14 Forest recovery with villagers—based on a case study in Khong Chiam, northeast Thailand

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ABSTRACT

Khong Chiam is chosen as a case study because of its remoteness, unique forest type, and its vulnerability as a public forest. Its relatively poor legal status of Reserved Forest makes it particularly vulnerable. In 1983, 700 ha were selected and established as an in situ gene conservation area. The objectives were to protect the forest and its genetic resources, particularly targeting Pinus merkusii, which is a valuable population with faster growth compared to highland pines of the same species and is recognised as a high-priority provenance for planting programmes. Pinus merkusii in this area is one of the last and largest lowland populations remaining in Thailand. Other important tree species are found, for example, Dipterocarpus alatus, Irvingia malayana, Peltophorum dasyrachis, Pterocarpus macrocarpus and Anisoptera costata. Immigrants have, over the years, caused an increasing pressure on land resources and the whole ecosystem is threatened. Conservation based on protective and prohibitive regulations has proved unsuccessful. Recovery of the forest resources may not be possible without the awareness and active support and participation of local communities. Sustainable conservation relies on good relations between forestry staff and local people. A new participatory approach based on generating alternative income other than forest exploitation is being established. It consists of four main activity groups. There are social aspects, aspects of income and livelihood, area and tree populations, and research and development aspects. All these efforts have projected development in the right direction and are alleviating the problems. However, continuation of external inputs, presence in the area, conducting meetings, facilitation of alternative products and markets, are detrimental for continued success—

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at least at this early stage. The presence of forest authorities is deemed essential in order to guide the community legally and in order to set limits for any trespassers or aggressors, who may not be easy to control locally.

BACKGROUND

In Thailand, *Pinus merkusii* is found mainly in lower montane forest in the north at altitudes between 600 and 1 200 m and smaller stands are found in the lowland (70–170 m) in the southwest and eastern/northeast (DFSC 2000). The average precipitation at Khong Chiam district in northeast Thailand is 1 835 mm annually (Meteorological Department 1998). The pine yields important forest products such as timber, resin, tender wood, and produces a very good pulp (FAO/UNDP 1968). The lowland sources from northeast Thailand have a shorter and less pronounced grass-stage[1] with faster early growth than highland provenances. The large variation among Thai provenances was confirmed by tests since 1971 under the Pine Improvement Programme in Chiang Mai. Soon, attention was drawn to sources from the northeast with a fast and early growth as a source for improvement work. Moreover, it was revealed that one of the most seriously threatened forest types was the mixed broad-leaved/pine type occurring in the south and southeast of northeast Thailand (Granhof 1998). Therefore, a *P. merkusii* stand in Khong Chiam forest area in northeast Thailand was chosen to establish an *in situ* gene conservation area. The objectives of the programme were divided into two parts. There were broad and narrow objectives. The broad objective was protection, maintenance and management of genetic resources of living tree species in their natural environment for present and future generations. The narrow objective was conservation of the pine stand for seed production, selection and possibly future breeding.

In 1983, 700 ha were selected as "a core area" to protect the forest. Danida (Denmark) and the Royal Forest Department (Thailand) joined forces to explore the area and establish a permanent *in situ* Gene Conservation Station (Sa-ardavut *et al*. 1989, Granhof 1998). The station was established as a part of the Royal Forest Department (RFD) with local forest staff to supervise the activities and monitor forest coverage and quality and to prevent encroachments. Early conservation measures entailed mapping, demarcation, relocation of illegal settlers, prohibiting agricultural activities and charcoal burning, and establishing firebreaks. At present, the station furthermore focuses on conservation and research implementation as follows (Piewluang *et al*. 2001):

- establishment of a seed production area;
- establishment of some research trials;
- study on characteristics of structure and floristics of forest community;
- culture and collection of seed from seed production area;
- establishing access/inspection roads and firebreaks;
- ploughing the area for natural regeneration implementation;
- enrichment planting in degraded areas.

