

# **TREE PLANTING IN THE UPPER MAE SA VALLEY, DOI SUTHEP-PUI NATIONAL PARK AUGUST 1<sup>ST</sup> 2006**

## **INTRODUCTION**

Chiang Mai University's Forest Restoration Research Unit was founded in 1994 to develop effective methods to restore forest ecosystems to degraded areas for biodiversity conservation and environmental protection.

Since 1996, the unit has developed a close working relationship with a local community within Doi Suthep-Pui National Park. With nearly 1,800 inhabitants, Ban Mae Sa Mai, in the upper Mae Sa Valley, is the largest Hmong Village in N. Thailand. FORRU has worked with the villagers and the national park authority to establish trial plots to demonstrate the framework species method of forest restoration (Goosem and Tucker, 1995; Lamb et al., 1997; Tucker and Murphy, 1997). This involves planting 20-30 indigenous tree species specially selected for their ability to rapidly shade out weeds and attract seed-dispersing wildlife (FORRU, 2006). Birds and mammals, attracted to the plots, bring with them the seeds of many other forest trees and thus help to re-establish a species-rich forest tree community similar to that of the original forest. Planted trees restore forest structure, whilst the animals attracted to them restore biodiversity.

With a village tree nursery and active education program now in operation, the site has been recognized as a successful example of the concept of Forest Landscape Restoration (FLR) now being promoted by the IUCN and WWF (Mansourian et al., 2005). However, to maintain the value of the site both as a demonstration area to promote FLR and as wildlife habitat within a national park, it was recognized that forest restoration needed to be implemented in the gaps that remain between the research plots. This will create a "corridor" to facilitate movement of seed-dispersing wildlife around the area and will also help maintain the enthusiasm and commitment of the local community. To assist with this, PATT kindly offered to sponsor the planting and maintenance of an irregularly shaped area of 20 rai, which adjoins plots previously planted in 1998, 1999 and 2000. Here we report on the planting event, which was successfully carried out on August 1<sup>st</sup> 2006.

## **AIMS**

The aims of the planting were:-

- to expand previously planted plots to increase the area of wildlife habitat and facilitate movement of seed-dispersing animals among previously planted plots and
- to improve and maintain the site as an example of FLR for education, research and extension.

