

Introducing the Cultivation of Medicinal Plants and Wild Fruits in Forest Rehabilitation Operations on Former Shifting Cultivation Sites in Sarawak Malaysia: Issues and Challenges

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Abstract

One of the threats to the practice of sustainable forest management in Sarawak is shifting cultivation. Ongoing rehabilitation measures taken by the State Forest Department in former shifting cultivation areas include natural regeneration, reforestation and agroforestry programs. Reforestation is making slow progress while agroforestry programs suffer from a lack of interest in tree planting by participants. The introduction of the cultivation of medicinal plants and wild fruits, which also addresses concerns about the depletion of the wild stock, may revitalize these programs. However, the venture faces many issues and challenges. In the light of these, a strategy for such an introduction is proposed.

Keywords: medicinal plant, wild fruit cultivation, conservation, rehabilitation of shifting cultivation areas, agroforestry

I Introduction

As Sarawak strives toward attaining sustainable forest management, one of the threats to this is posed by shifting cultivation, the pattern of which has changed from the traditional practice of long fallow to short and intensive cycles of cultivation. The Forest Department in Sarawak is concerned with the rehabilitation of areas affected by shifting cultivation within the permanent forest estate [Lee 1997]. Rehabilitation includes leaving the area to regenerate naturally, reforestation and agroforestry schemes. Reforestation is not making much headway while agroforestry schemes suffer from a lack of interest by former shifting cultivators in tree planting. The introduction of the cultivation of medicinal plants and wild fruits could present a viable alternative. However, the introduction of this scheme poses many issues and challenges. The aim of this study is to identify these issues and challenges and propose a strategy for this venture.

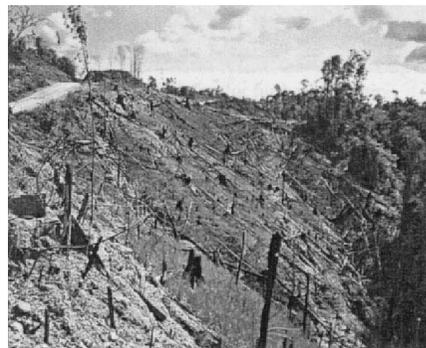
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II The Threat of Shifting Cultivation to Sustainable Forest Management

One of the greatest threats to sustainable forest management is posed by shifting cultivation (Plate 1). Traditional shifting cultivation is not to be decried as it is an ecologically sound form of land use and management. Planting of hill rice or other agricultural crops for one or two years in plots cleared in the forest is followed by a long period of fallow during which the cultivated site is allowed to recover to near its original state in terms of vegetation cover and soil fertility. However, the pattern of shifting cultivation has changed in recent times. Modern day shifting cultivation is accelerated by the increasing accessibility into forest areas provided by logging roads. Logged over forest represented by the residual stand is favored due to lower tree density and therefore lower labor requirement to clear-fell. There is now a movement from state land forest areas into the permanent forest estate in the practice of this form of agriculture. State land forests are located in unencumbered land for which forestry is not the main form of land use. On the other hand, permanent forest estate which comprises forest reserves, protected forests and communal forests (definitions for these may be found in [Anonymous 1954]) is exclusively set aside for forestry and is under the jurisdiction of the Forest Department of Sarawak. The use of chainsaws further accelerates the rate, intensity and extent of forest clearing leading to permanent loss of forest resources, especially if carried out in the permanent forest estate. The result of these shortened and intensive cycles of cultivation is that the cultivated sites are not given the chance to recover from the process of soil nutrient depletion. Natural regeneration of commercially important timber species is therefore extremely difficult.



(a) Burning



(b) Rice Cultivation

Plate 1 Shifting Cultivation Scenes in Sarawak

Source: Courtesy Forest Department Sarawak

Areas deforested by shifting cultivation become degraded in terms of (a) a loss of forest productivity, (b) severe reduction of biological diversity, and (c) deterioration of environmental quality due to the almost complete loss of intangible assets from the forest cover with the hydrological regime and nutrient cycles severely disturbed.

