

## TEA CULTIVATION IN THE NATURAL FOREST IN NORTHERN THAILAND : A Case Study on Rational Forest Management

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## บทคัดย่อ

จะเห็นได้ว่าการจัดการป่าไม้โดยมีการปลูกใหม่ยังคงทำทุกอย่างเดิมเช่นเดิมทั่วทั้งประเทศ ไม่ได้ให้ความสำคัญกับการอนุรักษ์ธรรมชาติที่เป็นภารกิจสำคัญที่ขาดไม่ได้ จึงเป็นภารกิจที่สำคัญที่สุดที่ต้องดำเนินการต่อไป

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## ABSTRACT

The structure and management of the tea producing forest in northern Thailand were studied in the area around Ban Pah Pae, Chiang Mai, where the remaining forests are defined as Hill Evergreen and Mixed Deciduous Forests. Locations of trees and tea trees (*Camellia sinensis* var. *assamica*) were mapped, tree species were identified and their DBH, height and crown sizes were measured.

The results revealed that the densities of tea trees are 700/ha in plot 1 ; 750/ha in plot 2 ; and 1,567/ha in plot 3 in which big trees are rather sparse. The sizes of tea trees are mainly under 2 cm. in DBH with a maximum of 5 cm. Heights are also mainly 1-3 m because tea trees are usually cut at a height of 1.5-2 m to make harvest of tea leaves easy at 3 yrs intervals. The Miang orchard is maintained by sowing 2-3 seeds in shallow holes dug around big trees. Seeds are collected from tea trees and sowed at about five years intervals. The presence of trees as shade trees is needed to cultivated tea-trees, but tending of natural trees in moderate sunlight is probably a reason contribute to a flavor improvement

The introduction of forest management with tea cultivation and cattle grazing in this region is said to be a form of integrated agroforestry "Agrosilvopastoral". From the viewpoint of forest ecology and agroforestry, a combination of trees and tea trees is undoubtedly appropriate in order to maintain the natural tea producing forest, unless proper management is highly considered.

## INTRODUCTION

Traditional tasting fermented or pickled tea, called "Miang" in Thai, had mainly been produced in villages in the Golden Triangle in northern Thailand. In Burma, this taste is called "leppet-so" and is also produced in northern Shan state adjacent to this part of northern Thailand. This processes for making fermented "Miang" tea have been described (Le Bar, 1967 ; Van Roy, 1971 ; Muriya, 1980 ; & Sasaki, 1981, etc.) and its economic contribution to the hill tribe communities has also been described (Keen, 1972, 1978). However, the structure and management of the forests which produce this tea (Keen, 1972, called "Miang orchard") have not been dealt with as yet.

From the view point of agroforestry, tea cultivation in the forest is undoubtedly recognized as one of the traditional agroforestry

systems peculiar to this region. In addition, cattle are turned out to graze in the forest. The system can probably be defined as an agrosilvopastoral system, i.e. integrated combination of agriculture, animal husbandry and forestry.

Leaves of tea as an "agricultural product" are harvested from tea trees in the natural forest in which tree density is kept appropriate for moderate sunlight to fall on the tea trees. The remaining trees serve as shade trees and are also used as timber for construction as well as fuelwood. Obviously, the contribution to erosion control in the mountain ranges in northern Thailand must be highly evaluated.

In this paper we introduce management of the natural forest in which tea cultivation is done and where at the sametime timber and fuel woods are being harvested. In particular, the structure of the forest, i.e. density of trees and

tea trees, species of remaining trees and regeneration methods are described.

We believe the results obtained contribute to an understanding of the structure and management of the tea producing forest in northern Thailand.

#### MATERIALS AND METHODS

The present study was carried out in the natural forest around Ban Pah Pae located midway between Mae Taeng and Pai, about 40 km north of Chaing Mai. The elevation is about 600-800 m.

According to the classification of the Royal Forest Department of Thailand, the forests remaining in this region are defined as Hill Evergreen Forest and Mixed Deciduous Forest. However, the vegetation in the research sites chosen is recognized as an ecotone between the two types. While time was limited, two quadrats of 10 m  $\times$  20 m and one of 10 m  $\times$  30 m were set in the forests in which tea trees are cultivated. Locations of trees and tea trees (*Camellia sinensis* var. *assamica*) were mapped, tree species were identified and their DBH, height and crown sizes, etc. were also measured.

#### RESULTS AND DISCUSSION

##### 1) Structure of the Forest

Table 1 shows the density, mean DBH, mean height, basal area and density of tea trees. In addition, Fig. 1 shows the location of trees and tea trees in the three plots. Tree species and densities vary greatly from site to site.