[1] The grass stage is considered as a temporary adaptation to seasonal drought and fire. During the grass stage, the young seedling remains suppressed for 2–4 years forming a dense cover of long needles that protect the shoot. Meanwhile, the root system strengthens (Sirikul 1980).

Recently, the area of the Conservation Station, including settlements, is estimated to be about 1 040 ha (Figure 1) (DFSC 2000, Piewluang *et al*. 2001).

The pine stands are found in a poor site area with low yielding agriculture due to shallow soils and a very hot dry season. In addition, the forest area has legal status of being a forest reserve. However, forest reserves in Thailand are not protected by strong legislation and enforcement such as National Parks. Therefore, they are often heavily degraded or in reality converted to swidden agriculture, or settlement areas.

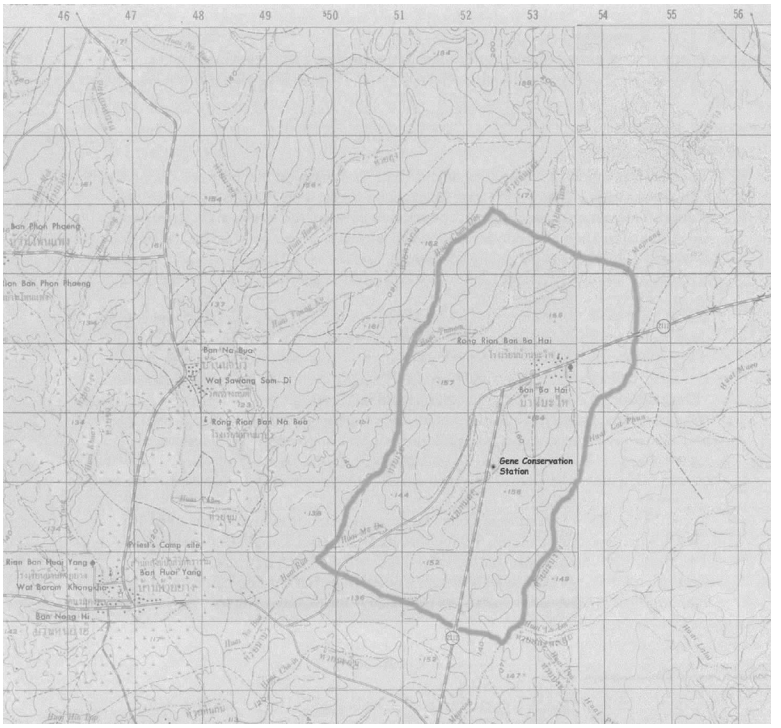

Figure 1. Location of Ubon Ratchathani Gene Conservation Station and surrounding villages in Khong Chiam district, northeast Thailand

Over the years, surrounding villages expanded in number and size due to immigrants from both neighbouring provinces and their own increasing population that has caused an increasing pressure on land resources. The forest became further exploited, degraded and settlers continued to take over forest land. In response to the unsuccessful protection, the conservation area was selected as a pilot project site in 1999 when the RFD and the Forest Genetic Resources Conservation and Management Project (FORGENMAP) initiated a new participatory approach (pilot project: *Partnership in Conservation of Forest Genetic Resources*) based on generating alternative income other than forest exploitation.

THE RESOURCE AND THE PROBLEM

The entire ecosystem of the area is threatened and fragmented due to illegal agricultural activities, settlers, clearing, cultivation, forest fires, firewood chopping, illegal logging, and charcoal production. The concern is how to protect the genetic resources of the forest, particularly targeting *Pinus merkusii*.

The population of *P. merkusii* is valuable due to a number of reasons. It is one of the last and largest lowland populations remaining in Thailand. It yields more and grows faster as compared to highland pine of the same species and is recognized as high priority provenance for planting programmes. The species prevails at higher altitudes but the advantages of the lowland type are faster growth and absence of "grass-stage", a serious disqualifying drawback in the years after planting.