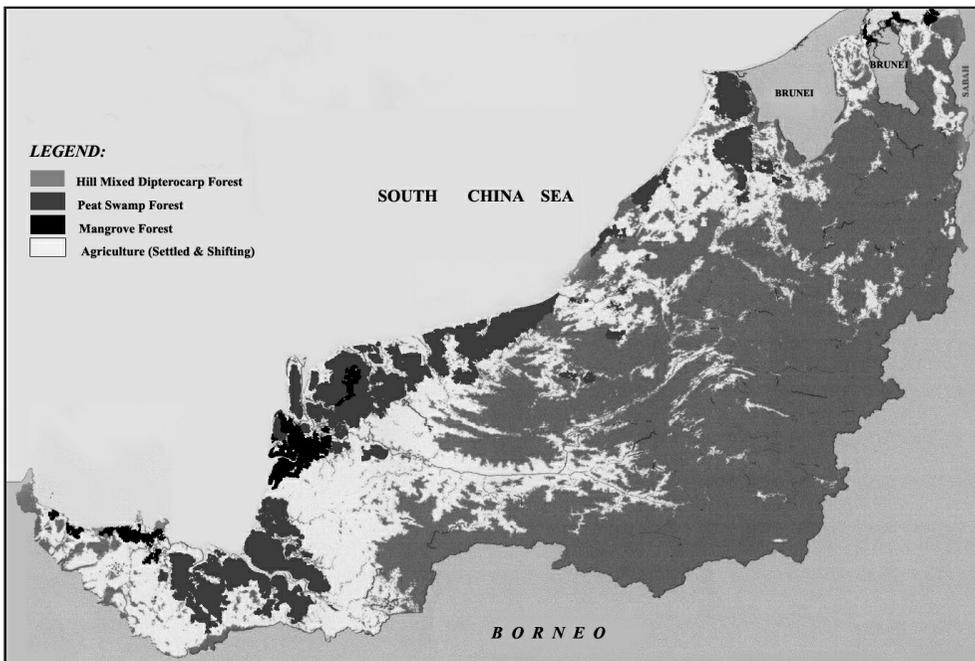
III Extent of Shifting Cultivation and Rehabilitation Exercises in Sarawak

The latest figures provided by the Geographical Information System Unit of the Forest Department Sarawak reveal that the total area of land affected by shifting cultivation amounts to some 3 million hectares or 25 percent of the State (Map 1). Approximately 180,000 hectares of the shifting cultivation areas are located within permanent forest estate while 12,000 hectares are inside totally protected areas made up of national parks, wildlife sanctuaries and nature reserves.

The need by the Forest Department of Sarawak to carry out various rehabilitation exercises on areas deforested and degraded by shifting cultivation has been discussed by Lee [1997]. Rehabilitation measures include (a) natural regeneration, (b) reforestation, and (c) agroforestry.

1. *Natural Regeneration*

Allowing the sites deforested by shifting cultivation to recover through natural regeneration has



Map 1 Forest Types of Sarawak (Showing Extent of Shifting Cultivation)

been offered as an option for the rehabilitation of such sites. This option has been described by Lee [1981] as a “do nothing” option that may be a sensible and certainly an inexpensive technique, and more so if the objective of the rehabilitation exercise is ecological in nature, that is, to allow for the restoration of a vegetative cover to re-establish the environmental protection functions of the sites. Leaving the sites undisturbed for a considerable period of time after the shifting cultivators have abandoned the sites may be considered as imposing moratoriums on the areas. Given time the ecosystem will recover by itself, though not necessarily to its original state. Halenda [1989] cautioned that foresters should not consider such naturally regenerated forests as worthless areas to be cut down, burned and replaced with monoculture plantations.

2. *Reforestation*

The Forest Department in the Fourth Malaysia Plan (1981–85) drew up a proposal for a Reforestation and Rehabilitation Project, which was to be implemented on areas affected by shifting cultivation within the permanent forest estate. As the Officer-in-charge of Research with some 10 years of research in plantation silviculture behind me at that time, I was assigned by the Forest Department to draw up the proposal. Rehabilitation will take the form of closed plantations and agroforestry projects. The proposal is contained in the Fourth Malaysia Plan Submission of the Forest Department [Anonymous 1980].

