Impact of land use changes on communities' livelihood strategies and environment in Kampung Empayang, Sarawak

by

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Abstract

The study was conducted in the Empayang village of Sarawak region in Malaysia. The area has practiced different land use practices since 1960s. The objective of the study was to assess the impacts of land use changes on the communities' livelihood strategies and the natural environment. In order to address our research question, we made use of both social and natural scientific methods for our data collection. We found that the land use practices, especially the oil palm, had observable impact on the natural environment. There have been continuous amendments to the Sarawak Land Code of 1958 in relation to Native Customary Rights which pave the way for commercial plantation and logging. As the community members of Empayang interact with their surrounding environment, the advantages of undertaking livelihood strategies aligned to the modernisation process of the more mainstream Malaysian community increases.

Preface

Date

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Abbreviation

DOA = Department of Agriculture

EPF = Employee Provident Fund

FAO = Food and Agricultural Organisation

FELCRA = Federal Land Consolidation and Rehabilitation Authority

FORIM = Institut Penyelidikan Kelapa Sawit Malaysia

IADP = Integrated Agriculture Development Program

GPS = Global Positioning System

JKKK = Village security and development committee

MARDI = Malaysian Agricultural Research and Development Institute

NCL = Native Customary Land

NGO = Non-Government Organisation

PDM = Pebble Distribution Method

RM = Ringgit Malaysia

SALCRA = Sarawak Land Consolidation and Rehabilitation Authority

SLC= Sarawak Land Code

Table of Content

1. Introduction

The Empayang village is located in the Sarawak state. It has two longhouses, Rumah[1] Jemat (19 *biliks*[2]) and Rumah Ayu (36 *biliks*). The residents of the village depend on agricultural practices as their source of livelihood like most rural Iban communities. Almost all farmers in Empayang grow rice[3] for their own consumption. In addition to this the community has practiced different development schemes since 1962 because the construction of the drainage system makes it possible to introduce the different schemes to the area. Coconut scheme, the first scheme for the village, was introduced in 1962. Other schemes introduced to the area include the rice scheme in late 1970s, pig rearing scheme in 1980, cacao scheme in early 1980s, the maize scheme in 1988 and finally in 1990s the oil palm scheme. It was SALCRA who came first to the village in 1993 and FELCRA[4] came after two years later.

These land use changes has been an issue of argument among scholars. Based on the argument to eradicate rural poverty and integrate the periphery to the center, traditional land use is considered to be a competitor for commercial plantation and thus viewed as a stumbling block for development (Ngidang 2005). For this group of people, commercialization of agriculture and integrating it to the market is the main solution for rural poverty alleviation. There are counter arguments and research results, however. Bowden in Butler (2007) underlined the poverty alleviation role of oil palm plantation is exaggerated. He found that despite low oil palm plantation coverage in Sarawak than Sabah, better poverty reduction achievements were registered in the former than the latter indicating that the causal relationship is not as strong as broadly assumed. In another study, Ichikawa (2007) found that the Iban land use practices were superior to the state land uses for the former involves small

[1] *Rumah* = longhouse

[2] *Bilik* is the individual household unit of longhouse

[3] Unless we mention otherwise, 'rice' refers mainly to the wet rice type which is dominantly cultivated by the residents of Empayang and which may or may not be minimally supplemented by the dry rice type.

[4] FELCRA = Federal Land Consolidation and Rehabilitation Authority

scale disturbance to the forest at relatively long periods than the latter. The Iban land use practices are also supported by the social institutions of the Iban, such as inheritance and their system of land and natural resource tenure. Despite these extreme positions among scholars, Wadley et al. 2005) showed how the different land use practices can be used complementarily as livelihood strategies.

This study combines both the poverty alleviation as well as the environmental and societal issues as a result of changes in land use unlike the above studies focusing mainly on a single theme only. We believe that these changes in land use practices will have impacts in the poverty alleviation endeavor and thereby led to changes in the livelihood strategy of the society in general and the individual in particular. Moreover, these changes in land use practices can also bring or led to changes in the societal structure and sense of community among the different members of the society. The study will also consider environmental issues like soil fertility, land quality, etc.

Research Questions

Accordingly, the main research question for our study is:
What are the impacts of land use changes on the communities' livelihood strategies and natural environment?

The sub-research questions are:

- What are the impacts of land use changes on the community's livelihood strategy?
- Will the land use changes affect land tenure?
- What is the impact of land use changes on the natural environment?
- What is the future aspiration and expectation of the community in relation to land use changes?

2. Method

Key Informant Interview

In order to gain access to information on specific topics we used key informant interviews. In the setting of Empayang we especially utilized Apai Will, who was well-respected in the village and possessed an overview of the diversified community members and their undertakings.

Questionnaire

We used questionnaire (Appendix 2) to get a statistical overview of land use and livelihood strategies practiced in the village, but also we put some open ended question to get more explanation on the answer given by the respondents. We merged and revised the draft questionnaires from Malaysian and Danish groups into one questionnaire. The respondents were 34 household headman/woman from Rumah Ayu (22 *bilik*s) and Rumah Jemat (12 *bilik*s), randomly picked.

PRA activities

History time line

To know the most important events occurred in and pertinent to the village and to see how these influence or relate to the community livelihood strategies and land use changes we used history time line exercise. We invited headmen and elder villagers (men and women) and split them into three different groups and asked them the history of different issues; one on land tenure, the two generally about the village.

Scoring

To get villagers opinion about their important income source before and after the oil palm was introduced and the benefit of oil palm for them, we used Pebble Distribution Method (PDM) scoring exercise using 100 counters (seeds) (detail see Sheil et al. 2003).

Transect walk and community mapping

We did the transect walk, to have a better understanding of Empayang village, in two groups one started from Rumah Ayu and the other from Rumah Jemat; each group took GPS points.

We merged our GPS points and draw the map of Empayang from the Google earth (Figure 2.1). It was helpful for all the activities we did afterwards.

In the afternoon together with some of young and old villagers we made community mapping. We explained them to draw the different locations of important the longhouses, road, sea, church; oil palm, coconut, and rice fields; forest; state land, etc. (Figure 2.2).

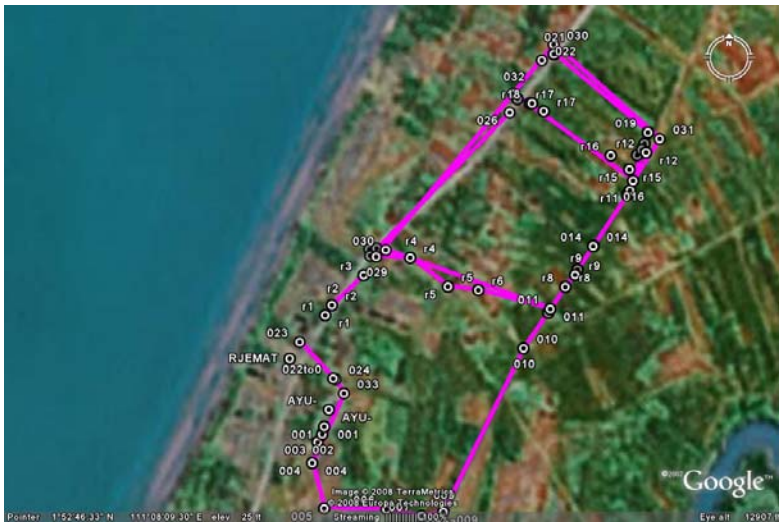

Figure 2.1. Map of Empayang from the GPS points

Figure 2.2. Map of Empayang as perceived by the community

Trend Analysis

Together with a group of participants from both longhouses did this exercise. We explained to them to discuss some major trends of events in their villages like out migration, fertility of soil, rice cultivation private or individual oil palm plantation.

Venn diagram

A group of women and men from both longhouses who were also members of the JKKK committee participated in the exercise. We explained to them to list major institutions related to agriculture and had role or importance to them. We further explained for them to use different sizes of circles, distance and overlaps to show the importance of the institution, whether it had significant role or not and if share or work together, respectively. First they did the maps in small sub groups and finally merged to a large map with discussion among them. The head man presented the last Venn diagram to the villagers with the reasons why they did so.

Seasonal activity calendar

A group of women represented from both longhouses Rumah Ayu and Jemat were participated to this exercise. We explained to them to list the major activities related to them over the 12 months. After they listed the activities, they roughly sketched their income, expenditure and time allocation. The same activity was repeated with men group to see if there was any difference.

Natural scientific methods

In order to triangulate the information we gathered through the other methods we made biophysical assessment.

Sampling

We took sub samples from each of the four land uses at three different depths (8-24-42cm) using soil auger. We tried to capture variation in the field considering slop of the field, age of oil palm and where we felt there was variation. We mixed all the same layer samples thoroughly and put in plastic bag after labelling. We also recorded the diversity of fruits in the orchard in 10mx20m plot. The corresponding GPS points for each of the land uses were also recorded.

Soil analysis

All the sampled soils were dried in the sun and pondered to get fine sample for chemical analysis. We measured pH, conductivity, phosphate, nitrate and potassium content of the 12 samples. We extracted the soil and used the different test kits to measure some of the chemical properties in the field. Aluminium, nitrogen and carbon contents were analysed at the laboratory of life sciences, university of Copenhagen. In the lab we weighed 30mg of soil from each sample and analysed using spectroscopy machine (IR-MS) to know nitrogen and carbon contents.

Forest measurement

We went with a key informant to measure a protected forest. 10mx10m plot was made using tape meter and the boundaries were marked with red ropes. We divided the big plot in to four sub plots. We then counted the number of faces and creeper species of plants in each sub plot and also we asked the key informant about the local knowledge and uses these plant species have.

