

Title: **Plants Diversity in a Small Plantation of Rubber-Based Intercropping System and Farmer Self-Reliance**

Field: Biology and Biodiversity

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Abstract

The rubber-based intercropping system has been mainly subjected to be a number of study by several researchers about its advantages on rubber farmers, who have been facing the decrease of rubber price. Yet, it still needs more information to support the idea. Hence, the study of Plant Diversity and Utility in a Small Plantation of Rubber-Based Intercropping System and Farmer Self-Reliance was conducted to investigate plants used and found in a sample plantation of a rubber-based intercropping system in the community of Baan Tung-Ngai, Kohong sub district, Hat-Yai district, Songkla province, which belongs to Mr. Arthorn Suksawangpol, and to simply evaluate the farmer's self-reliance by comparing 2 aspects; 1) the farmer's income and 2) list of expenditures of the sample area of rubber-based intercropping plantation with a monoculture plantation owned by Ms. Pranee Kaewchana, and using secondary data provided by concerned government agencies. The study investigated plant diversity and uses found in the rubber-based plantation from 2 sample areas during November 2017 to January 2018. The result indicated that 47 species in 46 genera, 32 families of Magnoliophytes and 1 Gnetophytes are used in the community. There are 18 species grown by human-grown and the 30 species naturally grown. Plants in Aracaceae was the family with the highest number of species used (4 species). The usage of plants were categorized into 3 categories, food (24 species), medicinal plants (11 species), and construction (26 species). Many plants could be used for more than one categories and there were 4 species being used for every category. The result also found that the farmer's self-reliance of the intercropping plantation was more self-reliant than rubber monoculture plantation, according to the rubber-based intercropping farmer's income that was 52,000 baht per year per rai being greater than the income from the monoculture plantation that was 12,500 baht. Also, lists of expenditures, which was found that the monoculture plantation had more costs in the attendance such as weeding and using chemical fertilizers. On the other hand, the sample area did not have to pay for it.

Keywords: Plant Diversity, Small Plantation, Rubber-Based Intercropping System, Farmer Self-Reliance

Introduction

Hevea Braciliensis is an economic crop playing the important role in Thai agricultural economy. In 1960 the cultivated area counted for 0.48 million hectare in 1987. During 1999-2011 rubber price extraordinarily increased from 19.89 to 127.26 Baht/Kg. Resulting that the cultivated area increased continuously to 3.55 million hectare in 2013.

According to the regulation of ORRAF (Office of rubber Replanting Aid Fund), the farmer who asks for replanting air fund must clear every kind of plants (native variety of fruit, vegetables, medical plants, etc.) out of the plantation. The farmer will be risky to have insufficient household income.

Rubber-based intercropping is a proposition to make farmer more self-reliance because farmer household income will be depended upon many resources apart from rubber. However, up to now, the study of plant diversity in rubber-based intercropping plantation is still unclear enough. So the farmer still see no advantage and the distrust to this proportion.

Methodology

The sample area

Purposive and conventional methods were used in this study. The sample area of this project was conducted in a rubber-based intercropping system plantation of Mr.Arthorn Suksawangpol, Baan Tung-Ngai, Kohong sub district, Hat-Yai district, Songkla province, focusing in a block of one rai (1,600 m²). For the study of a sample of monoculture, we investigated a plantation that owned by Ms.Pranee Kaewchana along with using secondary data provided by concerned government agencies.

Study of plant diversities and utility in the area

The study was investigated by using field survey to collect samples of plants (leaves, flowers, fruits etc.) that were used in the community, and interviewing the farmers about plant's utility. All the collected sampled would be made into dry plant specimens for further identifying for plant species, which used the books *Floral of Thailand, Malayan Seed Plants* (Hsuan Keng and Ro-Sui Keng, 1969) and other online resources as keys. After that, the plant specimens were examined again by a specialist to correct their genera and species. Then, the plants would be categorized by three criterions; utilization (medicinal plant, food, construction), plant distribution (human-grown, naturally grown), and plant characteristics (herb, shrub, tree etc.).

Study of the farmer self-reliance

Selected economic primary data was collected by interviewing Mr. Arthorn Suksawangpol, who practicing rubber-based intercropping system and Ms.Pranee Kaewchana, who practicing rubber monoculture; and using the secondary data from the government agencies. Then, simply compared farmer's income and lists of expenditures of rubber base intercropping plantation with the monoculture plantation.