Other important tree species found are *Anisoptera costata, Dalbergia cochinchinensis, Dipterocarpus costatus, D. alatus, Irvingia malayana, Peltophorum dasyrachis, Pterocarpus macrocarpus, Anisoptera costata, Shorea roxburghii* and *Schima wallichii.*

Figure 2. A group of *Pinus merkusii* trees scattered in the area of Ubon Ratchathani Gene Conservation Station

Some endemic species occur in the area. New orchid and ginger species have been found recently and more species are likely to be found from further studies. The ecosystem is of a rare and highly threatened type. The forest has become insular fragmented or an island in an agricultural landscape.

The pine has been reduced in number and an estimate predicts that less than 3 000 trees are left of which the majority are dying due to severe damage (Figure 2). The seed setting of the remaining trees is poor due to damage from chipping, cutting, resin tapping and forest fires (Figure 3) (DFSC 2000). Regeneration does not effectively take place due to more frequent annual fires (Figure 4).

Figure 3. *Pinus merkusii* wood chipping

Figure 4. The poor natural regeneration of *Pinus merkusii* in the conservation area

The forest thus decreases in area and coverage. Many forest products are becoming either scarce or are no longer available. Large animals have disappeared. This is likely due to habitat destruction but also increased hunting pressure. Lack of large animals reduces the seed dispersers and thus further impacts biodiversity. Tree species are declining and sensitive animal species are disturbed, and disappearing.

At Ba Hai village (the village located closest to the conservation area) alone, for example, the settlements increased from 10 houses in 1986 to 100 houses in 1997 (Granhof 1998). Forest fires affect the few, very big trees still present, typically *Dipterocarpus* spp. and *P. merkusii*. This, and storms have resulted in many fallen trees and small seedlings are destroyed by an increasing number of forest fires. People from outside cut wood to sell elsewhere (personal communication, villagers). At present logging operations have ceased due to the poor value of the remaining wood. However, forest fires are still destructive (FORGENMAP 2000).

Table 1. Problem matrix on the forest and communities around the conservation area

Threat to the forest	Community problem
• Forest fire	• Poverty
• Logging, clearing and resin tapping	• No land for agriculture
• Encroachment from outsiders who come to collect, catch, cut, and exploit the diminishing natural resources	• Too dry / too poor soil for farming • Population increase • Gambling and drugs
• No clear boundaries of the area—not clearly defined	• No land rights • Lack of knowledge, understanding, and co-operation with other organisations • No alternative job/income

Sources: FORGENMAP 2000.

There are increasing problems sustaining people's livelihood in the area due to an increasing population, higher demands for access to modern life and commodities, and less favourable growth/production conditions (Table 1). At present the responsibility for the area is in the hands of government officials. Provided there are officials and adequate budgets, the conservation can carry on over a long period. In the case of unchanged attitudes or government negligence, the deterioration will continue at a faster rate. Conservation and management for sustainable forest use should be undertaken by cooperation of the local people, government officials and NGOs.

In the year 2000, a survey for situation analysis was made through a rural research appraisal among the villagers in Huai Yang Sub-district. Table 2 lists the products and the yield trends for edibles/consumables of the area.

Table 2 indicates degradation of the ecosystem. This complies with a diminishing biodiversity and more prevailing occurrences of pioneer species at the expense of climax forest and species.

Table 2. Forest edibles – before[2] and now[3] status based on interviews with Huai Yang villagers

