AGROFORESTRY PRACTICES BY SMALLHOLDERS IN SANDAKAN, SABAH

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MUSA BIN SALLEH PS2002-010(K)-526 27 JULY 2005



PERPUSTAKAAN UNIVERSITI MALAYSIA SABAF

Dedicated to

My beloved wife, Asnia Hj Abdul Mumin

and my beloved children: Mohamad Aqmal Hafidz Dayang Nur Sakinah Dayang Nur Syuhada Dayang Nur Syamimi Mohamad Aniq Danish

ACKNOWLEDGEMENT

Alhamdulillah, thanks to Allah Subhanahu Wataala, for giving me strength and courage towards the completion of my study. I would like to express my sincere and deepest thanks to my supervisor, Prof. Dr. Aminuddin Mohamad for his invaluable guidance, advice, encouragement, and suggestions throughout the study. I am particularly indebted to the Forestry Department of Sabah for the permission granted to undertake this programme and for the sponsorship. I wish to express my sincere thanks to Prof. Madya Dr. Amran Mohamed for his guidance and advice on the statistical analysis. Record of thanks is also extended to all lecturers for their valuable lectures and guidance during the course. I would also like to thank the Department of Agriculture, Sandakan for their help rendered. Finally, I would like to dedicate this work to my beloved wife Puan Asnia Hj. Abdul Mumin and my beloved children, Mohamad Aqmal Hafidz, Dayang Nur Sakinah, Dayang Nur Syuhada, Dayang Nur Syamimi and Mohamad Aniq Danish. Special and deepest thanks to them for their continuous support, encouragement and sacrifice to enable me to complete this study.



ABSTRAK

AMALAN-AMALAN AGROPERHUTANAN OLEH PEKEBUN-PEKEBUN KECIL DI DAERAH SANDAKAN, SABAH

Agroperhutanan telah menjadi semakin penting dalam sistem penggunaan tanah di Malaysia. Ia berfungsi dari segi perlindungan dan produktif dan terbukti berjaya dari segi teknikal dan ekonomi. Oleh itu, agroperhutanan telah dijadikan sebagai salah satu plan tindakan strategik Dasar Pertanian Negara Ke Tiga (NAP3). Disamping itu, dalam Dasar Pertanian Negeri Sabah Ke Dua (SAP2), agroperhutanan telah diberi penekanan dengan objektif untuk meningkatkan guna tanah dan memaksimakan pulangan. Pekebun kecil adalah merupakan salah satu pengguna berpotensi sistem agroperhutanan. Walau bagaimanapun, data saintifik mengenai sistem agroperhutanan pekebun kecil di Sabah adalah berkurangan. Oleh itu, kajian ini dijalankan untuk menyiasat amalanamalan agroperhutanan oleh pekebun-pekebun kecil di daerah Sandakan, Sabah. Kajian ini memberi tumpuan kepada penglibatan pekebun kecil dalam pembangunan agroperhutanan, jenis sistem agroperhutanan dan komponennya; input dari segi perkerja, baja, dan mesin; pemasaran produk agroperhutanan, dan persepsi dan penilaian pekebun kecil mengenai amalan agroperhutanan. Data dikumpul menggunakan borang soalselidik dengan cara soal selidik bersemuka. Sebanyak 58 pekebun kecil dari 26 kampung terlibat dalam kajian ini. Hasil kajian menunjukkan 91.4% pekebun kecil mengamalkan agroperhutanan. Walau bagaimanapun, 77.6% daripada mereka tidak faham mengenai agroperhutanan. Terdapat enam sistem agroperhutanan dikenalpasti diamalkan oleh pekebun kecil iaitu agrosilvicultural, agrisilvicultural, agrosilvopastoral, agua-agrosilvicultural, silvopastoral, dan aquaagrisilvicultural. Agrosilvicultural merupakan sistem agroperhutanan yang paling banyak diamalkan oleh pekebun kecil. Komponen sistem agroperhutanan pekebun kecil adalah tanaman utama, tanaman tambahan, spesies pokok, binatang ternakan, dan kolam ikan. Input pekeria dan mesin didapati sangat rendah. Disamping itu, saluran pemasaran hasil agroperhutanan pekebun kecil adalah terhad dan tidak teratur, kecuali pasaran buah kelapa sawit. 82.8% pekebun kecil setuju bahawa agroperhutanan boleh menyediakan pelbagai keluaran dan perkhidmatan serta menawarkan lebih pendapatan. Walau bagaimanapun, 93.1% daripada pekebun kecil sangat bersetuju bahawa kekurangan model agroperhutanan yang berjaya merupakan halangan utama dalam pembangunan agroperhutanan. Disamping itu, 82.8% daripada mereka sangat bersetuju bahawa halangan yang kedua penting ialah kekurangan pengalaman dan kemahiran dalam agroperhutanan. Masalah dan halangan yang mereka hadapi menyebabkan sistem agroperhutanan pekebun kecil kelihatan tidak teratur dari segi pemilihan komponen agroperhutanan, susunan tanaman, dan kombinasi antara komponen.