Methods Reflections

Interviews

In regards to interviews, the setting of our fieldwork was ideal. As we lived in the midst of the community, it seemed natural for us to interact with the community members as they went about their daily business in the vicinity of their home. The community members were furthermore generous with their time and seemed willing to answer questions without great inhibitions.

However, due to the fact that most of our semi-structured interviews were conducted in public setting, they served to attract the attention of diversified community members in the proximity of the interview. It is probable that some informants have modified their statements to align them to community ideal, rather than put forth individual views which might diverge from the norm. Retrospectively we should have used it to our advantage that we had been provided a private *bilik* to reside in, and situated some of our interviews here.

Questionnaire

Our original intention with the questionnaire was to cover all households in Empayang, but due to the time restraint we limited ourselves to our covering 72% of the community questionnaire.

We made a pre-test of the questionnaire and discussed the final version in detail. However, but several questions were nonetheless unclear and ambiguous, which resulted in some unclear responses. This has caused us to consider some of the data obtained through the questionnaire unreliable. Retrospectively it would have been advantageous if we had limited the number of people merging and carrying out the questionnaire in order to allow in-depth understanding of the questionnaire.

Natural scientific methods

Both soil sampling and forest assessment activities were done at same time. The time was short to consider different possible sampling strategies to make a very good representative sample. For instance private oil palm plantation sample to compare against the state owned FELCRA. We did some of the soil analysis in the field; we might induce some errors in our data.

Working with translator

The Danish students who could not speak with the community members experienced some difficulties through the need for translation. Despite attempts to include our translator in the discussion of our activities, she could not possibly attain a full understanding of every issue pursued, which created some misunderstandings during translation.

We experienced that the need for translation especially presented difficulties when we conducted PRA activities and focus group interviews, as it was harder to grab the valuable information which usually comes out during the discussion among the participants. We found that a follow up discussion with the translator and other student participants, as well as note-sharing, served to give a clearer understanding of the activity.

3. Results and Discussion

3.1 Demographic

Unlike the gender composition of the world population, the Empayang female population is out number the male population (89:75 people, respectively). The villagers' ages are range from 2 weeks old to 78 years old (Figure 3.1), which 40% of them have secondary school education, 29% have primary school education, 15% have no education, and only 1% has tertiary school education (Figure 3.2).

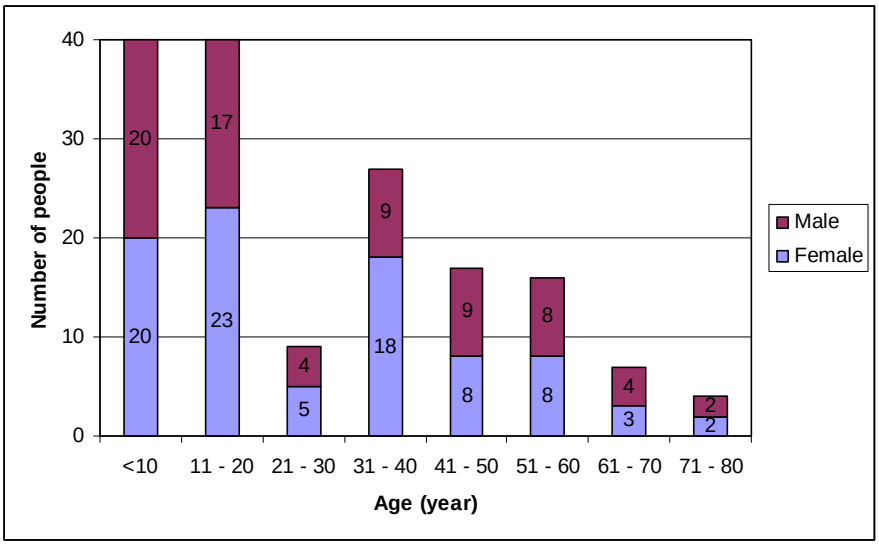

Figure 3.1. Distribution age of Empayang community (n=160)

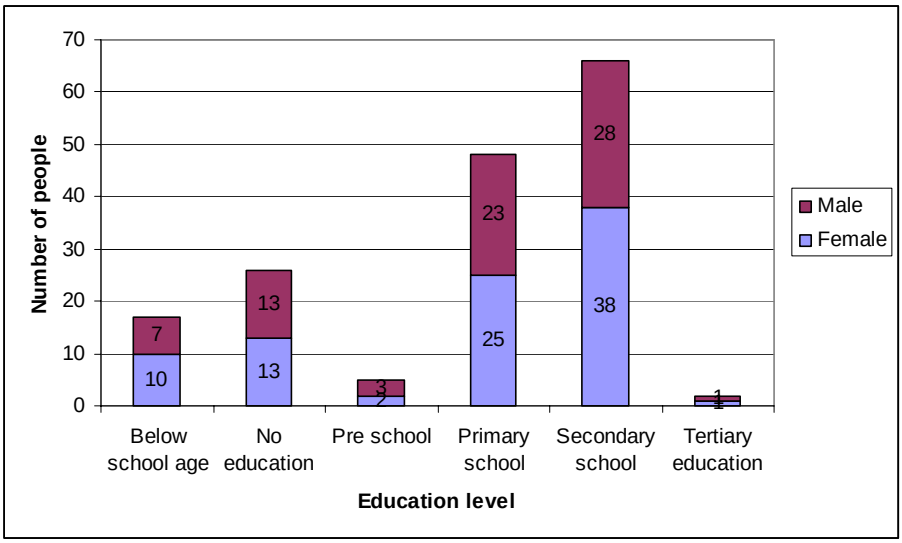

Figure 3.2. Education level of Empayang community (n=164)

3.2 Livelihood Strategy

In this section the focus is on the different livelihood strategies used by the residents of Empayang to cope with the different land use changes.

> Koczberski *et al.* (2001) defined the livelihood strategies as "activities undertaken by smallholder households to provide a means of living. A key goal of livelihood strategies is to ensure household economic and social security."

3.2.1 Occupation

The Empayang residents' main occupations are students, farmers, housewives, oil palm workers and others (Figure 3.3). However, almost all of them supplement their main occupations with one or two additional activities. For example, besides being farmers, they are also fishermen/women, construction workers, oil palm workers, and van/bus drivers. While the housewives usually help in the fields, maintain home garden and livestock and/or weave mats or back-carried baskets (*tubang*) (Figure 3.4). The category of 'Others' covers teachers, drivers, government employees, carpenters, building constructors, plumbers and factory workers.

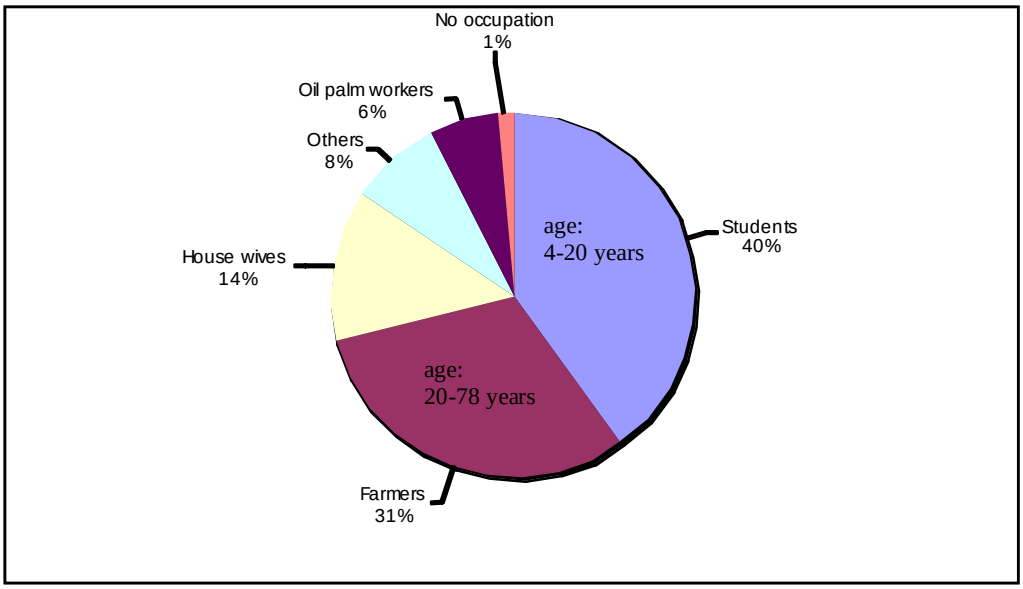

Figure 3.3: Major occupation of Empayang residents (n=148)

Figure 3.4. A housewife is weaving *tubang*

Holding more than one occupation is not an exception to the students who are the largest group in Empayang (40%). Almost half of them attend boarding schools and come home for the weekends and during holidays. On these occasions most students help their parents or other elderly villagers with farm work such as processing coconut, collecting and sorting fern, and cultivating rice. On long school vacations particularly the oldest students take up work at construction projects nearby.

The second largest occupational group is farmers (31%). They cultivate at least one agriculture plants such as rice, oil palm, coconut, vegetables (ie. corn, snake bean, taro, cucumber, okra), pepper, pineapple, water melon; some also collect edible fern (*Rambai*) and/or *buah asam* (*maram bura*) fruit. Walker *et al.* (2001) wrote that in rural areas of many countries, local peoples combine subsistence and income-generating activities. This is applicable to the Empayang community. The farmers plant rice dominantly for their households' subsistence use, while the other crops are planted in such amount that they can sell them for cash income.

