest management activities (Poffenberger, 1999). There is an increasing number of national parks which is in line with the 1985 National Forest Policy aim of reaching 40 percent forestland cover. However, conflicts do occur between local people and the government about the use versus protection of forest parks.

While Community Forestry Management (CFM) legislation has not yet been approved, the concept has gained legal support under the new constitution and decentralisation laws<sup>1</sup>. Before CFM laws are enabled, current conservation policies are unfortunately at odds with the community rights provisions listed in the Constitution (ibid.).

The two types of land in Thailand are land with private ownership, referred to as "deed land"<sup>2</sup> and land with use right that cannot be sold<sup>3</sup>. There are several grades of usufruct tenure, where the differences concern user rights, tax, legal documents etc.

Over the past 30 years, a number of policies supported by the Ministry of Interior, the military, and the RFD have legitimised the expansion of communities into the forest reserves, especially in the northeast Thailand. These included the establishment in 1975 of the National Forestland Management Division (NFLMD) within the RFD to administer the Forest Village Program and the national Forestland Allotment (STK) project. To support these programs the Thai cabinet gave amnesty to all illegal residents in reserved forest (Hafner & Apichatvullop, 1999).

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<sup>1</sup> The 1992 Tambon Administration Organization Act strengthens the role of village governments in forest use and decision making. In the 1997 Constitution, Art. 45 vests traditional communities the right and duty to manage resources (Poffenberger, 1999).

<sup>2</sup> This is referred to as *Channot ti din* and is only found in the most developed parts of Thailand and accounts for relative small proportion of the land of the country (source: [www.ethailand.com/business...estate/underst\\_land\\_titles/](http://www.ethailand.com/business...estate/underst_land_titles/)).

<sup>3</sup> For example, Nor Sor 3, Sor Kor and Por Bor Tor 5.

To solve the problem of more than one million families illegally occupying forest reserve land, the Thai government implemented the Sor Tor Kor in 1982. This is a usufruct license that grants the right to occupy and farm up to 15 rai of forest reserve for an initial period of approximately five years (Maokham, 1997).

In the study areas, tenure arrangements include Por Bor Tor 5, and the Sor Tor Kor. Both have usufruct status and can be passed on to family members but the land cannot be sold. In the case of the Sor Tor Kor, where the land is allocated from degraded forestland, the household is required to give up farm land that exceeds the 15 rai for reforestation (ibid.).

## 3.2 Study area 1

Ban Na Por Song Village, Nam Nao District, Petchabun Province

### 3.2.1 Community Background

Ban Na Por Song is the village closest to the study area 1, situated 3 km Northeast of the site. According to the village history, a hunter founded it three generations ago when travelling through the area. He decided to settle, and cleared the land for agriculture<sup>4</sup>. The population of the village is steadily increasing, with continuous inward migration primarily from further East and from the Khon Kaen area. Due to this growth, the original village has now been split into several administrative units with respective village leaders (headmen) in 1985. Today there are villagers of two administrative units interacting with the forest of study area 1. The most recent settlement (Moo 4) consists of 134 households located along the road. The other settlement, Moo 5, has 270 households and the houses are clustered. Most of the families are descendants from original settlers.

In 1977, the area was changed from being a sub district (*Tambon*), to a bigger district (*King Amphoe*). With the new status came increased presence of the authorities, among others through a government office and some military presence, as is normal in a King Amphoe. One effect of the development was increased control over remote forest areas and for the same reason local people were encouraged to settle in forest areas.

The main livelihood of the inhabitants of Ban Na Por Song is cultivating cash crops such as ginger, corn and lychee. Paddy and upland rice are primarily for household consumption. Some people also have orchards.

Non-wood forest products are important, especially for the poor and land-less new settlers. During the rainy season, mushrooms and bamboo shoots can provide an important income supplement.

The National Park of Nam Nao, situated two km south of the study area, covers an area of 96.000 ha. The boundary of the National Park also covers forest area in Loei Province, Khon Kaen and Chaiyapoom Province. It was declared a national park in 1965 despite protestors pursuing it to the Court. When it became a national park, people had to be relocated and all agricultural and construction activities in the forest stopped. This included halting a project to build a dam across the Huay Chern stream bordering the national park for producing electricity. However, the power supply problem was solved in 1977 when the village got electricity from another dam.

The forest area outside of the national park was logged in 1982 when the government authorised a concession to a logging company. Workers came with the company from other regions and extracted

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<sup>4</sup> The study team had access to locally produced document by a teacher about the village history and area

timber until the national logging ban was enacted in 1989. The concession and the uncompleted dam project left a network of good roads and tracks in the area.

There is a 3,200 ha community forest that is used by the villagers. It was established in 1996, and was formed in what was previously called the Common Land. The community forest is divided in respective zones: Conservation-zone and a User-zone. This has involved changes in the regulations and rules for the land use, described later in this report. Important functions of the user-zone of the community forest are provision of non-wood forest products, construction wood and areas for grazing.

The community forest was established after several villagers participated in a visit to a community forest in Lumpoon Province (close to Chang Mai) that was promoted by the RFD and a Non Governmental Organization (NGO). This event also coincided with village area being upgraded to an official District (Amphoe), four years ago. This milestone, was part in triggering the change from Common Land to Community Forest.

A small sacred forest is located on the eastern side of the village. The belief is that the spirits of the ancestors reside there. Out of respect, there is neither harvest nor collection of forest products. As described other religious ceremonies in the forest has also taken place.

### **Tree Ordination**

On two occasions in specific parts of the community forest, there have been organised Buddhist rituals (buad pa) to ordain trees. The first occasion coincided with celebrating the 50<sup>th</sup> Anniversary of the Coronation of the King of Thailand. The nation-wide program aimed to protect 50 million trees (Hoare et. al, 1997). In Nam Nao, together with 2000 people visiting, and as a collective activity with the people, monks performed ceremonies where important trees were picked out and marked as sacred. In the community forest, the ordained trees have a yellow cloth-rope tied around their trunks. Sacred trees cannot be cut. This cultural innovation of religious practice has been respected, and also used with animist hilltribes, so in fact, it helps create awareness of the need for forest conservation. This religious activity has gained vast interest and support from the public media, of which many have come to recognise the existence of forest dwellers through participation in the ritual (Luangarmsi, 1997)

### ***3.2.2 Observations from the Remote Sensing Study***

According to the remote sensing study, the forest cover had changed from closed forest to long fallow in the change polygon where study area 1 was located. The change has taken place in the Western part of the square.