Structure of each site are briefly described as follows :

##### Plot 1

Main tree is Gom Khom (*Picrasma javanica* Bl.). (Simaroubaceae with DBH of

3-14 cm and height of 4-14 m. The same size Ma Teak Ton (*Casuarina flexuosa* Craib.) (Flacourtiaceae), Dong Dam Khaw (*Mitrophora tomentosa* Hook. f.) (Annonaceae), Krai (*Glochidion kerrii* Craib.) (Euphorbiaceae), Ma Gram Ton (*Adenanthera pavonina* L.) (Leguminosae) also occur although in low density.

Tree density is estimated at 1,200/ha and the basal area is 4.9 m<sup>2</sup>/ha. The density of the trees in the highest but the basal area is the lowest among the plots. The density of the tea trees is estimated at 700/ha in this plot.

##### Plot 2

Ta Low (*Schima wallichii* Korth.) (Teaceae) with DBH of 6-27 cm and height of 4-17 m mixes with small Gom Khom (*Picrasma javanica* Bl.). Tree density is at 500/ha and the basal area is 14.9 m<sup>2</sup>/ha. The density of tea trees is at 750/ha.

##### Plot 3

A big fig tree Ma Dure (*Ficus subulata* Linn.) (Moraceae) with 96 cm in DBH and 35 m in height occurs. Ta Low (*Schima wallichii* Korth.) with DBH of 28-45 cm and Dong Dam Khaw (*Mitrophora tomentosa* Hook. f.) also occur. The density is estimated at 200/ha, the lowest among the plots but the basal area is the highest 40.3 m<sup>2</sup>/ha. Among the tree plots, this plot maintains the original structure of the forest mostly. The density of the tea trees in the highest attained 1,567/ha.

##### 2) Management of Forest and Tea Trees

The densities of tea trees are 700/ha in Plot 1, 750/ha in Plot 2 and 1,567/ha in Plot 3, respectively. The density of tea trees is highest in Plot 3 in which big trees stand sparsely. It is possible that small trees and

Table 1. Structure of tea producing forest

Local name	Scientific name	Density (/ha)	Mean DBH (cm) (Range)	Mean height (m) (Range)	Basal area (m <sup>2</sup> /ha)	Density of tea trees (/ha)
<b>Plot 1</b>						
Gom Khom	<i>Picrasma javanica</i>	750	6.2 (3.0-13.5)	7.0 (4.0-14.0)	2.8	
Ma Tack Ton	<i>Cascaria flexuosa</i>	200	5.4 (4.0-7.0)	6.8 (5.0-11.5)	0.5	
Ma Gram Ton	<i>Adenanthera pavonina</i>	100	7.5 (7.0-8.0)	8.0 (8.0)	0.4	
Dong Dam Khaw	<i>Mitrophora tomentosa</i>	50	14.0	12.0	0.8	
Ma Muc	<i>Choerospondias axillaris</i>	50	9.5	7.5	0.4	
Krai	<i>Glochidion kerrii</i>	50	3.5	4.0	-	
Total		1,200	6.6	7.1	4.9	700
<b>Plot 2</b>						
Gom Khom	<i>Picrasma javanica</i>	300	8.4 (4.5-14.7)	8.8 (5.5-12.5)	1.9	
Ta Low	<i>Schima wallichii</i>	200	18.2	15.6	5.5	
Total		500	12.3	11.5	7.4	750
<b>Plot 3</b>						
Ma Dure	<i>Ficus subulata</i>	33	96.0	35.0	24.1	
Ta Low	<i>Schima wallichii</i>	133	38.1 (28.0-44.8)	26.3 (23.0-32.0)	15.7	
Dong Dam Khaw	<i>Mitrophora tomentosa</i>	33	14.0	8.5	0.5	
Total		200	43.8	24.8	40.3	1,567