The villagers furthermore practice animal husbandry and fishing for subsistence and/or for cash income. The livestock are mostly small animal such as pigs, chicken and ducks, although two households own cows. There are two types of fishery in Empayang: sea fishery and fresh-water fishery. Rumah Ayu fishermen mostly do fresh-water fishery by using *bubu* (bamboo fishing basket) which are placed in the oil palm drainage canals. Meanwhile, most of Rumah

Jemat fishermen are the sea fishermen who use fishing nets to collect fish and Horseshoe crab (*Belangkas*) from the sea behind the Rumah Jemat.

Other income-generating activity practiced in the village is working as oil palm labours in FELCRA, SALCRA[5] or FORIM[6]. They work as daily workers doing weeding, pruning, applying fertilizer and pesticide, harvesting, or as truck drivers. Villagers prefer to work for SALCRA since it provides higher salary and Employee Provident Fund (EPF/pension fund) for all level of workers, while FELCRA only gives the EPF to supervisor level workers.

Only 1% of villagers have of no occupation. Even so, they still somehow help their family in activities that provide means of living. As Figure 3.5 shows an elderly lady with no occupation in her late 70s still help her family fixing fish net.

Weaving mats and baskets has been part of Iban culture, however now in Empayang there are only about 10 weavers, predominantly women over 40 years old, who are still doing it. The younger generation is no longer interested in this tradition.

Figure 3.5. An elderly lady in her late 70s still helps her family fixing fish net

[5] SALCRA = Sarawak Land Consolidation and Rehabilitation Authority

[6] FORIM = Institut Penyelidikan Kelapa Sawit Malaysia

3.2.2 Important income sources of Empayang nowadays

Through the Pebble Distribution Method (PDM) exercise, we acquired an overview of the five important sources of income according the perception of the male and female community members of Empayang. The specific income-generating activities and their score are indicated in Table 3.1 below.

Table 3.1: Current important income sources of villagers

A. According to men group

Source of income	Score
Private oil palm	38
Office work	24
Cash vegetable (market garden)	18
Work for SALCRA/FELCRA	15
Rice	5
Total	100

B. According to women group

Source of income	Score
Oil palm	31
Rambai fern	27
Work for SALCRA/FELCRA	19
Coconut	15
Rice	8
Total	100

From all the income-generating activities of the community, both women and men perceive oil palm plantation to be the most profitable undertaking. However, the men specified the cultivation of private oil palm as the most favorable, because this enables them to keep the entire profit for themselves. To contrast, joining venture with FELCRA would generate lower cash return, based on the dividend (30% for land owner, 70% for FELCRA) given twice a year. Even worst sometimes there is no dividend given in years as happened to grandma

Glima. She did not receive any dividend in the past two years for her 10 hectares oil palm managed by SALCRA. SALCRA informed her that there was no labour worked at their joined plantation so there was no production.

Even though few villagers work in offices, the men perceived office work as the second important income source because it gives a regular fixed income in addition to future monetary security (i.e. EPF and house loan). This is important especially when the oil palm yield is low.

For the women income from *Rambai* collection is the second largest contributor to their household income. Its cultivation needs minimal financial capital since it does not require fertilizer and pesticide. With the harvesting range being every two or three days, *Rambai* provides regular quick cash income approximately RM[7]400/month throughout the year. Persons who work at FELCRA/SALCRA plantations can harvest the fern which let grow there, but they have to know which ferns are free from pesticide. The men did not considered *Rambai* as their important income source probably because this activity mainly done by the women.

Sorting and packing of *Rambai* is done at the corridor (*Ruai*) of longhouse with the help of their neighbors, especially the ones who also collect *Rambai*. Despite this shared work, the persons who harvest the *Rambai* will keep all the profit from selling it, but in return they will help the other *Rambai* collectors in sorting their harvest on another occasion. This kind of Iban team-work is known as *Bedurok* (Figure 3.6).

[7] RM = Malaysian Ringgit , RM 1 = USD 0.315, approximately

Figure 3.6. Iban team-work, *Bedurok*, is practiced in sorting *Rambai* fern at the *ruai* of Rumah Jemat longhouse

The villagers also considered waged income from FELCRA/SALCRA as an important income source. For young people, working at FELCRA/SALCRA can give more money for saving and more secure future from having the EPF.

Women still considered importance of coconut income in their livelihood, although it is unstable as well as less important than waged income from working for FELCRA/SALCRA. The average income from coconuts is only about RM300/month, but it derives its value for being relatively simple to cultivate especially in comparison to oil palm cultivation. Coconut plantations do not require fertilizer and maintenance is less intensive. Furthermore, it takes longer time to produce (at least five years), while oil palm starts producing in the second or third year after planting. The existing coconut trees are only the old coconut trees which soon also will be replaced by oil palm, as many of coconut fields have already turned into oil palm fields.

Although rice is mostly for their own consumption, both men and women still considered it as important source of income. Producing it themselves enables villagers to not spending their money on buying rice, which is their staple food[8] (Figure 3.7).

Figure 3.7. An Empayang woman is drying her rice in front of the longhouse

Through the seasonal calendars (Figure 3.8 and 3.9), we saw that the local people are well aware of how to adjust their income and expenditure during the different months of the year. The income for women rises slowly from May until it reaches its maximum in October. Their income is the lowest in December because in this month the women are preparing for Christmas and are not so much involved in income-generating activities. Among the women

[8] In the PDM exercise for the source of income first we asked the participants to list major income sources of Empayang villagers, and then we purposely asked the participants to choose five important income sources from that list. The importance of the resource is not only based on the monetary value of the income they get from those resources. They might take other factors, such as functional and cultural value, sustainability, availability, do ability and facility related to the resources into their importance consideration. As for the rice, its importance as staple food and cultural identity might influence their decision.

In other case, the income data from the questionnaire showed that the average income from other occupation such as driver and contractor is higher (RM9,773/year) than the average income from the oil palm (RM6,300/year), and the average income from the fishery (RM3,910/year) and livestock (RM2,536/year) are higher than from the *Rambai* (RM2,391/year). Yet, the participants did not include the driving, contractor, fishery and livestock rearing in their five important income sources. This could be because those income sources were only benefiting smaller number of households compare to the other sources of cash income.

their expenditure is the lowest between September and October because they spent much of their time in different activities. Their highest expenditure occurs in December because of the high expenditure for Christmas and schooling costs for their children. For women their labor allocation and expenditure move on opposite direction. For men their income increases slowly from January to June where it stays peak till September where after it starts to decline and reaches its lowest in December. The expenditure for men overlaps with their labor allocation unlike the women.

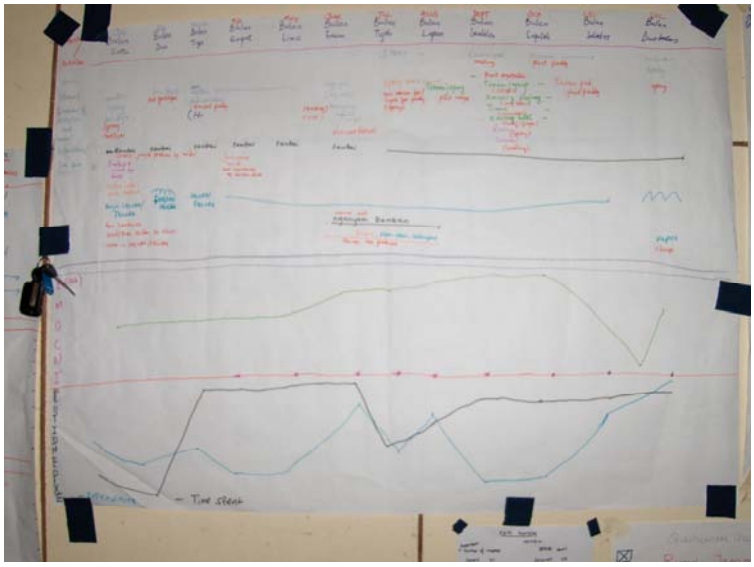

Figure 3.8. Seasonal activity calendar, income–expenditure and time spent for women group

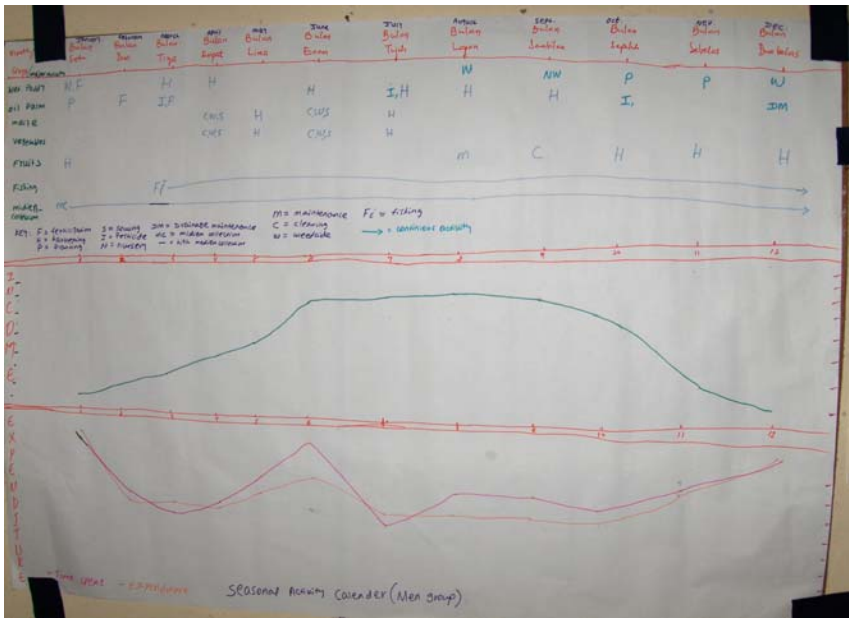

Figure 3.9. Seasonal activity calendar, income–expenditure and time spent for men group

3.2.4 Important source of income before the existence of oil palm in Empayang

Before the oil palm was introduced in Empayang the villagers' important income sources were coconut, market garden vegetables (including corn as the major product), *Rambai*, rice and sea products (Table 3.2).