Forest edible	Season	Area of catching	Amount status 2000
Bamboo shoots	June–September	Bamboo forest towards the west	Same level as before
Mushroom "koon"	June–October (depends)	Area around station	Less now
Mushroom "pooh"	June–February	Dry dipterocarp forest,	Less now
Mushroom "kai"		evergreen forest	
Red ants eggs	February–April	Here and there in forest	Less now
Forest vegetable 1	March–April	Anywhere	More than before
Forest vegetable 2	March–April	Everywhere	More than before
Forest ginger	Throughout	Evergreen forest	Less now
Thorny vegetable	April–December	Along streams	More than before
Edible fruits	March–August	Frequent in forest	Less now
Snakes	Occasionally	Frequent in forest	More than before
Squirrels	Occasionally	Anywhere Less	
Forest bees	March–May	Frequent Less	
Birds	Anytime	Everywhere	Less
Beetle, *Buprestis* sp.	August–October	Hill tops	Same level
Forest chicken	Occasionally	Frequent	Same level
Flying squirrel, civet, rabbit	Occasionally	Depend on species, luck and skills	Less
Frog, toad, bull frog (*Rana catesbejana)*	May–June	Along streams	Less
Fish, shrimp and shells	Rainy season. From August and onwards diminishing	Along streams	Less
Other edible animals	Occasionally	Evergreen and dry	Less

Sources: FORGENMAP (2000).

THE PILOT PROJECT

Following the unsuccessful forest protection approach focusing on protective and prohibitive regulations, FORGENMAP eventually decided to set criteria for selection of pilot project sites in 1999. The major criteria were areas located outside the protected area system, representing different ecosystem, forest remaining with some degree of disturbance, and availability of major agencies involved in rural development. The conservation area at Khong Chiam has matched those criteria. Therefore, the area was selected as one of four pilot sites and the pilot project was started in 2000 (FORGENMAP 2000).

The objectives of the pilot project are to investigate possibilities and conditions for a conservation model (partnership in conservation) under different conditions (forest types, ethnic groups and social conditions) and to bring together the RFD conservation objectives and legitimate rural needs. The initial activity of FORGENMAP was to make

[2] "Before" is not clearly defined, but refers to the situation 10–20 years ago.

[3] "Now": The interviews were carried out in 2000 as part of a Rural Rapid Appraisal.

villagers understand the project objectives and the importance/benefits of the forest. To achieve that target, a number of training courses, meetings and workshops were set up and were joined by the selected active/interested people from involved agencies as well as villagers, GOs and NGOs. FORGENMAP and the responsible local agencies organized these activities.

It was concluded that a work plan for the conservation area should be to compile the needs of all partners. The work plan consists of a description of the area and vegetation, social aspects, aspects of income and livelihood, and research and development. To decrease forest exploitation and to increase income generating activities, the partners of the conservation area decided to introduce the activities with a social aspect and aspects of income and livelihood before undertaking other activities. The first work plan was initiated in 2000.

THE HUMAN RESOURCE AND PARTNERSHIP

The conservation area is surrounded by eight villages: Naa Bua, Ba Hai, Huay Yang, Lao Jereun, Nong Hee, Naa Don Yai, Yang Soo Paa and Nong Phoue (Figure 1). The villagers agreed on the project objectives and implemented the initial activities of the project. However, Ubon Ratchathani Gene Conservation Station, the local agency responsible, selected Ba Hai village as the only village partner due to the project's limited resources. Moreover, since most Ba Hai villagers do not have land rights for creating income, they exploit the benefits from the forest area more heavily than other villages, which lie further outside the forest area.

The Ba Hai village headman works closely with his villagers to initiate and undertake most activities contained in the work plan with advice from the staff of the conservation station. Whenever the activities are implemented, the villagers supply the manpower while the conservation station staff provide materials and equipment as well as recommendations/suggestions for carrying out the activities. These partnerships are functioning well and are seen as evidence of a unique cooperation.

RESULTS

Research and development aspects

FORGENMAP requested the Forest Restoration Research Unit (FORRU) in Chiang Mai Province to organize a training course on forest rehabilitation in 2001. Staff members of this conservation station including three foresters from the other pilot sites attended the training course. The activity aims to teach the participants handling of new species and steps in forest rehabilitation using the framework work concept such as seed collection, nursery cultivation, site preparation, planting, etc.

Area and tree populations

FORGENMAP and the Ubon Ratchathani Regional Forest Office surveyed the status of *P. merkusii* in the conservation area. It was revealed, that out of 2 000 trees surveyed, 1 049 trees were found undamaged and 951 trees were damaged. For the GBH class, it was found that there were only 83 seedlings smaller than 10 cm, 191 trees in the 10–30 cm class and 1 726 trees larger than 30 cm respectively. The stem damage was caused by wood chipping and resin tapping. Forest fires, pests and diseases (Community Forestry Group 2000) cause other damage.