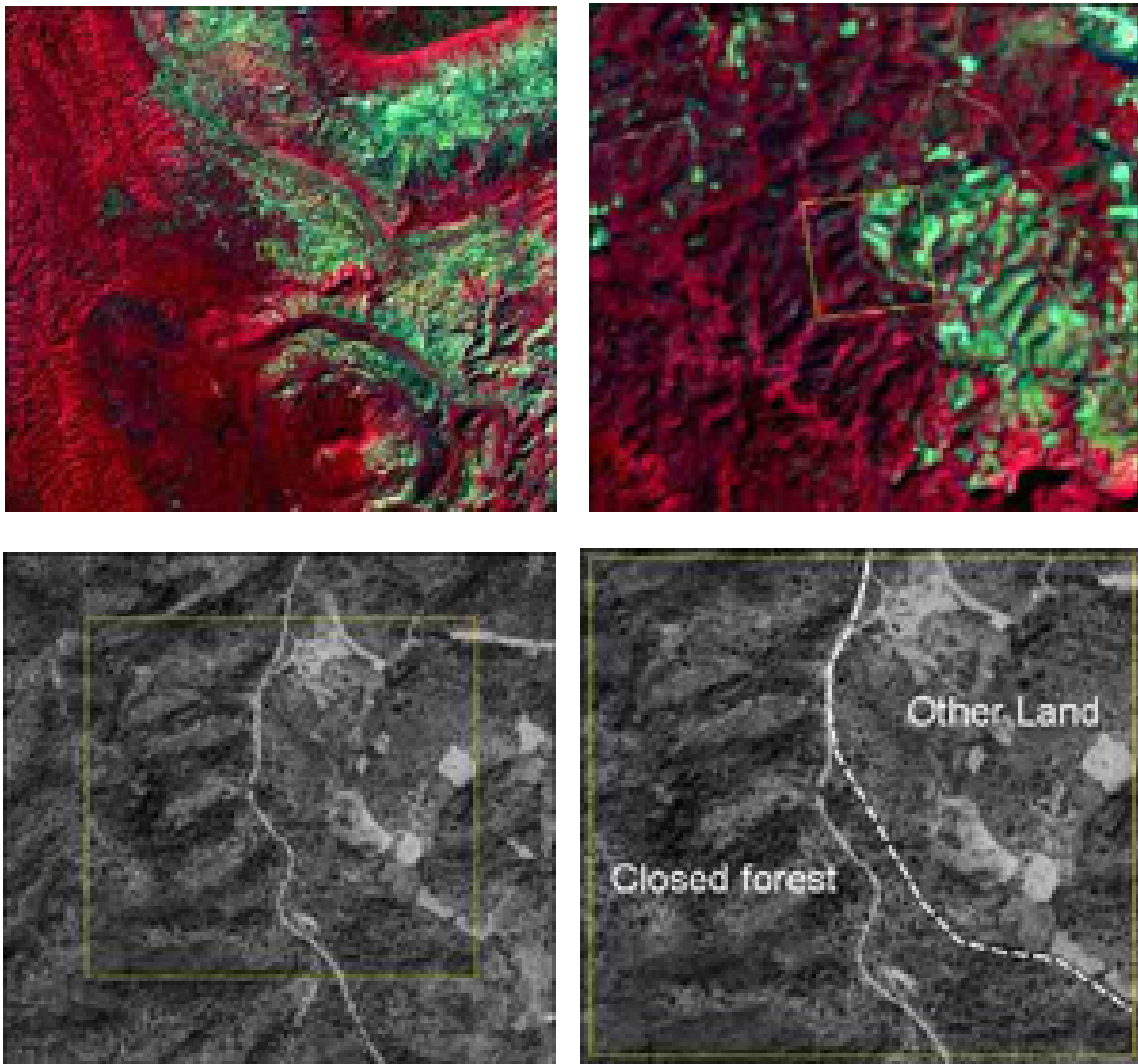


Figure 4. Study area 1 on the Landsat TM image from 1998 (T3) (top left and right), and on an aerial photograph from 1996 (lower left). Boundary between closed forest and other land in study area 1 (lower right).

### 3.2.3 Forest cover and land use based on field observations and aerial photographs

The land use in the area is diverse. In figure 4, the boundary shows a rough split into a part with predominantly agricultural land use and one part with forestland use.

#### **Agricultural part (other land<sup>5</sup>)**

This part of the study area is dominated by permanent agriculture, with occasional fallow-like fields. Mechanised tillage is widespread. Fruit tree plantations, fish ponds and paddy rice fields were also noted.

Fire is still a frequently used method for clearing land (almost everywhere there were signs of fire).

<sup>5</sup> Other land refers to land classification for FRA 2000 (FRA Working Paper 1)

Although some evidence of cutting and burning in the boundary zone to the forest, it was not enough to conclude that the agricultural part is still expanding.



Fig. 6. The agriculture part of study area 1 is dominated by permanent agriculture. A few fields were left in fallow. The regeneration, however, was set back by annual fires.

### Forested part (closed forest<sup>6</sup>)

The forest is heterogeneous with a mixture of forest types and species groups. Dry deciduous forest mixed with pines dominated on the dry ridges and evergreen broad-leaved trees dominated in the wetter low-lying parts of the terrain along streams and in valley bottoms. Common on the lower slopes along the streams were also dense stands of bamboo. The following species were identified as common forest species at study area no. 1:

<i>Pterocarpus macrocarpus</i>	<i>Memecylon scutellatum</i>
<i>Pinus kesiya</i>	<i>Dipterocarpus intricatus</i>
<i>Careya sphaerica</i>	<i>Euginia cumini</i>
<i>Cratoxylum spp.</i>	<i>Garuga pinnata</i>
<i>Cananga latifolia</i>	<i>Croton robusta</i>
<i>Stereospermum neuranthum</i>	<i>Castanopsis spp.</i>
<i>Schima wallichii</i>	<i>Lithocarpus spp.</i>
<i>Laegerstroemia macrocarpa</i>	<i>Quercus spp.</i>
<i>Anneslea fragans</i>	

Large parts of the forested land had previously been used for agricultural purposes. Now they had been abandoned. The explanation for this changed land use was the relocation of farmers from the forest to the agricultural lands on the other side of the road in connection with the establishment of the Community Forest. Furthermore, planting of trees (*Oxyilia xylocarpa*, *P. kesiya* and *Pterocarpus macrocarpus*.) in open areas in the forested part had taken place during the last couple of years.

In the forested part, there were traces of fire almost everywhere and often the natural regeneration and the planted seedlings had been damaged or killed by the annually recurring fires. Many stumps showed that there was a lot of tree cutting in this part of the study area.

<sup>6</sup> Closed forest refers to land classification for FRA 2000 (FRA Working Paper 1)

There were no signs of grazing in the forested part of the study area the reason being that grazing was restricted to a different part of the community forest, according to the local guides. According to the local guides the forest in the study area used to be much more open, when there was still grazing.



Fig. 7. Dry dipterocarp forest (left) and abandoned fields (right) from the forest part of study area 1.

### 3.2.4 Stakeholders interests in the forest

In order to collect qualitative information on forest cover change in the study area, the principal stakeholders<sup>7</sup> were identified: The Villagers, the Community Forestry Committee, the RFD Protection Unit and the Watershed Management Unit.

#### **Villagers:**

Non-wood forest products, such as mushrooms and bamboo-shoots, farmland for agriculture and wood for construction are the most important land uses of the study area for the villagers. Forest in general is also used for grazing, hunting, and cultural aspects such as ceremonies in the sacred forest and tree ordination.

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<sup>7</sup> We were not able to conduct interview with the *Poor People Federation (NGO)*. This is an NGO in the village that has been involved in the community forestry.

## Non Wood Forest Products

Table 2. A listing of the most common products collected from the forest. The marked products (\*) are ranked as the most important.

<b>Forest Product</b>	<b>When Collected</b>	<b>Use</b>
* Various mushrooms species	Rainy Season, depends on rain, but normally April/May	Food, marketed if surplus. The price varies from 40-100 bath/kg depending on species.
* Bamboo shoot, various species.	Rainy Season, April/ May, the big Bamboo shoot in June	Food and to market
Edible Fern (Pak Kood)	Rainy season	Food , and market 3-5 Baht per kg. The price has gone down due to high supply
Bamboo sp. various	Rainy Season and some later in June	Food and to market
Young shoot of rattan	not known	Food
Old rattan	not known	Weaving
Palm species Hua Peng	not known	Food (the bulb is edible)
Wild ginger	not known	
Wild vegetable	not known	Market
Sweet vegetable (Pak Wan)	Rainy Season	Only available in national park. Good price 60-100 bath/kg
Medicinal plants	All year	Medical treatment, i.e. muscle pains etc.
<b>Animals</b>	All year	
Birds, various, esp. doves	All year	Food
Lizards (ta kua),	All year	Food
Snakes	All year	Food
Wild hen	All year	Food
Wild pig	All year	Food
Armadillo (nim)	All year	Marketed for medicinal purposes. People extract a potion from its scale, and keep it alive (esp. the young). A middleman is contacted in Khon Kaen when they find one. Young nim (3-5kg) is worth 500 bath/kg. Older nim (up to 10 kg) is worth 200-300 Baht/kg.
Barking Deer (Geng), and other deer	All year	Food (illegal to hunt)
Fish from streams	All year	Food

Mushrooms and bamboo shoots are important products for family subsistence and almost all families collect them. There are special delivery points in the village where people sell their harvest. Middlemen come and buy from these points directly. Mushroom picking is important for generating extra income, especially for the poor and land-less. In the village today, twenty households are landless.

The price varies according to the mushroom type, but it is normally between 40 Baht/kg to 100 Baht/kg. Bamboo shoots are sold for approximately three Baht/kg. A large shoot can weigh up to two kilos. Both products can, in certain periods, reach prices between 80-160 Baht/kg.

Mushroom picking is predominantly a female activity, but during the weekend people come from long distances to collect mushroom. It is sometimes also regarded as a social outing to the forest, with both

women and men participating. Occasionally, disagreements occur about who occupies certain picking areas but they are usually resolved quickly. The informal rule is, however, first come first serve. There is no right to exclude others, nor any restriction on whom may pick where.