Table 3.2: Major income sources before the oil palm existed in Empayang

A. According to men group

Source of income	**Score**
Market garden vegetables	30
Coconut	26
Rice	24
Rambai fern	10
Sea product	10
Total	100

B. According to women group

Source of income	**Score**
Coconut	28
Corn	23
Rambai fern	22
Other market garden vegetables	17
Rice	10
Total	100

Prior to the introduction of oil palm scheme in Empayang, the villagers had already practiced several different types of plantation crop schemes, introduced mostly by the Sarawak Department of Agriculture (DOA).

In 1962 the DOA introduced the coconut scheme into Empayang, which was joined by all members of the community. They sold the fresh coconut or dried coconut. They also made

cooking oil from it. The coconut production peaked in 1978-1985, but has since then been on the decline. The women ranked the coconut as the most advantageous crop, whereas the men considered the market garden to be of even greater importance because it generated more stable income.

Corn scheme was introduced to Empayang in 1988. The women stated that in the old days corn was abundant to such an extent that surplus from the harvest was at times thrown into the sea. Corn could be sold to higher price than *Rambai*, and was therefore ranked higher. However, corn is seasonal plant, whereas the fern can provide cash income all year around and can grows under the coconut and oil palm tress. Meanwhile some farmers still planting corn as one of the vegetables that they plant after they harvest the rice.

Later in 1975 sago scheme was introduced, followed by rice scheme between 1977-1979. Then in 1982-1985 cocoa was introduced. Sago and cocoa practically does not exist anymore in Empayang. While rice, despite the pest and soil problem (see Section 3.4), before and after the oil palm became popular has been considered as one of the most five important income sources due to the money saved by producing rice for own consumption. A man said that their rice fields and market gardens generated money used to pay for their children' education.

According to the men the sea product could give a lot of cash income however the market was competitive so they sometimes had hard time selling the product. The sea product did not included in the women five most important income sources probably because fishing is for the most part done by the men.

3.2.5 Importance actors in livelihood strategy

In the Venn diagram exercise the participants identified 23 actors which have direct or indirect roles on their livelihood strategies in their livelihood strategies, including agricultural activities (Figure 3.10). The DOA is the most important actor for them. From interview with Kabong agriculture officer we noted that the DOA has strong attachment to the village in giving subsidies for agricultural production and technical support for the different commercial crops including the oil palm. Next importance are Kabong town and the hospital nearby. This could be because Kabong is the larger town nearby where there are market and offices; and they depend on the hospital for medical services including medicine since they do not use any

traditional medicine. They emphasised that FELCRA, SALCRA, IADP and the farmers organization were very important and has significant roles for Empayang, while the Malaysian Agricultural Research and Development Institute (MARDI) has less importance to them. The '*JKKK*' (the village security and development committee), the headman (TR) and '*Germpuk Induk*' (woman association) were drew in overlapping circles. This shows that they are working closely and share information.

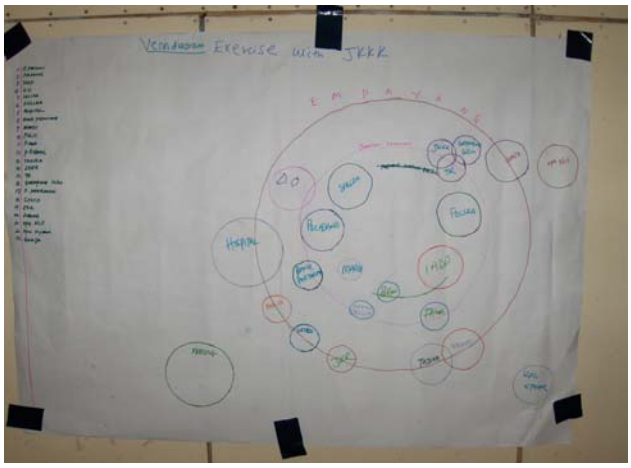

Figure 3.10. Venn diagram

3.3 Land Tenure

3.3.1 Legislation on Land Tenure

It was difficult to extract such information from the residents of the village as they have little or no knowledge about the legal issues in relation to land. So for this part of the discussion, we mainly depend on secondary sources and key informant interviews with individuals who have better understanding of this issue. Furthermore, given that I we have a different background and the sensitiveness of the issue, I we preferred to focus on the most visible changes without going to the detail. I we did this to avoid possibility of err from misunderstanding or misinterpreting some of the legal issues. Though land tenure issues have a long history in Sarawak, for this discussion our point of departure will be the SLC of 1958 as this is used as a point of reference for land policy and administrative issues today. Many amendments to the SLC have been introduced in post independence era for the expansion of logging activities and plantation development among other reasons (Ngidang 2005). "The 1994 amendment empowers the minister in charge of land matters to extinguish native customary rights to land. In 1996, the burden of proof with respect to Native Customary Rights was placed on the native claimant against the presumption that the land belongs to the state. .... In 1987, it was made illegal for communities to block companies from having access to their logging and plantation enterprises even if these roads crossed areas claimed by natives as customary lands." (Colchester *et al*. 2007).

Thus from the above discussion, it is clear that there are changes in land policies and/or amendments to the SLC to pave the way for commercial logging and plantation activities in Sarawak. According to Ngidang (2005), the main reason for these changes is that most of the state land suitable for plantation is already under use so the remaining suitable lands left for commercial plantations are found in areas claimed under native customary rights. From its different official documents and statements, though the government has admitted that between 1.5 million to 2.8 million hectares of the territory of Sarawak is subject to Native Customary Rights, the where about of these areas is not made public (Colchester et al. 2007). From the key informant interview we learnt that even if most of the people in Empayang have land title, they might have also Native Customary Rights Land. If this is the case, Empayang will not be unique from the rest of Sarawak concerning its Native Customary Rights Land.

3.3.2 Tenure Security

According to FAO 2002, Security of tenure is the certainty that a person's rights to land will be recognized by others and protected in cases of specific challenges. Tenure security cannot be measured directly and it is mainly what people perceive it to be. Its attributes also varies from context to context (*Ibid*). Under normal circumstances if there is frequent change in land tenure it is expected to create insecurity of land holding within the people. In case of Empayang, most of the people have got land title for their land holdings in 1959/60. In Rumah Jemat there is only one person who has no land title but in Rumah Ayu there are some which have no land even. From our interviews we learnt that those who have land title feel secured about their land holdings. From the questionnaire also it appears that above 70% of the respondents who have land are secured while around 8% are not. Over 13% of the respondents are not sure about their security status (Figure 3.11). Actually it seems that even there are some who haven't land title but feel secured because if their land is to be taken by the government for some reason, then they will be compensated for what they have grown on their land. There are eight empty *biliks* in the two longhouses because the residents of these *biliks* migrated to different places for some reason. So it seems that because of the migration trend the population pressure in the longhouses seems low. These could be another factor that contributed for those who have land but not land title to feel secured. Another reason could be that the area is already surveyed sometime in the past so that there could be no government intervention at least in the very short-run. In some areas of Sarawak joining SALCRA is used as a means to obtain land title, but this is not the case in Empayang as the majority of the community already has land title. Rather they joined FELCRA (works with titled land) not only for the better return from their land but also their land titles make it possible for them to join this scheme. On the other hand, there are also some who have land (NCL) but do not feel secured.

Generally, the result of the issue of tenure security is mixed for those who have land but not land title. Some feel secured as long as they are compensated for what they have grown on their land but for others they do not feel secured as long as they are not granted. But those who have title they feel secured about their land holdings.

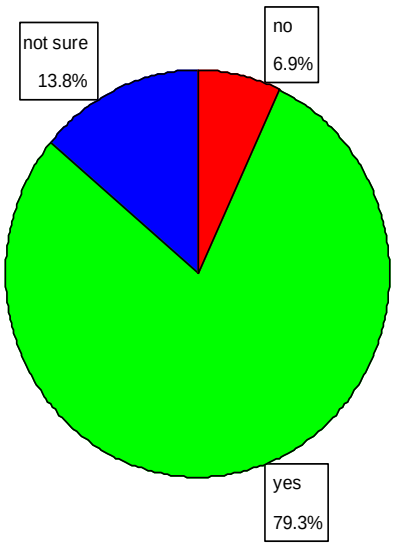

Figure 3.11: Tenure security status of respondents who have land

This tenure security has a clear impact on the livelihood options among the residents. Those individuals with land title have better livelihood options than those who do not have title and the landless. For example the individuals without land title can't participate under the FELCRA scheme for the simple reason that they have no land title. That is why one of the respondents from this category enters into a joint agreement with one of the locals to grow Oil palm since he was unable to participate in FELCRA because of the title problem, among other reasons. Their agreement is that he will come with his land and labor and his friend with his money so that they can share the benefit. For the landless it is worse even. They work for other farmers, other off-farm activities and recently on SALCRA and FELCRA too. The house of the respondent from this category was one of the lowest standards by any measure; unfinished roof, wall, and floor with small household utensils. This limited livelihood option could mean low income. This in turn could mean that those with limited livelihood options may be unable to afford for tuition fees to educate their children or to send their children to better schools, to pay health bills, and other expenditures too. That is why expectations about their future in relation to their land are different among the three groups. From those with land title the respondent's aim is to continue with what he is doing and transfer the land to his children. From those with land but not land title the respondent's aim is to make sure that his land is transferred to his children. But the landless seems even hopeless. He did not know

what to expect about the future but insisted that he will continue to apply to get land from the government.