It is concluded that this stand is in continuous degradation and unable to regenerate sufficiently. Therefore, pine seedlings from 40 selected mother trees are now grown to establish a *circa situ*[4] conservation stand at its site next year. Seedlings from each mother tree will be planted in square plot with spacing 4 x 4 m. The stand will consist of eight replications and will cover about 2.24 ha. This plantation will be used as a seed source for seed, scions and for other genetic observations/collections of this provenance for the future.

FORGENMAP staff cooperated with the conservation station staff and villagers on forest inventories. The objectives were to 1) assess the genetic resource, 2) monitor the status over time, 3) test methods prescribed in the forest inventory manual, and 4) train the partners for forest inventory in the future (Figure 5).

A B C

Figure 5. Steps of data collection, (A) Locating and measuring the distance to a tree, (B) Measuring girth of a selected tree, (C) Identification of a tree species

Many villagers/partners have learned the process of forest inventory well and are now capable to conduct further surveys of the forest area in the future. The results from the inventories reveal four forest types in the conservation area and each forest type maintains a variety of tree species (Table 3).

[4] *Circa situ* conservation is a conservation method "between" *in* and *ex situ*: It aims by active conservation and planting to enrich or reestablish the local genetic resource by using its own offspring.

Table 3. IVI top 5 for all forest types and their species characteristics in Khong Chiam (Greijmans & Piewluang 2002)

REDE	REDO	REFR	IVI	Species scientific name
Seasonal evergreen forest				
3.3	25.6	3.6	32.5	*Anisoptera costata*
3.8	6.1	4.2	14.1	*Irvingia malayana*
3.8	2.9	4.2	10.9	*Lithocarpus lindleyanus*
1.6	8.4	0.6	10.6	*Pinus merkusii*
8.7	1.3	0.6	10.6	*Shorea roxburghii*
Total 275 trees per ha & basal area of 8.3 m^2 ha^{-1}				
Dry dipterocarp forest				
6.9	22.9	7.9	37.7	*Parinari anamense*
8.3	22.2	3.2	33.7	*Dipterocarpus intricatus*
4.2	10.7	3.2	18.1	*Vitex pinnata*
6.9	2.5	7.9	17.3	*Pterocarpus macrocarpus*
4.2	4.3	4.8	13.3	*Madhuca kerrii*
Total 151 trees per ha & basal area of 7.6 m^2 ha^{-1}				
Mixed deciduous forest				
17.3	26.5	14.6	58.4	*Canarium subulatum*
21.2	15.8	17.1	54.1	*Pterocarpus macrocarpus*
9.6	7.1	7.3	24.0	*Terminalia corticosa*
9.6	1.5	9.8	20.9	*Xylia xylocarpa* var*. kerrii*
3.8	10.4	2.4	16.6	*Shorea roxburghii*
Total 410 trees per ha & basal area of 11.9 $m^2 ha^{-1}$				
Mix of seasonal evergreen & dry dipterocarp forests				
16.7	28.9	18.2	63.8	*Dipterocarpus intricatus*
10.4	25.8	11.4	47.6	*Irvingia malayana*
8.3	3.4	6.8	18.5	*Pterocarpus macrocarpus*
4.2	10.3	2.3	16.8	*Pinus merkusii*
4.2	6.6	2.3	13.1	*Terminalia corticosa*
Total 232 trees per ha & basal area of 10.5 m^2 ha^{-1}				

Abbreviations:

REDE is the number of species' individuals per ha divided by the total number of individuals x 100%. REDO is the dominance or basal area of a species per ha divided by the dominance or basal area of all species x 100%.

REFR is the frequency of a species divided by the sum of the frequency of all species x 100% and IVI (importance value index) is the sum of REDE, REDO and REFR of a species.