*Figure 8. Women in the Nam Nao forest after a morning of mushroom picking*

### Agriculture

There are agricultural fields in the study area. The explanation given to why agricultural practise is occurring is due to the fact that villagers were forced to move their farmland out of the forest five years ago. It was accepted that these individuals needed farmland and dispensation was given to concentrate some fields in an area where the forest was degraded many years ago.

### Grazing

There is no grazing in the study area today. A specific grazing zone for cattle has been identified within the community forest. The villagers have pooled the cattle and four families have been given the full time job of herding and feeding. Cattle must be herded since cattle-owners are responsible for damage done to farmland by grazing cows. This is different from the rules of the previous Common Land, where the custom was that no compensation was given and where people fenced in their farmland to protect the crops.

### Tenure

The Community Forestry Bill has still not been passed by the Parliament, therefore the community forest has no formal document yet. The informal agreement of having agriculture in this area (user-zone) means that the tenure arrangement is also informal. Part of the communal land was allocated to farmers as compensation from having to move their fields out of the forested area. The particular farmland has a usufruct status for families that cultivate, but there is no formal ownership. If a Community Forestry Bill is passed it is uncertain what kind of status this area would get.

In contrast, the tenure system applied in other farmland of the village, is a document showing that villagers have the user right to the land and that they are obliged to pay annual tax to the government of 5 bath/ rai. This type of tenure is called Por Bor Tor 5. The document does not include maps indicating the land borders. Agricultural farmland varies between 40-100 rai (6.4-16 ha) in size and is inherited to both women and men. The land can be leased (this is done informally on a village basis) but not sold.

Burning of grass and weeds is common practice for land preparation in the study area. However, it happens that it gets out of control and there is a problem of annual fires in the forest. Various reasons are given to the causes of fires. They can be triggered by certain hunting practices, such as smoking out animals, or drying the ceramic clay bullets that are used in the slings for killing birds. Careless cigarette smoking in the forest is mentioned as another cause. The fires mostly extinguish by themselves after a couple of days. In some cases, the RFD will intervene. Interestingly, it was mentioned that where cows are grazing there is less burning, because the ground vegetation is eaten.

### Tree Cutting

The Community Forestry Committee (CFC) grants permission to cut trees in the user-zone of the community forest for the following purposes: a) to poor people<sup>8</sup> for housing-construction<sup>9</sup>, or b) repair and construct public buildings. This was not the case ten years ago when no permission was obtainable.

Villagers expressed that illegal cutting continues. It is common today that external people from outside the village hire poor people in the village to cut.

Fuelwood is not extracted in large quantities from the study area or from the forest in general. People get fuelwood from areas closer to the village where they live, for example, from the farmland and fruit-orchards. Women utilise fuelwood, charcoal and gas for cooking.

### **The Community Forestry Committee**

The newly established Community Forestry Committee (CFC) has nine members, of whom two are women. They were selected by the Sub-District (Tambon) Council and are still defining their role and activities. Meetings are held on an informal basis.

One of their activities is granting cutting permits for house-construction and for public buildings, such as temples and schools. Before cutting takes place, those who fulfil the criteria's must specify how many trees and what tree species they want to cut. It does not seem to matter where the cutting takes place; but the CFC must be solicited. The committee then informs the RFD.

Allegedly there have been incidents where settlers, who were granted wood to build a house, were actually only speculating. When the wood was cut and the house was built, they sold it immediately for a profit and moved out of the community. Consequently, the committee now tries to check whether the newcomers are intending to settle permanently. A norm has been established that smaller trees are granted for cutting either for the first house or if there is uncertainty whether the family will stay long term in the village. Bigger trees are permitted cut for permanent settlement.

### **The RFD Protection Unit**

The main responsibility of the RFD Protection Unit is to protect the forest from illegal cutting, forest fires, and to work with public relations such as awareness raising. There is a problem of understaffing and underfunding of the office. The RFD office is located near the village centre. Confiscated logs that have been cut illegally with chainsaw are stored beside the office.

The forest under the responsibility of the Protection Unit is subjected to special restrictions due to being classified as a conservation and watershed area. In the conservation area, only mushrooms and bamboo shoots can be harvested. Fuelwood cannot be extracted. In the watershed area, there are stricter regulations. Neither mushroom nor bamboo shoots can be collected.

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<sup>8</sup> In the village, a focus group defined poor as those who were landless.

<sup>9</sup> who would otherwise not afford to buy wood from the Sawmill in Chum Pae

The RFD regards illegal cutting in the forest as a predominantly “internal” problem. Local people are mainly responsible for opening new land to grow ginger. Trees that are cut in order to access the land are either burned or sold. The RFD did not go into details about to whom.

When the RFD patrol arrests people they are brought to the police station in Ban Na Por Song, put to trial, and fined. In the period from October 1999 to April 2000, the RFD arrested nine locals for illegal cutting. Collaboration between the RFD and the villagers is improving. Especially long-term residents co-operate in trying to extinguish fires and in reporting illegal cutting. This is a consequence of the establishment of the community forest.

### **The Watershed Management Unit**

The role of the Watershed Management Unit is to reforest the watershed area (Nam Chern). When the unit was created in 1996, an officer with support staff from Khon Kaen was employed. At this time numerous agricultural fields in the forest were found that people claimed as “theirs”. There was resistance to stop cultivating on these farmlands.

There is still some way to go in order to overcome communication problems and mistrust between the unit and the villagers. One example is that the Watershed Management Unit has been unsuccessful in finding a local worker for the job to start a tree nursery in the forest. Most likely, the reason is a misunderstood fear. People think that they would be personally responsible and would have to compensate for damage done by for instance cattle.

The example below illustrates the experience of an employee at the Watershed Management Unit:

“I was instructed to plant trees in the plots and put up a sign “conservation area”. The villagers just tore these signposts down again. However, during meetings a compromise was found. Inter-cropping in the farmland was accepted, and people promised not to destroy the trees that were planted. Although we reforest and we organise tree planting activities with students (so that we can hopefully also indirectly sensitise their parents), the forest is generally becoming depleted. The main change in the forest over the last 5 years is that there are more young trees now, but less big trees”.

According to some villagers it has happened that people who reported illegal logging were in fact threatened and harassed by individuals who did not want official intervention.

### **3.2.5 Was the RSS result correct?**

The findings of the remote sensing survey were that the forest cover had changed from closed forest to long fallow in study area 1 during the period 1991-1998.

Summarizing the information given by people, the agricultural part of the site was already open 10 years ago. Then the land was mostly used for grazing. The aerial photograph from 1996 clearly shows that there has not been a major change during recent years. It is not possible to say that more forest disappeared between 1991 and 1996, although the stabilising effect of establishing the community forest might point in that direction. Anyhow, there is little doubt that cutting is taking place. Taken into account that the general trend is the development of more permanent agriculture use of the land (which means less fallow-land), there are good reasons for assuming that a change has taken place. In terms of RSS classes, it would in that case be from open forest to other land and not as originally interpreted.

The change is not evident and between different classes than was interpreted, therefore the conclusion must be that the interpretation from remote sensing was not correct.

### *3.2.6 Important processes and future outlook*

- Establishment of the National Park and the protected watershed area lead to a high presence of officials. This prevents people, at least to some extent, to cut illegally.
- The community forestry functions as a bufferzone for encroachment into the National Park, and supplies people with housing-materials and economic benefits from non-wood forest products. By concentrating agricultural activity in a specified area, other parts of the study area can regenerate.
- Economic wellbeing is a factor that must be taken into account. Those who are less well off are more vulnerable and therefore contracted for illegal logging by external demand.
- Secure and stable tenure arrangements provides incentives for permanent agriculture, since it affects the willingness to invest in for instance fruit trees or fertilisers.

For future sustainability it is imperative that communication improves, that can provide a feeling of mutual benefit in preserving the forest, for both RFD and the villagers. It seems that the establishment of the community forestry resulted in stronger local control over the forest resources and an increased feeling of ownership. Nevertheless, it is still necessary to improve communications. An example of this was that some villagers had the impression that the confiscated logs outside the RFD office were in fact cut by the officers themselves. Likewise, more secure tenure to the forest might diminish the problem of frequent fires that hampers regeneration today.

It is likely that the study area is reaching a stabilised land use pattern. Very little points in the direction that the forested part is going to decrease further. On the contrary, reforestation activities and recovering of forest on former farm fields in fact indicates that positive change can take place.

