Agricultural strategies and land titles in Kampung Johan Jaya – a settlement within a forest reserve



Group IV

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Abstract

The objective of this report is to investigate how residing within a forest reserve effect the practiced agricultural strategies and whether these would change if villagers were granted land titles. Natural and social science methods were applied using quantitative and qualitative approaches.

The Forest Department neither have management plan nor enforce any legislation and farmers have cleared the forest. The agricultural strategies are a result of living within a forest reserve, where cultivation and settlement are illegal. In the study area three agricultural strategies are practiced. The first strategy is rubber cultivation as this indicates that land is occupied while at the same time being labour and capital extensive. The second strategy is to avoid traditional fallow to prevent forest regeneration. The last strategy is focusing on subsidised crops to obtain financial support. According to the villagers they would change their agricultural strategies if they were granted land titles.

Keywords: Forest Reserve, agricultural strategies, land tenure, land title.

Fact sheet



Area	329.750 sq km
Population	22.229.040 (2001 est.)
Population growth rate	1.96% (2001 est.)
Currency	Ringgit (MYR)
GNP	3.600 USD / 14.128 MYR (1998)
GNP growth rate	5.8 % (1990-1997)
Population below poverty line	6.8 % (1997 est.)
Land use	Arable land: 3% Permanent crops: 12% Forests and woodland: 68% Other: 17% (1993 est.)
Agricultural products	Sabah: subsistence crops, rubber, pepper, timber Sarawak: rubber, pepper, timber Peninsular Malaysia: rubber, palm oil, cocoa, rice
Climate	Tropical: annual southwest (April-October) and northeast (October-February) monsoons

Sources: www.cia.gov (10.12.2001-12-10), www.um.dk (10.12.2001).

Acronyms

DLS	Department of Land & Survey
DO	District Office
DOA	Department of Agriculture
FD	Forest Department
FR	Forest Reserve
JKKK	Village Security Development Committee
KPD	Koperasi Pembangunan Desa / Rural Development Corporative
LA	Letter of Administration
NTFPs	Non-Timber Forest Products
PACOS	Rakan Membangun Masyarakat / Partners of Community Organisations
PRA	Participatory Rural Appraisal
SSI	Semi Structured Interview

Preface

The purpose of this report is to be a part of The Danish University Consortium on Sustainable Land Use and Natural Resource Management (SLUSE) joint course in 2001. The report is the outcome of research conducted from 12.10.2001 to 2.11.2001 on a fieldtrip to Sook Plain, Sabah, Malaysia.

The target group of this report is everybody with an interest in land use strategies, land tenure and rural development. Particularly the report is aimed at government officials from Sabah, natural resource management researchers and DANCED staff.

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1. Introduction

Since the Earth Summit conference in Rio in 1992 environmental problems and protection of the biodiversity has been on the global agenda. Especially the environmental condition of third world countries has become a public issue. A major focus has subsequently been put on the values of the natural resources and the possibilities of protecting rare and endangered species. One of the reasons for this increasing awareness concerning natural resources can be found in an accelerating deforestation¹ and forest degradation² caused by exploitation. This exploitation can often be related to logging or agricultural practices.

Deforestation can be seen as an effect of intensification of agriculture, where the fallow period decreases. This decrease is often related to population pressure in a given area and thereby increasing demand for agricultural products (Wunder 2000). In an attempt to conserve a large variety of flora, fauna and ecosystems, protected areas such as national parks and forest reserves are often established. Consequently, settlement and cultivation within these forest reserves is prohibited, but as local farmers often rely on utilisation of forest resources this can lead to conflicts with authorities (Neumann 1998).

The rural sector in developing countries as well as in newly industrialised countries (NIC) is a sector in transition and the intensification and commercialisation of agriculture is seen as crucial elements in the process of agricultural and thereby economic development. This transition also takes place in Sabah in the Malaysian part of Borneo. Here, approaches to intensify agriculture often include further intensification of existing lowland rice cultivation and replacement of shifting cultivation. In the process of intensifying agriculture the Government put a lot of effort into discouraging shifting cultivation by supporting different agricultural cash crop schemes such as wet rice production (Løvenback *et al.* 2000). According to Ngidang *et al.* (2000) farmers have a need for economic means. Farmers are therefore very interested in becoming a part of one of these cash crops promoting schemes. In regard to this, land tenure is a crucial issue, especially for farmers living within boundaries of protected areas - such as forest reserves. Often most of this land cannot be titled as cultivation in such areas is illegal and farmers are therefore not

¹ Deforestation refers to change of land use with depletion of tree crown cover to less than 10 percent (FAO 1993). ² Forest degradation refers to changes within the forest class (from closed to open forest) which negatively affect the stand or site and, in particular, lower the production capacity (FAO 1993).



eligible for government subsidies and investments in landesque capital (Løvenback *et al.* 2000). Land tenure is moreover a common constraint in the process of intensification as no farmer without land title is willing or able to invest effort and resources if he fears that he may be forced off his land (Ørskov 1993).

Before the Malaysian Government introduced the Land Ordinance³ the Adat system⁴ determined land tenure in remote areas of Sabah. According to this traditional system arable land was seen as common property and all members of a village had the right to use land for cultivation. Adat gave the individuals rights to use the land, meaning that they could freely clear the forest and cultivate (Long *et al.* 2000). The Land Ordinance is now slowly replacing the Adat and allows land to be privatised, inherited and commoditised. Land titles secured through the new Land Ordinance further opens up for the possibility of obtaining credit from financial institutions. Officially titled land furthermore provides a certain sense of security for the farmer (Long *et al.* 2000).

However, in areas where titles cannot be granted as on officially protected land, the Adat is still the prevailing system among the local villagers. As a result of this situation the existing land tenure system in Sabah is a mix of traditional land tenure systems and modern law. Consequently, this mix results in complex land tenure systems, property and exploitation rights. It furthermore creates differences in how locals and officials perceive land rights and in some cases this results in conflicting situations.

The main focus of this report will be dealing with the consequences of living on land under a certain administration – in this case a forest reserve - without the possibility of obtaining official land titles in accordance to the Land Ordinance. How will this situation affect the land use strategies practised by the farmers? This issue will be examined through a case study of the Malaysian village Kampung Johan Jaya situated within the Sook Plain Forest Reserve.

⁴ The Adat functioned as a holistic system of rules and customs, which determined how the land should be cleared and cultivated. The Adat varied from village to village and tended to change over time. It allowed land ownership or use rights through investment of labour (Long *et al.* 2000).



³ The Land Ordinance is based on British rules and is defined as the land titling process partly based on the recognition of customary rights. It allows land ownership through title grants for a time period of 99 years (Long *et al.* 2000). Land titles are acquired through applications to the Department of Land & Survey.

1.1 Objectives

The objectives presented in the synopsis prepared before entering Kampung Johan Jaya was concentrating on the conflicting situation between the settlement within the Sook Plain Forest Reserve and the official forest management. The situation was quite different than expected, as no visible conflict was existing. We have therefore adjusted the objectives according to the actual situation experienced in the field.

The overall objective to be analysed in this report is as follows:

"How is residing within a forest reserve reflected on the agricultural strategies practised by the farmers and will these change if land titles were granted"?

When using the term *agricultural strategies* in this report we are referring to the farmers' motives for cultivating a certain crop.

In order to study the overall objective we find it appropriate to formulate four specific objectives:

- 1. To assess the physical and human environment and the land use systems of the settlement. The agricultural potentials will be addressed.
- 2. To assess the management of Sook Plain Forest Reserve.
- 3. To assess and evaluate agricultural strategies practised by the people of Kampung Johan Jaya and the effect on the Forest Reserve.
- 4. To assess land tenure problems and analyse the consequences to the villagers.

1.2 Study area

Kampung Johan Jaya is located within the eastern block of Sook Plain Forest Reserve (FR)⁵. This Reserve is to be found in the Sook sub-district in the southwestern part of Sabah State on

⁵ The Forest Reserve is divided into four blocks; Northern, Southern, Western and Eastern Block.

³

Borneo, Malaysia.



Keningau District - Sook & Nabawan Sub-Districts



The study area is divided in two hamlets, Kampung Johan Jaya and Kampung Terlabong. The hamlets are located within ten minutes walk from each other and when we refer to Johan Jaya, Terlabong is included.



Map 1.2: Map of Kampung Johan Jaya

In the period from 1969 to 1973, a population of 336 persons settled in the area that was to become Kampung Johan Jaya. These newcomers came from the hilly Ranau, which is located north of Sook District. Due to population pressure and lack of arable land, some of the inhabitants of Ranau had to find new land. Muruts originally owned the land of Johan Jaya, but

they did not cultivate the land, they only used it for hunting. The area was therefore given for free to the Dusuns from Ranau⁶ and Johan Jaya was established. When these people took over the land it was covered with virgin forest. The original vegetation was lowland rain forest dominated by canopy-emergent dipterocarpaceae tree species, which form the canopy in a height of 45-60 meters. There exist more than 350 species of this native tree in Sabah, which are divided in fast and slow growing species (Brookfield *et al* 1995). The Johan Jaya population cleared the forest and the trees were either burned or used for building houses. In the beginning of the establishment shifting cultivation was practised and hill rice was the main cultivated crop.



Photo 1.1: Kampung Terlabong.

Today the village of Johan Jaya has a population of 184 people with 12 households in Terlabong and 15 in Johan Jaya. The majority of the adults in Johan Jaya are small-scale farmers and their main cultivated crops are rubber trees (*Hevea brasiliensis*), hill and wet rice (*Oryza sativa*) and yam (*Colocasia esculenta*). The farmers have over time transformed the farming system from shifting cultivation into permanent farming on fixed plots. The village area and fields cover an area of approximately 810 ha.

⁶ The population in the Sook area is a mix of Muruts and Dusuns.



Two social institutions are represented in the village, the Headman and the Village Security and Development Committee (JKKK). The Headman is appointed by the Government and has the overall responsibility of social affairs within the village. The JKKK is dealing with development issues in the village and is elected by the villagers.

In December 1969, the Sook District Forest Department (FD) transformed the area into a Class Four amenity forest reserve. This was done due to flood plain forest with unique vegetation and endangered species (pers. comm. DLS, Kota Kinabalu and FD, 2001). Class Four forests are protected due to aesthetic value and cannot be entered without permission (Unchi *et al.* 2000). This basically means that the villagers of Johan Jaya are living and cultivating illegally within the FR and therefore they cannot obtain title on their land. They are further not entitled to receive government funds in order to develop the village. Nor are they able to participate in any governmental agriculture schemes or receive subsidies.