Based on the data it was suggested that the forest area should be divided into three parts for different forest management according to different purposes, viz. 1) a biodiversity conservation, 2) a forest rehabilitation, and 3) a plantation or multipurpose area (Figure 6).

A B C

Figure 6. Management options, (A) Biodiversity conservation area, (B) Forest rehabilitation area, and (C) Plantation or multipurpose area

The staff from the Ubon Ratchathani Gene Conservation Station together with Ba Hai villagers built a public hall in the conservation area (Figure 7). The objectives of this activity are to create a place for demonstration and distribution of technical forest information about the station and for local activities as well as a meeting place.

Figure 7. The public hall under construction

Social aspects (training courses/meetings/workshops)

In the early stage of the pilot project, FORGENMAP in cooperation with the Regional Community Forestry Training Centre (RECOFTC), Ubon Ratchathani Regional Forest Office and Ubon Ratchathani Gene Conservation Station, the local responsible agency, organized about five training courses/workshops /meetings during 2000–2001 (Figure 8). The local partners were given a far higher understanding of the situation than otherwise because of these activities. Fortunately, the local responsible agency often organized a number of meetings, for instance, progress evaluation and discussion on the activities contained in the work plan.

A B

Figure 8. (A) Discussion on project objectives status and the villagers' needs, (B) Discussion on the forest among the partners

Aspects of income and livelihood

The pilot project supports establishment of non-destructive production. For example, brooms, silk, sales of mushrooms, honey and ant eggs are making up for the unwanted wood sale, which exploits the forest negatively (Figure 9). Further, village forest committees, VFC, are going to formulate guidelines in coherence with the overall public forest laws to define the limitations of forest use.

A B C

Figure 9. Alternative occupations for the community income development, (A) Broom-making, (B) Silkworm culture, (C) Local cloth-weaving

CONCLUSION

At this early stage, most of the activities on the pilot project at the conservation station were mainly concentrated on the social aspects, aspects of income and livelihood, forest area and tree populations. The purposes by focussing on social aspects were to create a better understanding of the project objectives, the importance/benefits of the forest, and to create a better relationship between the villagers and the foresters through deeper mutual understanding of others' needs/problems. At the same time, the involved agencies have started to implement activities on the aspect of income and livelihood in a potential village (Ba Hai village) in order to improve the people's lives and serve as an example

to others. Moreover, the inventory of the pine population, as well as training on forest inventory and forest rehabilitation, provided information and improved the management and rehabilitation skills of the staff. In future, involved agencies will undertake more activities on aspects of area and tree populations, and research and development aspects in order to focus more on the improvement of the forest status. Agencies will continue to undertake activities on social aspects and aspects of income and livelihood.

Some bottlenecks that occurred are, e.g. lack of market outlets where villagers can sell their products, low quality of products, and forest conservation/management information not continuously distributed to the community. Moreover, the communication between foresters and villagers or among villagers themselves is insufficient to fulfill some activities such as prevention of forest fire and illegal cutting.

LESSONS LEARNT

A conventional forest conservation approach based solely on protective and prohibitive regulations proved unsuccessful. Conservation of the forest resources may not be possible without the awareness and active support/participation of the local communities. Sustainable conservation relies on good relations between the forestry staff and local people.

Villager's ability to control the forest resource must neither be underestimated nor overestimated. Presence of foresters is useful to set ultimate limits. External attention and interest spur awareness among villagers.

The complexity of villages including their problems is rarely the same—a specific approach must be tailored in each case. Extra attention costs resources and skills—but eventually pays off in terms of better understanding, consensus, and significant results in terms of development and more effective forest conservation.

RECOMMENDATIONS

- Villagers and foresters shall learn how to deal with each other to improve communication and understanding.
- Limits for forest use must be set clearly.
- Consequences for trespassers must be established.
- Information level must be sufficient and clear.
- Alternative NWTP activities and products are to be stimulated by inputs, demonstrations, support and trials.

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