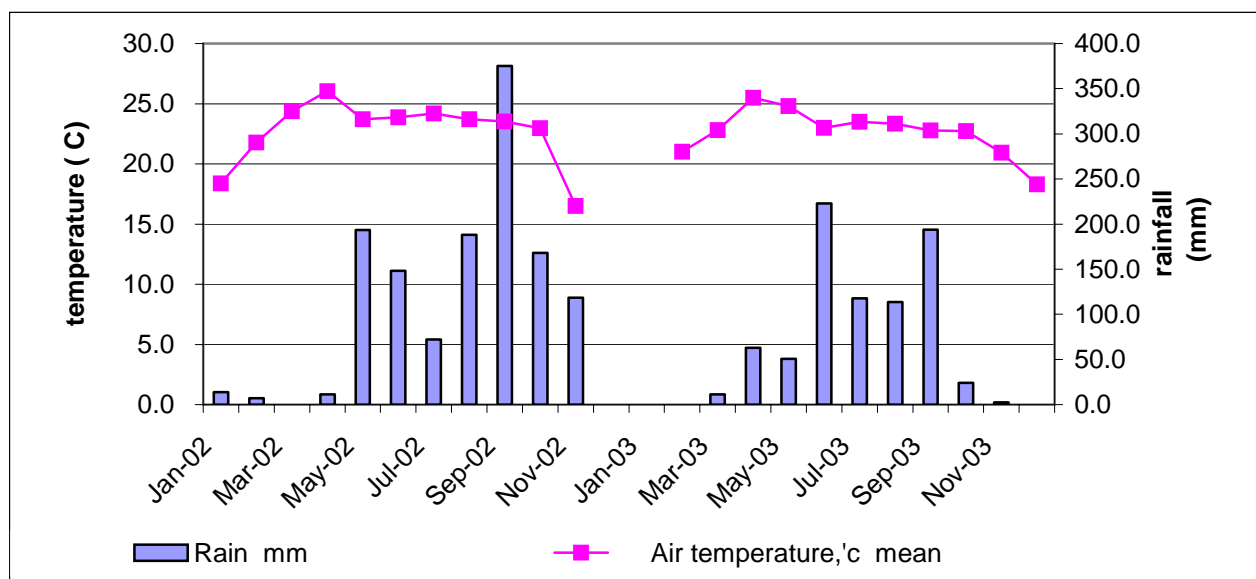
## SITE DESCRIPTION

The planting site was situated approximately 1-2 km southwest from the village of Ban Ma Sa Mae in Mae Rim District, Chiang Mai Province within Doi Suthep-Pui National Park at an elevation of 1,300 m above sea level. Originally, the site had been covered with evergreen forest, cleared approximately 30 years previously, to provide land for cultivation of cabbages, corn, potatoes and other cash crops. Cultivation of most of the site was gradually phased out from 1996, although a small part of the site had remained cultivated for corn until 2004. Fires had affected parts of the site in 1998 and 2003.

The abandoned fields were dominated by herbaceous weeds such as *Pteridium aquilinum* (L.) Kuhn (Dennstaedtiaceae), *Bidens pilosa* L. var. *minor* (Bl.) Sherf, *Ageratum conyzoides* L., *Eupatorium odoratum* L. and *E. adenophorum* Spreng. (all Compositae), *Commelina diffusa* Burm. F. (Commelinaceae) and grasses e.g. *Phragmites vallatoria* (Pluk, ex L.) Veldk., *Imperata cylindrica* (L.) P. Beauv. Var. *major* (Nees) C.E. Hubb. Ex Hubb. & Vaugh. and *Thysanolaena latifolia* (Roxb. ex Horn.) Honda (both Gramineae). Most of the slopes below the plots are still cultivated for corn carrots and a little upland rice, with lynchee orchards beyond, providing the villagers with their main source of income.

A few remnant trees, remained sparsely scattered across the plot, but had not resulted in substantial natural regeneration. The nearest patch of forest was about 4 km east from the plot. In general, soils in the deforested zone, analyzed in 2000 (Elliott et al., 2000), were significantly more acidic and contained significantly less organic matter and nitrogen, more sand and less silt and clay, compared with undisturbed forest.

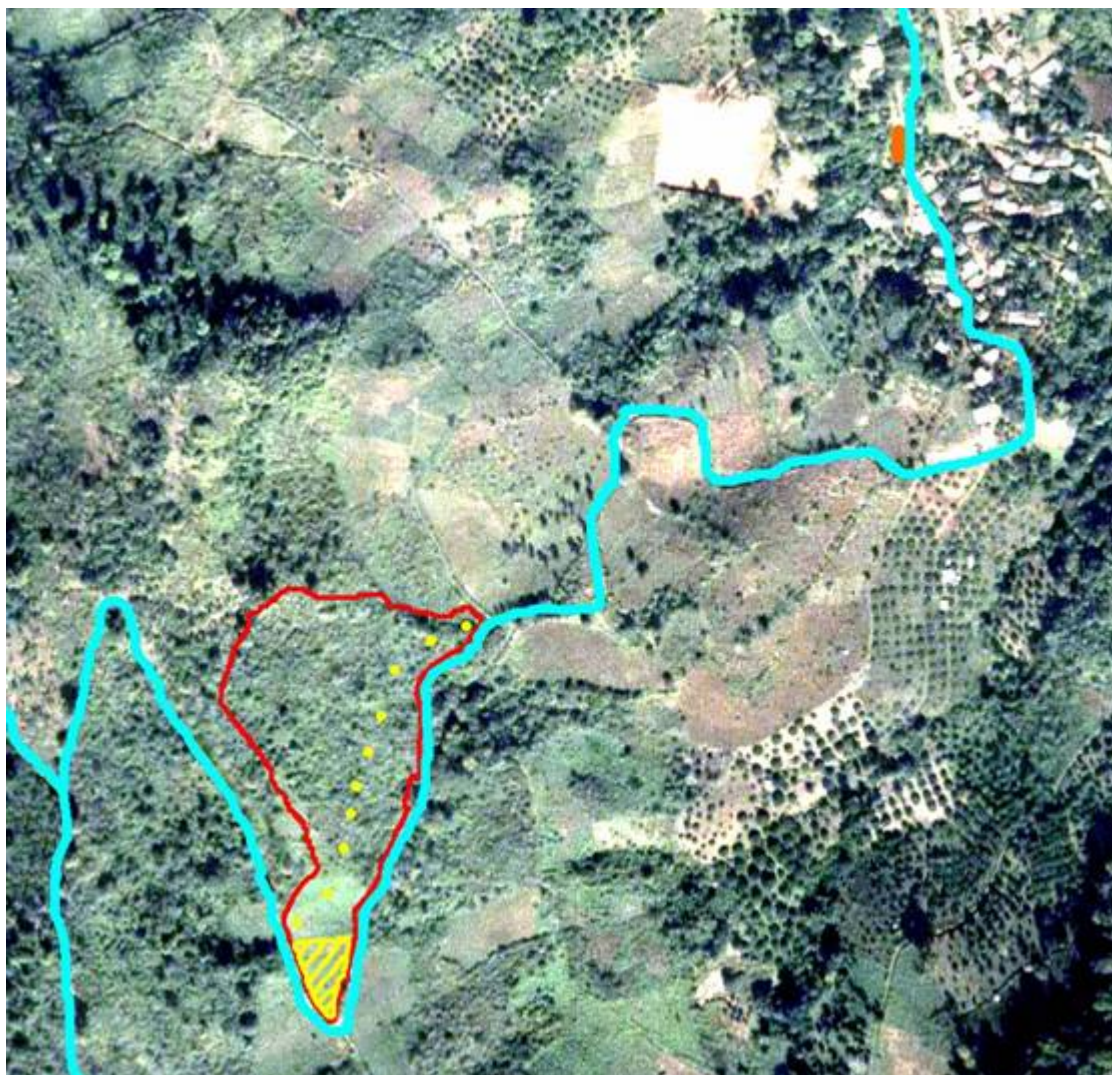
The area has two main seasons: the wet season (May – October) and the dry season (mean monthly rainfall below 100 mm, November – April). The dry season is subdivided into the cool-dry season (November – January) and the hot-dry season (February – April). Average annual rainfall, recorded at the nearest weather at similar elevation (Kog-Ma Watershed Station), was 2,094.9 mm. Extreme temperatures ranged from a minimum of 4.5°C in December to a maximum of 35.5 °C in March. Monthly data from the Royal Project Centre (420 m lower than the plot) are presented in Fig.1.