2. Methodology

During the fieldwork we practised methods of both general and specific character. The first part of this chapter deals with the general methodology while the second part describes the specific methods used to collect data in order to analyse and discuss the objectives.

2.1 Inter-disciplinary group-work

Development problems regarding forest reserve management and land tenure consist of both natural- and social science related issues. To be able to address the different layers of causal relationships, a holistic and interdisciplinary approach is needed and researchers from different scientific disciplines are essential (Mikkelsen 1995).

Prior our departure to Malaysia we created three sub-groups in which Malaysian and Danish students should work together. The overall intention of this sub-group division was to prevent writing a report representing the lowest common denominator within the group, but rather making the best possible use of the existing expertise and experiences from the different disciplines and group members.

The sub-groups were formed on basis of whether it was a natural- or social science related group (table 2.1). Two natural science groups were formed; one responsible for forestry and the other for agriculture. This division was however difficult to maintain because the reality in the field was different than expected. Consequently the forestry and agriculture groups worked together on several tasks. A time schedule for the fieldwork was also prepared (Appendix A).

Subgroup	Responsible	Tasks
		Interviews regarding the forest;
Forestry	Urban Planner, Environmental	Transect;
	Biologist & Forester	Field observation (forest);
		GPS-mapping;
		PRA (mapping & ranking)
		Interviews regarding agriculture;
Agriculture	Two researchers from Environmental	Soil sampling;
	Studies & one Agronomist	Field observation (agriculture);
		PRA (mapping & ranking)
Socio-economics and legal-institutional	Geographer/International	Interview regarding socio-economic
framework (socio-eco.)	Development Studies,	and legal-institutional issues;
	Geographer/Environmental Studies,	Questionnaires;
	Sociologist & Lawyer	Field observation (village);
		PRA (mapping & ranking)

Table 2.1: Sub-group composition and tasks.

2.2 Inter-cultural group-work

During the SLUSE course we have not only been working inter-disciplinarily, but we have also been working inter-culturally with students from Malaysia. This has been very interesting and challenging, as the procedure of group-work turned out to be somewhat different from our experiences from Danish universities. An obvious difference between our group and the Malaysian counterparts was that they had a group leader, which was a new concept for us.

Working with the Malaysian counterparts it further became clear to us that an internal "age- and experience hierarchy" was present within their group. This made to a certain degree the subgroup discussions a bit complicated as the "lowest" in the hierarchy found it difficult to make decisions on their own without consulting the group leader.

2.3 Use of interpreters

Working with interpreters was a challenging and educational experience. We find it important for a good translation to educate the interpreters and introduce them to the purpose and objective of the study. This was proven to us during the preparation of the participatory ranking. Here we were very persistent in telling the interpreters what the purpose of the ranking was and we further made a test of the ranking situation with the interpreters acting as local farmers. This ranking session turned out to be very positive and the job done by the interpreters was very satisfactory. However, we were not consistent in doing this training. We suspect that this might have resulted in un-precise translations or sorting out certain information the interpreters considered of no importance for our interviews. If the interpreter translates everything said by the respondent – including the introducing small talk as well as statements not directly related to the questions - the interviewer have the possibility to trace new, interesting topics for further investigation. We are further convinced that a precise translation can give the best preconditions for later interpretation and analysis of the statements given during an interview.

2.4 Description of methods

As mentioned in section 2.1 the different issues of this report have been studied by more than one person and by different disciplines. This has contributed to overcome disciplinary biases and improved the validity of the data. This way of using different methods and strategies is known as *data triangulation*. In our case we have been using two types of data triangulation: the

"investigator triangulation" meaning that more than one person examines the same situation and the "discipline triangulation" meaning that a problem is addressed with departure in different disciplines (Mikkelsen 1995). Following methods were therefore applied in the research.

2.4.1 Interviews

Quantitative and qualitative interviews were made with several stakeholders in order to obtain background information about the village and to go in depth with some of the more sensitive issues such as people living illegal within a forest reserve and their future situation. The best way to get to know people and the motives for why they act as they do is through dialogue. In an interview conversation the researcher listens to what people can tell about themselves, hear them express their views in their own words, learn about their working situation and get an insight about their hopes and wishes (Kvale 1996).

2.4.2 Quantitative household survey

A complete household survey including all 24 occupied households was conducted in Johan Jaya. In the original assignment the settlement was described as a community consisting of three villages (Johan Jaya, Terlabong and Nukakaton). Nukakaton was however excluded from the study as this village has their own headman whereas Johan Jaya and Terlabong share the same headman and Nukakaton was situated rather far from the other two villages. Other issues than the FR were more prevalent here such as a scheme of large-scale tapioca production and a governmental drainage scheme.

The objective of the household survey was to gauge quantitative information on physical as well as socio-economic issues within the village such as demography, income, employment, and land use activities and the villagers' use of the forest. It was moreover a method to gain a general idea of how the local villagers perceive their livelihood and future within the forest reserve and to reveal how the FR is managed. During the first two days in the field we made six tests of the questionnaire. After the tests irrelevant questions were deleted and questions leading to misunderstandings was rephrased (Appendix B).

When half of the questionnaires were conducted we realised that almost all respondents was the head of the household. If we had continued we would have ended up with a household survey mainly consisting of elder male respondents. Representatively this was not considered appropriate. However, it was not polite to visit a household for the first time and ask to see another person than the head of the household. The solution was to continue interviewing the head of household until we had completed the demographic profile of the village. Using the demographic profile of the village we calculated how many elder women and how many younger respondents we needed to make the questionnaire representative. The first part of the questionnaire consists of basic information mainly concerning the entire household and this was not necessary to repeat. However, the second part of the questionnaire, which contains questions regarding local perception, was hereafter conducted with people representing the "missing" demographic groups. In total 40 questionnaires and perception parts were conducted. The household survey was completed on a relatively early stage of the fieldwork and this made us able to go through the results to detect common trends or interesting issues for further investigation in the qualitative interviews. After the conclusion of the fieldwork the questionnaire was analysed using the SPSS-programme⁷.

2.4.3 Qualitative Interviews

Semi-structured interviews (SSI) with key-informants such as government officials, the local Headman and the chairman of the local JKKK were conducted to obtain specific information on various issues such as the establishment and management of the FR. We furthermore decided to do qualitative interviews with seven pioneers and six young villagers to go in-depth with some of the issues touched upon in the questionnaire. The objective of this qualitative method was to reveal perceptions and personal opinions that are not always possible to cover through questionnaires and official documents.

SSI guidelines were prepared for interviews with the Forest Department (FD), the Department of Land & Survey (DLS), the two Departments of Agriculture (DOA) in Sook and Keningau respectively, the District Office (DO), the Koperasi Pembangunan Desa/Rural Development Corporative (KPD)⁸), Rakan Membangun Masyarakat / Partners of Community Organisations

⁷ This was done by the Malaysian group in Kuching.

⁸ KPD is a statutory body of the government that deals with socio-economic problems of the rural population.

¹⁰

(PACOS)⁹ and the in-depth interviews with local villagers (Appendix C & D). Unfortunately, we often did not have the required time available during the interviews with government officials to complete the prepared guidelines, as these interviews were arranged for all five SLUSE-groups visiting the Sook District and were held on a relatively general level. This further caused that these interviews became more or less structured rather than semi-structured.

2.4.4 Focus group interviews

As a part of the SSIs we also conducted three focus group interviews. The first two groups were homogenous and consisted of four elder men and women and four young men respectively. The third group was a mixed group of young and elder, men and women; in total eight people.

The main topics of these focus group interviews were the agricultural practices, opinions regarding land tenure and future aspects. One of the advantages of doing interviews like this is that the researcher can be provided with valuable information in shorter time than by conducting single interviews with key-informants (Mikkelsen 1995).

2.4.5 Participatory methods

Participatory Rural Appraisal (PRA) is a growing family of approaches and methods to enable local people to share, enhance and analyse their knowledge of life and conditions. The essence of PRA is changes and reversals – of role, behaviour, relationship and learning. The researcher does not dominate and lecture but instead listens and observe (Chambers 1997). The PRA methods have mainly been practised as supplement to the questionnaires and qualitative interviews in the field.

Participatory mapping

The PRA mapping method was used in order to gain knowledge about the villagers' own perception of the physical structure of the area and areas for future agricultural activities. The intent of a mapping session like this is that we as researchers only ask questions and observe and the participants actively discuss the questions and hereafter draw the outcome on the map (Mikkelsen 1995). This procedure was also practised during the session.

⁹ PACOS is a Malaysian NGO dealing with development of indigenous communities.



The participants were selected on basis of gender and age. Age was important, as we wanted villagers that had knowledge about the land, the history of clearing the forest and the distribution of fields. The participants therefore had to be around 50 years of age. However it turned out to be quit difficult to gather elder women for our participatory sessions and because of this the female participants did not fully comply with our criteria. Gender was important, as we wanted to investigate if differences in the male and female perception of the physical environment existed. Furthermore, we wanted to avoid age and gender domination by some of the participants. Two mapping sessions were therefore conducted at the same time, one with four women around 40 years of age and one with four men around 50 years of age.

The participants were asked to draw the following legends:

- Roads
- Gates of Johan Jaya
- Rivers, bridges and ponds
- Headman's house
- The houses of the participants
- The fields of the participants
- The farming area of the village
- The boundaries of the FR
- "Good" and "bad" soil
- Area suitable for large scale irrigated rice production
- Sources of water

It was further possible to add other comments/legends on the map (Appendix E)

Participatory ranking

Ranking as another PRA methods was also conducted with villagers of Johan Jaya. The objective of this ranking was to get an idea of how the locals perceive the importance of the crops they cultivate and which strategies are underlying their choice of crops. As with the mapping, the ranking session was conducted in two groups with three women in one group and three men in the other. In this session we invited different age groups to participate in the ranking in order to investigate possible differences in issues such as choice of crops between the different age

groups. Again, it was not possible to involve elder women – they simply did not turn up for the session and the actual age division was not as large as intended. The age of the women ranged from 30 to 47 years. This was however not a problem for the male ranking session, here the age ranked from 20 to 72 years.

The fact that the participants actually did not comply with all our criteria could have had an impact on the actual results we got from the ranking. The knowledge and perceptions of the younger might differ from the elder. When one group is not represented in the session it will be obvious to conclude that it has an effect on the results.



Photo: 2.1: Ranking session.

The actual ranking consisted of organising drawings of crops in the order from one to ten according to criteria decided by the participants themselves. The difficulty consisted in making the participants understand the concept of criteria. Once all participants understood the concept we could stand back and observe the interesting discussions regarding the importance and strategies behind different crops. In order to investigate the impact of lack of land title and the farmers strategies, two different scenarios were introduced: A present scenario with no land title and a future scenario imagining possession of land title.



