

PJ-ABK-966

ISIV 76624

**USE OF MULTIPURPOSE TREE SPECIES  
BY MALAYSIAN FARMERS**

**REPORT NUMBER 8**

by

**Bahari Bin Yatim  
Lecturer  
Centre for Extension and Continuing Education  
Universiti Pertanian Malaysia**

**Sponsored**

by

**Forestry/Fuelwood Research and Development Project**

**Implemented by  
Winrock International, Bangkok, Thailand**

**Financed by  
U.S. Agency for International Development**

## TABLE OF CONTENTS

	Page
<b>ACKNOWLEDGEMENTS</b>	iii
<b>LIST OF TABLES</b>	iv
<b>ABSTRACT</b>	v
<b>Section 1 INTRODUCTION</b>	1
Background	1
Statement of the Problem	1
Objectives	2
Significance of the Study	2
Review of Related Literature	2
<b>Section 2 METHODOLOGY</b>	3
Selecting the Study Site	3
The Sample	3
The Instrument	3
Collection and Analysis of Data	3
<b>Section 3 FINDINGS</b>	4
Background of the Respondents	4
Cultivation of MPTS	9
Factors Affecting the Use of Trees and Tree-Products	15
<b>Section 4 CONCLUSION AND RECOMMENDATIONS</b>	27
Summary	27
Cultivation of MPTS	27
Use of Trees and Tree Products	28
Factors Influencing the Use of Trees and Tree-Products	28
Conclusion and Recommendations	30
<b>REFERENCES</b>	31
<b>APPENDIX</b>	32

## **ACKNOWLEDGEMENTS**

The writer would like to express his appreciation to the Winrock International F/FRED Project for financial assistance. The writer is grateful to UPM, local leaders, Seremban ADO Community Development, typist, enumerators and computer programmer for their valuable assistance.

## LIST OF TABLES

	<b>Page</b>	
1	Distribution of the Respondents by village	5
2	Occupational Status of the Respondents	5
3	Years of Formal Schooling	6
4	Ownership of Motor Vehicles	6
5	Monthly Income of Respondents	7
6	Total Farm Size	8
7	Size of Rice Fields	8
8	Farm Area Cultivated With Short Term Crops	9
9	Farm Area Cultivated With Fruit Trees	9
10	Trees Grown by the Respondents	10
11	Farm Size Cultivated With Rubber Trees	11
12	Tree-Crop Management Practices Adopted by the Respondents	12
13	Amount of Fertilizer Used Per Annum	13
14	Perception on Skill in Tree-Crop Management	13
15	Use of Trees and Tree-Products	14
16	Type of Fuel Used by Respondents	15
17	Source of Fuelwood	15
18	Use of Fuelwood by Occupational Status	16
19	Monthly Farm Income by Source of Fuel Used	17
20	Monthly Family Income by Type of Fuel Used	18
21	Frequency of Respondents Engaged in Livestock Farming	18
22	Type of Fodder Used as Animal Feed	19
23	Perception on Skill in Livestock Farming	20
24	Category of Livestock Farmers by Source of Fodder	20
25	Preferred Tree Characteristics	21
26	Crop Management Practices Adopted by Livestock Farmers	22
27	Category of Livestock Farmers by Type of Fodder Used	24
28	Preferred Fodder Characteristics by Category of Livestock Farmers	25
29	Category of Livestock Farmers by Monthly Income	26

## ABSTRACT

The main research objective was to determine the use of trees and tree products by Malaysian farmers. Labu Sub-district, Seremban, Negari Sembilan was chosen for this case study. Approximately one-third of the households were selected using a stratified random sampling technique. Interviews were conducted individually with the head of the household using a semi-structured interview schedule.

The data indicated that rubber was a common tree cultivated by the respondents. Thirty-nine percent of the respondents depended on rubber for their livelihood and 65 percent of the respondents used rubber tree and branches for fuelwood.

Other common trees grown by the respondents were fruit trees. The most popular trees found in the area were coconut, durian, guava, langsung, citrus species, rambutan, mangosteen, mango, cempedak, ciku, jack fruit and patai. Fruit trees provided food (71%), seasonal income (25%), fodder (10%) and poles (2%).

Use of trees and tree products were affected by its commercial value, abundant supply of fuelwood, availability of alternatives, availability of occupation, off-farm employment, income derived from farming activities, total family income and farm management skill. Very few respondents adopted the recommended crop and livestock management practices.

## **Section 1 INTRODUCTION**

### **Background**

Rubber, oil palm, cocoa and coconut are the major trees or tree-crops cultivated in Malaysia. They are grown by smallholders, groups of farmers and in organized plantations. Besides these commodity crop trees, fruit trees are normally cultivated for economic purposes, home consumption and shade. Trees provide household needs for animal feed, fuel, poles, farm equipment and furniture.

In order to maximise the benefit from a farming system, livestock production is usually incorporated with planting of trees and shrubs. Soil fertility can be improved with proper crop and livestock management. At the farm level, however, different management practices are adopted by the farmers. Some trees are grown for a specific purpose. Other trees were planted for multiple purposes. There are instances where livestock have been kept without an adequate supply of feed inspite of available land as a resource.

Agroforestry, or community forestry has been practiced for a long time by farmers. However, it has not been given much emphasis by planners and development workers. With the introduction of research on multipurpose tree species at the University of Agriculture and the Forest Research Institute, Malaysia, new ideas or management practices will be developed for promoting the development of multipurpose tree species at the farm level.

