Community Biodiversity Development and Conservation Programme

Traditional Hill Rice Production Practices of Indigenous Communities in Sabah, Malaysia

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Abstract

The traditional hill rice agricultural practices of the indigenous communities of Sabah are aimed primarily at obtaining optimum yield in each of the particular ecosystems. These practices developed from their years of farming experience and interaction with nature. These practices are manifested in terms of rules, permissions are restrictions, ceremonies and rituals in each stage of cultivation cycle. The salient features of the practices include being in harmony with nature, deep sense of respect for other creatures and spirits, subsistence and sustainability, and in-built mechanism for the use and access of resources.

The traditional system shows changes and many of its salient features are slowly forgotten and discarded, thus contributing in some cases to land degradation. To assist farmers, adapt to the rapid agricultural transformation, further studies will be required to assess how this traditional practice can be integrated into the present-day agricultural system.

Table of Contents

1.0 INTRODUCTION

This report complements the report on the results of the crop diversity survey in preparation for developing *in situ* community conservation and development program and activities.

1.1 Background and Rationale

The indigenous communities, comprising of at least 39 ethnic groups (King & King, 1984) represent about 70% of the estimated 1.4 million people of Sabah (Dept. Statistic, 1991). The rest comprise of other ethnic groups such as the Malays, Chinese, Filipinos, Indonesians and Indians. About 80% of these communities live in rural areas and are mostly subsistence farmers, maintaining their crops through traditional agricultural practices. Both wet and hill rice is planted, supplemented with cassava, sweet potato, taro, corn and vegetables. The surplus from their farms is sold in the local market to provide them with much needed cash, fulfill the local demands for food crops, thus reducing the State's imports of food. While the role of the subsistence farmers is recognized by the government, there has been little respect and understanding of indigenous traditional practices. Instead, the drive towards high productivity, sometimes without considering sustainability, has prompted the Government to come up with research objectives and policies, which discourage traditional agricultural practices and traditional cultivars.

Cultivation of rice and other crops in hilly and forested areas has been portrayed negatively as a major contributor to the destruction of natural resources. The role it plays in household and national food security is totally disregarded by the state. So far, there has been no serious attempt to understand the traditional farming system locally, to come up with an unbiased and appropriate policy towards its development. At present, our knowledge of this farming system is fragmentary and incomplete (e.g., Mariam Abd. Latip et al., 1991). There is an urgent need to document and understand indigenous knowledge and practices and their application in present-day agricultural systems. There is a need to develop an approach that allows and respects the contribution of both the traditional systems and institutional systems.

1.2 Scope and Objectives

The report presents an overview of the common traditional practices among the indigenous communities associated with the cultivation of rice in upland areas. An initial assessment of the strengths and weaknesses of the traditional agricultural practices based on the concept of sustainable agriculture is discussed. Several aspects of the traditional system, which need further research, are highlighted. This study can serve as a basis for further detailed case studies.

1.3 Data Gathering

The report is based on data gathered through a statewide survey on crop diversity using open-ended questionnaire, supplemented by informal talks with farmers, observations, and in some cases through direct participation of farm activities.

A total of 788 respondents from 592 villages in 21 districts were interviewed (Table 1). Most of the respondents belong to the six main ethnic groups, namely the Dusun, Kadazan, Murut, Rungus, Bajau and Sungai communities (Table 2). More than 50% of the

respondents are older than 50 years--this intentional bias aimed at getting those who are knowledgeable in traditional farming practices. The respondents were either planting wet rice or hill rice together with other food crops. Most of them are full-time farmers, although part of those near urban centers are engaged in other economic activities as well. The ethnic groups Muruts, Sungai, Rungus and a large percentage of Dusun rely entirely on hill rice cultivation. The Forest Department estimated about 350,000 people involved in this practice in 1989. The acreage under this practice is estimated by the Agriculture Department to range from 10,000 to 20,000 hectares.