## **3.3 Study area 2**

Ban Kok village, Na Haew District, Loei Province

### *3.3.1 Community Background*

The second site is located about 2 km Northwest of Ban Khok village. The village was founded 120 years ago, originally by 4 families from another village, Ban Noe, five kilometres closer to the main road. The families cultivated farmland in the Ban Khok area already before moving. As the name indicates, Ban (village) Khok (hilly) is an area with undulating hills. There are 180 households, which sums to approximately 700 inhabitants.

A logging company was active in the surroundings of the village between 1977 until 1988. Elephants were used to extract timber from the forest and local people were hired to work for the logging company<sup>10</sup>. The roads and tracks that are seen today, including the one leading to the study area, stem from this period.

Cash crops such as ginger, maize for animal fodder, soybean and mulberry tree for silkworms constitute the main livelihood for the villagers. Some households have recently started mango and lychee production. For subsistence people grow both paddy and upland rice.

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<sup>10</sup> One villager was 14 years old at the time and was paid between 8-12 Baht a day for taking care of the elephants.

Normally households occupy between three to six agricultural fields. The more fields, the longer the fallow period and the better the recovery of the soil fertility. There are no landless families in the community.

The part of the forest that is most dense is 5-6 kilometres from the village. Due to the steep landscape it is difficult to access. In the village, there is both a Cemetery forest and an Ancestral forest. In the Cemetery forest the dead are cremated. The village customs is that fuelwood only from this forest can be used for cremating. It is believed that the spirits of the ancestors live in the ancestral forest, and out of respect, the villagers do not pick any forest products here. An annual ceremony is held every August.

There are several projects in the village, ranging from building of ponds to promoting rural credit systems. Electricity was installed in the village 1987.

### 3.3.2 Observations in the Remote Sensing Study

According to the Remote Sensing Study, area 2 is shifting from long fallow to short fallow. In the top left image of the figure below, one can observe the short fallow in the eastern part of the study area and the long fallow in the western part. Compared to the image from 1991, the change-zone has expanded westwards.

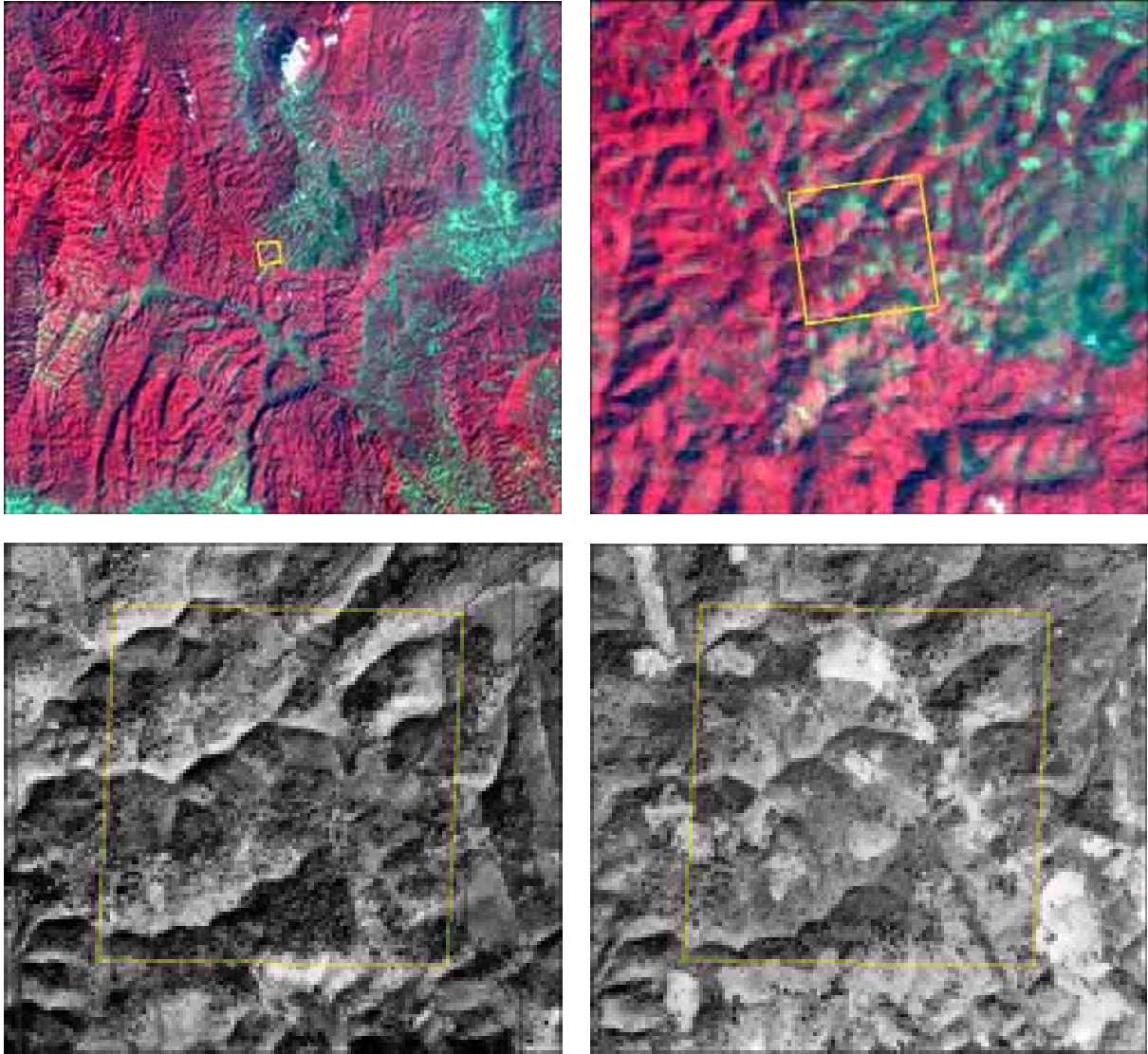


Figure 9. Study area 2 on the Landsat TM image from 1998 (T3) (top left and right), and on an aerial photograph from 1982 (lower left) and 1996 (lower right).

### 3.3.3 Forest cover and land use based on field observations and aerial photographs

Compared to study area 1, study area 2 was less complex. Except for small patches of remaining forest the land was mostly open or in different stages of fallow. There were also signs that land was being used for grazing. Broad-leaved evergreen trees dominated the forested parts. Furthermore, an extended network of tractor roads was found on the site.

When studying the two aerial photographs in figure 7, it is evident that deforestation has occurred since 1982. It is difficult to tell only from aerial photograph what the actual land-use was at that time. Even though there was a lot more forest, there are signs of human impact and that clearing of forest has taken place.

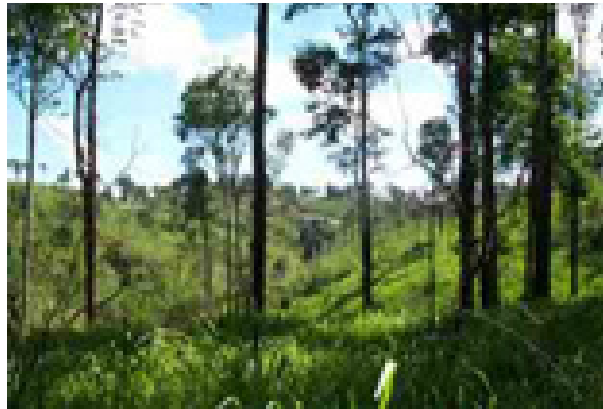


Figure 10. A view from within study area 2.

West of the study area, the forest becomes denser. Still, there are plenty of open areas in a range of three kilometres from the site, which are a result of shifting cultivation. Eastwards, towards the village and down the valley, the land-use tends to be more dominated by permanent agriculture, e.g. paddy fields in valley bottoms.

The following species were identified as common forest species at study site no. 2:

<i>Elaeocarpus sphaerius</i>	<i>Spondias pinnata</i>
<i>Schima wallichii</i>	<i>Aromadendron elegans</i>
<i>Shorea roxburghii</i>	<i>Alstonia scholaris</i>
<i>Dipercarpus alatus</i>	<i>Vitex pinnata</i>
<i>Eugenia cumini</i>	<i>Terminalia bellerica</i>
<i>Helicia robusta</i>	<i>Stereospermum neuranthum</i>
<i>Phyllanthus emblica</i>	<i>Careya sphaerica</i>
<i>Nephelium hypoleucum</i>	<i>Croton robusta</i>
<i>Cratoxylum spp.</i>	<i>Annaslea fragrans</i>
<i>Sapium baccatum</i>	<i>Garuga pinnata</i>
<i>Dillenia spp.</i>	<i>Castanopsis spp.</i>
<i>Arthrocarpus lakoocha</i>	<i>Lithocarpus spp.</i>
<i>Ficu spp.</i>	<i>Quercus spp.</i>

*Schima Wallichii* was commonly left standing as scattered trees on the fields.