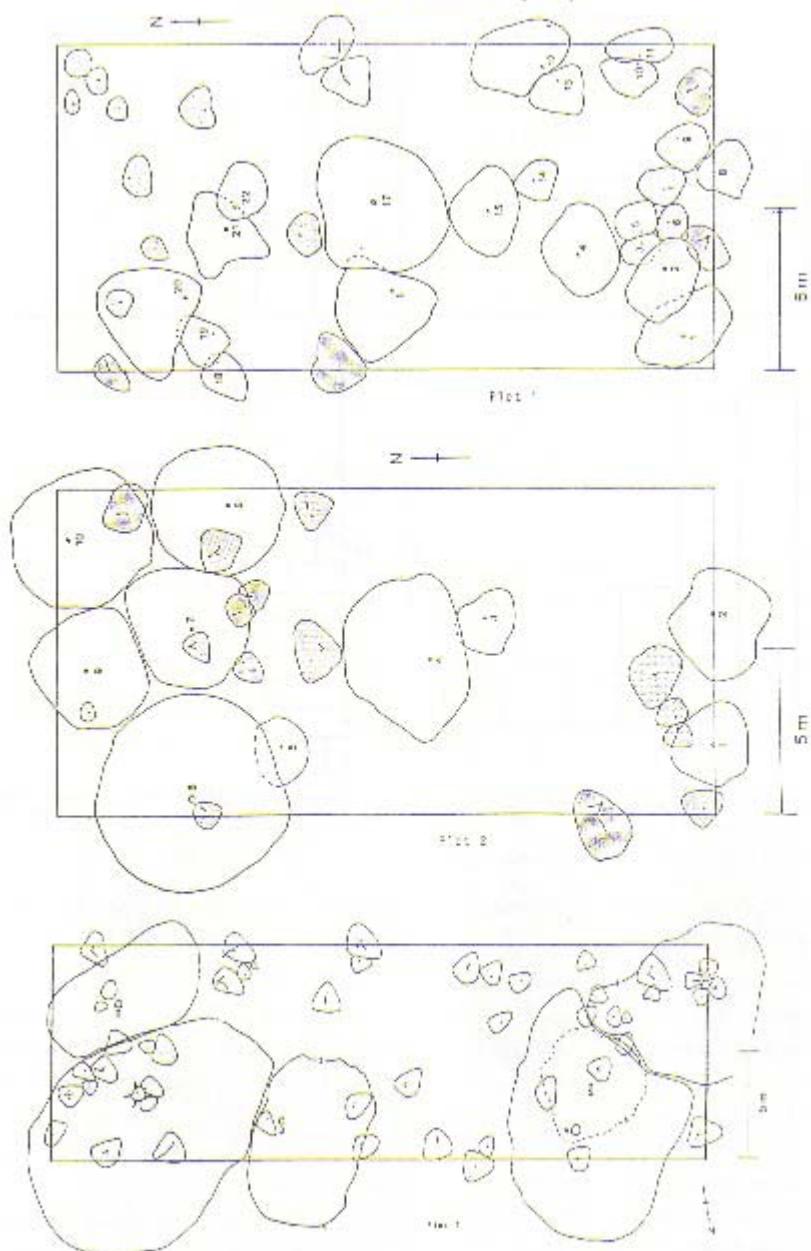


Figure 1. Maps of forest tree and tea tree location. ● : tea tree.