2.4.6 Transect and field observation

A transect was conducted to determine the vegetation and land use in the study area and to investigate whether there was any forest left. The village has an oblong structure stretching along a road. Therefore it was decided to make the transect perpendicular to the road from one end of the area claimed by the village to the other. The starting point was selected approximately in the middle of the village. A straight line was cut through the vegetation and for every 50 meters plant species were recorded and vegetation was described 5 meters to the left and right of the sampling point (Sutherland 1996). The transect line was also used for the soil sampling (section 2.4.7).

Two additional transects were planned in order to examine the area near the boundary of the Johan Jaya claim. However, this was not possible due to the limited timeframe, but we realise that further transects would have given us a more representative result.

Field observations with a local farmer were conducted in order to get an overview of the study area. These walks focused on the location of fields and cultivated crops to help the group understand the agricultural practises in the area. In total six field observation walks were carried out with the overall purpose of trying to cover the entire area claimed by Johan Jaya. During these walks mapping of the area was conducted using GPS and drawing sketch maps. The GPS mapping was used to make a map of the claimed area (Chapter 3). Small informal interviews were carried out along the way in order to increase the understanding of the physical environment.

2.4.7 Soil sampling

As the agricultural capability of the soils in Johan Jaya is an important factor for agricultural intensification, soil sampling was done in order to determine the fertility of the soil. The transect line described above was used for the soil sampling. Soil samples were taken with an auger in the range of 0-15 cm, 15-30 cm and 30-50 cm, every 200 meters on the transect. The transect went through the area identified by the villagers as a potential area for large scale irrigated rice production. Thereby, it was possible to assess the soil capability to support such a rice scheme.

Kommentar [TJ1]: Til litteraturlisten

Kommentar [TJ2]: Koordiner med Irene

Soil sampling was also conducted in a rice and a yam field as different soil colours were identified during field walks.

After field sampling the soil were air-dried and the samples were brought back to Kuching and analysed by our Malaysian counterparts. Here the soil samples were tested for pH, colour and the nutrients nitrate (N), phosphorus (P) and potassium (K) using the Thai soil test kit (Appendix F).

The group could have done additional soil sampling in the entire area of the Johan Jaya claim in order to make the sampling more representative. But as with the transect it was assessed that the soil samples were not as important to the overall objective as further interviews with villagers. If the above mentioned additional two transects had been conducted the soil sampling would also have been done on these and this would have raised the value of the results.

2.5 General bias and validity of data

It is important to be aware of possible biases as these can influence the outcome and validity of the collected data. First, we got the feeling once interviewing local villagers that some of them had high expectations that we were able to help and improve their current situation. This optimism could have had an effect on their response, as they might have been biased or exaggerating their statements. Government officials also have a certain point of departure or political agenda that influence their answers and statements. These different agendas are not necessarily influencing the report in a negative way, but we still find it important to be aware of this once analysing the different statements and making conclusions on basis of these.

3. Results and discussion

A main issue in this chapter is the adaptations and strategies underlying the land use systems practised by the Johan Jaya farmers living within the Sook Plain FR. Another issue is to investigate the importance of land titles.

3.1 Land use strategies

As farming is the primary occupation in Johan Jaya it is an important foundation for the livelihood of the majority of villagers. Today the main cultivated crop is rubber, which is grown in plantations and occupies large areas of arable land. Rubber is the farmers' main cash crop and provides them with a monthly income. The management of a rubber plantation is cost-efficient as fertilisers only are used in the initial phase. After 7-8 years the first tapping of rubber is possible and a properly managed rubber tree can be tapped for 30 years and one person can maintain a rather large area (pers. comm. local respondent, 2001; Sabah Rubber Industry Board, 2001; Dove 1993).



Map 3.1: Land use in the Eastern block of Sook Plain FR.

If indigenous forest was to be found within the FR, the FD might enforce the Forest Enactment¹⁰ and emphasise that the villagers are cultivating illegally within the FR. As a countermove, the farmers' strategy is continuously cultivation of all the land in order to prevent the forest from regenerating. The extensive rubber production keeps the area permanently cultivated and thereby manifesting their claim to the land (Map 3.1 & Photo 3.1).

Kommentar [TJ3]: Skal Reserve stå med stort?



Photo 3.1: Rubber production in Kampung Johan Jaya.

Another argument for planting rubber is to make the area as "unattractive" as possible by leaving no vegetation worth of preservation in the area (Horowitz 1998). As manpower and credit are major constraints for farmers in Johan Jaya, rubber production is an obvious crop to choose as it has low labour and investment requirements. The farmers' situation forces them to practice this strategy even though rubber production is not very profitable. This situation and the resulting strategy can be seen as a constraint on development, as the farmers choose a crop not because it is maximising their profit but in order to secure their land.

¹⁰ The Forest Enactment of the state of Sabah (1968) allows locals to extract Non-Timber Forest Products (NTFPs) from forest reserves for own consumption if they first have obtained permission from the authorities. On the other hand locals are not allowed to hunt, clear and cultivate land within a FR; if they do they will be fined (Unchi *et al.* 2000).



Gender	Women			Men				
Criteria	Fast	Conti-	Good	Own	Own	Income	Labour	Land
	return	nuous	market	consump-	consump-			security
Rank		yield		Tion	tion			
1.	Wet rice	Rubber	Rubber	Hill rice	Hill rice	Yam	Rubber	Rubber
	Hill rice				Wet rice		Banana	Wet rice
							Fruit	
2.	Corn	Hill rice	Yam	Wet rice	Yam	Rubber	Yam	Fruittrees
					Tapioca		Tapioca	
					Corn		Pineapple	
3.	Tapioca	Wet rice		Tapioca	Tobacco	Banana	Wet rice	Banana
					Banana		Hill rice	
					Fruit		Corn	
4.	Yam	Yam		Corn	Corn	Fruittrees	Tobacco	Pineapple
_					D 1			
5.	Tobacco			Banana	Pineapple	Corn		Hill rice
								Corn
-	5			D' 1		D' 1		
6.	Banana			Pineapple		Pineapple		Тарюса
						Tapioca		
7	D'							N
1.	Pineapple							ram
0	Dubbor							Tobacco
0.	Kubbei							TODACCO

Table 3.1: Results from ranking sessions.

The participants chose their own criteria for their ranking of crops.

As shown in table 3.1 rubber was by the men chosen as the most important crop regarding land security and the low labour requirement. For women rubber is important as the main income source and important due to continuous yield. Besides rubber trees the farmers also grow other long-term crops such as banana, pineapple and other fruit trees – however this is only a small-scale production and mostly for own consumption. Farmers are further cultivating hill and wet rice on small plots for own consumption as well – as indicated in table 3.1 by both groups. The rice production functions as a risk aversion strategy, as it is seen in many subsistence economies (Ørskov 1993). For a subsistence farmer food crops for own consumption are important in case the cash crop harvest are destroyed or fails.

The Johan Jaya farmers do not practice fallow in the traditional manner, as forest hereby would regenerate and cause a risk to the farmers. This can thereby be perceived as another strategy practised by the farmers. However, some of the farmers perceive parts of their rubber fields as fallow. According to Brookfield (*et al.* 1995) rubber can also be seen as a sort of fallow in a more intensified fallow system.

A farmer told us that the crops chosen by farmers depend on the DOA and the crops this Department choose to subsidise. This farmer would like to grow other crops - but with the access to subsidies the choice fell on yam. It should be noted that even though Johan Jaya is located within a FR they still receive subsidies for a local yam project. This will be discussed later in this chapter. It is therefore reasonably to suspect that the choice of crops grown by farmers in Johan Jaya is closely connected to what crops the DOA chooses to subsidies and this is therefore influencing their agricultural strategies.

In table 3.2 we have synthesised the above described land use strategies. From the table it is evident that the land use strategies imposed by the farmers are not ideal, not from a local nor from an official point of view. The disadvantages are comprehensive. The consequences for the Government (in this case represented by the FD and the DOA) are deforestation and loss of biodiversity in an area that should be conserving flora and fauna. From a local point of view constrains on development are particularly concerning. However, this would also largely apply for the Government, as they are also interested in rural development.

Practical Strategy	Motives	Advantages	Disadvantages	
-Rubber production	-To show that all land is	-Labour and capital	-Low income per hectare	
	"occupied"	extensive	-Constraining development	
-Not practising traditional	-Not letting the forest	-Utilising all land	-Nowhere to collect NTFPs	
fallow	regenerate		-Risk of soil exhaustion	
	- Indicating that there is		-Lower biodiversity	
	nothing to preserve		-Deforestation	
-Cultivation of subsidised	-To secure higher income	-Easier to finance	-Risk that the subsidies are	
crops		agricultural intensification	stopped	
		- Extension	- Pests and diseases in cash	
		- Income generating	crop	
			- Risk of human and	
			environmental pollution	

Table 3.2: Land use strategies practised by farmers in Johan Jaya.

3.1.1 Impact of land use strategies

The reality of the FR in which Johan Jaya is located turned out to be quite different from what we had expected before entering the field. Due to land use activities there is hardly any forest left in the eastern block of Sook Plain FR. The land claim of Johan Jaya is mainly situated within the FR as shown in map 3.2.



Map 3.2: Land Claims of Various Villages in Sook Plain FR (Eastern Block).

Through the household survey and the qualitative interviews, the elders responded that when they settled in Johan Jaya the area consisted of virgin forest. Comparing these statements with the transect and the direct observations it is clear that land use activities have had a decisive impact on the FR and that the original biodiversity has been depleted.





Figure 3.1 shows that shrubs, weeds and ferns dominate the vegetation today. The transect went through an area reserved for residential expansion. This area is not cultivated, but livestock is grazing here. The transect was placed in a potential area for agricultural intensification (legend 2 and 3 in figure 3.1) indicated by the villagers in the mapping session (Appendix E). The transect can help understanding the physical environment and the most commonly found species, but it cannot be generalised to the rest of the area.

There have furthermore been three major fires in 1975, 1982 and 1998 coinciding with El-Nino events, which also have had an impact on the vegetation. A local respondent stated that the most serious fire was the one in 1982 and this destroyed most of the remaining forest and their farms. We managed to locate the only remaining tree from before Johan Jaya was established¹¹.

¹¹ The tree is a Selangan batu (Shorea sp., a commercial species of the Dipterocarpaceae family).

