# INTEGRATING RUBBER WITH SENTANG - CURRENT AGROFORESTRY PRACTICE

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*Abstract*: In a research conducted to gather information about the agroforestry practices in Peninsular Malaysia, integration of plantation crop (rubber) and timber tree (sentang) was found to be the most common type (27.3%). Smallholder farmers preferred sentang, a fast growing timber species to supplement the low income generated by rubber especially during the low productive periods and during replanting. Most farmers employed hedge planting system (70%) which can be either alternate rows or alternate strips. Sentang tends to grow faster in rubber plantations but has smaller trunk diameter than in oil palm plantations. Normal agricultural management practices were implemented as in monocropping but no adverse effects in relation to plant growth and yield to the plantation crop (rubber) was observed. This indicates that integration of rubber and sentang is a viable approach to improve farm income.

Keywords: Agroforestry, Integration, Rubber, Sentang

## INTRODUCTION

Integration programs have gained recognition by growers in the country to enhance their agricultural production and farm income especially in the smallholders sector. Through integration, the cost of oil palm replanting can probably be covered by the income generated from the harvest and sale of the timber species[2].

Integrated farming was viewed to have promising future in the country's agricultural sector since a couple of decades ago. However, integrated farming including agroforestry has not developed to become a major undertaking in the Malaysian agriculture. Lack of knowledge, budget constraints and long-term returns are a few of the many problems identified in factors that influence agroforestry implementation [3]. Only recently, despite these problems, farm operators especially the smallholders are beginning to practice agroforestry programs due to the low prices of the country's major farm commodities. Additional information is required to establish sound management systems which will increase program viability and additional revenue to farm operators. This will also provide proof for the private sectors and corporate agricultural organizations to be more involved in agroforestry programs.

Specifically, the objective of this project is to study the technical aspects of integration of plantation crops with timber species that constitute the basic management and implementation works on the field.

## MATERIALS AND METHODS

The study was carried out through survey questionnaires and field observations. The survey was conducted by interviewing the respondents and field observations involved the measurement of plant height and diameter (DBH). A total of 50 farmers throughout Peninsula Malaysia were identified (based on information given by Department of Forestry) to operate agrosilviculture, i.e. integration of agricultural and forestry crops, during the survey. However, only 38 farmers could be interviewed and 33 questionnaires were considered complete and fit to be analyzed.

*Survey Questionnaires*

The survey questionnaires, designed to elicit information from respondents, consist of 38 variables in five main sections, i.e. Sections A, B, C, D, E and F. Information for Sections A through E are obtained by interview while Section F by field observation.Section A is the background information of respondents. Section B is aimed to collect information on the system of integration practiced by the respondents. Section C related to the agronomic practices carried out by respondents. Section D deals with the effects of integration on yield of agronomic crops. Section E refers to the problems faced by the farmers during implementation of integration.

*Field Observation*

This section (Section F) involves the measurement of plant height and diameter of both agricultural and forest crops by using clinometers and diameter tape. The data obtained were analyzed by using the Statistical Package for the Social Science (SPSS) available at the UiTM Jengka campus.

## RESULTS AND DISCUSSION

*Type of Integrations System*

The main type of integration being practiced is rubber + sentang (27.3 %) followed by oil palm+sentang (21.2 %) as shown in Figure 1. Some of the smallholders operate their farms under direct supervision of government agencies such as Smallholders Development Authority (RISDA) and Forest Research Institute of Malaysia (FRIM) and Department of Forestry. From interviews with the farmers, the rubber planters tend to be more interested to carry out integration programs as compared to the oil palm planters. This is due to the lower prices of rubber. The other reason is that the rubber planters are more frequently visited by officers from the government agencies especially RISDA, where they received the appropriate information and advice.