Presently, development agencies are more concerned with cultivation of fruit crops. Very little effort is being placed on understanding: (a) the problems, needs and constraints of the farmers; (b) strengths and weaknesses of development activities; and (c) developing effective delivery services that benefit the clients at minimal cost.

Agroforestry or community forestry is a potential area that could be developed to improve the well-being of farm families. It is multidisciplinary in nature, which in turn requires integration of services by development agencies. Each piece of land should have a combination of cash crop, livestock and tree crops which would demand the services of several agencies. Therefore, there is a need to have an effective delivery system that could organize the clientele into efficient and productive farmers.

### **Statement of the Problem**

Planting of trees are carried out for a variety of purposes. Some trees are used as shade and wind breaks. Certain trees are selected for landscaping due to their shape, colour, size and growth habit. Other trees are used for economic reasons such as the use of wood for fuel, timber for construction of structures, timber for commercial purposes, tree products for sale and as a source of animal feed. At the

same time, some trees are over-utilized or under-utilized. Similarly, some farms are not planted with trees, while others are overcrowded with trees.

Information on the use of trees is needed for planning future development programmes. What trees are used for what purposes? What are preferred characteristics of trees for these purposes? Where do farmers get their supply of tree or tree products?

### **Objectives**

The main objectives of the study are:

1. To determine the use of trees and tree-products by small farmers; and
2. To identify factors associated with the use of trees and tree-products.

### **Significance of the Study**

Findings of this study should be beneficial to planners and implementors of agro-forestry and agricultural-related development agencies. Existing activities could be modified for improving the supply of trees and tree products to farmers while at the same time maintaining soil fertility. Findings of this research are limited by: (a) scope of the study; (b) statistical methods used in selecting the study site, selecting the respondents and processing the data; (c) methods used in developing the research instrument, which include collecting the information and analyzing the data collected.

### **Review of Related Literature**

MPTS have economic as well as ecological advantages (Awang, 1987). They provide food, fodder, fibre, firewood, timber, building poles, material for fencing and furniture. However, studies on use of MPTS by Malaysian farmers are not available. In his paper on "Trees for Vegetables," Ng (1987), indications were that few trees were cultivated specially for vegetable production. Some MPTS were cultivated for fruit production with vegetable as a by-product. The majority of them were wild and semi-wild species.

## **Section 2 METHODOLOGY**

This chapter describes the methodology used in selecting the sample, developing the instrument, and the collection and analysis of data.

## **Selecting the Study Site**

Labu Sub-district was purposely selected as the study area after visiting three other sub-districts. It is about 40 kilometers South of Universiti Pertanian Malaysia. Labu is divided into seven administrative villages with about 700 families residing in the area. More than one-half of the households are engaged in farming activities. The nearest city is Seremban, the state capital of Negeri Sembilan.

## **The Sample**

Chinese and Indian ethnic groups were excluded from this study. Those from the Malay ethnic group who were not engaged in farming activities were also excluded. On the whole, about one-third of the total households were not included as respondents.

The purpose of the study was explained to the District Officer. After obtaining approval, village heads were asked to inform all households and to provide their assistance. All households were visited, but one out of two potential respondents was interviewed by trained enumerators. The respondents were either full-time farmers, part-time farmers, or those who were involved in farming activities. Two hundred and thirty-one families were selected as respondents from the seven villages in Labu Sub-district.

## **The Instrument**

Questions were developed using research objectives as a guide. Dichotomous, multiple-choice and open-ended questions were used in developing the interview schedule. Pre-testing was conducted with the households who were excluded as respondents. Suggestions given by them were used to improve the language, structure and organization of questions in the interview schedule.

## **Collection and Analysis of Data**

Interviews were conducted individually with the head of each household in April, May and June 1988. Responses given by the respondents were coded directly in the interview schedule. Responses to open-ended questions were clustered and coded. The data were transferred to coding sheets. The data were then computerized, analyzed and cross-tabulated using SPSS, to determine the frequency distribution. Tables were constructed and organized in order to generate information related to objectives of the study.

### **Section 3 FINDINGS**

This chapter presents the background of the respondents, cultivation of multipurpose tree species and factors affecting the use of trees and tree products. The data are presented according to the objectives of the study.

#### **Background of the Respondents**

Two hundred and thirty-one respondents were interviewed. They were residents of Batu 8, Pelegong, Kering, Jawa, Batu 9, Pulau and Lambar Villages, Labu Sub-district, Seremban, Negeri Sembilan (Table 1). Twenty-three percent of those interviewed were full-time farmers and 45 percent were part-time farmers. Part-time farmers had other means of earning their living. They were either wage-earners, pensioners, having family businesses, or labourers. Thirty-two percent of the respondents did not earn their living through farming activities (Table 2).

Most of the respondents were above 55 years and about one-third were between 40 to 55 years old. About one-fifth of them were below 40 years. The average family size was five. Thirteen percent of the respondents were living alone or with their spouse. About one-half had between 3 to 5 persons and more than a quarter had between 6 to 9 persons per household.

The respondents had an average of 5 years of formal schooling. The majority of them (61 percent) had primary education, while quite a significant number (20 percent) did not have any formal education (Table 3).

Most of the respondents (76 percent) had their own houses. Eighteen percent of the respondents were staying in houses built by their ancestors, while some (5 percent) were living in rented houses. The houses were mostly built by contractors (97 percent). They were either concrete (7 percent), wooden (29 percent) or semi-concrete (64 percent).