²¹

This indicates that the primary forest was a dipterocarp lowland rainforest. This is a fast growing, light demanding species, which mean that the forest would regenerate in a few decades if allowed (Brookfield *et al* 1995). The actual only forest to be found is small fractions of secondary forest at the riverbanks (Map 3.1). The land along the river is not suitable for cultivation due to risks of flood. The villagers can collect small amounts of NTFPs such as wild vegetables, fruits, firewood and medicinal plants in these areas (pers. comm. local respondent, 2001).

3.2.1 Establishment of the Sook Plain Forest Reserve

According to all the local respondents in Johan Jaya, it was not until 1972 that they became aware of the fact that they were living within a forest reserve. Rangers from the FD came and informed them about this and that the land was not suitable for cultivation. The farmers were told to stop clearing the land and move out of the FR, but the Headman refused, as he had already been advised to move to Johan Jaya by the DO in Ranau. The Headman held a meeting with the villagers and they decided to stay and keep clearing and cultivating the land. As the villagers perceive the area as their, they have marked the claimed land with a fence. This clearly indicates that the land is occupied and that outsiders should stay away. Map 3.3 shows the land claimed and marked by the villagers.



Map 3.3: GPS map of claimed land.

Whether the villagers settled without knowing that the area was a forest reserve or not is difficult to prove and it is not really relevant in the current situation. However, the relevance in this case is that they are living within the area and that they have removed all reasons for establishing the FR.

3.2 Official management of the Forest Reserve

A FR without a forest is a peculiar situation and we find it relevant to discuss whether this is connected to inappropriate management. The FD does not enforce any kind of legislation or rules towards the villagers. In the questionnaire some villagers indicated that they knew of restrictions and rules regarding the FR, while others rejected any knowledge of this. Sook FD does not have a management plan for the FR but instead they try to practise the Forest Enactment. The enforcement policy practised by the FD is shown in the following statement:

"The Forest Department tries to control the Forest Reserve, but it is difficult due to lack of manpower" (pers. comm. FD, 2001).

The local attitude towards the enforcement of restrictions is that:

"The law exists, but the Government does not act even though they have seen that people are living within the Reserve. They just keep silent" (pers. comm. Headman, Johan Jaya, 2001).

The statements above display the dilemma faced by the official government institutions. It does not make much sense to resettle the villagers now where they have cleared all the forest. On the other hand it would be difficult for the Government to excise the area from the FR, as this could create precedent for other areas, which the Government is probably not interested in. The result of the dilemma seems to be that the FD and the DOA ignore the problem and therefore, the villagers just continue their land use practices the way they always have done. Apparently the officers from the FD also tell the farmers to keep cultivating the land. The Chairman of the JKKK stated that:

"The forest officers came last year and told the farmers to continue cultivating the land they already had cleared, but they should not fell any virgin forest".

This finding is interesting, as it indicates that the FD does not show any kind of conservation attitude. According to the head of Sook FD the boundaries of the FR on the map have been marked in the field (Map 3.2). A line has been cleared and trees on the boundary have been marked with red paint. However, on the ground we were unable to find any boundaries or trees marked with this red paint. The location of the boundaries and extent of the FR create confusion among locals. We asked the participants in the PRA mapping to draw the boundaries of the FR, but this was difficult. The women could not draw the lines, as they claimed that the village and most of the fields are within the FR. On the contrary, it was possible for the men to draw the boundaries but not with precision, as it is unmarked in the field (Appendix E).

3.2.1 Management problems

The farmers have, as briefly mentioned, recently engaged in a yam cash crop scheme. Here the DOA is supplying the farmers with planting material, fertilisers and pesticides. The yam project is situated on land within the boundaries of the FR. Despite statements from the agricultural officer in Sook saying that the DOA does not give subsidises to agricultural projects on untitled

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Kommentar [TJ4]: Mille: hører det ikke under management? land – the project is however subsidised by this department. According to the DOA the farmers claimed that they had land title when they applied for the yam project and therefore they were given the project. The DOA has afterwards acknowledged that the scheme is in fact within the FR and it has therefore been changed from a "development project" to a "demonstration project". This means that the project period (the period in which the farmers are subsidised) has been limited to three harvests. The aim of the project is to teach the farmers how to grow yam as a cash crop and when the project stops, they will have to continue the cultivation without subsidies and supervision.

The fact that an agricultural project is supported by the DOA within a forest reserve, where all agricultural activities normally are prohibited, can be seen as a consequence of inappropriate communication between different departments. We find it paradoxical that the DOA decides to support the yam project, as the same department three years ago stopped the subsidies for rice production in Johan Jaya because of the FR. On one hand the village is recognised by receiving salaries for the Headman and the JKKK but on the other hand they are perceived as illegal settlers. The responsible departments do not take the consequences of either resettle or excise the area from the FR – the result is a laissez faire policy towards the local population.

3.3 Land Tenure

Lack of land title is a common problem in Malaysia but the case of Johan Jaya is special, as these people are living within a forest reserve where gaining land title is practically impossible according to the national legislation. In fact if land titles should be granted it would mean that land should be excised from the FR and this has only happened twice in Sabah (pers. comm. PACOS, Kota Kinabalu, 2001). In spite of these odds the local villagers keep on applying for land title.

3.3.1 Applying for land title

When a farmer in the Sook District applies for land title the application will be handled by different governmental agencies. The application procedure is illustrated in figure 3.2 below.



Figure 3.2: Land Application Processing Procedure (Source: Department of Land & Survey, Keningau, 2001). A) Department of Irrigation and Drainage, B) Head Quarter.

The survey procedure typically lasts 3 to 5 years, as DLS has difficulties keeping up with the amount of applications. The entire application procedure can last up to ten years (Long *et al.* 2000).

The applicant must state for what land use purpose the application is seeking approved. Here the DOA plays an important role in the approval of an application. This department can, if land is available, recommend what kind of crops that should be cultivated on the land applied for. If the farmer prefers to cultivate a different crop than recommended, the application will not be approved (pers. comm. DLS, 2001).

The Johan Jaya farmers have in vain applied for land title since the settlement was established. However, a land application was approved in the early-1970's and part of the land was surveyed, but the approval was later revoked. A local respondent told us that this survey was done just before the election in 1974. The same respondent further claimed that the villagers were promised land titles by the Berjaya Party¹² but no titles were given after the election, although the party won. The villagers have no legal possibilities to put pressure on the Government to act up to the promises as they are living illegally within the FR.

Several villagers are convinced that they are still applying for land and they all keep the Letter of Administration (LA) as a receipt for the application. The villagers perceive this LA as some sort of security for their land – as long as they have the receipt they can show this to outsiders and claim that they are applying for the land. In some cases they will even claim that this land "belongs" to them because of the receipt (pers. comm. Chairman of JKKK, 2001). We came to the knowledge that all the applications were made invalid after the election in 1974, so the villagers are in fact not actively applying for land title today (pers. comm. Chief of Natives Rights, 2001). The DLS further claims that all applications automatically are rejected in case the application concerns land within a FR. On one hand this can be seen as an example of lack of information practised by the governmental departments as discussed earlier in this chapter, as the villagers claim that they have not been informed that their applications are invalid. On the other hand we find the statements difficult to believe, as the Chief of Native Rights from DO is actually living in Johan Jaya. Why should he keep this kind of information to himself? Instead it seems like the villagers have chosen not to listen to the authorities.

Because official land titles cannot be obtained the villagers still operate under rules and norms of the Adat system. During the establishment phase of Johan Jaya each person above 18 years was given 15 acres of land. A consensus regarding ownership of land exists; if a field is clearly marked with sticks, every body knows that the plot is occupied. As long as the farmer keeps cultivating the land, the land belongs to this farmer and no one else will claim the land. Moreover, the community of Johan Jaya is small, and the farmers know the location of the other

¹² The Berjaya Party was a rival party to the United Sabah National Organisation (USNO) Government.

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farmers' fields. The land can be sold to another farmer, but as the farming area is limited, this seldom happens. The land can also be inherited, as long as the Headman approves the heritage.

This local land tenure system indicates that the farmers are able to manage the distribution of the arable land and respect the local laws regarding land. This is also the case between the villages in the area. They have been able to mutually organise and decide on the different village boundaries and there are no existing conflicts regarding this today.

3.3.2 The importance of land title

A crucial question for this report is whether the farmers would change strategies if they were granted with land titles. It is further interesting to investigate how this in general would influence their life. During our conversations with villagers it was proven that obtaining land titles is important for their future activities.

"The land title is very important, as it will mean that the Government can develop the area and it is also important to get credit. The lack of land title also means that the settlers are insecure – the people are afraid that the land will be taken from them. Some are afraid of investing on the land" (pers. comm. Headman, Johan Jaya, 2001).

Not only would a land title give the villagers security but they would also be entitled to receive governmental funds. With these the village could be further developed and the villagers would be supplied with basic facilities still missing such as power, a school and a health clinic. The farmers would further be in an improved position where they could obtain credits and subsidies from governmental agencies. This would result in an intensified agricultural production and thereby a higher economic output.

Without land title the farmers do not feel that they can make any changes in their agricultural practices. Changes can be costly and farmers' financial means are limited (pers. comm. local respondent, 2001). The farmers gave us the impression that if they were granted with a land title they would choose more long-term crops in order to increase their income. Several of the respondents would furthermore consider practising traditional fallow. Especially the young respondents would start growing timber- and more fruit trees and the elder respondents would plant more rubber trees in case they got land title. It became clear to us that a difference in the
way lack of land title affects the elder and the younger generation exists. The elder generation would not make remarkable changes in the cultivation pattern if land titles were given to them. Instead they expressed more concern about the possibility of leaving land for their children in the future. Gaining land title is however very important for the younger respondents, as they would like to make large investments in the land.

The above findings are interesting, as one could argue that providing farmers with a land title would actually result in more forest than today! To support this theory we compared the visual appearance in Sook Plain FR with areas outside the FR. Here forest and vigorous landscapes dominated the sight and through our observations in the surrounding areas, it seemed like there is more forest outside the FR than within. Furthermore, the only secondary forest in Johan Jaya is situated on land that is not suitable for agricultural activities. The villagers are not interested in letting the forest regenerate as a part of their strategic land use and they are therefore not practising shifting cultivation. On basis of this it can be argued that in areas where people find them selves forced to cultivate in a strategic way to mark their (illegal) presence, the biodiversity seems lower compared to areas in which farmers are legally allowed to settle and cultivate the land.

As the land use map below also indicates there is hardly any forest left in the area where Johan Jaya is located. Instead great areas of forest are to be found outside the FR.



Map 3.4: General Land Use of the Study Area.