### 3.3.4 Stakeholders interests in the forest

Study area 2 was very different from the previous one. There was less presence of forestry officials due to the long distance to RFD offices. There was no national park in the vicinity, nor any special watershed protection programme. The information from Ban Khok is therefore predominantly given by villagers.

### The villagers

The villagers use the land in the study area mainly for agriculture and grazing. Resin tapping and hunting are other forest activities. Forest products such as mushrooms, bamboo-shoots and wood for building materials are collected from the more dense and remote parts of the forest.

### Agriculture

An example can be given of the crop-cycle in the study area:

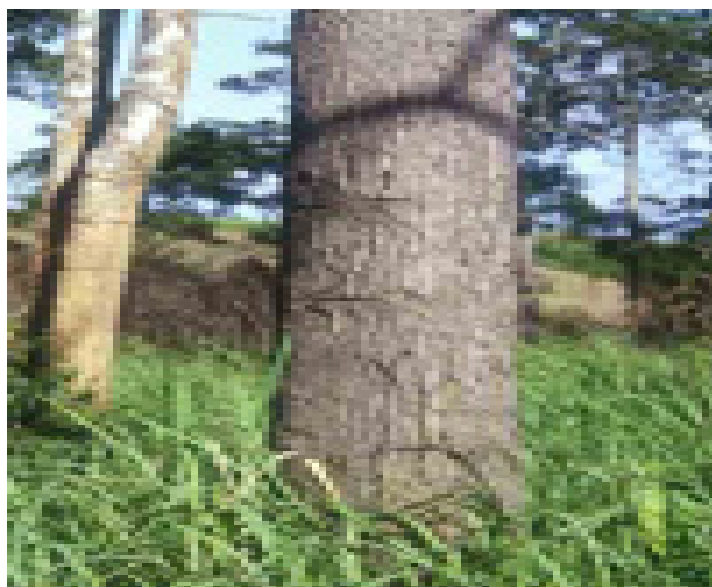
“Nine years ago the forest was converted to farmland and the owner planted ginger. After one year of ginger, the crop was changed to upland rice for the following four years. Now the farmland has been in fallow for five years.” – “When will the owner return and start planting again?” – “He will come back to the land plot when he can’t find other new land” (farmer, Ban Kok).

Changing crops and opening new land is related to the poor soil fertility and the lack of inputs such as fertilisers. It is noted that ginger, in particular requires good soil. Burning is a used land preparation method. In Ban Khok only 20-30 families in the village cultivate fields on a permanent basis. With the new rural credit programme, people can borrow money to buy inputs such as chemical fertiliser. However, villagers claim that it is mostly the richest families who can afford these services.

### Tenure

The tenure arrangement prevailing in Ban Khok is the “Sor Tor Kor”. This document states user-rights to agricultural land that cannot be sold, but can be passed on within families. All families have access to land under this tenure. By May 2000, about 40 households (20%) had obtained this document, and more will be allocated in the near future. The Land Department allocates 15 rai (2.4 ha) from degraded forest. The average size of land that a family actually utilises varies between 30-60 rai (4.8 ha). This means that households occupy more land than what is the formal tenure document. Farmland is often passed on to newly wed couples from respective parents. Otherwise, new land will be opened in the degraded forest.

In the study area there is an example of informal tenure. The bark of trees is marked in order to show that a person has taken claim to a field. Other people will have to respect this as an informal property right. This system of claiming land does not need to pass through the village Headman.



*Figure 11. Picture of a tree that is marked indicating land claim*

## **Village Headman**

A village headman is elected by the residents of a respective village and will normally sit until the age of 60. He is paid a small remuneration by the government (1000 Baht per month) in order to participate in meetings in the sub-district office and serve as a liaison between the government and the village. He acts as the spokesperson for the village as well as formally conveying decisions taken at the District Office.

### Cutting

When forest is cleared to open farmland, the tree species that are good for house-construction are used, while the rest is burned. Before the logging ban timber used to be sold to outsiders, but today this is not common.

### Non wood forest products

In contrast to study area 1, people from other communities do not make use of the forest. The forest products collected are: Mushrooms, bamboo- and young rattan shoots, chestnut fruit, palms, honey, resin to make torches, medicinal plants and sap to make glue. Wild lychee fruit is also harvested in the forest. Men hunt squirrels and birds.

During the rainy season, both women and men pick mushrooms. However, while women go out with the purpose of picking them, men do not. Men only pick mushrooms if they spot them on the way, as for example, when returning from the farmland. The harvest is for self-consumption, but if there is surplus, villagers go to the meeting point by the main road to sell.

A middleman buys chestnuts directly from the village, while palm-fruit and young rattan shoots the villagers themselves transport to the market in Dansai. A few families depend on resin tapping for making torches that are sold both in and outside the village.

There is one special bamboo shoot, which cannot be sold. The RFD permits it to be harvested only for village consumption.

### Fuelwood:

Men are responsible for collecting fuelwood from the farmland. Charcoal is the most common heating source for cooking. For rice, that needs long cooking time, fuelwood is preferred. Gas is also utilised.

### **Activity schedule:**

Ms. La, married with 2 children.

<b>Time</b>	<b>Activity</b>
5-6 a.m.	Gets up and cooks breakfast for the family
8 a.m.	Leaves to go to the farm fields
12 noon	Arrives at the farm- where they are now growing corn (although she travels with the I-tan (motorised combined tractor/waterpump)
5 p.m.	She starts the return journey (it goes faster on the way back- because it is downhill).
6-7 p.m	Arrives back home
7 p.m	Cooks
8-9 p.m	Goes to sleep

## **The Royal Forest Department Officer**

There is little presence of the RFD in the village and the office responsible for Ban Khok recently moved even further away. Visits are paid only occasionally and in specific periods, such as during the time of land preparation. People know that land clearing, even in degraded forest, is illegal and that it can lead to arrest.

## **Rural Development Office**

The Rural Development Office supports projects in the village such as promoting rural credit, a housewife group, and construction of ponds for irrigation. For example, the rural credit fund permits villagers to take a loan of 10,000 Baht for pig and cattle raising, and 6,000 Baht for cultivation of banana. The loan has to be returned to a revolving fund within three years.

### **3.3.5 Was the RSS result correct?**

The findings of the RSS for study area 2 indicated that a change in land-use from long fallow to short fallow between 1991 (T2)-1998 (T3) had occurred.

Since aerial photographs from two dates were available for this site, it can be confirmed that there has been a change in the study area. With the information from the villagers at hand, there are reasons to believe that the major part of this change occurred after the T2 acquisition date.

Short fallow is the correct classification of the land cover today, which was also correctly interpreted in the T3 image. To prove that the classification of the T2 to be long fallow was correct, is naturally more difficult. The 1982 aerial photograph shows more of a closed forest, although parts are probably in fallow. Simply interpolating the two aerial photographs would result in the classification long fallow.

Assimilating the theory that the expansion of the land used for shifting cultivation is a continuous process westward, the interpretation looks even more reasonable.

### **3.3.6 Important processes and future outlook**

- Compared to study area 1, the village has a stable population with few immigrants.
- Due to little official interference and relaxed attitude of villagers, shifting cultivation continues to expand. Nevertheless, villagers are aware that this is an illegal activity, and that the problem of scarcity of forest resources is unavoidable in the future.
- New livelihood opportunities are offered by various projects in the village. This might diminish the need for people to open new land and possibly lessen the dependency on agricultural farmland as the only source of income. Higher income might lead to increased use of agricultural inputs, and subsequently gives an opportunity to utilise the land in a more permanent way.
- The supply of both wood and non-wood forest products is not a problem since the forest is still quite bountiful. The villagers have noted that there are fewer mushrooms now in comparison to ten years ago, but these are not important factors for the development of the forest.

To conclude, it seems most likely that the deforestation process is the strongest and will be prevailing in the near future. When they are forced to, people will change their practises. In this case, it might happen before in a smooth fashion, as there are already new alternatives being offered and facilitated.

### 3.4 Study area 3

Ban Nam Chuang Village, Chattrakarn District, Pitsanulok Province.