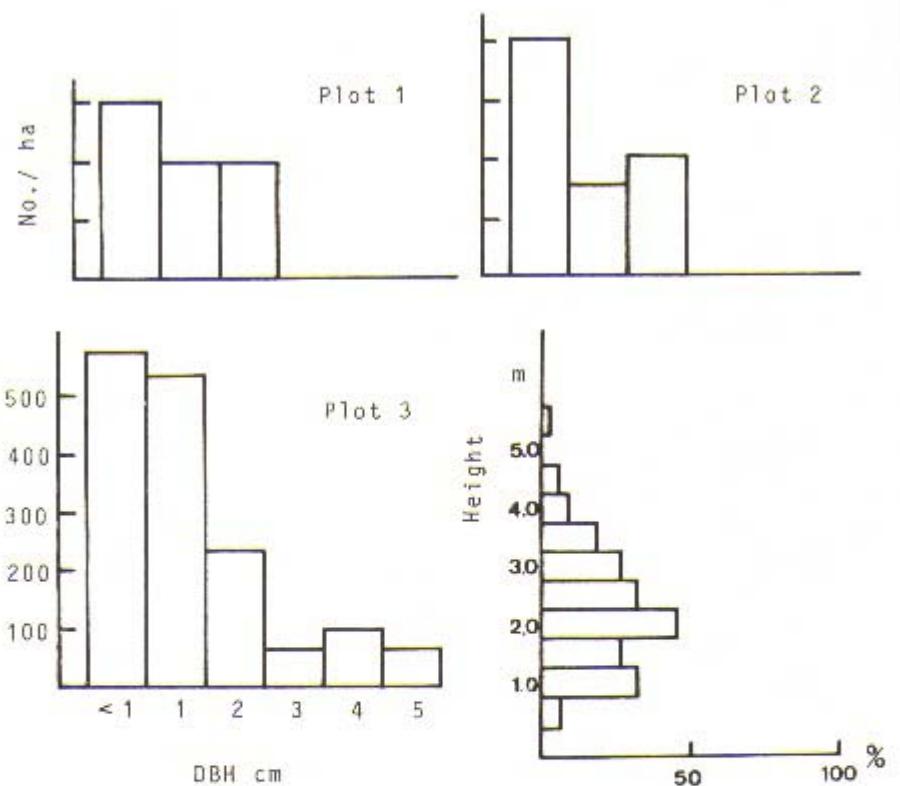


Figure 2. Distribution of diameter (DBH) and height to tea trees.

shrubs were thinned in order to increase the number of tea trees.

Fig. 2 shows the size class and height distribution of tea trees. Sizes of tea trees cultivated are mainly under 2 cm in DBH with a maximum of 5 cm. Heights are also mainly 1-3 m because tea trees are usually cut at a height of 1.5-2 m to make harvest of tea leaves easy at three year intervals. However, they sometimes attain 5 m or more in height when they are abandoned.

The scenery of tea cultivation in the forest differs greatly from that in Japan, Assam in

India, Sri Lanka, Java in Indonesia, etc., where tea trees are repeatedly pruned in a semicircle and form lines.

According to interviews with the farmers, seedlings of tea trees are not transplanted but two or three seeds are sowed in shallow holes dug around big trees. Seeds are collected directly from tea trees planted and sowed at about five-year intervals.

Concerning the establishment of Miang orchards, Keen (1972) briefly mentioned as follows, i.e. the customary method of establishing a Miang orchard, at least in the

past, has been simply to clear the forest from around already growing trees but in recent years a few people have begun to augment their "wild" trees by planting seedlings either raised in the nursery or grown in the forests.

However, in this area, the transplanting of seedlings raised or grown is never done as described above. It is possible that the sowing of seed of tea is a recent device in this region or that traditions concerning establishment and tending of tea orchards vary from village to village.

Trees are sometimes classified into two types, i.e. trees to be cut selectively and trees to be left. Mai Ko (*Castanopsis* spp. and *Quercus* spp.) are the former. These trees are cut first because they are usually big and their root system in the soil prevent the growth of tea seedlings. At the same time, these trees are commonly used as fuel to steam and dry tea leaves. It is believed the fire from this timber is strong and lasts long. This, of course, is important for fuelwood in daily life.

On the other hand, Ta Low (*Schima wallichii*) and Ma Limm (*Oroxylum indicum*) are left. It is said their small tree crowns moderate sunlight. Probably, easy management, i.e. fast growing, easy regeneration and easy thinning, etc., are the reasons.

Normally, weeding is done twice a year by hatchet in April–May and in June. However, the forest floor is almost completely covered with eupatorium (*Eupatorium odoratum*, *E. adenophorum*) and sense plant (*Mimosa pudica*) which cattle turned out to graze never eat.

In the introduction, forest management with tea cultivation and cattle grazing in this region is said to be a form of integrated agroforestry "Agrosilvopastoral". However, forage for cattle is practically not enough in the forest. It is necessary to have a device to maintain and to convert floor with rich forage.



Figure 3. Scenery of tea producing forests.

### CONCLUSIONS

Traditional agroforestry in which tea trees are cultivated in the natural forest certainly contribute to maintaining villagers' livelihoods and to developing the communities. In this system, the presence of trees as shade trees is needed to cultivate tea trees and to harvest high grade tea leaves for producing "Miang" or ordinary tea. While it is generally believed that soil and climate in this region contribute to a flavor improvement of tea (Le Bar, 1967), tending of natural trees in moderate sunlight is probably a reason.

Because Mai Ko (*Castanopsis* spp. and *Quercus* spp.) are important trees for fuelwood to steam and to dry harvested tea leaves, the establishment of a combination of Mai Ko and tea trees may be recommended. Namely, the sowing of acorns of transplanting of seedlings of those trees must be tried.

The existence of villages which depend on the maintenance of forests without clear cutting and which have been obtaining a continuous yield of tea leaves as their main product must be highly evaluated (Watanabe, 1990). However, it is recognized as a tendency to establish a tea monoculture in order to harvest tea leaves more. In those places, only few trees are left.

From the viewpoint to forest ecology and agroforestry, a combination of trees and tea trees in undoubtedly appropriate in order to maintain the natural tea producing forest. Further study on the proper density for both trees to maintain sustainable yield is needed.

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