The sense of security has also a clear link with environmental conservation. “Insecure land tenure is linked to poor land use which in turn leads to environmental degradation. Lack of clear rights can reduce the incentive to implement long-term resource measures.” (FAO, 2002). The respondent from those with land but not land title stated that he applied much fertilizer to his oil palm than the others used to do so that he was able to harvest the product within almost a year and half. Under normal circumstances, it might take up to three years to harvest the first production from the oil palm.

3.3.3 Compensation

In case the government wants the land of the residents in the village for some reason, it will compensate them for their land. But if they do not have land title, they will be compensated for what they have grown on their land not for the land itself. There are even some who have considered the compensation issue in their decision what to grow on their land. In other words, this leads to internal conflict within the individual regarding what to grow on his land. Compensation was one of the reasons why one of the respondents in our interview grow oil palm than coconut as the compensation for oil palm is known and yields butter compensation compared to coconut. Even so they believe that the compensation is not adequate but they can do nothing with the government decision. But for those who have land title, they will be compensated for what they have grown on their land and the compensation for the land itself depends on for what purpose the government needs the land. If the land is needed, say for community road where the land owner is part of it, the compensation will be for what is grown on the land not for the land itself. But if the land is needed for, say commercial plantation, the compensation will be both for what is grown and for the land itself. Both categories believe that the compensation for what is grown on the land is inadequate and known for some plantation types like oil palm but not for some others like coconut.

3.3.4. Awareness

It seems that the residents even do not know about the six different land categories (see Table 3.3). There is a huge gap between what is written in legal documents and what the residents in the village actually think. For example, if a certain land has title, then it is state land and the

individual with the title is supposed to pay a rent for that land though very low. Normally, when they are titled for a certain plot of land that means they will be given a lease for some period of time, usually 60 years, where they are supposed to renew their lease before its expiry if they want to continue using the land. If a certain individual wants to extend the lease holding of the land he is using, he must be using the land and he needs to have a reason for why he wants to extend his lease holding. But for the residents the reverse is true. If they have a titled land, they consider it as private property or at least private ownership. They do not regard it as a state land. It seems that they do not realize that they are allowed to use the land for a certain period of time for a specific purpose. But if they have NCL they considered it as a state land though the opposite is stated in legal documents. For the Native Customary Land no rent is paid since it is not surveyed and granted, in short since it is not state land. If a certain community has an NCL land, it will be their property "perpetually" unlike the titled land where they use the land for a certain period of time.

Table 3.3: Classification of Land in Sarawak

Land in Sarawak is classified in to six categories
➢ Mixed Zone Land: land which may be held by any citizen without restriction
➢ Native Area Land: land with a registered document of title but to be held by natives only
➢ Native Communal Reserve: declared by Order of the Governor in Council for use by any native community, regulated by the customary law of the community
➢ Reserved Land: reserved for public purposes
➢ Interior Area Land: land that does not fall within the mixed zone; and
➢ Native Customary Land: land in which customary rights, whether communal or otherwise, have been created.

Source: Bulan in Cooke (2006); State, Communities and forest in contemporary Borneo, pp 47-48

What is worse is the case of the landless and those who do not have land title. For the former it seems that they are hopeless. They applied many times to get land from the government but for the reason they do not know they did not get any yet. Though there are some landless they apply for land individually. Even it seems that they do not realise that it is possible to apply being in group (organized). For example, the individual we interviewed was in the village since 1973 but has no any plot of land yet. He did not think that it is possible to submit their application being in group or organized. He prefers to follow what the headman said to them. But still he has the hope to get some land from the government and will continue to submit his

application to the concerned officials. For the one with land but not land title, the situation is not far from the former. He applied many times to get title for his land but the response was simple; “You can grow whatever you want.”

Generally it seems that the residents have no or little knowledge about legal issues pertaining to land and were not informed about any change in legal issues about the land as far as they can remember.

3.4 Impacts of land uses on the natural environment

3.4.1 Soil/land quality

We approached through different ways to know the impact of land use changes on the quality of soil which was one part of natural environment in Empayang. From the questionnaire 81.8% of the respondents confirmed land used for oil palm plantation not suitable for wet rice cultivation afterwards (Table3.4). However the result showed that it is suitable for growing of the fruits which are perennial crops. The respondents associated the reason to be compaction of the soil during the establishing process of the drainage system which reduces the land quality for rice and vegetables which are shallow rooted and annual crops. We also asked their opinion on the probable effect of oil palm on crops yield and soil fertility. The result showed that 54.5% of the respondents think oil palm has a negative impact and decreases crops yield (Figure 3.12) and 58.3% think that fertility of soil in their surrounding decreased after the introduction of the oil palm plantation (Figure 3.13).

Table 3.4. Suitability of land formally cultivated with oil palm for other land uses

Land use	*Yes (%)*	*No (%)*
Rice	18.2	81.8
Vegetables	40.9	59.1
Fruits	81	19
Fish or prawn pond	47.6	52.4

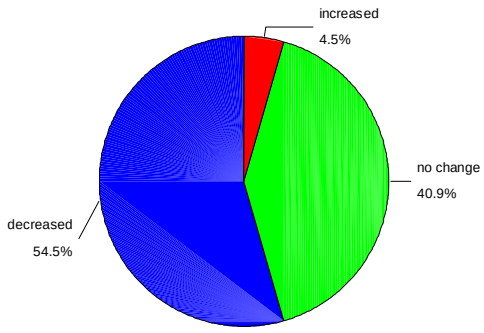

Figure 3.12. Respondents' perception of crop yield after the introduction of oil palm

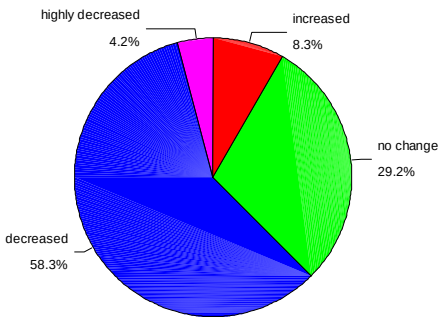

Figure 3.13. Respondents' perception of soil fertility after the introduction of oil palm

To triangulate this result we did soil sampling and analysis on four land uses or farming systems. The conductivity of the sampled soils from all the major land uses in the area ranged between 0.036 to 0.216mScm^{-1} (Table3.5). These soils are none-saline as soils which have EC bellow 4mS cm^{-1} are considered as salt free soils and are suitable for agricultural production . The pH ranged from 4.5 to 5.3 which are acidic but the sample from the oil palm had relatively higher pH compared to the other samples. This could be due to that oil palm plantation in FELCRA use lime to regulate the pH level of the soil. Some studies showed that oil palm can be grown up to pH of 5.59 as the crop tolerates soil acidity (Uzoho *et al*. 2007). The nutrient content of the soil samples nitrate and phosphate is quite low. This is very much related to soil pH that affects nutrient availability in the soil. The other reason could be that rice field was harvested when we took the sample and hence all the nutrients taken up by the crop. The area is also peat swamp and also very humid climate with heavy rains which may percolate through the soil. This may leach basic ions and replace them with acidic ions such as hydrogen and aluminium. We also noted that the higher pH in the oil palm also had higher phosphorous indicating that P is highly influenced by the soil reaction. The oil palm plantation had relatively higher phosphorus content on all the layers compared to the other land use practices. This could be due to higher rate of application of inorganic fertilizers in the scheme compared to the small scale rice or fruit cultivation. Relatively higher potassium was recorded on all layers of the forest. The rice and fruit samples had low levels of potassium compared to the forest and oil palm soil samples which had low to medium levels. Relatively lower aluminium content in the oil palm at all layers compared to the other land use practices followed by the protected forest. The traditional farming practices/land uses had higher levels of aluminium which also correlated with low pH of soil. Crop production could be hampered

under these land uses due to Aluminium toxicity. Total N decreases down the layers or profiles of all the samples from the land uses and was quite low which is a characteristics of tropical soils subjected to intense leaching (Uzoho *et al*. 2007). The low N contents indicate the need for N fertilization. Similar trend was also observed for the organic matter content of the land uses. Higher C: N ratio was recorded from the forest soil compared to the other land uses. The oil palm scheme had better C: N ratio compared to the wet rice and fruit orchard. This could be due to higher organic matter decomposition in the forest and the oil palm which is attributed to a better biomass. It has been reported that C: N ratio very much related to organic matter decomposition and nitrogen mineralization (Uzoho *et al*. 2007).It has also further mentioned that no tillage reduced a significant proportion of the wider C/N ratio and also maintained higher organic matter due to a lower decomposition rate (Hussian *et al.* 1999). It was also mentioned that continuous cultivation resulted in low organic matter in Tanzania (McDONAGH *et al*. 2001).