Eleven percent of the respondents owned cars, while the majority (50 percent) had motorcycles. About two-fifths of the respondents did not own motorized vehicles (Table 4).

Monthly income of the respondents is presented in Table 5. Fifty-eight percent of those interviewed had income from farming activities. These farmers earned an average of M\$132.00 per month<sup>1/</sup> from their farms. The majority of them (50 percent) were earning M\$300.00 or less for each month. Only eight percent of the farmers managed to earn more than M\$300.00 ringgit per month.

---

<sup>1/</sup> One Malaysian dollar is equal to about US\$2.5

Table 1. Distribution of the Respondents by Village.

Village	Frequency	Percent
Batu 8 and Pelegone	80	35
Lambar	40	17
Pulau	40	17
Kering	33	14
Jawa	20	9
Batu 9	18	8
Total	231	100

Table 2. Occupational Status of the Respondents

Occupation	Frequency	Percent
Full-time farmers	53	23
Part-time farmers	104	45
(Wage-earners)	(42)	(18)
(Pensioners)	(41)	(18)
(Labourers)	(7)	(3)
Wage-earners	33	14
Labourers	14	6
Pensioners	11	5
Businessmen	6	3
Unemployed	10	4
Total	231	100

Table 3. Years of Formal Schooling.

Year	Frequency	Percent
No Schooling	47	20
1-6 years (Primary)	141	61
7-9 years (Lower Secondary)	34	15
10-11 years (Upper Secondary)	9	4
Total	231	100

Table 4. Ownership of Motor Vehicles.

Type of Vehicle	Frequency	Percent
Without any vehicle	57	
Bicycle only	33	14
Motorcycle (with or without bicycle)	116	50
Cars (with or without other vehicle)	25	11
Total	231	100

Table 5. Monthly Income of Respondents.

Income	Percent Respondents by Source of Income.*		
	Farming Activities (n=134)	Off-Farm Employment (n=196)	Total (n=231)
M\$200 and less	40	33	25
M\$201-M\$300	10	24	26
M\$301-M\$400	2	14	17
M\$401-M\$500	3	8	14
More than M\$500	3	7	18
Nil	42	15	0
Total	100	100	100

$\bar{x}$  = M\$132

$\bar{x}$  = M\$266

$\bar{x}$  = M\$361

\* Some respondents have more than one source of family income.

Eighty-five percent of the respondents were involved in off-farm employment with an average off-farm income of M\$266.00 per month. More than one-half (57 percent) earned M\$300.00 or less per month. However, about one-third (29 percent) earned more than M\$300.00 per month.

When farm and off-farm incomes were added, an average family had a mean income of M\$361.00 per month. One-half of them earned M\$300.00 or less, while the other one-half earned more than M\$300.00 per month.

The respondents had an average of 1.35 hectares of land (Table 6). Three-fifths had less than one hectare compared to about one-fifth who had between 1.0 to 1.9 hectares. As indicated, eighteen percent had more than two-hectares of land. Only a few families (three percent) were landless.

Among the 71 respondents who had rice plots, most (89 percent) had one hectare or less of rice farm. All the rice fields in the area had been left idle for more than ten years (Table 7).

Table 6. Total Farm Size.

Size (hectare)	Frequency	Percent
Less than 0.5 ha	89	39
0.5-0.9 ha	49	21
1.0-1.9 ha	44	19
2.0-2.9 ha	21	9
More than 3.0 ha	21	9
Landless	7	3
Total	231	100

$\bar{x}$  = 1.35 hectares

Table 7. Size of Rice Fields.

Size (hectare)	Frequency	Percent
Less than 0.5 ha	36	51
0.6-1.0 ha	27	38
1.1-2.0 ha	6	8
More than 2.0 ha	2	3
Total	71	100

$\bar{x}$  = 0.6 hectare

Table 8 shows land size cultivated with short-term crops. Thirty-four respondents were involved with an average of 0.07 hectare. Seventy-nine percent cultivated less than 0.1 hectare of short-term crops. Some farmers (21 percent) cultivated between 0.1 to 0.2 hectare of their land with crops like banana, papaya and vegetables.

Table 8. Farm Area Cultivated with Short Term Crops.

Size (hectare)	Frequency	Percent
Less than 0.10 ha	27	79
0.10-0.19 ha	5	15
0.2 ha	2	6
<b>Total</b>	<b>34</b>	<b>100</b>

$$\bar{x} = 0.07 \text{ ha}$$

#### Cultivation of MPTS

Farm size cultivated with tree or tree-crops is presented in Table 9. Only 67 respondents (approximately one-third of the total respondents) had trees cultivated on their farms. The majority of them (49 percent) had 0.5 hectare or less, 30 percent had 0.6 to 1.0 hectare and 21 percent had 1.1 to 2.0 hectares. Each respondent had an average of 0.7 hectare of land planted with trees or tree-crops.

Table 9. Farm Area Cultivated with Fruit Trees.

Size (hectare)	Frequency	Percent
Less than 0.5 ha	33	49
0.6-1.0 ha	20	30
1.1-2.0 ha	14	21
<b>Total</b>	<b>67</b>	<b>100</b>

$$\bar{x} = 0.7 \text{ ha}$$

Nineteen tree species were commonly cultivated by the respondents (Table 10). The trees were primarily grown for shade and food. Coconut was the most common tree grown by the respondents (more than 50 percent). Durian, guava, jambu air, langsung, citrus, rambutan, mangosteen and mango were cultivated by 30 to 49 percent of the respondents. Between 10 to 29 percent of the respondents had bacang, cempedak, ciku, limau bali, jack fruit, rambai and jeering grown in their farms. Less commonly planted trees were pulasan and petai.