#### 3.4.1 Community Background

The village closest to study area 3 differed from the others since it was a hill-tribe community. This implies a different ethnic background. Their main language is not Thai and most of the inhabitants do not have citizenship. This was reflected in the headman's opening statements to the field-team: "We do different agricultural practices from the lowlanders because we are not Thai but Hillside People". The people of Ban Nam Chuang village are of either White or Black Hmong ethnicity. In general, the culture is similar between the two. The minor differences are for example the traditional costume.

The Black Hmongs settled in the present location around 1910. Their previous settlement which was in a moist evergreen forest area six kilometres further north had to be left due to problems of malaria. The White Hmongs arrived at the site in 1982, when the government resettled them. Today there are 250 households with approximately 1300 family members. Presently, 59 families with 280 males and 228 females have been granted Thai citizenship.

During the 1970's, the political situation was tense in the region due to anti-government insurgency and the vicinity of the Laotian border. In addition, the establishment of the Phu Mieng Pho Troong Wildlife Sanctuary in 1979 provoked both political and ecological challenges. The government relocated people and put more resources into controlling the encroachment on the forest. Continued deforestation, suspicions of illegal cultivation and lack of citizenship continue to create conflicts.

Another Hmong village with a similar background, Ban Nam Khap, also lies within the Wildlife Sanctuary and is located about six kilometres from Ban Nam Chuan.

#### **Citizenship and tribal people**

"In Thailand citizenship is not determined by place of birth, but by citizenship of the parents. Citizenship rights for tribal people (either born in Thailand or otherwise eligible for citizenship) have been withheld due to local level corruption and a confusing array of sometimes contradictory laws... It is estimated that 40 to 60 percent of the 834,000 tribal people living in Thailand's mountainous borders do not have citizenship... without citizenship, highlanders are denied access to higher education, they cannot vote, highlanders can be denied employment, and can be exploited if they are hired. And without citizenship, highlanders can be denied access to land and resources..." (Vaddhanaphuti C. & Aquino K., 2000 in Asia – Pacific Community Forestry Newsletter, RECOFTC, 13 (1): 1, 14-15, 28).

The community is situated in a wildlife sanctuary, that includes the forested area of the districts Nam Pad, Thong Saeng Khan, Tron, Uttaradit and Chattrakarn, all in Pitsanulok Province.

No logging company has been active in the area. The closest concession was at Ban Non Thon in the lowlands about 20 years ago.

There are no special spiritual or an ancestral forest, but a village forest is preserved for harvesting palm leaves for roofing, mushrooms, and other food products.

The main source of livelihood in the Hmong village is agriculture. Cash crops such as ginger, cabbage, banana/sugarcane, cassava (fodder), upland rice, corn (fodder) and fruits are cultivated. There are around 300 cattle owned by the community that graze in the forest and on the fallows. The externally

initiated projects in the village vary from reforestation activities to weaving. In February 2000, a dam project was completed that will be used for irrigation of farmland and for fish farming. There is no electricity in the village, but a project is supporting experiments with solar panels to charge batteries.

### 3.4.2 Observations in the Remote Sensing Study

Out of the three sites studied, study area 3 had most evident signs of deforestation. The interpretation result was a change from closed forest to other land from 1991-1998. The cleared part can be seen south of the study area in figure 9. Further south a patch of dense forest (village forest) can be seen which has remained more or less untouched during the past ten years. Furthermore, there seems to be an area where the forest has recovered (positive change) along the road coming up to the valley.

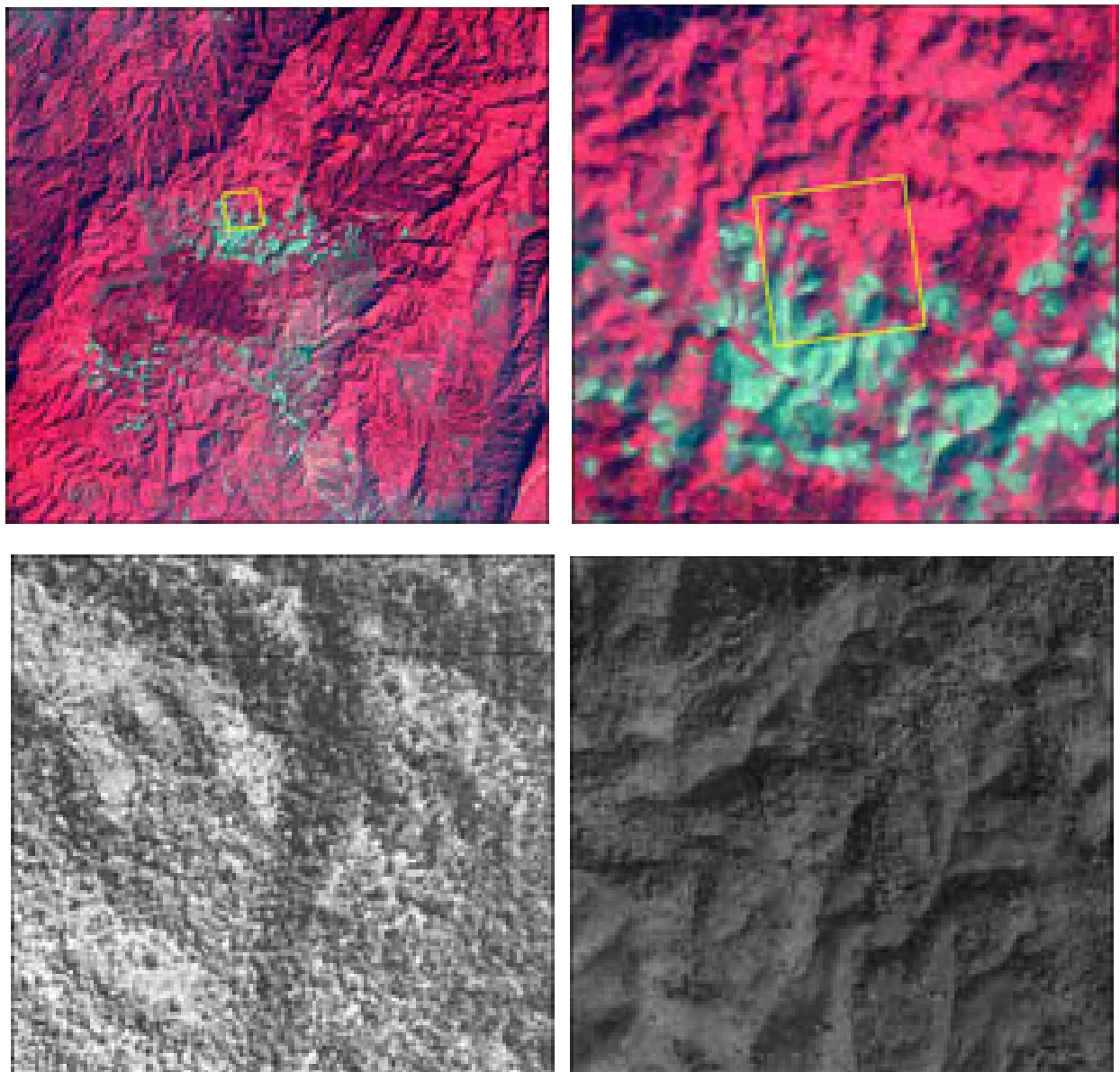


Figure 13. Study area 3 on the Landsat TM image from 1998 (T3) (top left and right). The aerial photographs from 1976 (lower left) and 1996 (lower right). The aerial photographs were not georeferenced and do not show exactly the study area.

### 3.4.3 Forest cover and land use based on field observations and aerial photographs

The landscape was heavily deforested and the land use was shifting cultivation. Small areas seemed to be currently used for crops, indicating long rotation period. There were signs of frequent burning. Cattle were seen grazing. The area was accessible with several tractor roads.

Trees outside forest were observed, mainly the Kor palm (*Livistona speciosa*). Tree plantations of broadleaved species were *Pterocarpus macrocarpus*, *Melia azedarach* and *Azelia xylocarpa* were also registered.

The observations made in the remote sensing study of the dense patch of forest could be confirmed to be dense evergreen forest (actually, it was the village forest). The indicated positive change of vegetation cover was more difficult to confirm, although the major impression was that there was less activity in that area.

The use of the aerial photographs was limited because they could not be referenced to the co-ordinate system. Anyhow, some interesting facts could be extracted; first, they show a quite intense deforestation in the area since 1976, when the forest was less disturbed. Second, in the photograph from 1996 there are no roads or tracks in the vicinity of the one square kilometre study area, which means that they were built during the past five years.