Table 3.5. Chemical properties of soils under four land uses in Empayang

Soil sample	*pH*	*EC*	*Nitrate*	*Potassium*	*Phosphate (*mg P g-1)	*Nitrogen (%)*	*Carbon (%)*	*C:N*	*Aluminium (µg/g of soil)*
Oil palm (0-8cm)	*5.3*	*0.108*	*No*	*Low*	*1.76*	0.06478	1.026	15.84	*1.40*
Oil palm (8-24cm)	*5.0*	*0.072*	*No*	*Low-medium*	*0.56*	0.03088	0.5426	17.57	*1.40*
Oil palm (24-42cm)	*5.3*	*0.036*	*No*	*Low-medium*	*0.72*	0.01825	0.3457	18.94	*1.39*
Forest (0-8cm)	*4.6*	*0.216*	*No*	*Low-medium*	*2.4*	0.2311	4.042	17.49	*7.98*
Forest (8-24cm)	*4.8*	*0.144*	*No*	*Low-medium*	*0.48*	0.1127	2.1	18.63	*7.98*
Forest (24-42cm)	*4.6*	*0.27*	*No*	*Low-medium*	*0.48*	0.04688	0.9746	20.79	*3.98*
Rice (0-8cm)	*4.7*	*0.216*	*No*	*Low*	*0.24*	0.2625	3.447	13.13	*23.95*
Rice (8-24cm)	*4.6*	*0.108*	*No*	*Low*	*0.48*	0.1224	1.525	12.46	*11.89*
Rice (24-42cm)	*4.5*	*0.108*	*No*	*Low*	*0.48*	0.08407	0.9688	11.52	*23.86*
Fruit orchard (0-8cm)	*4.7*	*0.18*	*N*	*Low*	*0.38*	0.1518	2.119	13.96	*11.90*
Fruit orchard (8-24cm)	*4.7*	*0.135*	*No*	*Low*	*0.38*	0.1099	1.474	13.41	*11.98*
Fruit orchard (24-42cm)	*4.6*	*0.18*	*No*	*Low*	*0.38*	0.1019	1.298	12.74	*23.90*

From the Agriculture office of Kabong we obtained information that there are four soil types (*Mukah, Igan, Kabong* and *Tatau*) identified in Empayang. But the two major ones in the area are *Kabong* and *Tatau*. *Tatau* is gleysols and 4-level fertility[9], which is characterized as sandy soil, sulphuric, marine origin, and none saline. Greater than half of the *Kabong* soil is saline and sandy. It was mentioned that both 3 and 4 level fertility soils are considered best for oil

[9] different class levels of fertility status known by the agriculture office

palm plantation as long as it is done with proper drainage (Agriculture office, pers.comm). We also interviewed a key informant about history and the different soil characters of the major land use practices where we took soil samples to substantiate with our soil analysis. Table 3.6 shows the result of the interview with a key informant from Rumah Jemat.

From four analyses of the different methods it appeared that the management system in the oil palm plantation at least is not affecting the soil quality in terms of the chemical property. But the compaction, the physical property of the soil, which we also observed during our sampling, could affect negatively subsequent annual crops like rice and vegetables in the area. The result also suggests the need of fertilization of soil to get optimum yields in peat swamp soils coupled with the humid climate where there is higher rate of leaching. Liming could also be one way to improve the soil acidity and hence reduce aluminium toxicity especially in the small scale traditional farming system (rice and fruit cultivation) to get an optimum yield. Integrating management strategies which help to derive N inputs from legumes or other N-fixing plant species could also be a viable option for the farmers.

Table 3.6. History, soil characteristics and local name of soils of four land use types in Empayang.

Land use	History	characteristics	Local name	Land title
Peat swamp forest	Never used for farming except some logging	- Less compaction, many leaves falling and high decomposition - The soil is also very dark	*Metang*	Has Iban land title or an individual land title
FELCRA oil palm	The same forest as above converted to oil palm 8-9 years ago	- Compacted soil Much pesticide applied or relatively higher agricultural inputs. - More sandy soil first generation of oil palm	*Metang*	Malay title
Fruit orchard	The area has also been forest before as the other land uses then converted to the fruit orchard	- About 20% of the soil is sandy and 80% is according to the respondent - The durian fruits dominate the orchard which are about 20 years old		Has no land title

Rice	The area has been swamp and water logged, no body likes to go there and has been a fallow for long period of time until it started three years ago. In 1970, a large area has been planted rice, and the harvest was not good due to the water logging condition or no drainage system developed	- The harvested or biomass or the straw left and decomposes there which supplies to the soil - The farmers fertilize the rice otherwise the leaves of the rice will be yellow a sign of nutrient deficiency - This probably could be due to leaching - The water table is this rice field is very close and you can find it just when you dug once - The colour of the soil is white and the people described this kind of soil is good for rice plantation	*Lugin*	State land

3.4.2 Impact on ecology

We asked the respondents perception on the number of the wild life after the introduction of the oil palm in the area. We found equal proportion of respondents who think wild life highly increased (33.3%) and decreased (33.3%) after the introduction of the oil palm (Figure 3.14). From further investigation through semi structured interviews it appeared that the oil palm plantations caused an increase in squirrels and rats, while big wild animals had decreased in number before the introduction of the oil palm. These rodents are considered as pests which attack not only the oil palm fruits but also other crops such as banana, coconut and rice, which has decreased their yield. Thus the change from natural forest areas to commercial oil palm plantation has created ecological disturbance which has had a major impact on the agricultural production of the area. Following the degradation of the forest due to oil palm a number of animal species mad oil palm as their habitat and studies reported conflicts with human beings (Wakker 2004). Practical evidences of human–animal conflicts have been summarised and documented by Wakker (2004) (See Box 2).

Some animals like bear, wild boar, mouse deer, deer and *Lutang* (a kind of monkey) are scarce, while monkeys are not because it is a taboo for the Iban community to eat them. On the other hand, the aquatic life, especially Catfish, has increased in both number and size. This is due to the drainage system constructed for oil palm which has caused the oil palm fruit to become a steady part of the Catfishes' diet. This has benefited the local community as fishing is part of their livelihood. We also noted the possibility intercropping with other crops at the younger stage of the oil palm plant.

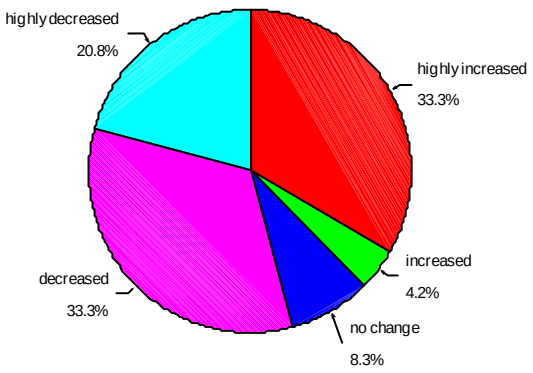

Figure 3.14. Respondent's perception of the wild life after the introduction of oil palm

Box 2 Examples of human–animal conflicts in oil palm plantations

"…

- Elephants which are either starved by the removal of the forest habitat, or disturbed by increased human activity, have the potential to destroy hundreds of hectares of young oil palms in a single night. In Lampung in 1998, angry elephants killed two people during such a raid. In January 2003, Riau, hundreds of villagers took refuge after a herd of at least 30 wild elephants ran amok after losing their habitat in Rambah Hilir district. The elephants devastated about 1,000 hectares of oil palm plantations and rice fields belonging to local people. According to WWF Indonesia, losses due to elephant damage of oil palm plantations and timber estates in Riau alone reached about US$100 million per year. Usually, the elephants are captured and sent off to 'training centres' but sometimes they are killed. In June 2002, 17 elephants were found dead with signs of poisoning at the border with North Sumatra. The authorities suspect farmers poisoned the elephants after the animals invaded their palm oil plantations.[65]
- Fatal conflicts also occur between plantation workers or villagers and tigers throughout West Malaysia and Sumatra. In the first half of 2003, seven tigers were caught in Riau alone, and one man was killed in an oil palm estate in Siak.
- In the past decade, the orang utan population in Kalimantan declined by as much as 50%, falling to around 25,000, in large part due to the loss of habitat (80% loss in the past 20 years). Up to one-third of the Indonesian orang utan population is believed to have died during the 1997-1998 forest fires.[65]

…"

Source: Wakker 2004

3.4.3 Loss of plant species

We interviewed a group of people about medicinal and fodder plants, and they listed a number of plant species known to be used for medicinal (Table 3.7) and fodder purposes (Table 3.8). The availability of these plants has decreased greatly since the 1960s and the locals felt that is due to the intensification of commercial crop plantation. It was noted that not only the plants are getting fewer and fewer but their knowledge on the medicinal value of each plant decreased. Moreover we noticed that younger generation (age around 35 and below) know little about the plants and their uses compared to the older generations. From our questionnaire it also appeared that about 72% of the respondents perceived the diversity of plants decreased after the introduction of the oil palm (Figure 3.15).The loss of biodiversity following commercialization seems very critical as it has irreversible impacts on the environment.