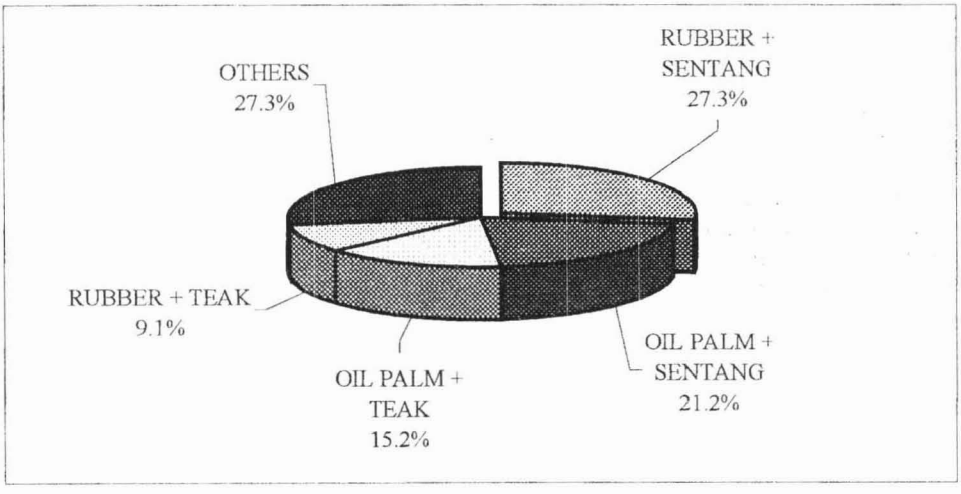


Figure 1: Major type of integration practiced in Malaysia

The survey also found out that sentang is the most frequent timber species planted by farmers (46.5%). According to sources from farmers and staff of the government agencies, sentang seedlings are more easily available in the market or from the Department of Forestry. Other types of integration consist of combinations of fruits, herbs and field crops (less than 5%) with any of the timber species. The type of agricultural crop most frequently integrated with timber is perennial crops mainly fruit trees. This is consistent to the report by Mohd. Tayeb (1996) that food crops have been identified to be suitable as intercrops with oil palm.[4].

*Nature of Integrated Farms*

Only five out of the total farms visited are estates, i.e., farm size or hectarage of more than 50 hectares. The rest of the farms are smallholders (hectarage of less than 50 ha). The largest farm practicing integrated farming is located in Segamat, Johor, which belongs to a private corporate company. Out of the total 2,000 ha of the oil palm estate, only 60 ha were integrated with sentang. The largest integrated farm is 73 ha while the smallest is 0.40 ha. The average hectarage of farm in the survey is 158.3 ha and average integrated farm is 8.63 ha. These figures differ from the average hectarage of estates of 1,010.80 ha and smallholders of 5.98 ha. The average hectarage of integrated estate and smallholders is 39.20 ha and 3.17 ha respectively. The study also reveals that 42.4 % of the farmers visited have the whole of their farms integrated.

*Age of Crops*

The average age of the agricultural crop (oil palm and rubber) at the time of the study is 6.82 years old while the average age of timber trees (sentang and teak) is 4.79 years old. This shows that the timber trees were normally planted after the plantations have been established with the main crops. However, the survey found out that many farmers practiced careful planning of their integration programs or processes whereby about 67 % of them, i.e. 22 farmers planted their integrated crops and trees at the same time.

*Planting Distance and Planting System*

The planting distance and planting system of agricultural crops are similar to the standard practice of single cropping farms. In this study, the planting system of the integrated farms is categorized into 3 types, i.e. parameter (timber trees are planted as farm borders or boundaries), hedge (alternate rows or strips of agricultural crops and timber trees) and mixed or others (random mixtures of agricultural crop and timber trees).

Hedge planting is the most frequent practice system, almost 70 %, in Malaysia (Figure 2). This corresponds to the time of planting discussed earlier whereby careful planning by the farmers during the process of integration such as at lining and planting is required to obtain hedge planting system. Lee and Hanafi (1978)[1] and Nawi and others [5] reported that hedge planting systems have shown very promising results in generating the income of oil palm plantations.