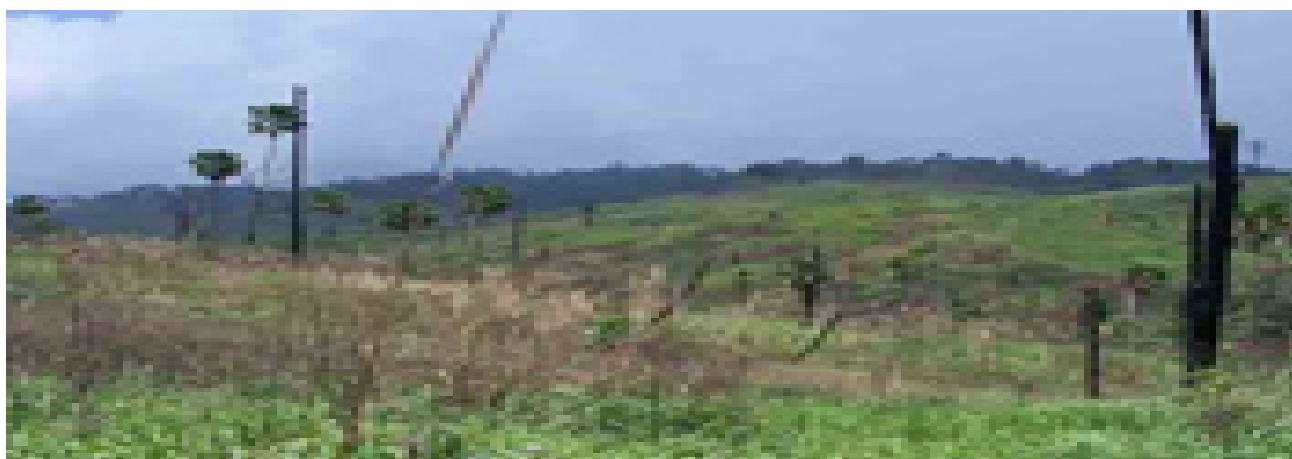


Figure 14. A view from the road coming up to study area 3. The heading of the picture is north and the edge of the forest seen is approximately where the boundary of the change polygon has been drawn.

### 3.4.4 Stakeholders interests in the forest

The stakeholders identified were the villagers, the RFD Forest Protection Unit, the RFD Wildlife Sanctuary Unit, projects and lowland people<sup>11</sup>.

#### **Villagers**

The most important interests of villagers in the study area are agriculture and grazing. Agricultural activities have been summarised in the table below:

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<sup>11</sup> Interviews with projects or lowlanders did not take place. However, signposts in Thai were advertising environmental protection of the watershed.

**Table 3. Agricultural calendar**

Products	When sow	When harvest	Market	Household consumption
Ginger	March/April	August/October (depends on market price) Otherwise wait until December/January	x	
Cabbage	Any time, but after 75 days	Highest price in July/August because the lowlander's do not grow it during this time	x	
Banana/sugarcane	March	October/ November		x
Cassava (fodder)	March April, anytime	January/ February	x	
Rice (upland)	May June	October/ November		x
Corn	May/April	August/ September	x	
Bamboo	March April	After being planted, it takes three years until they produce young shoots ( July/August)	still experiment	
Jackfruit, mango, coconut, Lychee (expected future market)		house/farmland		x

Bearing in mind the market fluctuations, an example of a crop-cycle can be as follows: Ginger and cabbage will be grown the first year and rice in the second. Cassava is the crop of the third and last year. The following fallow period is normally 4-5 years. Villagers started cultivating ginger approximately ten years ago. Today it is a dominant crop.

If offered a good price, products are sold to middlemen coming to the village. Otherwise, products are brought to the market in Lomsak, which takes 2-3 hours of driving.

### Tenure

Until now, fifty households of Ban Nam Chuang have benefited by obtaining the user rights of 15 rai (2.4 ha) for farming provided by the “Development Project for Security”. This land allocation is from degraded forest. Since households need more land, forest encroachment continues. The project staff is aware of this, and a request will be made to get more land from the Ministry of Agriculture. The land is only allocated, without any guarantee of permanent ownership.

### Forest Products

The Hmongs collect a lot of forest products from the village forest, Pah Huay Kor<sup>12</sup>, such as palm leaves used for roofing, young rattan- and bamboo shoots, mushrooms, forest vegetables and medicinal plants. The river, that is a source of drinking water, also originates in this forest. Around 1990 the villagers agreed on not to cut trees and encroach in the village forest<sup>13</sup>. Due to restrictions on marketing of products from a wildlife sanctuary, forest products can only be extracted for self-consumption. This is controlled by RFD checkpoints further down in the valley.

According to the assistant headman of the village, construction wood is cut on farmland. It may take several years to collect sufficient for a house. The preferred species for houseconstruction (Teak

<sup>12</sup> Pah= forest, Huay= stream and Kor= palm (*Livistona speciosa*)

<sup>13</sup> The local RFD officer was not aware of existing rules for the Village Forest

(*Tectona grandis*), *Pterocarpus macrocarpus*, *Hopea odorata* and *Azelia xylocarpa*) are becoming increasingly scarce.

### **RFD Protection Unit**

The unit has an office in the village. The main responsibility of the RFD Protection Unit entails patrolling to prevent illegal activities and to promote reforestation. In total, an area of 5,872 ha (36,700 rai) is planned reforested in the degraded areas of the wildlife sanctuary. The Protection Unit works in co-operation with the Wildlife Unit.

#### Illegal cutting

Villagers can be arrested for any agricultural practices on farmland exceeding the allocated 15 rai. All cutting is illegal.

An example stated by RFD: “There is a problem of a system for early warning of walkie-talkies. These are used to warn against patrols in order to avoid arrest for illegal activities. The villagers in both Ban Nam Chuang and Ban Nam Kaph have more than ten walkie-talkies in each village. They know how to tune into the RFD wave-line. Although we try to avoid sending out sensitive messages, the villagers are very updated on the RFD patrolling movements. People have time to warn each other of our movements due to the geographic location of the two villages. The patrolling cars pass by Ban Nam Kaph first (below the RFD office), before they continue towards the RFD office heading towards Ban Nam Chuang village”.



*Figure 15. The RFD patrol car after an arrest*

### **Wildlife Sanctuary Office, RFD**

The Phu Mieng Pho Troong Wildlife Sanctuary covers an area of approximately 400,000 rai and was established in 1979. Originally, 16,000 ha (10,000 rai) was set aside for agricultural activity for the two villages. Since then, this area has quadrupled in size due to illegal shifting cultivation.

A wildlife sanctuary, per definition, should have a healthy forest with a lot of wildlife. Research is permitted, but neither collection of non-wood forest products nor tourism is allowed. The wildlife is decreasing rapidly, but illegal hunting is still frequent.

## Projects

Besides the “Development Project for Security” mentioned in connection with land allocation, examples of projects operating in the village were many: The Royal project for hill-tribes that educates in weaving and embroidering, the Raja Put Foundation that conducts tree planting, and RFD reforestation of 21 degraded sites within the Wildlife Sanctuary. However, various problems, such as burning of seedlings, have been reported. In addition in February 2000 a large dam for irrigation was completed to promote permanent agriculture and aquaculture for the two villages.

### 3.4.5 Was the RSS result correct?

The RSS classified the vegetation change from T2 to T3 as being a change from closed forest to other land use.

In this study area, there was less input from interviews about the interpreted change. From the visit to the study area it can be stated that the correct remote sensing classification is long fallow, since shifting cultivation is the dominating land use. The classification *other land* was not correct. What about 1991 (T2 acquisition date)? The aerial photograph from 1996 shows that the major part of the deforestation had occurred already then. From the T2 satellite image we can clearly see spectral and textural difference between the adjacent dense evergreen in the study area. Still, compared to the valley further south there was certainly more vegetation.

The complicated political situation has traceable consequences in the land use, e.g, relocation of people. The change of area for cultivation activities might be explained by ordinary shifting cultivation land use pattern. A third explanation given was that this was due to the fact that land used to be utilised by lowland Thai people. They changed the area of activity according to new governmental directives.

The resettlement of people 1986, naturally increased the pressure on the land, and is a contributing factor for a significant change during the last decade.

To summarise, it is clear that there were too many data collection obstacles to get a full picture of the change that the land had undergone. Consequently, a reliable answer for whether there was closed, open forest or some early stage of shifting cultivation ten years ago, can not be given.