Table 1. Number of Respondent by District

DISTRICT	No of Villages	No of Respondent
Beluran	10	12
Kota Kinabalu	9	15
Kota Marudu	40	81
Kota Belud	37	46
Kuala Penyu	12	12
Kudat	18	26
Keningau	67	98
Kinabatangan	40	49
Lahad Datu	8	11
Penampang	33	50
Papar	35	55
Pensiangan	13	14
Pitas	3	5
Ranau	49	65
Sipitang	13	17
Tuaran	60	78
Tambunan	63	104
Tenom	8	12
Beaufort	2	2
Nabawan	11	13
Telupid	18	23
Total	549	788

Table 2. Number of Respondent by Ethnic Group

ETHNIC GROUP	NO OF RESPONDENT
Kadazan	47
Dusun	552
Murut	92
Bajau	13
Berunai	1
Rungus	27
Paitan	5
Tidung	1
Iranun	3
Iban	1
Kedayan	4

Idaan	3
Sungai	27
Others	12
Total	788

2.0 TRADITIONAL HILL RICE AGRICULTURAL PRACTICES

2.1 Introduction

The traditional hill rice agricultural practices among the different ethnic groups follow the same cultivation pattern, which is, based on natural knowledge gained from their years of farming experience. Some ethnic groups, however, have more elaborate practices. Although most farmers are aware of certain regulations, and rituals associated with their farming practices, the percentages of those still actively carrying out elaborate rituals during various cultivation stages are quite small, about 10%. The reasons for the decrease could be related to the influence of modernization processes and the adoption of new system of belief or religion.

2.2 Calendar and Seasons

The indigenous communities have their own traditional calendar based on the movement and phase of the moon, passed from generation to generation. The Kadazan and Dusun communities, for example, have established names for each phase of the moon (Table 3). The stars are also utilised for specific purposes. Every movement and change of phase of the moon has its own meaning and has in many ways influenced the indigenous communities' social, cultural and agricultural practices. Up to this day, a large portion of the indigenous communities still observe the shape of the moon to determine the right time to plant their crops in order to avoid or minimize pests and diseases and therefore get optimum yield for their crops. The Rungus believe that the right time to plant rice is at half-moon. At the same time, the movement of a group of stars, called *walatik* (Aries) and *mupuru-puru* (Globular clusters) is used to determine the seasons, whether it is going to be wet or dry.

In addition to the moon and the stars, changes in growth of certain trees are also used to determine the season, so that farmers can time their cultivation cycle precisely. For example, when a tree locally called *tombung* by the Dusun starts to flower, the wet season is coming. When the flower has fully developed, the dry season will follow, and it is time to burn the felled trees in their field. Similarly, the appearance of new leaves on a tree locally called *kundai* by the Murut indicates that the wet season has started and therefore it is time to plant.

2.3 Cultivation Stages

The cultivation of rice as the main food crop follows several basic stages -- field preparation, planting, tendering, harvesting and storing. On wet rice, the stages are quite standard -- ploughing, transplanting of seedlings, weeding, tendering (pest and disease control) and harvesting. The cultivation of other food crops is quite independent of the rice growth, since they are planted on different plots. Cultivation of hill rice also includes field selection, felling, burning, dibbling, tendering/weeding and harvesting. While rice is still in its early growth stage, other short cycle food crops like maize and vegetables are intercropped.

2.4 Rules/Regulations and Rituals/Ceremonies

Almost all indigenous groups have some kind of rules or regulations apart from ceremonies or rituals during each stage of the rice cultivation. The rules/regulations are described first, followed by their corresponding rituals/ceremonies.

2.4.1 Field Selection

Field selection is mainly confined to hill rice cultivation, because they must move on to a new plot every year or two. This practice is to allow the cultivated land to revert to its forested state during its fallow or rest period, which traditionally ranges from seven to ten years. A certain length of growing time is required by the trees to be able to eliminate and suppress existing weeds. The fallow period has gradually reduced from five to seven years due to pressure on land by increased population in certain areas.