Result and Discussion and Conclusion

Plants diversity and utility

A total of 47 plant species in 46 genera, 32 families of Magnoliophytes and 1 Gnetophytes are used in the community. Of these species, there were 29 trees, 7 shrubs, 8 herbs, 3 secants, and 1 climbers. Plants in Aracaceae was the family with the highest number of species used (4 species), accounting for 8.5% of the total species. The family of Dipterocarpaceae, Phyllanthaceae, and Rubiaceae were all found in 3 species. It can be seen that most of the plants in the sample area are trees which give the shade to the area. It results in preventing the growth of weeds in the sample area and also maintaining the nutrients in soil. (Waiyarat R., 2016)

According to the survey and the interview of Mr. Arthorn, it indicated that there were 18 species human-grown and 30 species naturally grown in the sample area which were locally found in Ko-Hong hill. (Sara Bumrungsri, 2017) It may be discussed that the sample area locates at the foot of Ko Hong hill (as shown in Fig 2). As a result, the seeds might be carried out of the forest area into the agriculture area by carriers such as animals. Fig 3 indicates a trace of a bat living in *Livistona speciosa* Kurz, or Ko, by using the fan-like leaves to hide while it was eating fruit and dropped a seed that grew around the tree as seen in Fig 4.



Fig. 2. The distance between the sample area and Ko Hong hill
Source: www.google.com/map/place



Fig. 3. *Livistona speciosa* Kurz, or Ko, with the trace of a bat living in its leaves, noticed by the folding down of that



Fig. 4. The plants growing around *Livistona speciosa* Kurz is an evidence that the plant seeds might be carried by animals to the sample area.

The utility of plants was separated into three purposes including herbal medicine, food, and construction. The result indicated that there were 26 species used for construction, 24 species used for food, and 11 species for herbal medicine in the sample area (Table 1). Most of the plants could be used more than 1 purpose, for example *Clausena excavate* Burm.f., or Samui, is a plant that its leave are edible and have the medical effect on minimizing the abdominal pain. Also its stem could be used as supporting levers in the construction.

Table 1 plant species in the sample area separated by purpose

Purpose	Species
Food	<i>Gnetum gnemon</i> (Melinjo), <i>Archidendron jiringa</i> (Jengkol), <i>Ananas comosus</i> (pineapple), <i>Clausena excavate</i> (Samui), <i>Azadirachta</i> sp. (Siamese neem tree). <i>Alpinia</i> sp.(Earth ginger), <i>Salacca magnifica</i> (Salak), <i>Antidesma ghaesembilla</i> (wild black berry; mao kai pla) , <i>Garcinia merguensis</i> (naoun), <i>Carallia brachiata</i> (Sheing pra nang-air), etc.
Herbal Medicine	<i>Kaempferia pulchra</i> (peacock ginger), <i>Chromolaena odoratum</i> (siam weed), <i>Molineria letifolia</i> (prow nok kum), <i>Carallia brachiata</i> (sheing pra nangair), <i>Clausena excavate</i> (Samui) , <i>Azadirachta</i> sp.(Siamese neem tree) , <i>Garcinia merguensis</i> (naun), etc.
Construction	<i>Clausena excavate</i> (Samui) , <i>Azadirachta</i> sp. (Siamese neem tree) , <i>Aquilaria</i> sp.(eagle wood), <i>Hopea odorata</i> (iron wood), <i>Garcinia merguensis</i> (naun), <i>Carallia brachiata</i> (sheing pra nangair),etc.

Farmer self-reliance

According to the interviewing and the studying of economic information, the result was that the farmer practicing rubber-based intercropping system is more self-reliant than the one with the rubber monoculture plantation. Overall income from rubber-based intercropping plantation attained 65,155 baht/rai/year(13,155 baht from field latex and 52,000 baht from rubber intercrops such as *Gnetum gnemon* (Melinjo), *Archidendron jiringa*

(Jengkol), *Ananas comosus* (pineapple) and *Clausena excavate* (Samui) while income from rubber monoculture plantation counted only 12,500 baht/rai/year (table 1).

Table 1. The comparison table of lists of expenditures between the monoculture and the sample area

Lists	<i>Rubber-base intercropping plantation owned by Mr.Athorn Suksawangpol</i>	Rubber Monoculture (the planation owned by Ms.Pranee Kaewchana)
Overall income	65,155 baht/rai/year	12,500 baht/rai/year
Plant seedlings	Paying for rubber seedling while almost of intercrops were freely received from or exchanged with neighbor in the area farmer network and some were freely supported by government agencies	Paying for rubber seedlings
Attendance	No weeding(weeds are not growing well in shade) and using bio-fertilizers	Weeding and using chemical fertilizers
Wages	Tapping the field latex and maintaining plantation by family labor.	Tapping the field latex and maintaining plantation by family labor

Apart from overall income showing above, farmer practicing rubber-based intercropping system also could reducing household expenditures by using some rubber intercrops from plantation for food, medicine, and construction. Moreover, the plantation also has some kind of young trees such as *Aquilaria* sp. (eagle wood), *Hopea odorata* (iron wood), etc. that could bring more income to the farmer in the future.

Conclusion

It was clearly that rubber-based intercropping plantation compose of various kind of plants that some were human-grown and some were naturally-grown. Some rubber intercrops provided cash income for farmer while some provide for household uses. Concerned government agencies should concretely promote by encouraging rubber monoculture farmers to practice rubber-based intercropping system because rubber-based intercropping plantation could not only conserve bio-diversity but also make farmer more self-reliant.

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