**Figure 1** - Average monthly temperature and rainfall at Mae Sa Royal Project Centre (2002-2003) (880 m elevation, 4 km from the planted plot)

The area had initially been planted with trees at the beginning of the rainy season 2005 but unfortunately FORRU did not have sufficient funds to support weeding and fertilizer application throughout the 2005 rainy season. Consequently, by the beginning of the 2006 season, many of the trees became overgrown with weeds and had died, whilst survivors were generally in poor and declining health. Therefore, the specific objective of the planting and other activities, sponsored by PATT in 2006 was to replace dead or dying trees and re-instate effective maintenance (*i.e.* weeding and fertilizer application) operations before more trees died as well as monitoring of the area.

**Figure 2** - Location of PATT planted plot (boundary in red). Yellow hatched area is for intensive monitoring of labeled trees. Yellow dots indicate sample points for extensive monitoring. The dirt track leading from the village to the plots is exaggerated in blue and the position of the community tree nursery is indicated in orange. Please note that this is an old (undated) aerial photograph of the area taken before most of FORRU's plots had developed. We are awaiting a more up to date image from the park authority. However, it does allow a rough representation of the position of the PATT plot relative to the road and the village to be made along with a schematic representation of the monitoring system. Measurements by GPS around the boundary of the area were 47Q 0484105 UTM 2085727, 47Q 0484064 UTM 2085536, 47Q 0484100 UTM 2085554, 47Q 0484086 UTM 2085659, 47Q 0484065 UTM 2085681, 47Q 0484078 UTM 2085743, 47Q 0484175 UTM 2085803, 47Q 0484160 UTM 2085834, and 47Q 0484200 UTM 2085756.



## THE TREES PLANTED

On August 1<sup>st</sup> 2006, a total of 4,010 tree saplings were planted, representing 46 species of proven value as framework species, plus a few species considered to be rare or threatened with extirpation from the national park, planted for species conservation purposes (e.g. *Acer laurinum*, *Carallia brachiata*, *Podocarpus neriifolius* etc.). The names are listed in Table 1. Some of the trees had been grown from locally collected seed by the villagers themselves in their community tree nursery, whilst the rest were transported to the site from FORRU's research nursery at the HQ of the National Park. Trees had been grown for 6-18 months (depending on species) in 9 x 2 ½ inch plastic bags in a medium of forest soil: coconut husk: peanut husk, 2:1:1 with slow release fertilizer (Osmocote 3 months) applied as required.