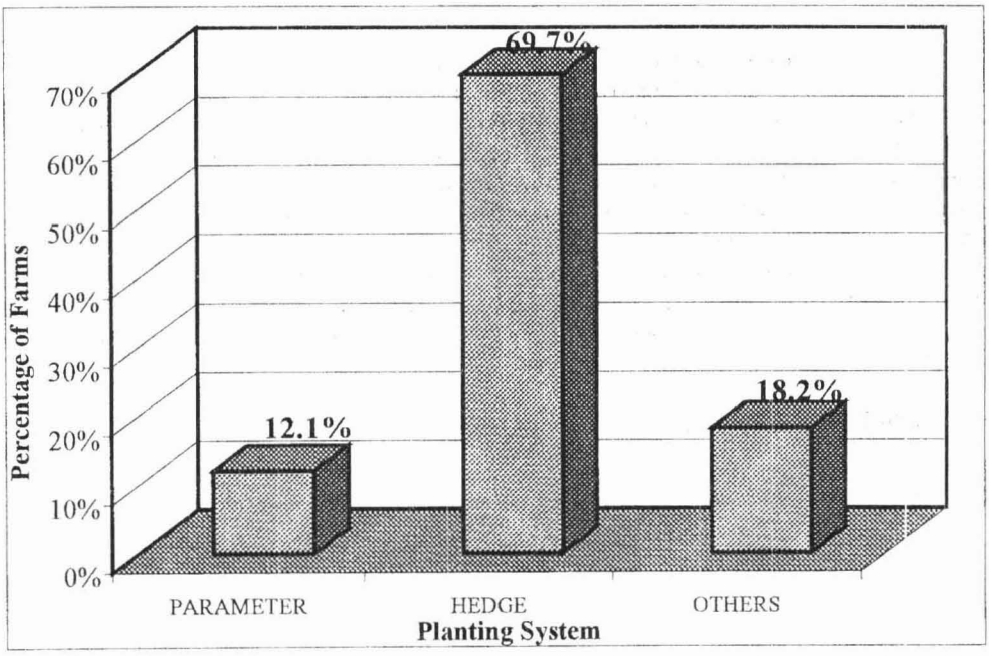


Figure 2 : Planting system of integrated farms

*Agronomic Practices*

Most farmers carried out normal agronomic practices. These practices include planting systems of agronomic crops, types of fertilizers and rates of fertilizer used. Most farmers used extra dosage or additional fertilizers to fertilize their timber trees.
The frequencies of other agronomic activities carried out by farmers are also considered as normal. Frequency of fertilizer application of agricultural crops and timber trees is 3 to 4 times per year. Frequency of weeding is 2 to 3 times while frequency of pruning is once to twice yearly.

*Effects of Integration on Growth of Timber Trees and Agricultural Crops*

Data from field observations show that the effects of integration on growth of agricultural crops and timber trees greatly vary. These were mainly due to the different types of integration and agronomic practices carried out by the farm owners. Estate operators manage their farms considerably better than most smallholders do. Some smallholders could only carry out most of their agronomic practices with the aid of government agencies.

Measurements of plant height, i.e. bole height, of agricultural crops and trunk diameter, i.e. diameter at breast height (DBH), of timber trees are the only parameters taken. Data were taken from ten (10) random plants or samples of every plantation visited. The average values of these samples were then analyzed.

The average age of sentang in the oil palm+sentang integration is 9.36 years, while the average height is 7.09 m and DBH is 13.27 cm. In the rubber+sentang integration, the average age of sentang is 3.83 years, and the average height is 9.51 m and DBH is 10.64 cm. These results show that sentang tends to grow faster or taller in between rubber trees but the DBH is smaller compared to those between oil palm trees. Smaller DBH of sentang in the rubber integration is compensated by the vertical growth (height). Fierce competition for sunlight between sentang and rubber trees as compared to sentang and oil palm is the main reason for these results.

In the oil palm+teak integration, the average age of teak is 5.30 years, and the average height is 9.64 m and DBH is 16.32 cm. Meanwhile, in the rubber+teak integration, the average age of teak is 4.33 years, and the average height is 7.22 m and DBH is 9.47 cm. These data show normal growth of the teak trees in both types of integration. Thus, the integration process does not affect growth of teak trees.

*Effects of Integration onYield of Agronomic Crops*

The age of agricultural crops at first yield ranges from 1 to 7 years (Table 1). Some annual or short-term crops can be harvested in less than one year while perennial crops usually take 3 to 7 years to produce yield. These are considered normal maturation periods for crops such as oil palm which matures in 3 to 4 years and durian in 5 to 7 years. Thus, the integration process does not affect the time of crop production in all the farms surveyed. The average fresh fruit bunch (FFB) yield of oil palm is 7.32 tones per hectare per year (t/ha/yr) with maximum of 20.00 t/ha/yr and minimum of 0.80 t/ha/yr. The average yield of rubber is 475.00 kilograms per hectare per year (kg/ha/yr) with maximum of 500.00 kg/ha/yr and minimum of 450.00 kg/ha/yr. These yields are quite low because the average age of agricultural crops of the farms visited is only 6.82 years. Thus, the process of integration does not affect crop yields and farmers can still obtain normal yield of agricultural crops while waiting for the timber trees to mature (15 to 25 years).

Table 1: Age at first harvest and yield per hectare of agricultural crops

| Age and Yield | Minimum | Maximum | Average |
|---|---|---|---|
| Age of Agricultural Crops at First Harvest | 1.0 | 7.0 | 3.72 |
| Yield Per Hectare of Agricultural Crops - Oil Palm (t/ha/yr) | 0.80 | 20.00 | 7.32 |
| Yield Per Hectare of Agricultural Crops - Rubber (kg/ha/yr) | 450.00 | 500.00 | 475.00 |

Both visual observation and data collected show that the growth and yield of oil palm and rubber in the integration areas are normal compared to single-cropped areas. Thus, there are no adverse effects of the timber trees on plantation crops and vise versa.

## CONCLUSIONS AND RECOMMENDATIONS

This study revealed that the most common type of integration being practiced is rubber+sentang and hedge planting is the most frequent system practiced. Since the integration process does not affect the growth and yield of the agricultural crops adversely, farm owners especially smallholders should be encouraged to integrate their farms in order to get additional revenue.

Farmers should plan the time of planting of their integrated farms so that the time of replanting of agricultural crops coincides with the harvesting of the timber trees whereby the farmers will get adequate and sustainable income to replant the agricultural crops and waiting for the crops to produce yield. Related agencies (government or private) should conduct more programs and research in the implementation processes of integration and advice farmers on items such as types, systems, crops and trees, technical support and agronomic practices involved.

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