### 3.4.6 Important processes and future outlook

- This site was the most exploited, in spite of the strong RFD presence. Neither strong control, nor other efforts have overcome the problem of deforestation. It is not likely that this will change before people get access to citizenship, other livelihoods and alternative agricultural extension techniques.
- More investigation is needed to get the full picture of supply and demand aspects of forest products. In the past foods from the forest played a more important role. Today mostly the poorer rely on forest vegetables.
- Shifting cultivation is very much due to culture and tradition. It also reflects land insecurity and lack of access to inputs.
- The interviews pointed out problems with communicating the overall benefit of governmental projects. Villagers criticised the dam project for only helping 20 per cent of the population. Most

of them have upland agriculture and will therefore not benefit from irrigation. On the other hand, the RFD claimed that the dam project is only the first part of a series of activities.

**Table 4. Comparison of results from the three study areas.**

<b>Process/ factor</b>	<b>Study area 1</b>	<b>Study area 2</b>	<b>Study area 3</b>
<i>Tenure rights</i>	Yes, but not formalised	Informally agreed upon	Slight
<i>Shifting cultivation methods</i>	Not any more	Yes	Yes
<i>Permanent agriculture</i>	Yes, dominating	Slight	No
<i>Population increase</i>	Fast	Slow	Fast
<i>Level of official presence</i>	High	Low	High
<i>Utilisation of NWFP</i>	High	High	Lower
<i>Utilisation of WFP</i>	High	High	High
<i>Dependency on agricultural products</i>	High	Very high	Very high
<i>Availability of sources of income</i>	Yes	Some	Few
<i>Forest Cover Change (T2-T3)</i>	Probably No	Yes	Probably Yes

## 4 Experiences on practical issues

### 4.1 Preparations and logistics

Lessons learned from the preparation phase were to allocate sufficient time for terms of collaboration and research permits to be processed, and for the location of study sites to be verified. In this case, underestimation resulted for instance in cancelling the planned pre-visit to the study areas. Consequently, more time of the actual fieldwork had to be spent on logistics and basic information.

Other problems encountered included late delivery of technical equipment and unexpected rains. To overcome unforeseen obstacles to severely impact the study, the importance of flexibility is again stressed.

### 4.2 Technical equipment

A pre-condition for the study was functional technical equipment. Without a georeferenced digital image it would have been difficult to retrieve the co-ordinates for the study areas. Moreover, without a GPS-receiver it would have been almost impossible to find the co-ordinates in this kind of terrain with few landmarks.

One critical time-consuming task was georeferencing of the image. As it turned out the registration error was about 1200 meters at the first study area. Before being able to locate points in the image by using the GPS, the image registration had to be corrected. This was done manually by reading co-ordinates from the GPS for road crossings that were visible in the satellite image. The lack of good landmarks made this a painstaking process and not always very accurate. For this task, a track log, that is, a large amount of points continuously stored in the GPS-receiver, would have been very useful.

It was not very useful to have the computer connected to the GPS for navigation using the digital satellite image. Probably the most important reason for this was that so good analogue map material and aerial photographs were provided. Another reason was that the technical set-up was not good enough for this rather physically rough environment.

A connection kit between the digital camera and the GPS, for automatic geocoding of the pictures would have been valuable. Instead, the method used was taking notes on paper. This had several drawbacks: Further, the post-processing was time consuming, and there was also a risk of mixing co-ordinates and digital files.

### 4.3 Approaching stake-holders

Upon arrival in the village nearest the study area, the field team went directly to the house of the village headman. Introductions were made and the objectives of the mission were explained. Emphasis was given to the fact that the information that people gave was not intended to be used at local level, but that it was rather part of a global programme.

The next step was to make appointments with local guides for the fieldwork and to find other stakeholders to interview. It proved very fruitful to approach the villagers with the aerial photos, especially when photos existed from two points in time. Discussing the study area and locating it on the aerial photograph became a natural entry point for conversations. Special effort was made in each village to meet separately with a group of women. This proved to be fruitful, as they then tended to speak more easily and participated to a higher extent.

Contribution was given to those that helped with transport, fieldplots and when the team was leaving, a symbolic amount was also handed to the headman to thank for the collaboration.

Among the lessons learned was that a pre-visit would have been very useful, for deciding in advance which stakeholders to meet and which questions to prepare and direct. As it turned out, the headman had an influence on the selection of key informants, which might have led to biased result.

## 5 Methodological findings

To travel to the study areas, to locate the centre points and to find local stakeholders did not constitute major obstacles in the fieldwork.

Slightly different strategies were tried for the data collection at the three sites. At the first site, the field team split up in two groups. One group did field observations, while the other identified the stakeholders for interviews. The team later joined together to do the transect walk with the villagers. It then became evident the great value for the interviewers to have knowledge of the physical characteristics of the study area. Likewise, the forest team was helped in the interpretation of the terrain and signs of land-use activities. At the two other locations the team visited the study area before conducting further interviews and land-use surveys.

Forest change is a controversial issue with conflicting interests and must be approached with care. Often the perception of rules or events is very different, depending on the viewpoint. Consequently, the experience is that it is very important to have knowledge of different stakeholders' roles and to invest time and effort in crosschecking of information. However, in general, all stakeholders were willing to provide information on the observed vegetation changes and the possible causes.

In the discussions with the stakeholders, field observations and aerial photographs were of great value. First of all for verification of information, but also for getting ideas of questions to ask. In study area 1, for example, the extent and characteristics of the fairly intensive cutting going on both in the forest and in the open land would have been very difficult information to catch only from the interviews (more likely is that the farmland cutting would never have been discovered). On the other hand, that the cutting in the farmland was allowed and legal and that the cutting in the forest was predominantly illegal could not be seen from the observations in the forest.

The aerial photos were of course of utmost value for confirming the interpreted change in the remote sensing study, especially when two photographs from different dates were available. More unexpected was the possibility they gave to relate the discussions and interviews to the study area. Many of the villagers could quite easily orient and point out different features such as specific agricultural fields and their respective owners.

Many things went smoothly also thanks to the efforts and skills of national collaboration partners. Besides interpretation, their services concerning logistics, safety, local knowledge as well as expertise on the subject was of great value.

## 6 What can be assessed?

The objectives for the study were as follows:

1. to verify the satellite image interpretation on the ground;
2. to make a comprehensive documentation of the site, related both to the state and management of the forest and other land, and to the socio-economic situation affecting the management of the land;
3. to investigate the causes of recent changes and outlook for the future;
4. to provide an in-depth case study section to the report from the remote sensing survey

Deliberately three different approaches for the fieldwork with different time consumption and consequently also different degrees of detail were employed.

Re. 1. Verifying the satellite image interpretations of the vegetation changes that had occurred proved to be possible within the allocated time, at the 3 specified sites. The verifications were only done at the sites studied, and not for the entire Landsat TM sample unit.

Re. 2. Providing a documentation of the site including the land management proved possible, partly through the aerial photographs and images and partly through the description arising from the interviews of stakeholders on the site. However due to the time factor this point was not covered satisfactorily at the 3<sup>rd</sup> site.

Re. 3. The cause mechanisms behind the observed changes at the sites could also be explored and discussed, and a future outlook suggested.

To describe the supply and demand of forest products and services at the three study areas was also attempted. A tentative methodology was used since this is partly a new approach in forest inventory. To assess the supply more or less standard-surveying methods can be applied, although assessment methods of non-wood forest products are less put into practise.

To assess the demand was the more difficult task. The result from the study showed that to ask quantitative questions can bring very vague answers. To improve data collection more advanced socio-economic methods are recommended, including aspects of how to measure household consumption and marketing of different products.

The most complicating circumstance is that for the demand side to be comparable with the supply side, the collected data must refer to the same physical forest area. For example, the needs for forest products were easily covered in the village of study area 2, but the actual study area was almost deforested and contributed only slightly to this supply. The extraction was rather made in adjacent more dense forest.

If the study area would have been an administrative unit or somehow physically demarcated, it would have been easier. With a randomly located square kilometre survey area, even the most advanced methods of today will face problems. Measuring household consumption of mushrooms or fuelwood

might be realistic, but measuring mushroom picking or collection of fuelwood in a specific forest area is difficult.

If the supply and demand is too complex to describe, other approaches for studying causes of forest change might be more feasible. This study indicated that a good description of stakeholders, stakeholders' interest and historic development can be achieved. This provides an understanding of important processes, and makes it possible to give a future perspective.

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