With point of departure in map 3.4, we find it relevant to question why the Sabah Government continues to keep the Sook Plain FR as a so-called FR. As already mentioned the FR was established because of the unique vegetation and endangered species represented in the area. However, the FD as well as the DO in Sook acknowledges that no forest is left. They are further recognising that the illegal settlements within the FR are the main problem in the district. Why protect something that does not exist; in this case a FR without any trees or endangered species, and instead provide people with land title and government funds and thereby make their presence and activities legal? When asking the head of the FD of his personal opinion about people living and utilising the land within the FR he answered:

"They should be given a fair treatment. They should only be removed if the Government really emphasises the enforcement of the Forest Reserve and not without proper resettlement scheme. What is the point of moving them now when much of the forest already is gone? Politicians say just continue as usual – they do not want to face the problems".

A further benefit from gaining land title would be that the farmers in Johan Jaya would be able to take part in some of the agricultural schemes provided by the Government. At the moment the DOA in Sook are planning to establish a 2025 ha wet rice project, which will be divided into smaller projects in the Sook area. The farmers in Johan Jaya are interested in irrigated rice production, but since the farmers are cultivating on un-titled land, they will not be involved in any of the DOAs long-term schemes.

3.4 Agricultural potential

The future perspectives for the agricultural production are not only dependent on farmers getting land titles or not - the physical environment is also very important. Especially the soil types play an important role when assessing the future agricultural potential, as the level of nutrients will have a direct influence on the yield. If the soil has a low level of nutrients the farmers will have to allocate much fertiliser, pesticides and other inputs in order to maintain a reasonably yield.

In the Sook Plain FR there are two types of soil to be found; the Sook and the Kepayan soil type (Map 3.5). One of the main soil units in these soil types is gleyic podzol, which is smooth and soft and suitable for yam production (Appendix G).



Map 3.5: Soil Types of the Study Area.

According to the Chairman of the yam project as well as the agricultural officer in Sook the soil in Johan Jaya is suitable for yam production. Nevertheless, the production will still need inputs such as fertilisers, pesticides and water.

Nitrogen (N), phosphor (P) and potassium (K) are among the most important plant nutrients and deficiencies cause severe crop losses. The results (table 3.3) from our soil sampling indicates that the level of nitrate (NO₃), ammonium (NH₄), phosphor (P) and potassium (K) in the topsoil (0-15 cm) range from very low to medium. The results are not quantitative but only a qualitative indicator of the soil fertility (Appendix F). The soil is rather acidic ranging from pH 4.02-5.41. These results are consistent with a statement from the agricultural officer in Keningau saying that that the Sook area is not very suitable for agriculture as the soil is poor and dry.

Tuble eler by h	mesis of som	bumphing rebuilds (0 10 cm);	
Soil sample	Nitrate (NO ₃)	Phosphorus (P)	Potassium (K)	Ammonium (NH ₄)
Transect A	VL	L	М	M
Transect B	0	L	М	L
Transect C	VL	L	М	L
Transect D	VL	L	М	L
Transect E	0	L	М	L
Transect F	0	VL	М	VL
Rice	VL	L	М	L
Yam A	VL	L	М	L
Yam B	VL	L	М	L
Yam C	VL	L	М	L
(1 11 15)				

Table 3.3: Synthesis of soil sampling results (0-15 cm).

(Appendix F)

As earlier mentioned the rice production in Johan Jaya was subsidised¹³ until three years ago. After the DOA stopped the subsidy the output from the rice fields has decreased. This is a further indication of the need to use fertilisers and other inputs if a high yield is to be obtained. It seems that the farmers will need to apply abundant amounts of fertilisers but as the farmers are lacking resources they will most likely not be able to supply the required amounts and consequently the yields will be low. On the other hand, if the farmers were using all the inputs a high yield requires it could have a negative effect on the physical environment in the area due to wash out of chemicals into rivers. If the education of the farmers is not improved wrong use of these chemicals might also lead to a decreased human health status.

¹³ 32,4 kilos of fertiliser per ha per year (80 kg/acre/year) and RM 40,5 per ha per year (RM 100/acre/year).

The choices of crop will not only depend on subsidies, but also on the amount of labour required, since manpower is a scarcity in Johan Jaya.

Criteria]	Men	W	omen
Rank	Income	Own Consumption	Income	Own Consumption
	Rubber	Hill Rice	Rubber	
1	Wet Rice	Wet Rice		Wet Rice
	Fruit trees	Yam		
		Fruit trees		
	Banana	Pineapple	Yam	
2	Hill Rice	Banana		Hill Rice
	Yam	Maize		
	Pineapple		Wet Rice	
3	Maize	Tobacco		Banana
	Tobacco	Tapioca		
	Tapioca			
			Hill Rice	
4				Corn
			Banana	
5				Tapioca
6				Pineapple

Table 3.4: Ranking result.

This ranking result indicates the choice of crops the participants would prefer to cultivate for income and own consumption if they were granted with a land title.

As seen in table 3.4 the preferred crops for income are all long-term crops such as rubber, wet rice and fruit trees. As mentioned earlier farmers are interested in irrigated rice cultivation and during the participatory mapping both men and women indicated an area behind the village they found suitable for wet rice production. Also in the questionnaire 88,2% of the respondents agree that the rice production would increase their income. Due to poor soils, low precipitation and rivers drying out during the dry season and long distance to large rivers the farmers will only be able to engage in irrigated rice production if subsidised by the DOA. Table 3.4 above also shows that yam is highly ranked on the list of crops grown for income. Farmers are very keen on growing yam, as this crop is easy to cultivate and does not require as much labour as rice. If the DOA continues to subsidise yam the farmers will be willing to grow more. However, if subsidising is ended the farmers will continue growing yam - but most likely only on small plots, as they cannot afford the required supply of fertilisers, pesticides and herbicides.

4. Conclusion

The main focus of this report has been to study the following:

How is residing within a forest reserve reflected on the agricultural strategies practised by the farmers and will these change if land titles were granted?

First of all we can conclude that there is practically no forest left in Johan Jaya even though the village is located within a FR. The lack of forest can be seen as a consequence of the farmers' agricultural strategies. We can also conclude that no management plan and no enforcement of the legislation are practised.

One strategy practised by the farmers of Johan Jaya is to cultivate rubber on a large part of their land. The reason for choosing this strategy is that the rubber indicates that all land is occupied in a labour and capital extensive way. The villagers are preventing the forest from regenerating and this secures the land, as the FD thereby has nothing to conserve and therefore would have difficulties justifying an enforcement of the legislation.

A second land use strategy used in Johan Jaya is that the farmers do no practise traditional fallow. This strategy can be seen in connection with the first strategy where areas with rubber are seen as a kind of intensified fallow system. Allowing fallow would result in secondary forest. This is something the FD might want to conserve and at the same time it is difficult for the farmer to signalise that the area is occupied. Substituting traditional fallow with rubber trees therefore constitutes a rational alternative land use strategy for a farmer within a FR.

The third strategy noticed in Johan Jaya is cultivation of subsidised crops. The farmers used to cultivate rice because this was subsidised, but when these subsidies were stopped the farmers instead prioritised yam production since this was subsidised. This strategy is not unique to villages within FRs, but it is evidently something that these communities also practise even though they were not supposed to receive subsidies, as their land is not titled.

The present agricultural strategies would however, according to the villagers, change in case they were granted with land title. A land title will make them entitled to receive subsidies and

participate in agricultural schemes initiated by the Government. The individual farmer would furthermore get the possibility of obtaining loans and credits, as land can be used as guarantee for these. The farmers claim that they will start cultivating other crops and make more investments on their land in case land titles were given. On basis of interviews and observations we conclude that the agricultural strategy practised by the Johan Jaya farmers would change if they were granted with land titles. Ironically there might even be more forest if the area were excised from the FR.

Regarding the potential for the agricultural development we can conclude that it is not very suitable for agriculture without supply of fertilisers, pesticides, herbicides, water and labour inputs.

5. Perspectives

From our point of view it seems paradoxical that the authorities claim to maintain a FR in spite the fact that no forest is left for preservation. An argument for maintaining a FR gazetted is that the authorities might fear the reaction if they decide to de-gazette or excise an area from the FR. A reaction could be that it would cause a trend where other villagers will claim the same treatment and the farmers would perhaps claim more forest excised.

Another motive for insisting on keeping a FR without forest could be that the Malaysian Government in general feels obligated towards the international society. The global environment has become a highly prioritised issue and the attitude towards countries concerned about conservation and protection of the environment is positive. Unfortunately, the reality is sometimes far from the political promises and declarations!

This, however, can also be a lesson to the countries concerned about conservation and environmental protection. In their eager to promote protection of nature they sometimes seem to forget the indigenous people living in the areas considered as valuable. It is a common thought that people are the main reason for environmental degradation and that these shall be excluded if nature must be conserved. We therefore find that a decision of whether an area should be turned into a protected area should take its point of departure in the people depending on this area by integrating conservation with development and not so much in the statistics and global expectations!

It is increasingly acknowledged that it is impossible to conserve nature without taking the local population into consideration. This perception of the conservation issue is also supported by this report. Since the FR has had no management plan, no enforcement of the legislation and no resettlement schemes for the local population the forest is gone and the area is now fully cultivated.

Another issue is how many of the FRs in Malaysia, or the whole developing world for that matter, that are in a similar situation as Sook Plain Forest Reserve. It could be feared that this case is far from unique and again this could mean that the global deforestation is larger than assessed at this point with the information available.

The land use strategies analysed are straightforward and rational from a local point of view. This implies that this situation could very well be prevailing other places with similar conditions. Therefore, the experiences from this study could be useful for conservation and development agencies and involved governmental agencies dealing with the management of FRs and local people.

6. Evaluation of fieldwork

In the following we will briefly reflect on methods used throughout the fieldwork and last the outcome of this. As described in the methodology chapter we have used several methods to gather data for this study. Some of these have been practical while others rather have been "exercises" on how to work in groups consisting of different disciplines and cultures.

The reality in the field was far from expected as no forest existed and this had an obvious impact on the natural science methods that we had selected before the fieldtrip. Some of these turned out to be inappropriate to conduct and unfortunately we to abandon these. Evaluating on our semistructured interview guidelines with locals we find that we should have added some more indepth questions. However, this first came to our knowledge once analysing the data and it can be argued that the limited timeframe does not leave much time for evaluation and readjustment of such guidelines in the field. In spite of the above mentioned we all together ended up with a pool of empirical data from respondents, which we regard as useful as well as comprehensive in regard to our objectives. An example of fieldwork that we gained valuable experiences from is the PRA-methods. If relevant information is to be subtracted from this kind of methods it has to be well prepared and regarding this experience is essential. Doing fieldwork with SLUSE had many advantages among others that the study area was prepared, that supervision was available during the fieldwork and that being part of a team opens a lot of doors. One disadvantage was that the interviews with the official agencies were conducted with all the SLUSE groups at the same time. Consequently the meetings were often held with a long introduction and on a general level, leaving limited time for and focus on each individual case study.