Most of the indigenous groups put extra effort in ensuring that they have chosen the right plot to cultivate through the observance of various unusual signs of nature -- from birds, animals, insects, reptiles, rocks, plants and water. Among the Kadazan, Dusun, Murut and Rungus the sound of certain birds like the *lokiu, kopio toki, nahagan, mongontik kisi* and a few others indicate that the proposed field is not a good one. Similarly, the sight of certain animals (e.g., fox, bat, deer, rat, anteater), reptiles (e.g., snake, iguana) and insects (e.g., millipede, centipede) indicate the unsuitability of the field. The farmer must move on to another area. The field is also considered unsuitable if big rocks, big trees, stinging bees, or reddish waters are found.

Dreams also play a very significant role. After a farmer has marked a proposed site with a stick, he/she will be on the alert for any unusual dreams. Bad dreams signify that the site is unsuitable, and a new one is looked for. During the process of looking for an area, the farmer must refrain from cutting any roots and collecting wood.

Once a particular field has been chosen, a simple ritual, by chanting a prayer is performed to courteously ward off unwanted elements or spirits currently occupying the site. The Murut call this ritual *ampalang* -- where the farmer symbolically clears a small portion of the field and goes around the future field, at the same time peeling off the bark of tree trunks off to mark the border. To make extra certain that the site is satisfactorily chosen a more elaborate ritual called *mongolitan*g by the Dusun is performed. This involves the placing of four small sticks in a square on the cleared ground. If the stick shifts or moves from its original position, the area is considered unsuitable for farming. This ritual is repeated three times, and if the stick moves all the time, the farmer should look for another site. Another ritual called *momiropo* by the Dusun involves the use of a plant called *tolidus*. The plant is cut and left on the ground. If the stem of the cut plant starts to sprout, it is taken as a sign that the spirits inhabiting the site do not want to be disturbed. The ritual is also repeated three times and if the negative sign continues, then another area ought to be selected. If the farmer, however, still wants to use the area, then further ritual will have to be carried out. This will then involve the sacrificing of a chicken to appease and to request the spirit to move to another area, at the same time requesting that the farmer not be disturbed while working on the field. Apart from the offering of chicken, water-sprinkling ceremonies may also be carried out for similar purposes, locally called *mongakap* by the Rungus.

2.4.2 Clearing

The clearing of the field is usually done by chopping down small trees followed by the bigger trees a few months before planting. Fruit trees and some useful trees are left standing. Trees along streams or rivers are generally left alone.

Even if the site has been selected following the rituals, it is still uncertain whether the site is good until clearing has started. The Rungus for example still looks for unusual signs. A broken parang, a big hole in the ground, roots entwined with each other, or snake spotted are some reasons for abandoning the field. The Dusun farmer similarly stops walk when the parang used for clearing is broken.

Once the clearing has started, there are several things that the farmer should observe. Among the Dusun, the farmer should not sleep in the clearing site; eat in the field while walking; look for hair fleas in the clearing site; pull rattan across the field; peel a tree's bark and so on. These practices are meant to ward off back luck, which may befall on the crops later.

Before or after the clearing, a ceremony is held either to appease or ward off the spirits or as thanksgiving for the uneventful and successful completion of the job. The Kadazan and Dusun call this ceremony *mansalud* which is accompanied by the sacrificing of a chicken.

2.4.3 Burning

Once the trees on the cleared area are dry, burning can begin. To ensure that the fire does not spread to the surrounding areas, the edges of the field are cleared of debris. The burning process is also carefully executed to avoid destruction to the surrounding vegetation. A clearing about 3 metres wide is usually made along the perimeter of the farm to prevent the fire from spreading. A good burning would ensure fewer weeds at the early growing stage.

Before burning, certain signs will have to be observed. The presence of insects (millipedes and centipedes) and snakes. If these creatures are present, burning should not be carried out because the field will not burn properly. Among the Muruts, finding snake skeletons after the burning is a bad sign, and the area must be abandoned. But if the snake was burnt on the ground, then an appeasing ceremony can be carried out to ward off the bad omen. During the process of burning, sugar cane should not be brought in because this will cause incomplete burning of fields. According to farmers, sugar cane symbolizes wetness.