The objectives of the Reforestation and Rehabilitation Project are:

- (a) To restore deforested and degraded areas to productive forests;
- (b) To restore the fertility and the environmental protection functions of the deforested areas;
- (c) To provide employment and therefore raise the income level of the basically poor population by engaging them in various activities relating to plantation establishment;
- (d) To ensure a future sustainable supply of timber from the areas so reforested and rehabilitated both for domestic and industrial use; and
- (e) To emphasize the role of agroforestry in rural community development.

Despite the Forest Department’s best efforts, however, the total area reforested up to the end of December 2002 was only 24,000 hectares [Anonymous 2003a].

3. *Agroforestry*

It was recognized very early in the rehabilitation exercise that the participation of shifting cultivators is important and must be solicited. This participation is effected through agroforestry schemes. Agroforestry is a land use option that aims to improve productivity and therefore profitability by combining agricultural and forestry activities on the same land unit. The Forest Department devised a scheme whereby shifting cultivators are permitted to occupy the land they have already cleared and carry out agricultural activities of their choice

with the proviso that they assist the Department to plant a crop of timber trees within the same plot of land. The scheme had been expounded by Lee [1997]. By restricting the shifting cultivators to the areas already cleared, the Forest Department believes that further clearing of fresh areas within the permanent forest estate will be reduced. It is observed, however, that although the shifting cultivators pursue the agricultural activities with a fair degree of enthusiasm, they show a general lack of interest in the tree-planting exercise. There is a perception among rural communities that tree planting is too lengthy a venture even for what foresters consider to be short-rotation tree crops that can be harvested in 8 to 10 years. When they venture into any activity, they expect to see financial returns in about 3 years. It is perhaps also unclear to the farmers whether they own the trees that they plant.

IV Alternative to Timber Tree Planting

In view of the lack of interest shown by shifting cultivators in timber tree planting, I propose that encouraging them to cultivate medicinal plants and wild fruits might be a viable alternative. Medicinal plants and wild fruits are likely to generate greater interest among the rural communities in the sense that they will yield financial returns more quickly than would a forest tree crop. In the case of medicinal plants, financial returns may be realized within a year in some cases, while some species of wild fruits may be productive within two years. Medicinal plants and wild fruits are also in a sense forest crops. Once cultivated by the farmers, it is clear that the ownership of the cultivated plants belong to them. Therefore the cultivation of medicinal plants and wild fruits will help to solve the problem of the lack of interest in timber tree planting. Cultivation of medicinal plants and wild fruits might also address the concern about the depletion of their natural stock. This leads us to the question of whether the wild stock of medicinal plants and wild fruits are being depleted.

1. *Is the Wild Stock of Medicinal Plants being Depleted?*

In Sarawak, it is safe to assume that a large majority of the rural communities still depend on medicinal plants to treat a variety of ailments largely because of two factors. Firstly, unless they visit government hospitals and clinics, the price of prescription drugs is often beyond their financial reach. Secondly, due to the distance (and therefore the time and expense) that rural people have to travel to visit even the nearest government hospitals and clinics, they may abandon such plans in favor of seeking cures from plants that can be collected from forests or fields in the vicinity of their settlements.

Rural people also collect medicinal plants for sale in both rural and urban markets. However such sales are random rather than systematic. They do not normally go out of their way to deliberately collect specific plants with medicinal value for sale. It is believed that such collections tend to be casual in nature. There may be cases where the villagers cultivate specific medicinal plants for sale but there is no record to show this is the case.

The Forest Department has been conducting surveys and gathering information on the use

Table 1 Use of Medicinal Plants by Various Communities in Sarawak

Community	Species
Chinese	57
Malay/Melanau	213
Bidayuh/Selakau	266
Iban	297
Orang Ulu	387

Source: [Runi and Lee 2001]

of plants for medicinal purpose by the various communities [Runi and Lee 2001]. Such surveys involved interviews and dialogues with members of the various communities, especially those identified as the village or community doctors and elders of the communities. The number of medicinal plant specimens recorded and collected from the various communities in Sarawak is summarized in Table 1.