ABSTRACT

AGROFORESTRY PRACTICES BY SMALLHOLDERS IN SANDAKAN, SABAH

Agroforestry is emerging as an important land use system in Malaysia. It has both protective and productive functions and proven to be technically feasible and economically viable. Therefore, it has been made as one of the strategic action plan of the Third National Agriculture Policy (NAP3). Besides, in the Second Sabah Agricultural Policy (SAP2), agroforestry was emphasized with the objective of further optimize land use and maximize returns especially in areas where soils are marginal for agriculture. In addition, smallholders are one of the potential users of agroforestry systems. However, the scientific data on smallholders' agroforestry systems in Sabah is still lacking. Therefore, this study is carried out to investigate agroforestry practices by smallholders in Sandakan, Sabah. study focuses on smallholders' involvement in practising The agroforestry; the type of agroforestry systems and its component; input of workers, fertilizers, and machineries; marketing of its products, and smallholders' perceptions and evaluations about agroforestry. Data were collected through questionnaire survey by face-to-face surveys. There were 58 respondents from 26 kampungs involved in this study. The study showed that 91.4% of smallholders were currently practising agroforestry. However, 77.6% of them did not understand about agroforestry. There were six types of agroforestry systems found in their were agrosilvicultural, agrisilvicultural, The systems farms. agrosilvopastoral, agua-agrosilvicultural, silvopastoral, and aquaagrisilvicultural. The most common agroforestry systems practised by smallholders were agrosilvicultural. The components of smallholders' agroforestry systems were main crops, supplementary crops, tree species, animals, and fish ponds. It was found that input of workers and machineries were very low, Besides, the marketing channels of smallholders' agroforestry products, other than oil palm fruits, were found to be unorganized and limited. In addition, 82.8% of them agreed that agroforestry can provide a variety of products and services as well as offered more income. However, 93.1% of them strongly agreed that the lack of successful demonstration models of agroforestry practices is the main potential obstacle in agroforestry development. Besides, 82.8% of them strongly agreed that the second potential obstacle was that lack of experience and expertise in agroforestry. Due to various problems and obstacles, their agroforestry systems were appearing unorganized in terms of selection of agroforestry components, planting arrangement, and combinations between the components.

LIST OF ABBREVIATIONS

| AFTA | Association of Temperate Agroforestry |
|--------|---|
| NAP3 | The Third National Agriculture Policy (1998-2010) |
| SAP2 | The Second Sabah Agricultural Policy (1999-2010) |
| FELDA | Federal Land Development Authority |
| ICRAF | The International Centre for Research in Agroforestry |
| IDRC | The International Development Research Centre |
| MRB | Malaysian Rubber Board |
| PORIM | Palm Oil Research Institute Malaysia |
| FRIM | Forest Research Institute of Malaysia |
| JIRCAS | Japan International Research Centre for Agricultural Sciences |
| FFB | Fresh Fruits Bunch |
| FAMA | Federal Agriculture Marketing Authority |

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| ABST | RAK | vi |
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CHAPTER 1

INTRODUCTION

1.1. General Introduction

Agroforestry is a land use system. It has been practised for a long period of time by the farmers in Malaysia. The earliest farmers' agroforestry practices were homestead and shifting cultivation. Therefore, it is not new for the farmers in the country. However, they are not familiar with the term "agroforestry". Most of them have little knowledge on agroforestry. They also did not recognize that their farming practices are called agroforestry. It appears that the development of their agroforestry practices is not systematic and unorganized. Nair (1989a) and Mahmud (2001) have pointed out that the development of agroforestry as a science and an organized practice is relatively new.