2.4.4 Dibbling and Planting

After a few days, once the burned field has completely cooled down, the planting of rice begins using a dibbling stick to poke a small hole on the ground, about 30 centimeters apart for the seeds to be planted. The work is usually carried out communally -- the men usually do the dibbling, and the women and children do the filling. Other food crops like maize, cassava, groundnuts, banana and all sorts of vegetables are also planted earlier or later, depending on the farmer's cultural choice. The most fertile part of the land is usually the site for more intensive mixed cropping. A farmer plant at least three varieties of rice on different areas of the field to ensure that at least one will survive should there be natural calamities, like drought or infestations by diseases or pests.

The timing of dibbling and planting is considered important to avoid pests and is usually governed by the traditional calendar and season. During the full moon for example, farmers believe there are a lot of pests and planting should be avoided. Only the owner of the field is allowed to bring in the seeds and distribute them to other people. The same person should bring the leftover seeds back home. Among the Murut, the remains of burnt animals and insects can be the starting points for dibbling. During the process of dibbling, if certain unusual signs or bad omens show up, like the sound of a particular bird or the presence of an iguana, the work must stop immediately and should be continued only the next day. To avoid these bad omens, dibbling must not be done too early or too late -- the appropriate time should be around 10 a.m. to 2 p.m. Similarly, if someone dies in the village, the work must be discontinued and carried out only after a certain period of time. It is believed that if this is not adhered to, the rice will not grow at all. After the dibbling has been completed, the dibbling stick should be placed upright in the field to ensure that the rice will grow well. Among the Murut, no one is allowed to go to the field or even pass by the field for 4 days after planting.

A day before the seeds is planted in the field a cleansing ritual called *momonod* or *morogop* by the Dusun and Murut, respectively, is carried out to ensure good seed germination. The ritual involves the sprinkling of water or chicken blood on the seeds, accompanied by sacred chants or prayers. The Muruts soak their seeds together with several types of wild roots in water overnight to enhance their germination rate. The Dusun uses water extracted from a tree called *somuru* for sprinkling.

Another ritual is usually carried out to ward off unwanted spirits, keep off potential pests, increase soil fertility and crop yield. Among the Kadazan and Dusun, the assistance of a *bobohizan/bobolian* or priestess is sought. The ritual involves the making of four small pickets in the form of a square in the middle of the field by the farmer, followed by the dibbling of seven holes inside the square and filling it with rice seeds while the *bobohizan* murmurs sacred chants. Among the Rungus, the holes are then sprinkled with chicken blood. After the planting is completed, some perform sealing and thanksgiving ritual called *monompon*. This involves piling down a short stick on the hole made by the dibble and sacrificing of a chicken. Among the Rungus, the farmers cover their face with charcoal as a sign that the planting is over.

2.4.5 Growth

The farmer is not allowed to go to the planted field for several days (between 3-7 days). No weeding is allowed before the rice grows. During the growing stage, creeping plants of all sorts (e.g., rattan) and roots are not allowed to be pulled out or dragged across the field. There should be no unusual activity going near the field, like barbecuing with animals, as this will attract pests. Among the Dusun, trimming of farmer's hair at this stage is forbidden, for it will stunt or hinder the growth of the rice. To prevent pest and disease infestation, the Murut scatters a type of pounded sour fruit called *liposu* in the field. Similarly, the leaves of a tree called *babas,* is soaked overnight, and the water sprinkled over the affected rice plant. This is believed to prevent maggot infestation as well. The Kadazan and Dusun stick a red palm leaf in an area affected by the red disease, caused by fungus. To ward off rats and insects, burning of tree roots, which produce strong smells are common. To control insect infestations, farmers burn and hang all sorts of creatures in the field. Among the Kadazan and Dusun, the burning and hanging of the skin of buffalo and the shell of a king crab attracts the insect away from the rice. Similarly, the Bajau uses frogs and the skins of cray fish to attract them. The Dusun hangs out cloth soaked with human urine to attract insects.