Table 10. Trees Grown by the Respondents.

Percent of the Respondents Involved	Common Name	Scientific Name
More than 50 percent	Coconut	<i>Cocos nucifera</i>
Between 30 to 49 percent	Durian	<i>Durio zibethinus</i>
	Guava	<i>Psidium guajava</i>
	Jambu air	<i>Eugenia aquea</i>
	Langsat	<i>Lansium domesticum</i>
	Limau kasturi	<i>Citrus microcarpa</i>
	Limau purut	<i>Citrus hystrix</i>
	Limau nipis	<i>Citrus auranthifolia</i>
	Rambutan	<i>Nephelium lappaceum</i>
	Mangosteen	<i>Garcina mangostana</i>
	Mango	<i>Mangifera indica</i>
Between 10 to 29 percent	Bacang	<i>Mangifera foetida</i>
	Cempedak	<i>Artocarpus integrus</i>
	Ciku	<i>Achras zopata</i>
	Limau bali	<i>Citrus grandis</i>
	Jack fruit	<i>Artocarpus heterophyllus</i>
	Rambai	<i>Baccaurea motleyana</i>
Less than 10 percent	Pulasan	<i>Nephelium mutabile</i>
	Petai	<i>Parkia speciosa</i>

Eighty-nine respondents (more than one-third) had rubber smallholdings. The majority of them (51 respondents) had one hectare or less of their land grown with rubber trees. Rubber is the main economic activity for more than one-half of the rural population. Table 11 presents frequency of respondents by farm size cultivated with rubber trees.

Table 11. Farm Size Cultivated with Rubber Trees (*Herea brasiliensis*).

Size (hectare)	Frequency	Percent
One ha and less	51	57
1.1-2.0 ha	27	30
2.1-4.0 ha	11	12
Total	89	100

$$\bar{x} = 1.1 \text{ ha}$$

Tree-crop management practices, as adopted by the respondents, is summarized in Table 12. Weeds were effectively controlled by 17 percent of the respondents. More than one-half applied some control measures, while the rest (25 percent) did not control weeds at all.

Trees were pruned at intervals by a small number of the respondents (8 percent). Other respondents performed some pruning (51 percent) or did not prune at all (41 percent).

Only a few respondents (14 percent) attempted to control insects/pests effectively. One-half of them applied some control measures, while 37 percent did not control pests or insects at all.

There were 143 respondents (62 percent) who applied fertilizers to their crop. Two-thirds of them (41 respondents) applied an adequate quantity and 102 respondents only applied some fertilizer. More than one-third of the respondents had never applied fertilizers to their tree-crops.

The amount of fertilizers used per annum is presented in Table 13. Though the respondents had more than one hectare cultivated with tree crops, only 13 respondents (6 percent) used an adequate amount of fertilizer.

Table 12. Tree-Crop Management Practices Adopted by the Respondents.

Practice	Frequency	Percent
<b>Manuring</b>		
Apply adequate quantity	41	18
Apply some fertilizer	102	44
Do not apply fertilizer	88	38
Total	231	100
<b>Weeding</b>		
Always control weeds	40	17
Sometimes weed	133	58
Do not control weeds at all	58	25
Total	231	100
<b>Pruning</b>		
Always prune tree branches	19	8
Perform some pruning	118	51
Do not prune at all	94	41
Total	231	100
<b>Control of Insects/pests</b>		
Effective control of insects	32	14
Apply some control measures	133	49
Do not control at all	86	37
Total	231	100

**Table 13. Amount of Fertilizer Used per Annum.**

Kilogram	Frequency	Percent
50-150 kg	49	60
200-300 kg	20	24
350-450 kg	4	5
500 kg and more	9	11
<b>Total</b>	<b>82</b>	<b>100</b>

For those who applied fertilizers (143 respondents), they were asked to indicate the amount of fertilizers used per annum. Eighty-two respondents managed to state the amount that they used the previous year. As indicated in Table 13, 60 percent of them applied between 1 to 3 bags of 50 kilogram fertilizers. The amount used was far from adequate to fertilize one hectare or more of trees.

Perception of the respondents on their skill in tree-crop management is shown in Table 14. Most of them (61 percent) perceived that they had some or a little skill in the growing of trees. About one-third said they did not have any skill. Only eight percent perceived themselves as having the necessary skills for effective tree-crop management.

**Table 14. Perception on Skill in Tree-Crop Management.**

Perception	Frequency	Percent
Have the necessary skill	19	8
Have some or a little skill	140	61
Did not have any skill	72	31
<b>Total</b>	<b>231</b>	<b>100</b>

## Factors Affecting the Use of Trees and Tree-Products

Use of tree and tree-products is shown in Table 15. Thirty-eight percent utilized them for food or fuel. Fourteen percent used trees for food only. Similar numbers used trees for food, fuel, and sale. There were thirteen percent who used trees for fuel only. Trees were also used for food and animal feed by ten percent of the respondents. Other respondents utilized trees for food, sale, and poles.

Table 15. Use of Trees and Tree-Products.

Use	Frequency	Percent
Food and fuel	87	38
Food only	33	14
Food, fuel and sale	32	14
Fuel only	29	13
Food and fodder	23	10
Food and sale	22	10
Food and pole	5	2
Total	231	100

Approximately two-thirds of the respondents depended on trees for fuelwood. The data show that 33 percent of those interviewed used fuelwood and gas for fuel and 13 percent used fuelwood only. There were respondents (11 percent) who utilized fuelwood, gas and kerosene as fuel. On the whole, about one-third of the respondents did not depend on trees for fuel (Table 16).

