

AGROFORESTRY PRACTICES IN MALAYSIA - INTEGRATING PLANTATION CROPS WITH TIMBER SPECIES

Ahmed Azhar Jaafar, Norman Kasiran,
Suhaimi Muhammed and Wan Hanisah Wan Ismail
Faculty of Applied Science, Universiti Teknologi MARA (Pahang)
Malaysia
Email: ahmed_azhar@pahang.uitm.edu.my

ABSTRACT

*This research has been conducted to gather information about the integration of plantation crops such as oil palm (*Elaeis guineensis*) and rubber (*Hevea brasiliensis*) with several timber species such as sentang (*Azadirachta excelsa*) and teak (*Tectona grandis*). The study involves government and private agencies and farmers practicing this type of agroforestry activities. It has been found that the most common type of integration involves rubber and sentang implemented by smallholder farmers to supplement the low income generated by rubber especially during the low productive periods and during replanting of rubber. The research has shown that most respondents applied the normal agricultural management practices as in monocrops but has not experienced any adverse effects in relation to plant growth and yield (both the crop and the timber trees). This indicates that integration of crop plants and timber species is a viable approach to improve farm income. However the respondents do indicate the need for more technical advice from related agencies to improve the implementation of their integration programs and acquire better outcomes in terms of yield and income.*

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 (Mahmud *et al.*, 1998).

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 as factors that influence agroforestry implementation (Mohd. Nazip and Suhaimi, 1998). 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 plant diameter. 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 (Plate 1 and Plate 2). Data were taken from ten (10) random plants or samples of every plantation visited. The average values of these samples were then analyzed.

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.



Plate 1: Measuring the height of a tree using clinometer.



Plate 2: Measuring the diameter at breast height using diameter tape.

RESULTS AND DISCUSSIONS

Type of Integration System

The main type of integration being practiced is rubber+sentang (27.3 %) followed by oil palm+sentang (21.2 %) and oil palm+teak (*Tectona grandis*) as shown in Figure 1. Some of the smallholders operate their farms under direct supervision of government agencies such as Rubber Industry Smallholders Development Authority (RISDA), Forest Research Institute of Malaysia (FRIM) and Department of Forestry (DOF). 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.

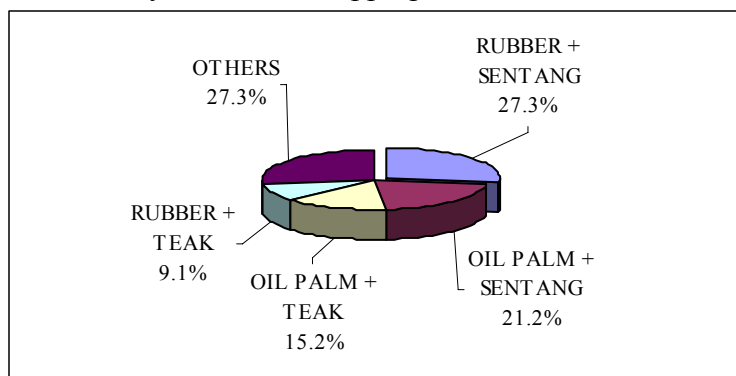


Figure 1: Major type of integration practiced in Malaysia

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 DOF. 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.

Size of Integrated Farms

Only five out of the total farms visited are estates, i.e., farm size or hectareage of more than 50 hectares. The rest of the farms are smallholders (hectareage 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 hectareage of integrated farm in the survey is 8.63 ha. while the average hectareage 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.

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) and Nawi and others (1986) reported that hedge planting systems have shown very promising results in generating the income of oil palm plantations.

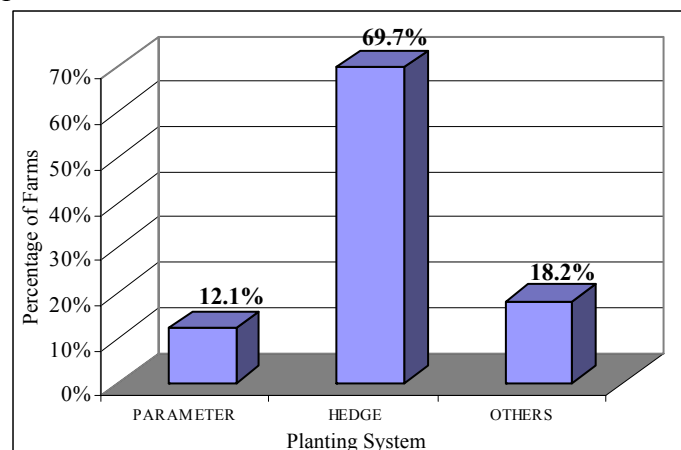


Figure 2: Planting system of integrated farms.

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.

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 competition between 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 on Yield of Agronomic Crops

The age of agricultural crops at first yield ranges from 1 to 7 years. 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).

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 vice 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 and systems of integration, crops and trees, technical support and agronomic practices involved.

REFERENCES

- Lee, A. K. and Hanafi Kasbi. 1978. Intercropping Cocoa and Oil Palm. Proceedings of the International Conference on Cocoa and Coconuts. The Incorporated Society of Planters, Kuala Lumpur. pp 158 - 171.
- Mahmud, A.W., Najib Lotfy Arshad and Abd Ghani Ibrahim. 1998. Integration of Rubber with Forest Species through Agroforestry. Paper Presented at the Seminar on Rubberwood Supply. Sungai Buloh, Selangor, Malaysia.
- Mohd Nazip Suratman and Suhaimi Muhammed. 1998. Agroforestry Practices in Malaysia: Factors that Influence its Implementation. Bureau of Research And Consultancy, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia.
- Mohd Tayeb Dolmat. 1996. Prospect for Crop and Animal Integration in Oil Palm. Oil Palm Management Course – Selected Readings, Kuala Lumpur. pp 202 - 216.
- Nawi Che Yusoff, Leong, C. W. and Jamaludin Lamin. 1986. Intercropping Cocoa and Oil Palm – Eleven Years of Trail Results. In Cocoa and Coconuts: Progress and Outlook (Pushparajah, E. and Chew Poh Soon, eds) Incorporated Society of Planters, Kuala Lumpur. pp 489 - 497.