Working inter-disciplinary has been a good challenge for us all. From our different universities we all have preconditions and ideas on how to deal with a study like this. This has caused some discussions as we realised that communication and choosing the right "language" is important in such group-work. This is also the case once working inter-cultural, which probably was the most challenging exercise in this SLUSE-course. Even though this occasionally caused some frustrations we managed to work together as one integrated group and we are all grateful for this experience, which we without doubt can use in the future.

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Date	Schedule	Sub-group
13.10.01	Kuching/Kota Kinabalu Briefing	All
14.10.01	Briefing	All
15.10.01	Depart for Kampung Johan Jaya Courtesy call on headman, En. Leman and Kampong folks General introduction	All
16.10.01	Village mapping (midday/afternoon)	All
	Test of household survey (morning and evening)	Socio-eco.
	Brief meeting with Forestry Department and Department of Agriculture in Sook	All
	Evening meeting	All
17.10.01	Morning meeting to finalise the household survey	All
	Visit to yam project in Johan Jaya. Visit to community forestry project in Kampung Delayan	All
	Practical sampling meeting	Agriculture and Forestry
	Village mapping	Socio-eco.
	Evening meeting	All
18.10.01	Joint meeting in Kampong Tiulon	All

Appendix A: Time schedule for the fieldtrip

19.10.01	Farm survey Identify soil sampling spots Field Mapping (GPS)	Agriculture and Forestry
	Household survey	Socio-eco.
	Visit to Kampung Nukakaton	Socio-eco.
	Evening meeting	All
20.10.01	Household survey	Socio-eco.
	Planning of PRA Ranking (incl.test with interpreters)	All
	Field trip to yam project	Agriculture
	Evening meeting	All
21.10.01	Participatory mapping	All
	Evening meeting	All
	Interview with Chairman Of yam project	Agriculture
22.10.01	Meeting with Department of Agriculture Interview with KPD Interview with Chief of Natives Rights	Agriculture Forestry Socio-eco.
	Planning of participatory ranking	All
	Evening meeting	All
23.10.01	Interview with locals	Agriculture
	Participatory Ranking	All

	Evening meeting	All
24.10.01	Interview with Forest Department	Forestry
	I Interview with Department of Agriculture in Keningau	Agriculture
	Interview with Land & Survey in Keningau	Forestry and Socio-eco.
	Interview with District Office	Socio-eco.
	Interview with villagers	Agriculture
	Evening meeting	All
25.10.01	Transect and soil sampling	Forestry and agriculture
	Qualitative interviews with farmers	Agriculture
	Analysis of soil samples	Agriculture and Forestry
	Evening meeting	All
26.10.01	Analysis of soil samples	All
	Farewell dinner in Johan Jaya	All
27.10.01	Depart for Kota Kinabalu	All

Appendix B: Questionnaire

As the Malaysian counterparts were given a broader assignment some questions not directly relevant for our objectives are included in the questionnaire.



Part I

Respondent Profile

1.	Ethnicity:	a. Kadazan/Dusun	b. Murut	c. Melayu	d. Kedayan	e.
	Others (Specify) _					
2.	Religion:	a. Islam	b. Christian	c. Others; (Sp	ecify)	

3. Age: _____ years old

 Highest qualification: Never attended school/Pri 6/Form 3/Form 5/Form6/Diploma/Degree holder & above. * (Delete where not applicable)

Household Profile

Fill the table below based on instructions in 5, 6, 7

- Number and age of members of immediate family (inclusive of those who stay outside but do not have a permanent household elsewhere) and return whenever they are not working or attending school outside including respondent.
- Household members' education level including the respondent.
 1= Never attended school
 2=Primary 6
 3= Form 3
 4=Form 5
 5=Form 6
 6=Diploma holder7=Degree holder & above
- 7. Employment status of household members. e.g. farmer, labourer, businessman, government servant, etc.

Family Member		Gender	Age	Education	Main
Circle head	Relationship to	(M/F)	_	level	occupation
of household	head of household				
1 (respondent)					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

12			
13			
14			
15			

Category	Male	Female
Born here		
Migrated		
Died		
In-laws		

12. Migration Patterns

How many of your family members who work outside the village (not due to marriage)? Male: Female: _

C. Estimate of Income

13. Estimates of family average income.

Family source of income	Average per year (RM)
Sale of agricultural produce (vegetables, livestock,	
etc.)	
Sale of fish products	
Sale of gathered jungle products	
Rubber tapping	
Tobacco sale	
Sale of yam	
Sale of fruits (durian, rambutan, etc.	
Own business (transportation, shop, etc.)	
Remittance from family members elsewhere	
Wage/salary	
Handicraft item	
Others (To specify)	

D. **Economic Indicators**

Please indicate whether you own the following items? Please tick.

No	Items	Yes	No
14.	Generator set		
15.	Radio		
16.	Television		
17.	Gas stove		
18.	Refrigerator		
19.	Electric fan		
20.	Rice cooker		
21.	Sewing machine		

22.	Settee	
23.	Motorbike	
24.	Dining table	
25.	Sprayer	
26.	Chainsaw	
27.	Motor vehicles	

E. Respondent's Land Information

- 28. How many parcels of land do you have? _____ parcels.
 29. What is the estimated total hectarage? _____ ha
 30. Do you have land in the Forest Reserve? Yes: _____ No: ____
 31. If "Yes", how many parcels? _____ Parcels. Estimated size: _____
 32. How did you get your land? (Tick the appropriate response)

Fell/Cleared by me	
I bought it	
Given by my parent	
Given by the Government	
Others (To specify)	

ha

33. Can you tell me how much land is utilised as below?

Use	Estimated (ha)
Cultivation	
Grazing	
Idle	

F. Agriculture

34. Do you cultivate the following crops and if "yes" for what purpose? (Please tick response).

Crops	Yes/No	Est. size	Own	For sale	Both
		(ha)	consumption		
Hill rice					
Wet rice					
Yam					
Tobacco					
Rubber					
Сосоа					
Fruits					
Others (Specify)					

35. Do you farm in the Forest Reserve? Yes: _ No: Uncertain: 36. If "Yes" are you felling a. Virgin jungle b. Old fallow d. Others (Specify): c. Both

37. Do you use the following agro-inputs in farming?

Types of agro-input	Please tick if "Yes"
Pesticides	
Weedicides	
Fertilizers	
Others (Specify)	

38. Do your rear the following and if "yes" for what purpose? (Please tick response).

Animals	Yes/No	Number of heads/tails	Own consumption	For sale	Both
Cattle					
Sheep					
Goat					
Chicken					
Ducks					
Fish					
Others (Specify)					

39. Marketing Channels

Please tell me how do you market your agricultural produce. Tick response in the appropriate column.

Products	Not	Marketing Channel			
	selling	Nearby shop	Middlemen	LTGS	Co-operative
Rice					
Yam					
Tobacco					
Rubber					
Сосоа					
Fruits					
Others (Specify)					

LTGS Lembaga Tabung Getah Sabah.

G. Health

40. What types of toilet does your family use?

Types	Tick if response is 'Yes"
Bucket/Splash toilet	
Latrine	
"River" toilet	
No fix toilet	
Others (to specify)	

41. How did you get your water?

Types	Tick if response is 'Yes"
Gravity feed water	
Water tanks	
From the river	
Others (to specify)	

H. **Use of Forest**

- 42. Do you collect wild vegetables from the forest? Yes: _____ No: _____
 43. If "Yes", what types of vegetables you normally collect and for what purpose? Rank them in order of importance to household food and contribution to income. [1 = most importance followed by others]

1	o
4	n
	~

Name of wild vegetables (Use local name)	Own Consumption	For Sale	Both	Scientific name, if known

44. Do you hunt wild animal in the Forest? Yes: _____ No: _____

45. If "Yes", what types of animal you normally kill and for what purpose? Rank their importance to your household food and contribution to income. [1 = most importance followed by others]

Name of wild animals [Incl. Birds, etc.] (Use local name)	Own Consumption	For Sale	Both	Scientific name, if known

46. Do you fish in the river? Yes: _____No:_____

47. If "Yes", what fishing methods do use?

Name of methods	Tick response
Bubu (fish trap)	
Pukat (Fishing net)	
Tuba (Poison)	
Jala (
Kail (fishing hook)	

48. What fish you normally catch and for what purpose? Rank them in order of importance to household food. [1 = most importance followed by others]

Name of catch (Use local name)	Own Consumption	For Sale	Both	Scientific name, if known

 49. Do you collect medicinal plants from the Forest? Yes:
 No:

 50. If "Yes", can you give the name of the plants, for what cure and for what purpose?

Name of medicinal plants (Use local name)	Type of Cure	Own consumption	For Sale	Both	Scientific name, if known

51. What other jungle resources you collect from the Forest? Can you tell for what use?

Name	Usage (e.g. handicraft/building materials/religious use, etc.)
Rattan	
Timber	
Bamboo	
Sago palm	
Firewood	
Fruit trees	

I. Forest Management

- 52. Before the Forest Reserve was gazetted, are the local people being consulted? Yes: _____ No: _____
- 53. If "Yes", who were they?

People involved	Tick response
Ketua Anak Negeri)	
Ketua kampong (Village headmen)	
Village Committee members	
Every head of household	
Others (Specify)	

54.	as there any objection by the local people? Yes:	No:
55.	If "Yes", did your family object to it? Yes: No:	
56.	Are local people involved in the enforcement of the Forest Reserve? Yes: _	

No:_____

57. If "Yes", who are they?

People involved	Tick response
Ketua Anak Negeri	
Ketua kampong (Village headmen)	
Village Committee members	
Every head of household	
Others (Specify)	

Do you have to ask permission to enter the Forest Reserve? Yes: _____ No.:_____ 58. If "Yes" from whom? Name: ____

Part II

Attitudes towards development and credit

Please read the statements below and request the respondent to response either he /she agree (A), uncertain (U) or disagree (D). Tick the response in the appropriate column.

No	Statements	Α	U	D
62.	I don't need credit to do farming			
63.	I never sought financial assistance from the Government			
64.	The Government need to extend credit assistance to the farmers			
65.	I want to get credit facilities			
66.	I don't like borrowing to farm			
67.	I always sought fertilizer subsidy from the Government			
68.	Most of the farmers here are independent			
69.	I need a piece of land to cultivate to support my family			
70.	I am not interested to participate in any agricultural scheme			
	implemented by the Government			
71.	I am satisfied with my current work			
72.	The youth in this village do not want to work in the farm			

If you have borrowed money last year, what is the amount of loan you obtained for?