Among those who used fuelwood, 91 percent obtained their supply from rubber trees only. A few respondents utilized rambutan fruit trees (7 percent), or rubber and rambutan trees (2 percent) as their main source of fuelwood (Table 17). About one-fifth of fuelwood users had some difficulty in obtaining their supply.

Among the fuelwood users, one-half of the respondents (51 percent) used fuelwood and gas as fuel (Table 18). Fifty-nine of them were farmers (full-time and part-time farmers) and 17 others were not engaged in farming activities. Of those who depended on fuelwood only as fuel (29 percent), two-thirds were farmers (full-time and part-time farmers), while the rest were non-farmers.

Table 16. Type of Fuel Used by Respondents.

Fuel	Frequency	Percent
Fuelwood and gas	76	33
Fuelwood	29	13
Fuelwood, gas and kerosene	25	11
Fuelwood and kerosene	18	8
Kerosene and/or gas	83	36
Total	231	100

Table 17. Source of Fuelwood.

Source	Frequency	Percent
Rubber trees	135	91
Rambutan trees	10	7
Rubber and rambutan trees	3	2
Total	148	100

Table 18. Use of Fuelwood by Occupational Status.

Source of Fuel	Occupation	Frequency	Percent
Fuelwood and gas	Full-time farmer	18	
	Part-time farmer	41	
	Others	17	
	Total	<u>76</u>	51
Fuelwood only	Full-time farmer	8	
	Part-time farmer	12	
	Others	9	
	Total	<u>29</u>	20
Fuelwood, gas and kerosene	Full-time farmer	6	
	Part-time farmer	10	
	Others	9	
	Total	<u>25</u>	17
Fuelwood and kerosene	Full-time farmer	5	
	Part-time farmer	3	
	Others	10	
	Total	<u>18</u>	12
Total		148	100

Fuelwood in combination with gas and kerosene were used by 25 respondents or 17 percent of the fuelwood users. Sixteen respondents were farmers, while nine other respondents were not involved in farming activities. There were 18 respondents (12 percent of the fuelwood users) who used fuelwood and kerosene as fuel. More than one-half of them (10 respondents) were not engaged in farming.

When the number of full-time farmers were divided with the total number of users in each category (Table 18), the ratio tended to indicate that full-time farmers did not have a specific preference for fuelwood, gas, or kerosene. The ratio ranged

from 23 percent to 28 percent. Very little variation was observed among the four categories of fuelwood users.

There were 134 respondents involved in farming activities. Their average monthly income was cross-tabulated with source of fuel used (Table 19). Among the low monthly income group (less than M\$201.00 a month), 25 percent of the farmers did not use fuelwood. The majority of fuelwood users (29 percent) used fuelwood and gas. Only 12 percent of the farmers depended on fuelwood as their source of fuel.

Table 19. Monthly Farm Income by Source of Fuel Used.

Source of Fuel	Distribution of Respondents (Percent)		
	<M\$201	201-400	400+
Fuelwood and gas	29	10	1
Fuelwood only	12	2	1
Fuelwood, kerosene and gas	4	1	3
Fuelwood and kerosene	2	1	3
Kerosene, gas and electricity	25	5	1
Total	72	19	9

n = 134

Twenty-eight percent of the farmers received more than M\$200.00 a month from farming activities. Twenty-two percent used fuelwood, while six percent did not use fuelwood. About one-half of the higher income farmers preferred to use fuelwood and gas compared to other sources of fuel.

Frequency of total monthly family income by type of fuel used is presented in Table 20. As shown in the table 19, percent of the low income group (less than M\$200.00 income per month) compared to 26 percent of the higher income group (more than M\$200.00 income per month) did not use fuelwood. Among the fuelwood users, seven percent received a monthly family income of less than M\$200.00, 17 percent received between M\$201.00 to M\$300.00, 13 percent had a monthly income of M\$301.00 to M\$400.00, and 19 percent had more than M\$400.00 income per month.

Table 20. Monthly Family Income by Type of Fuel Used.

Type of Fuel	Distribution of Respondents (Percent)			
	<M\$200	201-300	301-400	>400
Fuelwood and gas	3	9	8	10
Fuelwood only	3	3	2	3
Fuelwood, kerosene and gas	0	2	2	5
Fuelwood and kerosene	1	3	1	1
Kerosene, gas and electricity	19	9	5	12
Total	25	26	17	32

n = 231

Poultry and ducks were mainly raised for family consumption. None of the poultry and duck farmers managed to obtain more than M\$50.00 income per month from their livestock. Other livestock kept by the respondents were goats (36 respondents), cattle (44 respondents) and buffaloes (29 respondents). The majority of livestock farmers kept goats, cattle and buffalo for economic reasons (Table 21).

Table 21. Frequency of Respondents Engaged in Livestock Farming.

Livestock	Number of Respondents Involved	Purpose (Percent)	
		Family Consumption	For Sale
Poultry	181	95	5
Duck	61	90	10
Goat	36	42	58
Cattle	44	25	75
Buffalo	29	21	79

n = 231

The respondents were asked to describe the type of fodder used as animal feed (Table 22). Seventy-two percent of those who kept goats, cattle or buffaloes indicated that their animals fed on grass through free-grazing in the village. Other fodder used as animal feed were jackfruit leaves (12 respondents), tapioca leaves (5 respondents), Gliricidia leaves (4 respondents), banana leaves (one respondent) and rubber leaves (one respondent). Among the livestock farmers, only 12 farmers kept livestock in their own farms.