Agroforestry systems involve the combination of more than one component. Generally, the most common combination in agroforestry is agricultural crops with woody perennial and or animal. Due to the presence of more than one component, agroforestry systems are more complex than a monoculture system. Current *et al.* (1995) mentioned that agroforestry special characteristics include a large number of species, management intensities, and multipurpose usage of outputs. Besides, AFTA outlines agroforestry should have the components that intentionally designed and managed as a whole unit to qualify the system as an agroforestry, rather than as individual elements and manage separately (Mahmud, 2001).

Agroforestry is a form of multiple cropping if only crops are involved. Multiple cropping systems can be divided into simultaneous cropping and sequential cropping. Simultaneous cropping is related to the other terms, concomitant and interpolated cropping, which is referring to a cropping sequence where two or more species, one of which has shorter crop duration than the other (s), are grown together on the same unit of land (Huxley and Houten, 2001). On the other hand, sequential cropping systems involve intensification only in time (Mahmud, 2001). In this system, the succeeding crop is planted after the preceding one has been harvested.

Agroforestry can offer various benefits economically and environmentally. Economically it can provide varieties of products that can be marketed. Agroforestry can increase productivity and income opportunity, reduce risk of price fluctuation, reduce weeding requirements, and reduce establishment cost (Mahmud, 2001). Environmentally, agroforestry serve more services. It can reduce soil erosion and moderate microclimate extremes. In addition, agroforestry has been proven to be technically feasible and economically viable (Abdul Razak *et al.*, 2001).

In view of the attractive benefits of agroforestry, it has been made as one of the strategic action plan of NAP3 (Abdul Razak *et al.*, 2001). In NAP3, both the agriculture and forest policy have been merged with two new strategic approach emphasized, namely agroforestry approach and product based approach. In agroforestry approach, agriculture and forestry are viewed as mutually compatible and complementary. In Sabah, the Second Sabah Agricultural Policy (1999-2010) or SAP2 has been formulated to ensure that the state's agricultural development policy is in line with the new NAP3. In SAP2, the integration of commercially forestry species into existing agriculture activities was emphasized with the objective is to further optimize land use and maximize returns especially in areas where soils are marginal for agriculture (Ministry of Agriculture Development and Food Industry Sabah, 2000). It showed that the government recognized agroforestry as a potential land use system. Agroforestry can be considered as an important land use system in the country as it has been emphasized in both NAP3 and SAP2. Generally, it has been developed by the smallholders and estate plantations. Abdul Razak *et al.* (2001) stated that the main potential users of agroforestry will be the smallholders who own uneconomic size of land. Smallholder is a farmer who only owns a small portion of land less than four hectares or approximately 10 acres. The rubber industry defined smallholder as a farmer who owns land holding which is not more than 40.47 hectares or 100 acres (Felix and Mohd Dos, 1988). Generally, they are poor and mainly engaged in the cultivation of cash crops, rubber, coconut, paddy, and fruits as well as engaged in the rearing of poultry, buffaloes, and goats.

As agroforestry can offer various benefits economically, it can be used as a tool to improve smallholders' income and further uplift their living standards. Current *et al.* (1995) and MacDicken and Vergara (1990a) have mentioned that agroforestry system are profitable to farmers and can be a valuable tool for rural development. However, they need technical assistance in order to enable them to properly develop their agroforestry systems. Smallholders' technical expertise in agroforestry can be developed through extension services. However, the present extension workers are more oriented to single or separate discipline with foresters on forestry aspects and agriculturist on agriculture aspects (Mahmud, 2001). Therefore, the expertise and capacity of these extension workers should be enhanced before genuine effort could be carried out to encourage agroforestry among the smallholders.