No	Purpose	RM
73.	Agriculture/economic projects	
74.	Household needs	
75.	Others (To specify)	

Attitude towards Government Plan (Please tick the appropriate response)

a. Commercial Irrigated Rice Farming

- 76. Are you interested to develop this area for commercial irrigated rice cultivation? Yes: ____No: ____
 78. If you agree, why?

Reasons	Tick response
Increase income	
Create employment close to home	
We have requested for it for long time	
Others (To specify)	

79. If you don't agree, why?

Reasons	Tick response
Not enough labour to work	
No land	
We want other crop	
No market	
We want in land of our choice	
Others (To specify)	

b. Agro-forestry project.

80. Do you agree that the forest reserve should be kept intake? Yes: _____

No: ____ Uncertain: ___

- 81. Would you agree if the Government start some kind of combine agriculture project in this area?
 - 51

Yes: _____ No: _____ Uncertain: _____

82. Would you want to participate in this type of project? Yes: _____ No: _____ Uncertain: _____

c. Integration of other projects.

83. If there were any plan to integrate forest with livestock/poultry/aquaculture farming, which activities would you want to be included in the project? Please rank your choice (1= highest, use NO if not interested)

Activities	Rank (1-8)
Fish culture	
Cattle farming	
Sheep rearing	
Goat rearing	
Raise chicken	
Raise ducks	
Buffalo	
Others (To specify)	

84. If there were any plan to integrate forest with crop farming, which of the following crops would you prefer? Please rank them according to preference of choice. (1= highest, use NO if not interested at all)

Сгор	Rank (1-9)
Oil palm	
Coconut	
Rubber	
Pineapple	
Fruit trees	
Сосоа	
Vegetables	
Tobacco	
Others (To specify)	

Part III

Perception of their environment during the fieldwork.

Please read the statements below and request the respondent to response either he /she, agree (A), uncertain (U) or disagree (D). Tick the response in the appropriate column.

a. Agriculture

No	Statements	Α	U	D
85	Fertilizer are easily obtain here			
86	It is difficult to get planting materials here			
87	Pesticides are easily available here			
88	There is no Government agency extending credit here			
89	It is easy to get agro-advisory services in this village			
90	Agriculture Department official seldom visit our village			
91	We have a lot of problems selling our agricultural produce			
92	The middlemen offered reasonably good price for our			
	produce			

b. Schooling Facilities

No	Statements	Α	U	D
93	The primary school in this village is well equipped			
94	It is difficult for our children to study in secondary school			
95	It is easy for our children to go to the primary school			
96	The textbook scheme given to our children ease our			
	burden			

c. Local Communication & Infrastructure

No	Statements	Α	U	D
97	The water supply in our village is not good			
98	Electricity supply in this village is inadequate			
99	Travelling to nearby town (Sook, Keningau) is very easy			
100	The transportation fare is cheap here			

d. Land

No	Statements	Α	U	D	
101	We don't have enough land for cultivation				
102	Land title is not important				
103	We don't need much for agriculture				
104	Land title is not important in getting credit facilities				

e. Forest Reserve Management

No	Statements	Α	U	D
105	There is no restriction imposed on us to enter the Forest			
	Reserve.			
106	The government officers are strict on us when we enter the			
	Forest Reserve.			
107	We can collect anything we want from the Forest reserve.			
108	We are not allowed to kill wild animals in the Forest			
	Reserve.			
109	We are not involved in protection of the Forest Reserve.			

Part IV

Expectation

Please read the statements below and request the respondent to response either he /she agree (A), uncertain (U) or disagree (D). Tick the response in the appropriate column.

a. Infrastructure

Do you want the government to provide or improve the following in this village?

No	Statements	Α	U	D
110.	Community hall			
111.	Football field			
112.	Roads			

113.	Telephone service		
114.	Postal service		
115.	Clinic		
116.	Playground		
117.	Fire Extinguisher		

b. Schooling

No	Statements	A	U	D
118.	We need a secondary school here.			
119.	More teachers are required here.			
120.	The primary school need food assistance			
	program.			
121.	Children here need tuition.			

c. Land matters

No	Statements	Α	U	D
122.	We want the Government to excise our land from the			
	Forest Reserve			
123.	We want to be issued with land title			
124.	If the government needs our land we want to be			
	consulted first			
125.	We want our village to be declared as Communal Land			
	(Settlement)			

d. Irrigated Rice Projects

No	Statements	Α	U	D
126.	We want the Government consult us on any plan they			
	have.			
127.	The project would give us employment opportunities.			
128.	It would help to improve our income.			
129.	We want the local people to be given priority to work			
	here.			

e. Agro-forestry Project

No	Statements	Α	U	D
130.	We expect the Government to discuss plans with us.			
131.	The project would give us employment opportunities.			
132.	It would help to improve our income.			
133.	The government should provide the necessary			
	assistance.			
134.	We would like to have fixed area for each household.			

Date of Interview: _____-October 2001 Time from _____hrs to _____hrs

Time taken for interview: _____minutes/hrs

Give comment of respondent's behaviour during interview (e.g. friendly/hostile/uneasy/worry etc.).

Appendix C: SSI Guidelines

Guidelines for interviews with KPD, PACOS and DLS were prepared. However, it was not possible to follow them during the interviews.

SSI Guideline for Forest Department, SOOK

General information:

Date:Interviewers:Place:Name:Occupation:

General Introduction (initial comments by respondent):

Questions:

- 1. What was the initial objective for gazetting the Sook Forest Reserve and why was the Forest Reserve placed in this exact location?
- 2. What was the process of the gazettement of the Forest Reserve and were any local people consulted?
- 3. What do Class 4: Amenity Forest mean and how is the classification interpreted?
- 4. How many forestry staff is assigned to manage the Forest Reserve?
- 5. What kind of qualification/expertise do they have?
- 6. What actions have been taken towards encroaches by the Forest Department?
- 7. Is there any flora and fauna inventory/surveys ever done before the gazettement? (If so are the reports available?)
- 8. Are the villagers within the vicinity given any special rights/privileges to collect forest products from the Forest Reserve? (Are there any restrictions imposed on them?)
- 9. Is there any plan to excise any part of the forest reserve presently occupied by the local villages?
- 10. Was there any survey made on the extent of the encroachment?
- 11. What is your perception of the encroachment?

- 12. Are there any plans for an agro forestry and/or community forestry project in Kampung Johan Jaya? (If so, how will it be implemented (strategy, objectives, approach, component, local participation)?)
- 13. Do you have ant records of the forest fires in 1975, 1982 and 1997 (location and size of area)?
- 14. Is there any marking of the Forest Reserve boundary?
- 15. Is there a management plan for the Sook Plain Forest Reserve? (If so, request a copy)
- 16. As I understand it, boundaries are normally situated at either rivers or ridges but it seems that this is not the case with the Sook Plain Forest Reserve; why is it so?
- 17. What do you think about people living within and utilising the land in Forest Reserve?
- 18. Has there been any attempt to explain the boundaries and extend of the forest reserve to the local population?
- 19. Has the rejection of the land title applications (claims) anything to do with the gazetting of the Forest Reserve?
- 20. Which section of the Sabah land ordinance gives power for land to be classified as a Forest Reserve? (Criteria and authority)
- 21. Do you realise that the Agriculture Department are supporting and subsidising agriculture within the Forest Reserve?
- 22. What implications does this have on the Forest Reserve ordinance?
- 23. Do you know of any local land use strategies to secure land title given the fact that they have settled in a Forest Reserve?
- 24. Why was the land that was cultivated before the gazettement not excluded in the beginning?
- 25. How can it be that there is a Yam project supported by the AD inside the FR?
- 26. How do you manage deforested land inside the FR?
- 27. Who is the Sook FD referring to in the organisation?
- 28. Does the FD allow any new settlement inside the FR?
- 29. Other issues:

SSI Guideline for Department of Agriculture, SOOK

Interviewers:

General information:

Date:

Place:

Name: Occupation:

General Introduction (initial comments by respondent):

Questions:

- 1. Do you think the lack of land titles for farmers in Johan Jaya have an impact on their investment in agriculture?
- 2. What do you advise farmers that have no land title to do?
- 3. Can you explain how Department of Agriculture can give subsidises to farmers inside a Forest Reserve?
- 4. In the yam project farmers are given pesticides and fertilisers do they receive any training in the use of these?
- 5. Does the Department of Agriculture have any future strategies for further intensification for the agriculture of the farmland in Johan Jaya?
- 6. Soils and land intensification?
- 7. Are there any long-term development plans for the Sook region especially Johan Jaya?
- 8. Is there any plan to implement commercial irrigated rice production in Johan Jaya?
- 9. The collaboration between the Forest Department and the D.O.A.?
- 10. Other issues:

SSI guideline for District Office, Sook

General information:

Date:	Interviewers:	Place:
Name:	Occupation:	

General Introduction (initial comments by respondent):

Questions:

- 1. We are made to understand that some/many of the settlers residing in the Sook Region are migrants and might be living in the Forest Reserve. Does the Government know of this situation and if yes, what action has been done. Is there any plan to issue them with a land grant or are you going to resettle them elsewhere?
- 2. The 7th Malaysian Plan expired in the year 2000 and during that period what development has been implemented in the Sook Region?
- 3. What future development will be undertaken by the (Sabah) Government in this the 8th Malaysian Plan?
- 4. We are also made to understand that these settlers were already in the area when the forest was gazetted as a forest reserve. If this is true, what are the reasons for this decision?
- 5. If in the near future the Government decides to utilize the Forest reserve for other use, what alternatives are there for the settlers?
- 6. Are there any plans by the Government to excise or to de-gazette the Forest reserve?
- 7. Other issues:

SSI Guideline for local people

General Information:

Date:	Interviewer(s):	Interpreter:
HH number:	Respondents name:	Age:
Occupation:	Education:	Family:

Questions:

- 1. Background:
- 1.a) Are you a pioneer in Johan Jaya (Where did you come from?):
- 1.b) Historical background (years of fires etc.):
- 1.c) Distribution of land (did someone get "better" land/soil than other and why?):
- 1.d) The boundaries of the village (geographical, how was it decided?):
- 1.e) His/her perception of the word/concepts "Adat":

2. Forest Reserve:

- 2.a) Establishment of the forest reserve procedure?
- 2.b) Was the locals' consulted/involved?
- 2.c) Was there any objections from the locals? (if yes, in what way?):

3. Application for land title:

3.a) The internal procedure within the village (when did they decide to apply for land titles?):

3.b) Do you have any knowledge about the further procedure (on your application)?