The survey is by no means comprehensive. However, it does indicate an increasing degree of dependence on plants for use as medicines as the communities are located further and further from the urban setting. Historically the demand for medicinal plants was met through a combination of wild collection, enrichment of natural populations and cultivation in kitchen and house gardens.

Many researchers have compiled lists of medicinal plants for various states, regions or countries, for instance for Australia [Lassak and McCarthy 1983], Sarawak [Chai *et al.* 1989], and Malaysia [Kamaruddin and Latiff 2002]. Almost all publications of such nature carry cautions pertaining to the use of plants being described and indemnity from any responsibilities to injuries that maybe sustained through the use of plants they listed. Thus Lassak and McCarthy [1983] cautioned:

This book describes Australian native medicinal plants and their reported uses. The authors do not endorse any plant or method of application found here as a prescription of any ailment. We strongly discourage experimentation by untrained persons in the collection and administration of native plants for medicinal purposes because, as can be seen in the text of this book, many plants can be dangerous taken internally or applied externally. Scientifically their real effects have yet to be determined. The authors and publisher waive any responsibility for injuries to readers of this book resulting from the use of plants listed here.

The experience throughout Southeast Asia is that even though medicinal plants are freely sold in market places (Plate 2), there is a general lack of confidence in their usage except those sold as herbal teas and for external application for treating wounds. This is because medicinal plants are generally sold without any clear instructions as to how they are to be prepared for consumption or application. This is unlike herbal medicines that are sold in traditional Chinese drugstores, which come with detailed instructions for preparation and usage. Given this scenario, the answer to the question of whether the stock of medicinal plants in the wild is being depleted is “probably no” except for species like *tongkat Ali* (*Eurycoma longifolia*), which will be explained later. In other words, uncertain demands do not threaten collection from, and therefore, supplies in the wild.



(a) Market Scene in Kuching, Capital of Sarawak



(b) Wild Fruits, Vegetables and Medicinal Plants being Offered for Sale

Plate 2 Market Scenes

Source: the author

2. Consumption and Stock of Wild Fruits

It is not easy to obtain statistics on the consumption of wild fruits in Sarawak. Like medicinal plants, collection of wild fruits is on an ad hoc basis and wild fruits appear in local markets obviously only when the fruits are in season. So is the stock of wild fruit plants being depleted? The answer is “probably yes.” There are a few contributory factors to the depletion of the wild stock. Wild fruits are obviously popular among local communities who spend more time in the forests collecting vegetables and fruits than cultivating them. There is evidence in the forest to suggest that when trees bearing fruit are encountered, the collectors will almost always fell the trees if the fruit is not within arms’ reach. The collectors generally consider that they would not be passing through the same way again and therefore the felling of the trees is justified and not a loss to them in any case. Loss of habitat is another factor, engendered by the alienation of forest areas for agricultural, housing and other development purposes. In addition, no importance has so far been placed by the Forest Department on the stocking of wild fruits during silvicultural operations apart from conserving trees known to be food sources for birds and animals.

V Issues and Challenges in the Utilization of Medicinal Plants and Wild Fruits in Rehabilitation Exercise

Notwithstanding that there is a preference for wild stock of medicinal plants and wild fruits because many believe the wild stock to be more potent [Sheldon *et al.* 1997], there are benefits to be derived from their cultivation compared to collection from the wild.

Cultivation offers both producers and buyers advantages that enable more control over production and profits than is generally the case for collection from the wild. Cultivators are able to selectively breed for desired qualities and thus develop more potent products. Cultivation offers buyers raw materials, which are of more consistent quality with lower risk of

alteration. Cultivated stocks are harvested where they are planted; therefore travel to distant places for collection is not required. Finally it offers more concentrated financial returns.