Samples of twenty five individuals of each of 20 species were selected and labeled for intensive monitoring (within with yellow hatched area on the aerial photo). The surviving density of trees previously planted in 2005, as well as naturally established trees, is being monitored in 10 sample units spread across the site (yellow circles on the map). Maintenance and monitoring of these trees will also be covered under the present PATT grant.

Table 1 – Trees planted on August 1<sup>st</sup> 2006

S.no	Species	Family	Thai name	Amount of labeled trees	Amount of non-labeled trees
80	<i>Acer laurinum</i>	Aceraceae	ก้าม		5
31	<i>Acrocarpus fraxinifolius</i>	Leguminosae (Caesalpinioideae)	สะเดาช้าง		25
123	<i>Aglaia lawii</i>	Meliaceae	ประยงค์ป่า		210
301	<i>Albizia chinensis</i>	Leguminosae (Mimosoideae)	กวางหลวง		5
254	<i>Aquilaria crassna</i>	Thymelaeaceae	กฤษณา	25	
112	<i>Archidendron clypearia</i>	Leguminosae (Mimosoideae)	ไคร้ช้อย		34
129	<i>Artocarpus lakoocha</i>	Moraceae	หาด		28
239	<i>Baccaurea ramiflora</i>	Euphorbiaceae	มะไฟ	25	14
48	<i>Betula alnoides</i>	Betulaceae	กำลังเสือโคร่ง	25	
4	<i>Bischofia javanica</i>	Euphorbiaceae	เด็ม	25	120
363	<i>Brassia ficifolia</i>	Araliaceae	ต้าง	25	127
377	<i>Carallia brachiata</i>	Rhizophoraceae	เลียงพร้าวนางแอ		8
270	<i>Castanopsis acuminatissima</i>	Fagaceae	ก่อเดือย	25	
269	<i>Castanopsis tribuloides</i>	Fagaceae	ก่อใบเลื่อม		5
106	<i>Cryptocarya amygdalina</i>	Lauraceae	หมากขี้ไต้		15

346	<i>Diospyros coastanea</i>	Ebenaceae	ลำตาควาย		1
198	<i>Dysoxylum procerum</i>	Meliaceae			23
8	<i>Elaeocarpus lanceifolius</i>	Elaeocarpaceae	พีฟ้าย		4
67	<i>Engelhardia spicata</i>	Juglandaceae	ค่าหด		5
333	<i>Eugenia albiflora</i>	Myrtaceae	มะห้ำ		14
326	<i>Eugenia fruticosa</i>	Myrtaceae	หว่าจี้กวาง	25	
29	<i>Ficus benjamina</i>	Moraceae	ไทรช้อย		10
344	<i>Ficus callosa</i>	Moraceae	มะเดื่อกวาง		1
59	<i>Ficus fistulosa</i>	Moraceae	มะเดื่อปล้อง	25	11
372	<i>Ficus heteropleura</i>	Moraceae	สลอดหิน		1
380	<i>Ficus hispida</i>	Moraceae	มะเดื่อปล้อง	25	85
348	<i>Ficus microcarpa</i>	Moraceae	ไทรช้อยใบหู่		6
365	<i>Ficus racemosa</i>	Moraceae	มะเดื่อ อุทุมพร		17
78	<i>Gmelina arborea</i>	Verbenaceae	ช้อ	25	
157	<i>Heynea trijuga</i>	Meliaceae	ตาเสื่อทุ่ง	25	170
18	<i>Hovenia dulcis</i>	Rhamnaceae	หมอนหิน	25	110
273	<i>Lithocarpus garrettianus</i>	Fagaceae	ก้อก้างด้าง	25	
7	<i>Manglietia garrettii</i>	Magnoliaceae	มณฑาแดง		6
70	<i>Markhamia stipulata</i>	Bignoniaceae	แคหางค่าง		3
138	<i>Magnolia baillonii</i>	Magnoliaceae	จำปีป่า	25	128
153	<i>Mischocarpus pentapelatus</i>	Sapindaceae	พะบัง		25
146	<i>Nyssa javanica</i>	Nyssaceae	คางคาก	25	190
73	<i>Oroxylum indicum</i>	Bignoniaceae	เพกา		3
186	<i>Ostodes paniculata</i>	Euphorbiaceae	มะกั้งดง		12
293	<i>Podocarpus neriifolius</i>	Podocarpaceae	พญาไม้	25	350
71	<i>Prunus cerasoides</i>	Rosaceae	นางพญาเสื่อ โคร่ง	25	915
105	<i>Sarcosperma arboreum</i>	Sapotaceae	มะขาง	25	330
66	<i>Spondias axillaris</i>	Anacardiaceae	มะกัก	25	200
195	<i>Terminalia bellirica</i>	Combretaceae	สมอพิเภก		200
115	<i>Toona ciliata</i>	Meliaceae	ขมหอม		10
51	<i>Vitex quinata</i>	Verbenaceae	อีแปะ	25	84