The development of agroforestry systems among smallholders can also be improved through research and development. In order to fulfill the expectations on the role and potential of agroforestry as a development vehicle, it is imperative that research and development be focused on the generation of appropriate, sciencebased technologies of wide applicability, especially under resource-poor conditions

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and in smallholder farming systems (MARDI, 2001). However, the development of agroforestry systems and practices requires an integrated and a multidisciplinary approach, cutting across many research and development and extension agencies (Mahmud, 2001; MARDI, 2001).

1.2. Statement of the Problem

Agroforestry is one of strategic action plan stipulated in NAP3 and SAP2. This indicates that the government considers agroforestry as an important land use system both in national and state level. By the year 2010, the policies should be fully implemented. However, their implementation, particularly in agroforestry matters is very slow. The National Seminar on agroforestry in September 2004 acknowledged this problem. Besides, Sukandar (2004) pointed out that agroforestry adoption as one of the mainstream farming systems is yet to achieve success as that aspired in NAP3. There is another five years to go, then efforts by the all parties concerned should be intensified in order to achieve the goal of the policies.

Currently, agroforestry was implemented by smallholders and estate plantations. Smallholders are identified as one of the potential users of agroforestry. In view of the economic benefits of agroforestry, it can be used as a tool to uplift smallholders' living standard. Thus, promotion of agroforestry to smallholders should be intensified. However, they have various problems such as lack of management skills, capital, and technical expertise; limited access to the financing facilities and market information; and small-size land holding. We need scientific data to address these problems. However, scientific data on smallholders' agroforestry systems are still lacking. According to Mahmud (2001), agroforestry cannot be practised to a great extent without an adequate scientific basis. Boland (1991) also mentioned that no promotion of agroforestry would be effective or even desirable without a strong research to support it.

At present, research activities towards developing agroforestry technologies and systems are limited, especially on the interactions between various components in agroforestry systems. Besides, the smallholders have not adequately benefited from the research activities. According to Samion and Normiyah (1994), smallholders are often rejected the technologies from the outcome of these research due to the researchers did not consider their conditions and needs. Therefore, research and development on agroforestry should be intensified and geared towards the smallholders' needs. One approach that considers farmers' conditions specifically is the farming systems approach (Samion and Normiyah, 1994). Based on this approach, this study is carried out and focused on the involvement of smallholders in agroforestry practices in order to investigate and evaluate what agroforestry systems they already have.

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1.3. Objectives of Study

The objectives of the study were:

- i. To investigate the involvement of the smallholders in prctising agroforestry.
- To evaluate the type of agroforestry systems developed by smallholders.
 This includes evaluating the components of smallholders' agroforestry systems and the combinations between the components.
- iii. To evaluate the input of workers, fertilizers and machineries and the marketing of agroforestry products.
- iv. To evaluate the smallholders' perceptions and evaluations about agroforestry. This includes evaluating their understanding on agroforestry, their perceptions on agroforestry benefits, and their perceptions on the potential obstacles in agroforestry development.

CHAPTER 2

LITERATURE REVIEW

2.1. Agroforestry Defined

Efforts to define agroforestry began in the mid-1970s and the early definition is as follows (MacDicken and Vergara, 1990b):

"agroforestry is sustainable management system for land that increases total production, combines agricultural crops and forest plants and or animals simultaneously or sequentially, and applies management practices that are compatible with the cultural patterns of the local population".

The following are the other definitions of agroforestry:

- i. Agroforestry is a land-use system that involves socially and ecologically acceptable integration of trees with agricultural crops and/or animals, simultaneously or sequentially, so as to get increased total productivity of plant and animal in a sustainable manner from a unit of farmland, especially under conditions of low levels of technology inputs and marginal lands (Nair, 1989b).
- ii. The International Centre for Research in Agroforestry (ICRAF) defines agroforestry as a collective name for land use systems and technologies where woody perennials are deliberately grown on the same piece of land as agricultural crops an or animals, either on some form of spatial arrangement or temporal sequence and which there are both ecological and economic interactions between the different components (Mahmud, 2001).