Table 3.7 List of medicinal plants known by the key informants in Empayang

No.	*Local name*	*Local use or knowledge*	*Remark*
1	Hempedu bumi	• High blood pressure	
2	Daun terup	• For constipation among small kids and infant • For dye, for green color for pua kumbu	For dye for' paukumbu'(green colour)
3	Randau Kemedu	• The latex is used for wound healing	
4	Siti Fatimah	• High blood pressure	From Malay
5	Daun kapan	• -	From Malay
6	Meruju	• Prevent worm in the stomach	
7	Idu	• Diabetes , high blood pressure	
8	Tongkat Ali	• High blood pressure	From Malay but the tree is not found in Empayang
9	Kulit garumpang	• For small wound or cut	
10	Kulit buah engkalak	• For boils, swollen skin	
11	Kulit buah langsat	• For itchiness , scabies (kudis) and malaria	
12	Misai kucing	• Gallstone , urethra blockage or sumbat air kencing	Not originally from Iban
13	Paku kadindang (big fern, brown in color)	• Boils - it is a skin disease	
14	Daun sulu'	• Kurap – ringworm, skin disease	
15	Bunga tiong	• Ringworm, cooling effect on body heat,	
16	Daun mambong	• Lowering body heat for small kids	
17	Daun rungan muda (young leaves of papaya)	• Diarrhea	
18	Pelepah apong	• Diarrhea	
19	Buah mengkudu	• High blood pressure	
20	Daun mengkudu	• Herb to cook fish	
21	Akar mengkudu	• As a red dye for pua kumbu	
22	Sirih	• Blood clot	
23	Kunyit	• For cut	
24	Entemut kuning	• Itchiness, cut	
25	Entemut putih	• Take as ulam(food) to remedy constipation	
26	Daun liban(young leaves)	• For cut	
27	Dawan kamunting (young leaves)	• For cut	

Table 3.8 List of plants or fruits known for animal feed

No.	*Local name*	*Animal*
1	Buah buwan	Mouse deer
2	Buah kamunting	All kind of birds
3	Buah leban (fig tree fruit)	Burung Punai All kind of birds Fish
4	Ubi kayu (cassava root)	Fish
5	Buah getah (rubber) and oil palm fruit	Fish especially catfish
6	Buah Berangan, buah empilik (the fruit are found in the hinterland area, not here. But, they have knowledge about this)	Wild boar
7	Buah bangas	Wild boar
8	Buah panggu, sila, cheruwit, sanjan and bujau	Birds

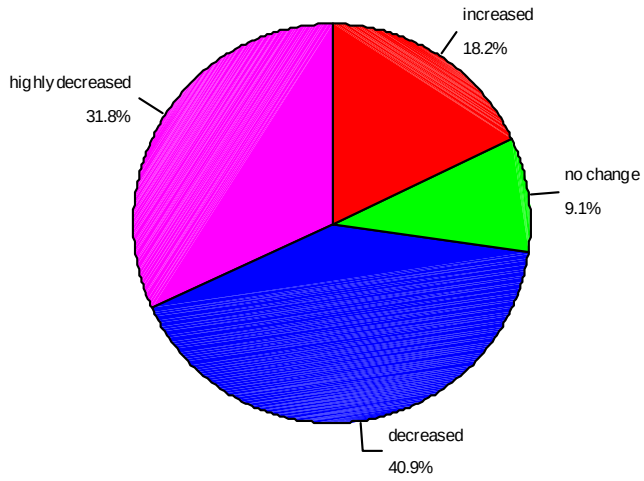

Figure 3.15. Respondents' perception of plant diversity after the introduction of oil palm

An Empayang *Bemban* mat weaver started to experience the decreasing of material in Empayang since last year. Usually *Bemban* is planted on the weavers' fallow lands or surrounding other agriculture fields. Now due to the scarcity of *Bemban* in Empayang, she is left with no other option than to buy the *Bemban* reed from Emplan (Malay's area), which is about 30km away from Empayang. Another elderly stated that the cause of the diminishing *Bemban* from Empayang is due to the increasing number of squirrels. They are initially attracted to the area by the oil palm fruits, but in addition they eat the young *Bemban* leaves, leaving *Bemban* reeds unsuitable for weaving. According to her, the reason suitable *Bemban* is still readily available in Emplam is because the oil palms in this area are fewer and more scattered than in Empayang, and there are not many Malay use it anymore.

3.4.4 Loss of natural forest

The informants confirmed that there is no more virgin forest available, although they can not remember exactly when it ceased to exist. The oldest "forest" in Empayang area is called *Pengerang*, which is a secondary forest aged 20-30 years old. It belongs to a person in *Rumah* Jemat who has left the area fallow for the purpose of extracting timber for building his house. Other types of uncultivated land have been intensively used for farming such as rice and currently aggressively for oil palm. We also observed clearing of secondary forest for planting of private oil palm and a number of young oil palm plantations recently established during our transect walk. The informants categorized the forest in to four different grades as shown in Table 3.9.

Table 3.9 Four different grades of forest according to the key informants

No.	Grade	Local name	Characteristics
1	Grade 1	*Kampung tuai*	Primary forest, virgin forest and untouched forest. This category is not found in Empayang.
2	Grade 2	*Pengerang*	Secondary forest, aged 20–30 years old. Size of the trees is about the size of an adult head. Only one person has this type of land in Rumah Jemat but he had extracted the timber from it to build his house.
3	Grade 3	*Temuda*	The height of forest is lower compared to the Pengerang forest. Grounds shrub is more. The diameter of the trees are a big as an man's calf.
4	Grade 4	*Jerami*	No trees, just weed here.

Practical evidences have been documented on the conversion of natural or virgin forest to oil palm plantation in Indonesia and Malaysia. In Malaysia, about 87% of deforestation from 1985-2000 has been occurred in connection to oil palm plantations (Wakker 2004).It has also been mentioned that quite large forest areas have been replaced by oil palm plantations following subsequent land cover changes (Hansen 2005). Examples of forest conversions to oil palm plantations have been summarized by Wakker (2004). This rapid land clearing is increasing as oil palm is fetching better price in markets and suitable lowland areas not available any more. Thus upland oil palm plantations with terracing are coming (Wakker

2004) and even we observed along on our way to Kuching. This trend may cause significant soil erosion following deforestation, asides other impacts associated with loss of natural forest (Box 3).

Box 3. Example of forest conversion to oil palm plantations

"…

Field observations indicate that many oil palm plantations in Indonesia and East Malaysia are planted in areas that were clearly forested immediately prior to conversion to plantation.

- In Sembuluh, Central Kalimantan, at the time of writing PT Kerry Sawit Indonesia (subsidiaries of the Sabah-based plantation company **Perlis Palm Oils Berhad (PPB))** is about to start field operations after the company obtained the concession rights from a Hong Kong based investor. One of the four subsidiary companies holds the rights to develop 17,200 ha of land. Within the area, there is still some 7,500 ha of forest and forest gardens that local community members desperately wish to see protected against conversion. The forest area is one of the last in the area of Lake Sembuluh that is completely surrounded by oil palm estates.[50] PPB has a responsible reputation in Sabah, where the company left a "buffer zone" of forest in the Tabin Game reserve.[51] It is not known if the company will be as sensitive to conservation priorities in Indonesia.

- In Muara Wahau, East Kalimantan, a **PT SMART (Sinar Mas)** subsidiary converted some 2,500 ha of primary forest into oil palm plantations. The lowland forest in the PT Matrasawit area used to provide habitat for the orang-utan, an endangered and protected species in Indonesia.[52]

- In Riau, Sumatra, a subsidiary of the Indonesian **Indofood Sukses Makmur group** (PT Gunung Mas Raya) is in the process of clearing peat-swamp forest, part of which may be outside the concession boundaries. If this is the case, it will be in contravention of the risk policy of one of the group's main investors, ING from the Netherlands, which has a policy of not financing illegal forest conversion.[53]

- Satellite map analysis undertaken by the Indonesian NGOs Sawit Watch and Friends of the Earth Indonesia (Walhi) found that around Lake Sentarum National Park in West Kalimantan, the oil palm plantation area grew by 91,000 ha over a period of only six years, from a mere 3,000 ha in 1994 to 94,000 ha in 2000. Meanwhile, according to newspaper reports, the total forest area decreased by 205,000 ha, from 528,300 ha to 323,000 ha.[54] Sawit Watch has mapped out the oil palm companies that have cleared virtually all forests surrounding Lake Sentarum National Park. Several of these companies abandoned their operations once the timber stand was removed.

- Around Mount Meratus in South Kalimantan, some 43,000 ha of forest have been converted into plantations since 1994, enlarging the total area of plantation from 86,000 ha to 129,000 ha. The forest areas surrounding Mt. Meratus meanwhile shrunk by 350,000 ha, from 1,337,000 to 987,000 ha.[55]

- Map and anecdotal evidence strongly suggests oil palm plantations have been developed within a number of other national park buffer (low intensity use) zones as well including Tanjung Puting National Park, Bukit Tiga Puluh National Park and Gunung Leuser National Park.[56]

- In Pahang, West Malaysia, a 6,000 ha block of High Conservation Value Forest in the Permanent Forest Estate was cleared after the ruling political party in the State and the country, UMNO, was given rights to take timber from the area. On paper, **Ladang UMNO Pahang** should be about 4,000 ha but satellite images suggest that the area cleared was closer to 6,000 ha. The operation was never subjected to an Environmental Impact Assessment (EIA), despite government regulations stipulating that any project beyond 500 ha should have an EIA. Instead, the land had been divided into 10 separate smaller plots. The Kuantan Department of Environment was unable to explain how the approval was given despite almost 90% of the area being Permanent Forest Estate (PEF). This forest was the home of rhinos, tigers, honey bears, gibbons, tapirs, and panthers as well as endangered ramin trees. By mid 2003, the area remained unplanted with oil palms.[57] UMNO is the leading political party in Malaysia. The logging concession was granted in 1998, one year before the General Elections of 1999.