## PLANTING METHOD

Firstly, the area was surveyed for any of the trees planted in 2005 which had survived under the weeds. The survival rate was higher than initially expected, estimated at about 60-65%, but survival was very variable and patchy across the site, with more trees surviving along the northern and eastern sides of the site and very few in the middle and at the southern end. Bamboo stakes were placed by each surviving tree to make sure that they were visible and not damaged during site clearance and planting operations. Then the site was cleared of weeds by slashing them down to ground level.

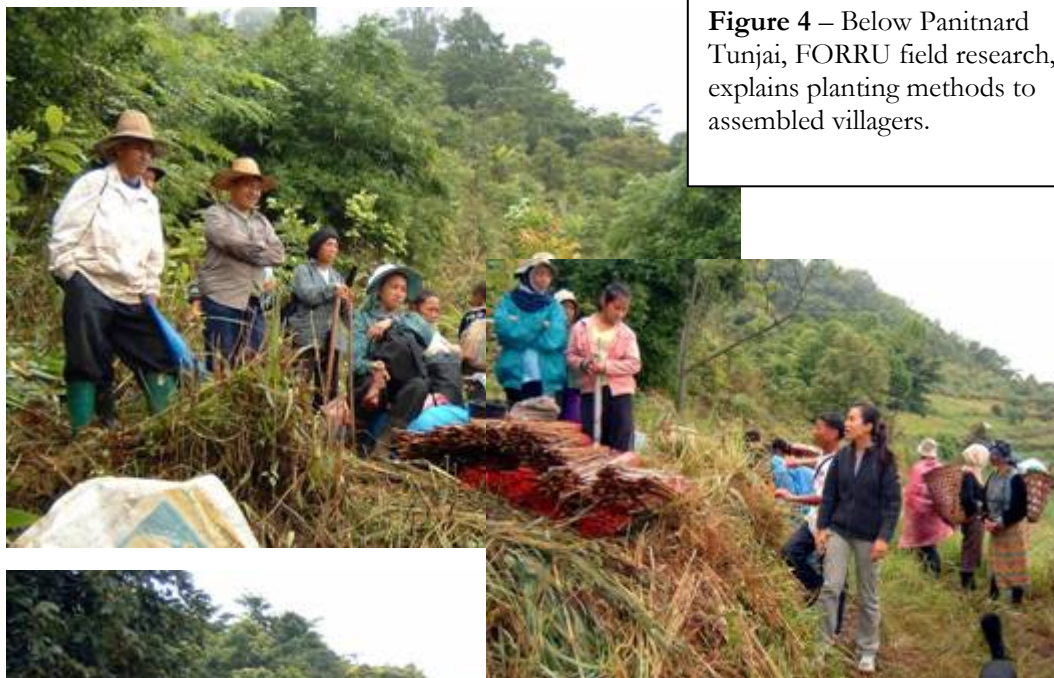
The place where each tree was to be planted was marked by 50-cm tall bamboo stakes. The stakes were placed randomly across the site roughly 1.8 m apart to create a natural looking layout to the restored forest. The tree saplings were loaded into baskets and distributed to each of the stakes. Beside each bamboo stake, a hoe was used to dig a hole, approximately twice the volume of the plastic bags in which the trees had been grown. The hoe was also used to dig out the weed roots in a circle 50-100 cm in diameter around the hole. The plastic bags were slashed with box cutters to remove the saplings without damaging the roots. Then the saplings were placed upright in holes. The space around the root ball was packed with loose soil, making sure that each sapling's root collar was eventually positioned level with the soil surface. Fifty grams of fertilizer (Rabbit brand, N P K 15-15-15) was then spread in a ring on the soil surface, about 10-20 cm away from the sapling stem. Finally, dead weeds were placed around each planted tree as mulch.



**Figure 3** – A perfectly planted *Podocarpus neriifolius* tree, ready for mulching. This rare tree species is confined to a single stream gully on Doi Suthep and has been reduced to just a handful of surviving mature individuals. Including it in tree planting programs is helping to save the species.