What strategy should be adopted for the introduction of medicinal plants and wild fruits in rehabilitation exercises? A safe strategy for medicinal plants would be to utilize species that are well known internationally or locally and which are in demand as raw materials. Likewise for wild fruits we should start with those species identified by the relevant authorities as having the potential for commercial exploitation. Some examples are given below of species having such potential.

1. Medicinal Plants

Examples of medicinal plants that are in demand include *Morinda citrifolia*, *Eurycoma longifolia*, *Centella asiatica* and *Leonurus sibiricus*.

Morinda citrifolia (Plate 3-a) is known in Malaysia as *mengkudu*. Internationally it is traded under the name of *noni* and is also known as the Indian mulberry. It is a small evergreen tree native to India, Polynesia, Australia, China, and Southeast Asia. In recent years, *Morinda citrifolia* has become a popular folk medicine, with claims that it can help with high blood pressure and cancers. It is used in various countries as poultice for treating ulcers, gout, ringworm and boils or applied to rheumatic joints. It is also crushed in lard or oil, and applied to face for head colds. It is also used as a purgative and astringent. *Noni* is traditionally prepared by fermenting the juice. It is also taken in the natural juice form, or in a dried extract, which is either encapsulated or added in a drink mix. Given the traditional accreditation of



(a) *Morinda citrifolia* – *mengkudu*
in Malaysia and *noni* in Hawaii



(b) *Eurycoma longifolia* – *tongkat Ali* (Ali's Walking Stick)

Plate 3 Examples of Medicinal Plants

Sources : (a) the author; (b) Courtesy of Forest Department Sarawak

noni, researchers became interested in the biological and chemical attributes of the plant. Modern science has begun to investigate the claims made by folk medicine, attempting to answer the question: Is *noni* a medicine? *Noni*'s roles in fighting cancer and tumor immunotherapy are the main areas of extensive research. Currently, *noni* is traded as an unregulated herbal supplement. There is a growing popularity of *noni* juice among health enthusiasts in Japan [Anonymous 2003b]. The growing demand is forcing businesses to seek new supply sources.

Eurycoma longifolia (Plate 3-b) is known in Malaysia as *tongkat Ali* (Ali's walking stick) and has long captured the imagination of the male population in the country. Many believe that it is Malaysia's equivalent of Viagra and that it can cure erectile dysfunction. Others believe that it can enhance sexual potency. The plant is widely used by the Malays and rural communities as a traditional medicine. The roots are boiled and used in the preparation of a tonic for treating malaria and hypertension. In Malaysia extract of *tongkat Ali* is widely incorporated in drinks and used in health supplements. There is even a *tongkat Ali* wine. The unprocessed roots of this plant fetch a price of 40–50 Malaysian ringgit [Rasadah and Azizol 2002]. Since the roots are the active part of the plant, collection is necessarily destructive. Over collection from the wild is obvious, so much so that the Ministry of Primary Industry is particularly concerned and has formed a Task Force to take actions to ensure that the species does not become extinct. Cultivation of the species is strongly emphasized.

Centella asiatica (Plate 4) is known in Malaysia as *pegaga*. It is a small creeping herb with long stalks and kidney-shaped green leaves which are soft and smooth in texture. It can be easily propagated by using the rhizome or stem cuttings. The method of cultivation is more fully described in Vimala *et al.* [2003]. *Pegaga* has been used for treating bronchitis, asthma, excessive secretion of gastric juices, dysentery, leucorrhoea, kidney problem, urethritis and dropsy. The herb is said to have a direct effect in lowering blood pressure and is often referred to as a rejuvenating medication. The leaves, eaten raw, are believed to purify the blood and cure indigestion. The decoction of the leaves is used to treat leprosy and rheumatism. The poultice of the leaves is sometimes used to treat sores and the pounded leaves are applied to the body to reduce fever. *Pegaga* is commonly consumed as a raw vegetable by the Malays, as a cooling drink by the Chinese and as a brain tonic by the Indians [*ibid.*].