- 4. Agriculture:
- 4.a) What crops do you have on your fields?
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4.b) Do you use fallow?

4.c) How do you use/manage the forest-land near the rivers?

4.d) Do you practice hunting?

4.e) How does the lack of land-title influence the agricultural activities and your life?

5. Management of the FR:

5.a) How does it work?

5.b) Have you been given any information about the management of the forest reserve?

6. Lack of land-title:

6.a) Hoe does the lack of land-title influence

I: Income:

II: Investment:

III: Effect on life (quality):

IV: Do you think that the lack of land title have an effect on the farmers investments in agricultural activities I JJ?

7. Rules and legislation:

7.a) Are you aware/informed of any official rules/legislation that must be followed regarding settling in a FR?

7.b) Is there any official restrictions?

8) Other issues:

Appendix D: List of persons and departments met

Following is a list of key-informants or departments interviewed during the fieldwork (in alphabetical order):

- Chairman of JKKK, Kampung Johan Jaya (23.10.2001)
- Chairman of yam project, Kampung Johan Jaya (22.10.2001)
- Chief of Natives Rights, District Office, Sook (22.10.2001)
- District Office, Sook (24.10.2001)
- Headman, Kampung Delayan (25.10.2001)
- Headman, Kampung Johan Jaya (22.10.2001)
- KPD, Sook (22.10.2001)
- PACOS, Kota Kinabalu (29.10.2001)
- Sabah Rubber Industry Board, Keningau (24.10.2001)
- The Department of Agriculture, Keningau (24.10.2001)
- The Department of Agriculture, Sook (16.10.2001 & 22.10.2001)
- The Department of Land & Survey, Keningau (24.10.2001)
- The Forest Department, Sook (24.10.2001)
- Villagers of Johan Jaya (15.-27.10.2001)

Appendix E: Map from PRA mapping

Due to a very large size of the map done by the women only the map done by the men is shown in this appendix.

3 Teranal 03 Comos ST. POTENTIAL RICE AREA Terore LOMBN beset it 51 T KSLOV

Appendix F: Soil sampling analysing method and results

Soil Sample Preparation

After field sampling, soil samples were air-dried by putting them loosely on plastic sheets. Bigger pieces were crushed down into smaller pieces. The samples were turned around everyday to make them dried faster.

Air-dried samples were crushed slowly using mortar and crusher. Then, they were sieved through a sieve of the size 0.25 mm. The samples were put into plastic bags that have been labelled clearly.

Methodology

Normally in Malaysia, for pH determination using soil: water suspension method, the ratio between soil and solution is 1 part of soil to 2.5 parts of solution.

a) Wet pH Determination

i. 10.0 g of air-dried sample is weighted and being put into a plastic bottle.

ii. 25 ml of distilled water is being filled into the bottle and the cover is closed. The bottle is shaken for 5 minutes

iii. After that, the pH of the soil solution is measured by using a pH meter.

b) Dry pH Determination

i. 10.0 g of air-dried sample is weighted and being put into a plastic bottle.

ii. 25 ml of distilled water is being filled into the bottle and the cover is closed. The bottle is shaken for 24 hours using an electronic shaker.

iii. After 24 hours, the pH of the soil solution is measured by using a pH meter.

c) NPK Soil Test Kit Extraction

i. One scoop of the soil is taken into the plastic bottle.

ii. 20 ml of the extracting solution No. 1 is used.

iii. The soil is shaken for 5 minutes and being filtered. The filtrate will be used for ammonium, nitrate, phosphorus and potassium determination.

Determination

Ammonium determination

i. 2.5 ml of the filtrate is taken into the test tube using the marked dropper.

ii. The reagent No. 2 is added with one small spoon.

iii. Five drops of solution No. 3 is added.

iv. The solution is mixed and shaken for 5 minutes. The colour developed is compared with the standard colour chart.

Nitrate determination

i. 2.5 ml of the filtrate is taken into the test tube using the marked dropper.

ii. Ten drops of solution No. 4 is added together with 1/2 small spoon of reagent No. 5.

iii. The solution is shaken for 5 minutes. The colour developed is compared with the standard colour chart.

Phosphorus determination

i. 2.5 ml of the filtrate is taken into the test tube using the marked dropper.

ii. Ten drops of solution No. 6 is added together with 1/2 small spoon of reagent No. 7.

iii. The solution is shaken for 5 minutes. The colour developed is compared with the standard colour chart.

Potassium determination

i. 0.8 ml of the filtrate is taken into the test tube using the marked dropper.

ii. 2.0 ml of reagent No. 8 and one drop of solution 9A are added.

iii. The solution is shaken well and two drops of solution No. 9 is added.

iv. The solution is shaken for 5 minutes. If there is the precipitation, the reading is high in K. If there is no precipitation, the colour developed is compared with the standard colour chart. Dark orange colour means low in K. If light orange colour developed, the solution is medium in K.

Soil sampling results

All the results for the soil samples are displayed in Table 1.

Table 1: Soil sampling results

Soil sample	Soil Colour (Munsell Chart)	Wet pH	Dry pH	Nitrate (NO ₃)	Phosphorus (P)	Potassium (K)	Ammonium (NH ₄)
W100 (0-15)	Very dark grayish brown	4.36	4.46	VL	L	М	М
W100 (15-30)	Brown	4.86	4.27	0	L	М	L
W100 (30-50)	Light brownish gray	4.37	4.45	VL	L	М	L
W300 (0-15)	Very dark brown	4.23	4.11	0	L	М	L
W300 (15-30)	Very dark brown	4.44	4.33	VL	М	М	L
W300 (30-50)	Brown	4.60	4.73	VL	VL	М	L
W500 (0-15)	Dark grayish brown	4.99	4.37	VL	L	М	L
W500 (15-30)	Brown	4.55	4.30	VL	L	М	L
W500 (30-50)	Very dark grayish brown	4.75	4.31	VL	L	М	L
E100 (0-15)	Brown	4.50	4.02	VL	L	М	L
E100 (15-30)	Light brownish gray	4.29	4.22	VL	L	М	L
E100 (30-50)	Light brownish gray	4.22	4.31	VL	L	М	L
E300	Dark	4.78	4.55	0	L	М	L
(0-15)	grayish brown						
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E300 (15-30)	Yellow	4.60	4.52	VL	М	М	L
E300 (30-50)	Light yellowish brown	4.62	4.50	VL	М	М	L
E500 (0-15)	Very dark grayish brown	4.75	4.75	0	VL	М	VL
E500 (15-30)	Yellowish brown	4.78	4.56	0	VL	М	VL
E500 (30-50)	Brownish yellow	4.50	4.43	0	VL	М	VL
Pit Soil (0-15)	Very dark grayish brown	4.47	4.27	VL	L	М	L
Pit Soil (15- 30)	Light brownish gray	4.77	4.33	VL	L	М	L
Pit Soil (30- 50)	Gray	4.50	4.23	VL	L	М	L
Rice (0-15)	Very dark grayish brown	5.02	4.82	VL	L	М	L
Rice (15-30)	Brown	4.66	4.63	VL	L	М	L
Rice (30-50)	Brownish yellow	4.67	4.27	VL	L	М	L
Yam A (0-15)	Brown	5.36	4.85	VL	L	М	L
Yam A (15-30)	Yellowish brown	5.30	4.72	0	0	М	L
Yam A (30-50)	Brownish yellow	5.41	4.65	VL	L	М	L
Yam B (0-15)	Very dark grayish brown	4.97	4.40	VL	L	М	L
Yam B (15-30)	Yellowish brown	4.99	4.63	VL	VL	М	L
Yam B (30-50)	Light yellowish brown	4.84	4.43	VL	0	М	L
Yam C (0-15)	Brown	5.15	4.46	VL	L	М	L
Yam C (15-30)	Dark yellowish brown	4.73	4.49	VL	L	М	L
Yam C (30-50)	Yellowish brown	4.95	4.43	VL	L	М	L

Appendix G: Soil Types of the Study Area

Soil Association	Landform	Parent material	Soil suitability Group/Limitations	Soil Units/Family
Brantian	Terraces	Alluvium	2 (localized gravel layer & localized compact sandy layer)	Orthic Acrisol, Ferric Acrisol, Gleyic Acrisol, Gleyic Podsol, Humic Podsol, Orthic Podsol, Orthic Ferralsol, Albic Arenosol
Labau	Valley floors & minor terraces	Alluvium	2	Dystric Fluvisol, Eutric Fluvisol, Dystric Gleysol, Eutric Gleysol, Gleyic Acrisol, Orthic Acrisol, Dystric Cambisol, Eutric Cambisol, Gleyic Cambisol
Sook	Broad lacustrine and river terraces with minor freshwater swamps	Alluvium	3 (low moisture & nutrient retention)	<u>Gleyic Acrisol</u> , Gleyic Podsol, Ferric Acrisol, Orthic Acrisol, Dystric Cambisol, Dysrtic Histosol
Dalit	Moderate hills & minor valley floors; slopes 0 -20 ⁰	Sandstone, mudstone & alluvium	3	Orthic Acrisol, Ferric Acrisol, Gleyic Acrisol
Kepayan	Raised river, marine and lacustrine terraces	Alluvium	5	<u>Gleyic podsol</u> , Gleyic acrisol, Albic, Arenosol, Dystric histosol
Crocker	Mountains & Steep lands	Sandstone & mudstone	5 (very steep terrain, very shallow to skeletal soils)	Orthic Acrisol, Chromic cambisol, Dystric Cambisols

The main soil types found in the Sook Plain are as listed in the table below:

Soil units defined according to FAO/UNESCO project for the soil map of the world (FAO 1968, 1970). Dominant soil units in each association are underlined.

Two of the above-mentioned soil types are found in the study area, i.e., the Kepayan and Sook Associations. According to the Sabah DOA's Soil Suitability Classification for Agriculture, the Kepayan Association is placed under Class 5. The soils in this class have at least one very serious limitation to agricultural development and would not be suited for such a purpose. For Kepayan Association, the limitations being acidic and low plant nutrients content.

While the Sook Association is slightly better for agriculture, it is placed under Class 3. Class 3 soils are seriously limited by one factor (soil property) as far as general agricultural development is concerned, but maybe productive for more tolerant crops. For other crops, a considerable financial

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input is required if high yields are to be obtained. The limitations for Sook soils are their low moisture & nutrient retention properties. The Sook soils are basically alluvial deposit.

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