## THE PLANTING EVENT

On August 1<sup>st</sup>, about 60 villagers from Ban Mae Sa Mai joined FORRU staff to plant the trees. The villagers joined in enthusiastically digging the holes, transferring seedlings to the holes and applying fertilizer. Although national park staff were meant to join the event, they were unable to come due to flooding of the district forest office. However, Kuhn Surachai Tuamsomboon, Head of the park did visit to lend his support. Three foreign volunteers also joined the event. The activities on planting day began around 9.30 am by demonstrating the correct planting methods to everyone, emphasizing the correct average spacing between each bamboo stake, extracting saplings from plastic bags without damaging the root ball and applying fertilizer in a ring correctly. Then, planters were divided into two groups. A smaller group completed planting of labeled trees for monitoring and a big group, lead by Khun Naeng Thanonworakul (manager of village nursery) worked on planting of the rest of the trees. The event started at 9.30 am and was finished by about 3.00 pm when a small ceremony was held to thank the villagers for their work and a donation to the village development fund was presented by PATT representative Chris Doherty.



**Figure 4** – Below Panitnard Tunjai, FORRU field research, explains planting methods to assembled villagers.



**Figure 5** – During the planting event Park Chief, Kuhn Surachai Tuamsomboon, visited the planting site to express his support for the event with PATT representative, Chris Doherty and FORRU co-ordinator Steve Elliott.

## MONITORING

Monitoring to assess immediate post-planting mortality of trees planted this year has already been carried out and the data are being analyzed. Initial results indicate zero mortality for most trees planted this year and low mortality for the rest, including: *Aquilaria crassna*, *Eugenia fruticosa*, *Ficus fistulosa*, *Magnolia baillonii*, *Nyssa javanica* and *Prunus cerasoides* (all 4% mortality); *Vitex quinata* (8%) and *Spondias axillaris* (16%). This mortality may have been due to transplantation shock and to rough handling during transportation and planting and also due. Average density of trees planted this year surviving in 10 circular sample units (10 m in diameter) placed regularly across the site was 17.6 (SD 7.47) which is equivalent to 359 trees per rai. Trees surviving from last year, as well as scattered naturally established trees, increased this density well above the required 500 per rai required for rapid canopy closure.

## FUTURE PLANS

Events	Dates
Monitoring of post-planting shock of labeled trees	15 AUG 2006 DONE
Monitoring in 10 circle plots	24 AUG 2006 DONE
Analyzing monitoring data	SEP 06 IN PROGRESS
Weeding and fertilizer applications (1)	8 SEP 2006
Weeding and fertilizer applications (2)	20 OCT 2006
Weeding and fertilizer applications (3)	24 NOV 2006
Monitoring after 1 <sup>st</sup> rainy season	28 NOV 2006
Monitoring after 1 <sup>st</sup> dry season	15 MAY 2007
Monitoring after 2 <sup>nd</sup> rainy season	28 NOV 2007



**Figure 6** – PATT representative, Chris Doherty presents a donation to the village development fund to Ban Mae Sa Mai Environment Committee member, Kuhn Naeng Thanonworakul at the end of the planting event.

## REFERENCES

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## CUT STUFF

### ANNEX

Experimental plots were established in the north of Doi Suthep-Pui National Park, they were positioned along the ridges of a degraded watershed area, 2-3 km from Ban Mae Sa Mai (the Hmong hill tribe community in the north of the park). This village is administratively linked to Pong Yang Subdistrict, Mae Rim district, Chiang Mai province.

According to the research report from the University of Hohenheim, the village was founded in 1965. The first family are said to have come from Doi Samuen in Mae Cham district. Most of the families did arrive in the village before 1970. Ban Mae Sa Mai is one of the largest Hmong settlements in northern Thailand, with a total population of 1765 inhabitants divided into 204 households (Pong Yang Subdistrict development plan for 2003). Despite its proximity to Chiang Mai, traditional social structures of the Hmong society based on clans, lineages and a council of elders still play a dominant role. However, in dealing with the Thai administration, the villagers developed a complex system of representation, administration and local juridical institutions. Since Mae Sa Mai was founded in 1965, a village headman (called by the term *pob luang*) has been responsible for the village administration and represents the village before government institutions. The village headman is supported by four assistants he usually chooses himself. Due to its size the village is further divided into six zones each with their own head, supported by a secretary. Each zone has to manage waste disposal, sewage systems and drinking water supply (Schiller, 1999).