Table 22. Type of Fodder Used as Animal Feed.

Type of fodder	Frequency	Percent
Grass	58	72
Jack fruit leaves	12	15
Tapioca leaves	5	6
Gliricidia	4	5
Rubber and banana leaves	2	2
Total	81	100

When asked to indicate how the respondents perceived themselves, the majority stated that they had no livestock farming skill (55 percent) or had a little skill (44 percent). Only three respondents perceived themselves as having the necessary livestock farming skill, though none of them received more than M\$50.00 per month from selling their produce (Table 23).

Source of fodder by different category of livestock farmers is shown in Table 24. The majority of them (66 out of 81 farmers) left their animal in the village unattended. Small farm size was given as the main reason for adopting the free grazing technique. Only one respondent managed to earn more than M\$100.00 per month compared to 16 respondents who earned less than M\$50.00 a month.

Among those who collected fodder from their own farms (12 respondents) only one farmer earned more than M\$100.00 a month. Three farmers earned less than M\$50.00 a month, while eight farmers kept livestock for family consumption.

Table 23. Perception on Skill in Livestock Farming.

Response	Frequency	Percent
Having the necessary skill	3	2
Have a little skill	85	44
Without any skill	107	55
<b>Total</b>	<b>195</b>	<b>100</b>

Table 24. Category of Livestock Farmers by Source of Fodder.

Source of Fodder	Category of Livestock Farmers (Frequency)			Total
	For Home Consumption Month	For Sale < M\$50 Per Month	For Sale > M\$100 Per Month	
From own farm	8	3	1	12
From neighbours farm	3	0	0	3
Free grazing in the village	49	16	1	66
<b>Total</b>	<b>60</b>	<b>19</b>	<b>2</b>	<b>81</b>

The majority of livestock farmers (60 farmers) kept livestock for family consumption. Four full-time farmers and 56 part-timers were included in this category. Out of 19 respondents who earned less than M\$50.00 per month, five of them were full-time farmers. There were two respondents who earned more than one-hundred dollars a month from the sale of their livestock. Both of these part-time farmers admitted that they did not have adequate livestock management skill.

Preferred tree characteristics for different uses is presented in Table 25. The respondents preferred to have fuelwood which is easily combustible (75 percent), with little ash (12 percent) and with long lasting embers (6 percent). Poles made from trees should be strong and lasting (64 percent), resistant to attack by insects (7 percent), should be straight (4 percent) and resistant to decay (3 percent). Fodder for animal feed should be nutritious (65 percent), palatable (17 percent), medicinal (10 percent) and fast growing (2 percent). Food derived from trees should be delicious (60 percent), nutritious (33 percent) and produce plenty of fruit (4 percent).

Table 25. Preferred Tree Characteristics.

Use	Preferred Characteristics	Frequency	Percent
For Fuelwood	Easily combustible	174	75
	Little ash	27	12
	Long lasting embers	14	6
	No response	16	7
For Pole	Strong and lasting	148	64
	Resistant to attack by insects	15	7
	Straight	10	4
	Resistant to decay	7	3
	No response	51	22
For Fodder	Nutritious	150	22
	Palatable	40	17
	Medicinal	24	10
	Fast growing	4	2
	No response	13	6
For Food	Delicious	138	60
	Nutritious	76	33
	Plenty of fruits	8	4
	No response	9	4

n = 231

Tree-crop management practices adopted by livestock farmers is shown in Table 26. The majority of livestock farmers (55 out of 81 respondents) did not apply fertilizers to their trees or tree-crop. Among them, eight livestock farmers received less than M\$50.00 income per month and one respondent received less than M\$100.00 income per month from the sale of livestock.

Table 26. Tree-Crop Management Practices Adopted by Livestock Farmers.

Tree-Crop Management Practices	Category of Livestock Farmers (Frequency)			Total
	For Home consumption	For Sale <M\$50 per month	For Sale >M\$100 per month	
<b>Manuring (n=81)</b>				
Apply adequate quantity	6	3	0	9
Apply some fertilizer	8	8	1	17
Do not apply fertilizer	46	8	1	55
<b>Weeding (n=81)</b>				
Always control weeds	5	2	0	7
Sometimes	10	14	1	25
Do not control weeds	45	3	1	49
<b>Pruning (n=81)</b>				
Always prune tree branches	2	1	0	3
Perform some pruning	8	11	1	20
Do not prune at all	50	7	1	58
<b>Control of insects and pests (n=81)</b>				
Control insects effectively	2	1	0	4
Apply some control measures	13	13	0	26
Do not control insects at all	45	4	2	51

The majority of livestock farmers (49 out of 81 respondents) did not control weeds at all. Seven respondents controlled weeds effectively and 25 respondents applied some control measures.

Pruning of trees was carried out by three livestock farmers, while twenty other livestock farmers performed some pruning. The majority of them (58 out of 81 respondents) did not prune their trees at all.

Insects and pests were controlled effectively by four out of 81 respondents. Twenty-six respondents applied some control measures. However, the majority of livestock farmers did not control insects and pests at all.

Data in Table 26 also indicated that none of those who received more than M\$100.00 income per month from the sale of their livestock adopted the recommended practices in manuring, weeding, pruning and control of insects and pests. Out of 19 respondents who received less than M\$50.00 income per month from the sale of their livestock, very few of them adopted the recommended practices in manuring (3 respondents), weeding (2 respondents), pruning (1 respondent) and control of insects and pests (2 respondents).