No ritual is necessary, if the rice grows well. If it is infested by a certain disease or attacked by pests, then a ritual called *mansalud* by the Kadazan and Dusun is performed to ward off these infestations. The ritual involves the sprinkling of chicken blood over the affected rice plant by a *bobohizan*. Seven feathers of the slaughtered chicken are inserted into sago's frond and piled on the ground while the *bobohizan* murmurs sacred incantation.

A simple ritual to increase soil fertility is carried out by the Murut. This involves the placing of several types of trees (*lolondom, kaliada, loupa, serai, lilitom, timpa & simal)* inside a spliced bamboo stem and placing it in the middle of the field and leaving it until the rain comes. The rainwater, after mixing with the concoction, will overflow to the field. Another ritual involves the sprinkling of water over the field -- the water coming from the river soaked with a type of leave called *diriu.*

2.4.6 Fruiting and Maturing

This stage is critical to farmers and they make sure that the rice is not disturbed, attacked by birds, pests or diseases. The common diseases are rice blast (caused by *Pyricularia oryzae Cav*.), brown spot (caused *by Helminthosporium oryzae Breda de Haan*) and sheath rot (caused by *Sarocladium oryzae Gum and Hawksworth*) similar to wet rice. The proper conduct of farmers at all times and security from outside intrusions is therefore very important.

Only the owners of the field are allowed to monitor the rice plant. If possible no one should be allowed to roam in the field and weeding is prohibited. There should be minimum activity going into the field, avoiding dragging of roots or wood. While scaring away birds from disturbing and eating the fruits, it is prohibited to make loud noises and using abusive words, for the birds will only increase in numbers. Strong smelling foods should not be brought to the field as they attract pests.

When the rice begins to produce mature seeds, a ritual called *monginggit* by the Dusun is carried out by a *bobohizan* to make sure that the rice stays healthy and protected from pests and diseases. The Murut has a similar ritual called *titiopo* to hasten the maturity process of rice. This ritual involves the planting of a plant (type not mentioned) in the middle of the field and bending the rice plant towards it while chanting a prayer. This is followed by a selection and harvesting of small amounts of rice, pounded and cooked for the family members to eat. When the rice is about to ripen, a ritual called *papataam* by the Kadazan and Dusun is conducted, to eliminate any unwanted elements associated with the rice. This involves the picking of a selected rice stock and throwing it away to the side of the field.

2.4.7 Harvesting

Harvesting of rice is very special to the indigenous communities. Only the family members are allowed to carry out the initial harvesting on the first day. The new rice should be cooked exclusively for the family members too. Rice harvested during the first day cannot be given away to other people. This is a sign of respect for the close relationship of the farmer with the spirit of rice. While harvesting, it is prohibited to make a lot of noise in the field or in their huts, as this is believed to anger the spirits of the rice and consequently decrease the volume of harvest.

The indigenous communities believe that, like other plants, the rice has a spirit, and it is this spirit which is responsible for the growth of the rice. When the rice is ready to be

harvested, a ritual called *magambambazon* by the Kadazan is carried out to inform *bambazon* or the spirit of the rice that harvesting is about to begin. The ritual is quite an elaborate one involving the preparation of foods, drinks, "sacred" water and gears for the *bambazon*'s army and lasts for three days. The *bobohizon* will start harvesting from the site identified earlier during the dibbling and planting stage ritual. Some rituals are, however, simple, mainly carried out as a thanksgiving to the almighty for the bountiful harvest and in certain cases to grant the spirit of the rice an opportunity to feed on the first food served during the farmer's family meal. Some farmers feed the *bambazon* once during the earlier stage or after harvesting, a ritual called *magavau* by the Kadazan, and this could also be quite elaborate and lasts for three days.

2.4.8 Storing

After harvest, the rice will be carefully placed in a wooden container inside a specially prepared storage hut. The hut is specially built to protect crops from birds, rats and other insects.

While storing the rice, fooling around and making loud noises are discouraged as this disturbs the spirit of the rice. Children and other people are usually not allowed into the hut.