Leonurus sibiricus (Plate 5), known locally in Sarawak as *kacangma*, is a herb that is being promoted as one of Sarawak's flagship products [Anonymous 2002]. It is very popular among the Chinese in Sarawak. The sun-dried form of this plant is cooked with chicken, ginger and wine for women during their post-birth confinement period. It is also known as



Plate 4 *Centella asiatica* (*Pegaga* in Malaysia)
Source: the author

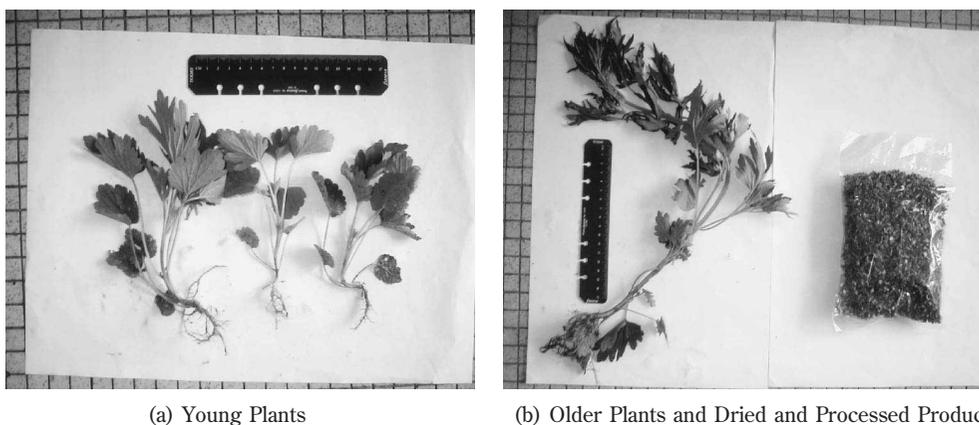


Plate 5 *Leonurus sibiricus* (*Kacangma*)

Source: the author

motherwort in the west and *yimucao* (good-for-mother-herb) in China and has been widely used in Southeast Asia for menstrual ailment, tonic, heart stimulant and to reduce blood pressure. Chinese immigrants had apparently introduced the plant to Sarawak.

The challenges faced by herbalists in Malaysia include finding market acceptance of their herbal materials and creating medical and marketing networks. In response to these needs, plans have been made by the Ministry of Health to establish an organization called HERBTRADE on the recommendation of Marditech Corporation Sdn. Bhd. Among other functions, HERBTRADE will be responsible for the processing and quality control of medicinal herbs. A special fund is also being set up to provide financial assistance to firms and individuals involved in herb production [Anonymous 2003c]. Marditech Corporation, the corporate arm of the Malaysian Agriculture Research and Development Institute (MARDI) has been commissioned by the Ministry of Health as consultants to prepare a comprehensive report on the herbal industry in Malaysia. Their consultancy report is pending. In the meantime, the firm has been organizing briefings, dialogues and seminars in various states in the country. This augurs well for the medicinal herb industry in Sarawak.

2. Wild Fruits

In the case of wild fruits, species identified by the Agriculture Department of Sarawak as having immediate potential for commercial exploitation include *green longan*, *dabai*, *durian kuning*, *terap* and *embawang* [Voon 2001]. The following information on these fruits is drawn from Anonymous [1990].

Green longan (Plate 6–a) (*Dimocarpus longana* var. *malesianus*) is a fruit unique to Sarawak. A mature tree can produce 200 kg of fruit per season with the normal ripening season from March to April. The fruit has superior prospects for commercialization with no serious pests or diseases.

Dabai (Plate 6–b) (*Canarium odontophyllum*) is locally known in Sarawak as Sib



(a) *Dimocarpus longana* var. *malesianus*



(b) *Canarium odontophyllum*

Plate 6 Wild Fruits with Commercial Potential

Source: Courtesy of Forest Department Sarawak

olives. It had been widely planted in Kapit, Sibul, Sarikei and Limbang. It commands a good market price and commercial planting using superior selected quality material is promising. The export market is currently limited to Brunei and the state of Sabah.