Category of livestock farmers by type of fodder used is presented in Table 27. The finding showed that the high income livestock farmers (more than M\$100.00 income per month) used grass and jack fruit leaves as fodder. Those with a small income (less than M\$50.00 per month) derived from the sale of their livestock used grass, jack fruit leaves, tapioca leaves and *Gliricidia* as fodder. The majority of respondents who kept goats, cattle and buffaloes for home consumption (44 farmers) used grass as fodder in addition to jack fruit leaves (9 respondents), tapioca leaves (3 respondents), *Gliricidia* (2 respondent), rubber leaves (1 respondent) and banana leaves (1 respondent).

Table 27. Category of Livestock Farmers by Type of Fodder Used.

Fodder Used	Category of Livestock Farmers (Frequency)			Total
	For home consumption	For sale <M\$50 per month	For sale >M\$100 per month	
Grass	44	13	1	58
Jack fruit leaves	9	2	1	12
Tapioca leaves	3	2	0	5
Gliricidia	2	2	0	4
Rubber leaves	1	0	0	1
Banana leaves	1	0	0	1
<b>Total</b>	<b>60</b>	<b>19</b>	<b>2</b>	<b>81</b>

Preferred fodder characteristics as perceived by livestock farmers is indicated in Table 28. Those who obtained more than M\$100.00 per month from the sale of their livestock preferred to have fodder with high nutritive value. The majority of those who obtained less than M\$50.00 per month from their livestock indicated that the fodder should be nutritious (16 respondents) and palatable (2 respondents) to the animal. About three-fourths of those who kept their livestock for home consumption did not have any idea on preferred fodder characteristics.

Table 28. Preferred Fodder Characteristics by Category of Livestock Farmers.

Preferred Characteristics	Category of Livestock Farmers (Frequency)			Total
	For home consumption	For sale <M\$50 per month	For sale >M\$100 per month	
Nutritious	8	16	2	26
Palatable	6	2	0	8
Medicinal	0	0	0	0
Fast growing	0	0	0	0
No idea	46	1	0	47
<b>Total</b>	<b>60</b>	<b>19</b>	<b>2</b>	<b>81</b>

Monthly income from farming activities, off-farm employment and total family income of livestock farmers is summarized in Table 29. The majority of those who earned less than M\$200.00 from farming activities (58 out of 73 respondents) tended to keep livestock for home consumption. About 20 percent of the respondents in this category earned M\$50.00 or less from the sale of their livestock. Six out of eight respondents who had more than M\$200.00 farm income per month received less than M\$50.00 or more than M\$100.00 per month from the sale of their livestock. Similar trend was observed when data on monthly off-farm income and total monthly family income was cross-tabulated with data on the category of livestock farmers.

Table 29. Category of Livestock Farmers by Monthly Income.

Income	Category of Livestock Farmers (Frequency)			Total
	For home consumption	For sale <M\$50 per month	For sale >M\$100 per month	
<b>Monthly Farm Income</b>				
Less than M\$200	58	14	1	73
More than M\$200	2	5	1	8
<b>Monthly Off-Farm Income</b>				
Less than M\$200	53	11	1	65
More than M\$200	7	8	1	16
<b>Total Monthly Family Income</b>				
Less than M\$200	51	7	0	58
More than M\$200	9	12	2	23

n = 81

## **Section 4 CONCLUSION AND RECOMMENDATIONS**

The main objectives of this study were to determine the use of trees and tree-products by Malaysian farmers, and to identify factors associated with the use of trees and tree-products. Labu Sub-district was selected for this case study. Approximately, one-third of the households (231 respondents) were selected and interviewed using a pre-tested interview schedule.

### **Summary**

Three-fourths of the respondents interviewed were farmers while the rest were earning their living through off-farm employment. Most of the respondents were 55 years or older with an average family size of 5. They had an average of 5 years of formal schooling, though 20 percent of them did not have any formal education. Farming activities contributed an average of M\$132.00 per month to 58 percent of the respondents. Through off-farm employment, 85 percent of the respondents earned an average of M\$266.00 per month. The average family income per month was M\$361.00.

Only three percent of the respondents were landless. The majority of the respondents had less than one hectare of land. The respondents had forty-two hectares of rice plots which had been left idle for more than ten years. About one-eighth of the respondents were involved in the cultivation of short-term crops.

### **Cultivation of MPTS**

Approximately one-third of the respondents had an average of 0.7 hectare of land cultivated with trees. Nineteen common tree species were recorded. Coconut was the most common tree cultivated by more than one-half of the respondents. The second most commonly grown trees were durian, guava, jambu air, langsung, citrus, rambutan, mangosteen and mango. Less common trees found in the study area were bacang, cempedak, ciku, citrus species, jack fruit, rambai, jeering and petai.

More than one-third of the respondents had rubber smallholdings. Each of the respondents involved had an average of 1.1 hectare or approximately 400 trees per hectare. Rubber provided the main source of income to the owners and the main source of fuelwood to about two-thirds of the respondents.

Only a small number of the respondents adopted recommended farm management practices. Eighteen percent applied fertilizer, 17 percent controlled weeds, 8 percent pruned tree branches and 14 percent controlled insects and pests as recommended. The respondents perceived (92 percent) that they had some or did not have the necessary skills in tree-crop management.