Once all the rice is safely transferred to the storage hut, there is a simple ritual to invite the spirit of the rice to reside there until the next planting season is carried out. In certain cases, this ritual is carried out in combination with a thanksgiving ceremony, which is a joyous occasion for the farmer's family, relatives and friends. This festival is referred as the kaamatan or kokotuan by the Kadazan and Dusun.

2.5 Soil Restoration

Soil texture and fertility are usually maintained naturally by allowing the land a fallow period. For wet rice, the field is usually left to rest until the next planting season. Grass and weeds are allowed to grow, to be ploughed in and left to rot as natural fertilizer. Immediately after harvesting, buffaloes are allowed to roam in the field and to feed on still-standing rice stalks. Apart from accelerating the rotting of rice stalks, the animal's droppings will also contribute to the fertility of the soil.

For hill rice, the field is left to fallow for several years until the trees have grown back to a certain size after using it for one or two years. To accelerate the rejuvenation of the soil, certain leguminous root crops are planted immediately after the rice is harvested. Even during the clearing of the field, some special trees are left standing to provide shade for the food crops and later for the smaller trees. During the process of weeding, the farmers are selective in the types of weeds and plants that they pull. Unwanted grasses or small plants are not thrown away but spread out on the ground and left to rot. This provides a natural mechanism to control soil moisture, reduces soil erosion and later provides the much-needed nutrients for the growth of trees. Certain types of fast-growing trees (e.g., *pokudata, tapau, and randagong*) are allowed to grow among their crops to hasten the growth of vegetative cover of the field once left to fallow.

3.0 OBSERVATIONS AND DISCUSSION

From field selection to storage, it is observed that elaborate sets of regulations and rituals are intricately linked with the indigenous communities' farming activities. These

regulations and rituals, apart from the traditional calendar serve as a kind of "natural prescription" for ensuring that farmers get an optimum yield from the land, through careful selection of farm site, right timing of crop cycle and prudent management of soil fertility, pests and diseases. The associated prohibitions appear to be a built-in mechanism for controlling resource use and access, in this case the land and forest. The many rituals performed points to the intricate understanding of natural ecosystems, both physically and spiritually. For example, by courteously warding off unwanted elements or seeking permission to the use of a particular ecosystem, the indigenous communities recognise their intrusion to a natural ecosystem from the beginning. The rituals in a way provide them with an avenue to ensure that the altered ecosystem will not be to their disadvantage. In short, the traditional practice appears to have been systematically formulated in response to how the natural environment works. Knowing very well that their livelihood depends on the wellbeing of the land, their approach towards resource conservation is pro-active in nature.

The traditional farming practices of the indigenous communities of Sabah are not very different from other traditional farming communities in the tropics (Spencer, 1966). The hill cultivation of rice for example shows striking similarity with those indigenous communities in other part of Malaysia (Sarawak and Peninsular Malaysia) and Asia. The practice of natural soil restoration using fallow periods and biomass and nutrients recycling through crop and weed residues; mixed cropping for increased food production and optimum utilization of land, apart from providing good ground cover to prevent nutrient loss through run-off; and usage of natural means in soil fertility, pests and disease management in these countries correlate well with those in Sabah. The indigenous communities of Sabah's special relationship with their land, which they see as being imbued with a spirituality and sacredness not generally comprehensible by others is shared by other indigenous communities in Asia (Nicholas & Singh, 1996).

On the question of sustainability, there is growing evidence to suggest that the traditional farming practices in hill areas fulfill certain critical criteria for a sustainable agroecosystem. These are related to the low requirements for nitrogen and phosphorous as external subsidies; efficient use of available resources; protection from biological invasion; and low risk. According to the Brundtland Report (United Nation's World Commission on Environment and Development, 1987), the strategy for sustainable development aims to promote harmony among human beings and between humanity and nature. The regulations and rituals associated with the traditional farming practices of the indigenous communities of Sabah certainly have something to contribute to the understanding of harmony between humanity and nature. In fact, the Brundtland Report recognizes the critical role played by indigenous communities in formulating policies about natural resource development in their areas.