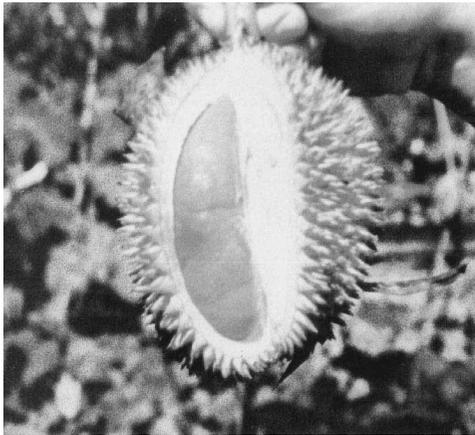
Durian kuning (Plate 7-a) (*Durio kutejensis*) is a tree with a low branching habit. It has fruits of medium size that generally weigh around a kilogram each. The skin is yellow in color with short thorns. The flesh is yellow, and a bit drier and less sweet than the ordinary durian. While this species generally grow wild, it is often cultivated by the Kedayan in the Miri Division.

Terap (Plate 7-b) (*Artocarpus odoratissimus*) is commonly found in the secondary alluvial and primary lowland forests with the trees cultivated by farmers in Bintulu, Miri and Limbang. A fully mature tree carries about 180 fruits per season. The aril is white and juicy with a delicate fragrance and is sweet and delicious to the taste.

Embawang (Plate 7-c) (*Mangifera pajang*) is a striking and handsome tree that often towers over the forest canopy. It can be found in the upper reaches of the Rejang River in the Kapit division. Its fruits have a bright yellow fibrous aril and a tangy, sweet and sour taste.

VI Technical Problems in the Domestication of Medicinal Plants and Wild Fruits

There are many technical problems associated with the domestication process. Although the



(a) *Durio kutejensis*



(b) *Artocarpus odoratissimus*



(c) *Mangifera pajang*

Plate 7 Wild Fruits with Commercial Potential

Sources: (a) Courtesy of Agriculture Department Sarawak; (b) and (c) Courtesy of Forest Department Sarawak

examples of medicinal plants and wild fruits identified above serve as a starting point for cultivation, it will be necessary to launch a study to evaluate the economic potential of the long lists of medicinal plants and wild fruits available in Sarawak. Before this can be done, it will be necessary to conduct a resource inventory on these two plant groups. This inventory will provide a good guide to habitat preference of the various species of medicinal plants and wild fruits. To support the domestication process, it will also be necessary to look into the outsourcing of planting materials and the propagation techniques of medicinal plants and wild fruits, the information on which is rather scant at the moment.

VII Conclusion

The introduction of wild fruit and medicinal plant cultivation is best effected through agroforestry schemes. As success is profit driven, it is necessary to select for cultivation

species to which monetary value can be attached. The selection of medicinal plant species for cultivation is unlikely to present a major problem, as there is a long list to draw from. However, wild fruits may be more problematical because their flowering and fruiting can be seasonal even in the tropics. Some wild fruit species will bear fruit only in certain months of the year. Other species will bear fruit only in certain years. And the trees of most species will flower and fruit in abundance at same time, usually towards the end of the year. When this happens, fruit supplies will likely flood the market, commanding unattractive prices. The choice of species to be utilized must, to a large extent, be made by the farmers involved in the cultivation with advice provided by either the Forest or the Agriculture Department.

Acknowledgements

This paper had been prepared during my 6-month tenure as Visiting Research Fellow at the Center for Southeast Asian Studies, Kyoto University from January to July 2003. I am very grateful to the Director, Professor Koji Tanaka, for the kind invitation to join the Center and Professor Isamu Yamada, my counterpart, for his guidance. Professor A. Terry Rambo of the Center reviewed the first draft of the manuscript and provided very useful and helpful comments. I thank him for his assistance and friendship. Finally I would like to acknowledge the contribution of my former colleagues at the Forest Department of the State of Sarawak, Malaysia in supplying me with information, which I requested for my research. The permission of the Agriculture Department and the Forest Department of Sarawak to use some of their photographs in this paper is gratefully acknowledged.

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