The following definition adopted from Nair (1984) is the most appropriate to define the art and science of agroforestry (MacDicken and Vergara, 1990b):

"Agroforestry is land use that involves deliberate retention, introduction, or mixture of trees or other woody perennials in crop/animal production fields to benefit from the resultant ecological and economic interactions"

The basic ideas can be drawn from the above definition are as follows:

- Agroforestry is a distinct land-use system, which may include combinations of agricultural, forestry, horticultural, and animal husbandry subsystems and practices.
- Agroforestry integrates trees with crops and/or animals, with the main objectives of reducing risk and increasing total productivity.
- iii. Agroforestry systems are both stable and sustainable. Agroforestry practices have greater diversity than do monoculture practices and can distribute production over a longer period of time.
- iv. Integration of trees into agricultural systems may result in more efficient use of sunlight, moisture, and plant nutrients than is generally possible by monocropping of either agricultural or forestry crops.

Besides, in the Malaysian context, NAP3 defined agroforestry as "a land-use maximization concept that involves the integrated planting of agricultural crops and forest species. It includes the cultivation of short-term crops in forest plantations during the early phase of establishment. It may involve the rearing of livestock and fisheries in such integrated cultivation. As land and labour become increasingly scarce and pressure continues for the forest to be maintained for environmental and ecological considerations, agroforestry offers a better alternative to maximize returns from the same piece of land" (MARDI, 2001). However, the component of forest species in the above definition has drawn much debate. The centre of debate focused on the issue of whether oil palm could be considered forest species. Sukandar (2004) mentioned that oil palm is a forest species which is already domesticated. As it is originated from the forest, oil palm should be considered as forest species. Therefore, it should be included in the definition. Besides, forest species can be classified into timber and non-timber forest species. Mahmud (2001) pointed out that we should include these components in our definition on agroforestry. In view of that, the non-timber forest species such as rattan, bamboo, medicinal, and herbal plants should be included in the definition on agroforestry.

In addition, AFTA outlines a land use system must satisfy all of the following four criteria, in order the system to be called agroforestry (Mahmud, 2001):

- i. Intentional: Combinations of trees, crops and or animals are intentionally designed and managed as a whole unit rather than as individual elements which may occur in close proximity but are controlled separately.
- ii. Intensive: Agroforestry practices are intensively managed to maintain their productive and protective functions and often involve annual operations such as cultivation and fertilization.
- iii. Interactive: Agroforestry management seeks to actively manipulate the biological and physical interactions between the tree, crop and animal components. The goal is to enhance the production of more than one harvestable component while at the same time providing conservation benefits.

 iv. Integrated: The tree, crop and or animal components are structurally and functionally combined into a single integrated management unit. Integration maybe horizontal or vertical and above or below ground.

2.2. Agroforestry Systems

The common terms used in agroforestry are system, subsystem, practice, and technology. For the purpose of distinguishing and classifying agroforestry systems, an agroforestry system can be considered as a type of land use that is specific to a locality and described according to its biological composition and arrangement, level of technical management, and socio-economic features (Nair, 1990). Subsystem is part of the system. Besides, an agroforestry nature on a farm and usually consists of arrangements of agroforestry components. Hierarchically, a system consists of several subsystems and each subsystem consists of several practices. Another common term in agroforestry is technology. Technology is referring to an innovation or improvement, usually through scientific intervention, that can be applied to advantage in the management of the system or practice concerned.

2.2.1. Classification of Agroforestry Systems

According to Nair (1990), the sets of criteria used in classification of most agroforestry systems are structural, functional, socioeconomic, and ecological basis. Firstly, structural basis refers to composition of the components, including spatial admixture of the woody component, vertical stratification of the component mix, and temporal arrangement of the different components. Secondly, functional basis refers to the major function or role of the system, mainly of the woody components. Thirdly, socioeconomic basis refers to the level of input of