Presently, the status of traditional agriculture practice, especially hill cultivation or shifting cultivation, is still largely considered uneconomic activity due to the low return compared to the high labour input systems. It is generally viewed negatively by governments as inherently destructive to the natural environment (e.g., Hatch & Lim, 1979; SFD, 1989). The relatively low economic efficiency of the agricultural system is related to a large extent to the length of the agricultural cycle, the optimum found out to be a 10-year cycle (Ramakrishnan, 1995). The land re-use factor of 0.1 or 0.2 for 10- or 5-years cycle for hill rice cultivation is clearly at a disadvantage if compared to a re-use factor of 1 for wet rice cultivation. In the absence of available land for wet rice cultivation, the existing hill cultivation practices provide farmers with most of their dietary requirements and some cash. Given an appropriate population-land ratio and access to sufficient forest land to permit an adequate fallow period between farming cycles, hill cultivation is found to be genuinely adaptive of

tropical rain-forest environments (e.g., Cramb, 1989; King, 1988, 1995; Chin, 1985). As hill rice is the staple food for a large percentage of the rural population, it is expected to remain an important crop in Sabah (Mariam Abd. Latip *et al*., 1991). Studies by Benong et al., (1989) which showed reasonable yields between 1.2-3.8 t/ha from 23 local, early maturity hill rice varieties, suggests its potential for further improvement.

Recognising the problems and distortions in terms of economic yield and land degradation associated with hill cultivation due to increased population pressure, some countries and institutions have tried to come with other alternatives, based on agroforestry concepts -- which is the deliberate association of trees, shrubs, crops and lifestocks -- but is yet to show any significant impact (Ramakrishnan, 1995). Some of the earliest recognised forms of agroforestry by farmers involved slight modification to the hill cultivation practice to include planting of tree seedlings with food crops. As the tree canopy develops and brings to shade the annual crops, the farmers move to another area for cropping. Using this system of "Taungya," large areas of teak plantations have been established in Indonesia and Nigeria. The introduction of a variety of legumes during the cropping and fallow period could accelerate the restoration of the nitrogen in the soil. It is recognised that while short- and medium-term strategies may emphasize redevelopment of the shifting cultivation itself, long term strategies may consider alternative land use systems integrated with other kinds of cultivation and non-farming economic activities (Ramakrishnan, 1995; King, 1995). The objective there should be to relieve the pressure on land for hill cultivation so that an appropriate length of the fallow cycle can be sustained.

4.0 CONCLUSIONS

The traditional hill rice agricultural practices of the indigenous communities of Sabah are primarily aimed to obtain optimum yield from a particular agro-ecosystem. The salient features of these practices include being in harmony with nature, deep sense of respect for other creatures and spirits, subsistence and sustainability and a built-in control mechanism for the use and access of resources. These practices are essentially maintained and developed by communities without much intervention from the government. These practices are undergoing changes and many of the salient features are slowly forgotten and discarded, thus contributing in some cases to land degradation.

5.0 RECOMMENDATIONS

While some of the practices are easy enough to understand, some are, however, quite difficult to comprehend. More in-depth research possibly through case studies will be required to validate and understand the significance of these practices. For example, why certain type of trees is useful, why planting is done at a certain time of the day, why other people are not allowed in the field, what is the role of priestess, what are strengths and weaknesses of the in-built natural checks and balances, control, use and access of resources and so on.

The appreciation of this traditional practice in terms of its ecological, cultural, social and economic values to farmers needs further assessment. Some basic calculations will need to be carried out to determine how much is derived directly from the land per farming cycle -- in terms of its monetary values. Is the output justified considering that the land can be used for other purposes. Besides purely economic reasons, other reasons why farmers

continue or discontinue to maintain this practice need to be understood further to help in formulating an appropriate policy for its development.

In relation to hill rice cultivation, more comprehensive study will need to be carried out to determine how the farmers can be assisted in improving their varieties to produce high and stable yields suited to their particular environment and at the same time maintaining their diversity and cultural practices.

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