## **Use of Trees and Tree Products**

Trees were cultivated for different uses. Trees were grown for: (a) food and fuel (38 percent); (b) for food only (14 percent); (c) for food, fuel and sale (14 percent); (d) for fuel only (13 percent); (e) for food and fodder (10 percent); (f) for food and sale (10 percent); and for food and poles (2 percent).

The majority of the respondents (two-thirds) depended on trees for fuelwood. The major sources of fuel in the study area were fuelwood and gas (33 percent), fuelwood only (29 percent), fuelwood in combination with gas and kerosene (11 percent), fuelwood and kerosene (8 percent), and kerosene and/or gas (36 percent). Rubber trees were used as fuelwood by the majority of the respondents.

Multipurpose trees produced fruits for home consumption. Eighty-eight percent of the respondents indicated that trees were planted for its food value. As indicated in Table 10, most of the MPTS grown were fruit trees. The MPTS were also used for sale, fuel, food and fodder, only rarely for poles, timber or fibre.

## **Factors Influencing the Use of Trees and Tree-Products**

Greater use of MPTS was observed when trees were utilized as the main source of family income and fuelwood in the case of rubber, and as food in the case of fruit trees. MPTS also provided fodder to 10 percent of the respondents. Other uses of trees and tree products were rather limited in the study area. Major factors that could have affected the use of tree and tree-products are; income from the sale of tree-products, limited or over-abundant supply of trees and tree-products, availability of alternatives, occupational constraints, income level from farming activities, total family income, crop management practices and livestock management practices.

1. The rubber industry is an organized activity. In this study, 39 percent of the respondents cultivated rubber as a source of family income. Cultivation of other trees is less organized than rubber.
2. Sixty-four percent of the respondents used fuelwood. Very few respondents had difficulty in obtaining a supply of fuelwood. The major source of fuelwood for the majority of the respondents are rubber tree trunks and twigs.
3. The ratio of full-time farmers to total number of fuelwood users in each category (a. use fuelwood and gas, b. use fuelwood only, c. use fuelwood, gas and kerosene, and d. use fuelwood and kerosene) seemed to be constant. It showed that full-time farmers and those who had off-farm employment did not have specific preference related to use of firewood.
4. Low income group from farming activities preferred to use: a. fuelwood and gas, b. fuelwood only and c. kerosene, gas and electricity. The higher income group from farming activities preferred to use fuelwood singly or in combination (22 out of 28 respondents). Among those who did not use fuelwood only 6 out of 31

respondents had more than M\$200.00 farm income per month. The majority of non-fuelwood users had less than M\$200.00 income per month from farming activities.

5. For those respondents who received M\$300.00 or less family income per month, they seemed to use fuelwood as well as non-fuelwood as sources of fuel in equal proportion. Among the higher family income per month group (more than M\$300.00), a greater number (two-thirds) preferred to use fuelwood compared to other sources of fuel.

6. Though, ten percent of the respondents were involved in livestock production, only 15 percent of them used fodder available on their farms. The majority of livestock farmers allowed their animals to graze freely in the village unattended. The farmers concerned (98 percent) admitted that they did not have the necessary skill to manage their livestock.

7. Only a few respondents adopted the recommended tree-crop management practices. Only eight percent indicated that they had the necessary skill to manage their crop.

## **Conclusion and Recommendations**

Common MPTS cultivated by the respondents were rubber and fruit trees. Trees were used as a source of family income, food, shade, fuelwood and fodder. Use of trees or tree-products by the respondents was rather limited.

The respondents seemed to have low production of crops and livestock. Their farms were not managed efficiently. More than 90 percent perceived themselves as unskilled farmers. Trees or crop were left without proper manuring, weeding and pruning. Most of the goats and cattle were left unattended in the village without proper feeding. In order to increase the use of trees and tree products, the following recommendations are made:

1. Monthly income from rubber can be increased by improving adoption of crop management practices. Income from other MPTS can be improved by increasing the number of plants per unit area and by the adoption of improved farm management practices. Low farm productivity encourages the farmers to seek off-farm employment.
2. Food derived from MPTS is basically small in quantity compared to the total food consumed by each family. However, the amount of food from MPTS could be increased by implementing a tree-crop rehabilitation program.
3. The respondents had shown interest in livestock farming, but they require guidance on tree-crop management practices.
4. The respondents require exposure and training on new uses of tree and tree-products, other than what they normally use.

## **REFERENCES**

- Awang, Kamis (1987), "Research and Development for MPTS - An Overview". Seminar paper presented at National MPTS Seminar I, FRIM, Kuala Lumpur, December 14-15.
- Ng, F.S.P. (1987), "Trees for Vegetables". Seminar paper presented at National MPTS Seminar I, FRIM, Kuala Lumpur, December 14-15.

## **APPENDIX**

### **QUESTIONS INCLUDED IN THE SURVEY**

1. What is your main occupation?
2. How many children do you have?
3. What is your average monthly income?
4. What trees do you grow in your farm?
5. What do you use as a source for fuel?
6. Why do you grow trees you have cultivated?
7. What trees are used for what purposes?
8. Where do you get your supply for trees that you do not grow?
9. Do you use trees/timber for construction of animal shed?
10. What are the problems that you encountered related to the cultivation and marketing of trees and its products?
11. Which development workers or local leaders provide advisory services?
12. Do you use trees for making furniture and building materials.
13. How do you select trees that you have planted?
14. Are you interested in planting the following recommended trees?
15. Are you interested in initiating a livestock project?
16. How is your village administered?