- In Hutan Simpan Sungai Paka, Terengganu State (Peninsular Malaysia), 3,899 ha with lowland and highland dipterocarp forest in the Permanent Forest Estate are being converted into oil palm at time of writing in 2003, under the approval of PAS, the leading Islamic party in the State. Sungai Paka Forest Reserve lies on the slopes of the Eastern Highlands of Peninsular Malaysia. Being isolated from the Main Range, the flora and fauna of the area contain various endemic species. The state of Terengganu is famous for its big mammals, including tigers, elephants and seladang (a huge wild ox).[58]

- In Sabah, East Malaysia, new oil palm plantations are being developed from forestland in the Labuk-Sugut district, Tongod, as well as in Kinabatangan and lower Sagama. Forest conversions have led to a string of environmental problems such as flooding (where palms are planted in floodplain land), soil loss and river sedimentation.[59]

- In Alotau, Milne Bay, Papua New Guinea, a member of the OPIC found that landowners were enticed to give their forested land to the UK Government-owned company **CDC**[60] for advance payments of royalties in the form of a Toyota truck. This advance would be recovered from a royalty over a 30 year lease back period. An area of well over 3,000 ha was clearfelled by mechanical clearing by use of a caterpillar after the merchantable logs were taken from the forest.[61]

- In Oro Province, Papua New Guinea, oil palm plantations have encroached upon the habitat of the world's largest and endangered Queen Alexander Birdwing butterfly. This species is endemic to the plains in Oro Province. Further expansion of oil palm in Oro Province will increase the risk of extinction of this butterfly species.[62]

…"

Source: Wakker 2004

3.4.5 Impacts on other land uses

From our semi-structured interviews, we realised the drainage in the area has made the land dry and therefore suitable for oil palm and other crops. However, the drainage effected a compaction in the soil, making the area become unsuitable for rice cultivation, and the rice yield has decreased every year since the introduction of the drainage in the area. This has influenced farmers to opt for oil palm instead of rice, asides from the higher price of oil palm. Prior to this, the area was covered with rice field which was a source of income for them as well as being produced for self-consumption. Starting approximately ten years ago, most of the rice farmers discontinued the cultivation of rice around Empayang and instead rented land suitable for rice cultivation in Nyabor. The agronomic change required for the cultivation of the oil palm has necessitated that the traditional and cultural crop of the Iban community be greatly reduced. It was reported that formerly dominant Iban traditional land use practices are being converted to commercial plantation (Hansen 2005).

3.4.6 Environmental Pollution

From a semi-structured interview with the district agricultural officer, we learnt that certain rumours were circulating about water pollution due to oil palm cultivation, but no research has been conducted to verify the situation. In the Plasu area a nearby village to Empayang, skin problems have been reported to have been caused by bathing in the river. It has also been observed that the fish of the river have decreased in number. This was attributed to excessive pesticide and fertilizer application following the oil palm plantation. These chemicals are drained to the drainage system in rainy season. The pollution could be due to the existence of more acreage of oil palm in this area and also, the plantation had been there for more than 15 years unlike the Empayang area which has less than 10 years or younger. In commercial plantation like the oil palm they apply fertilizer intensively to get more fruits and also herbicide to control the weed inside the plantation. The situation indicates that long term negative effects are coming in area in relation to the oil palm. However, in the view of the district agricultural officer, the negative impacts oil palm might have on the surrounding natural environment is of minimal consequence compared to the price the oil palm fetches in the world market. Pollution related to agrochemicals in oil palm plantations also has been reported on approximately 30,000 women in Malaysia who work daily as pesticide sprayers (Wakker 2004).

3.5 Future aspirations and expectations

A distinct picture of the Empayang community's future aspirations and expectations emerged from numerous interviews both directly and indirectly related to this topic, which will be discussed in the following sections.

3.5.1 Aspiration for Modernity

The development discourse of the government is particularly embodied in the Vision 2020 and promoted to the civil public through media and schooling. The goal represented by Vision 2020 is that Malaysia be a fully developed nation by the year 2020. The dichotomy traditional-modern seems to be a particularly highlighted aspect of Vision 2020, wherein a traditional lifestyle is negatively equated with economic poverty and a modern lifestyle is positively seen as the facilitator of economic wealth. Modernization is advocated through use of phrasings such as 'radical mental revolution' and 'paradigm shift,' serving to underline that a complete abandonment of traditions and a full embracement of modernity is the only viable direction of development[10].

The government actively aims to influence the rural inhabitants of Malaysia to replace traditional practices with a modern lifestyle, through means such as plantation schemes and the promotion of Vision 2020 through media and schooling. In addition, the community members of Empayang are influenced by the government objective more indirectly through the more mainstream modernization process taking place in Malaysia, and which they are connected to through means such as media, transport, mobilephones, education, job opportunities and migration.

In light of this, we wished to investigate the prospects of Empayang further. Is a complete change from a traditional lifestyle to a modern lifestyle, as advocated by the government, probable? In the following sections we will attempt to move towards an answer to this question, which we will attempt to answer in the final section, entitled 'Prospects for the Future.'

[10] (http://www.mlds.sarawak.gov.my/project.html).

A basic objective of the individuals residing in Empayang is in fact to partake in the modernization process in order to improve their livelihood, an aspiration which seems remarkably aligned with the development discourse of the Malaysian government. In the following two sections we will discuss the prospects of the aspiration to improve livelihood through oil palm and out-migration respectively. This will serve to indicate the transition from a traditional to a modern lifestyle, as well as include an assessment of the future sustainability of the Empayang community.

3.5.2 Implications of oil palm

Since the government made policy changes which introduced and induced oil palm to Sarawat, several Dayak (ethnic) communities and NGOs have resisted their establishment (Colchester 2007). Similarly in Empayang, most community members were initially cautious of rushing into oil palm cultivation. However, after observing oil palms impact on the livelihoods of those individuals who readily participated in the oil palm cultivation, and weighing the benefits and drawbacks of oil palm to their own livelihood, the community members have revised their opinion. At the time of our research, the community was remarkably enthusiastic in regards to oil palm cultivation.

Oil palm has is presently perceived to be positive for the livelihood, which was also indicated in the results our questionnaire. From 22 respondents who either own or work in the oil palm plantations, 77% of them perceive their livelihood to have been improved by their involvement in oil palm cultivation (Figure 3.16).

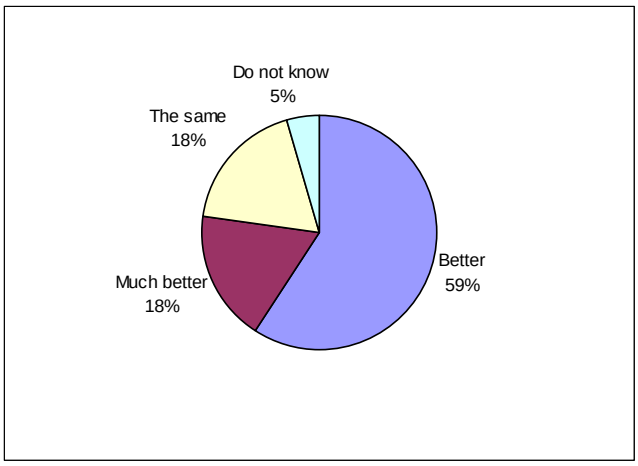

Figure 3.16. The villagers' perception of their livelihood quality as a consequence of oil palm cultivation

In the PDM exercise with the men group indicated that they perceived the main benefit of oil palm to be its potential to generate a long-term source of steady cash income, which also figured as a major element in the women PDM exercise (Table 3.11). The questionnaire further indicated that all farmers not currently involved in oil palm wished to be so in the future, and in agreement with the PDM exercise stated cash income as the main motivation for taking part of the oil palm cultivation.

In the PDM done with the women, they ranked the potential of turning their idle lands into income-generating oil palm plantations as the most important. This was expected to be especially relevant as the community members became older and no longer able to cultivate crops on their own, yet with no children residing in Empayang due to out-migration. The availability of Indonesian workers willing to work for minimum wages is essential for this equation, which was expected to provide future income security.

However, despite that oil palm was expected to improve the Empayang community livelihood by generating economic capital, semi-structured and focus group interviews with the adults of Empayang revealed that they also recognized a danger of the opposite happening. The biggest menace to the oil palm prices was perceived to be the development of the bio-fuel Jatropha, which could not be cultivated in Empayang due to the areas soil characteristics, but which could turn out to pose competition to oil palm on the world market. By striving towards extensive involvement in oil palm production, the community would be left particularly vulnerable if the oil palm prices dropped.

Aside from the strictly income-related issues in relation to the oil palm, the changes in the natural environment were also relevant, both as a cause and consequence of oil palm plantations. According to the male PDM group, oil palm was advantageous due to its ability to resist flooding, which has become a reason for concern in the Empayang area over the last decade. The last flooding occurred in 2007, destroying pepper and fruits plants, and causing mayor setbacks to the livelihood. However, as illustrated in the sections ‘Impacts on ecology’ and ‘Impacts on Other land uses’ the establishment of extensive oil palm plantations itself impacts the natural environment in such a way that transferring to other crops will be difficult due to the increased number of rodents and soil change. This fact leaves the community extremely vulnerable to changes in the oil palm prices.

It seems that the future of the Empayang community in large part depends upon how oil palm fares on the world market, something they have little control over. However, whether oil palm cultivation will result in increased cash income and an improvement of livelihood as the community expects, the fact remains that the community expect to replace most of their traditional crops to oil palm, and going back on this decision will crops will not be possible. The sustainability of oil palm in the long run remains to be seen, but it seems traditional land cultivation is being left behind for good in favor of the modern lifestyle of cash crop cultivation.

Table 3.11. The benefit of oil palm to the Empayang villagers

A. According to the men group

Benefit	**Score**
Source of Income	40
Resistance to flood	30
Long term activity	18
Provide free meat	12
Total	100

B. According to the women group

Benefit	**Score**
Reactive idle/fallow land	55
Source of Income	45
Total	100

3.5.3 Implications of out migration

As a starting point to this section it needs to be noted out-migration to some extent is necessary, due to the limited number of people the natural resources in the vicinity of Empayang can sustain. However, Figure 3.17 shows that if the out-migrated individuals from Empayang are included in the table of occupation, migration is a mayor livelihood strategy of the community members of Empayang.

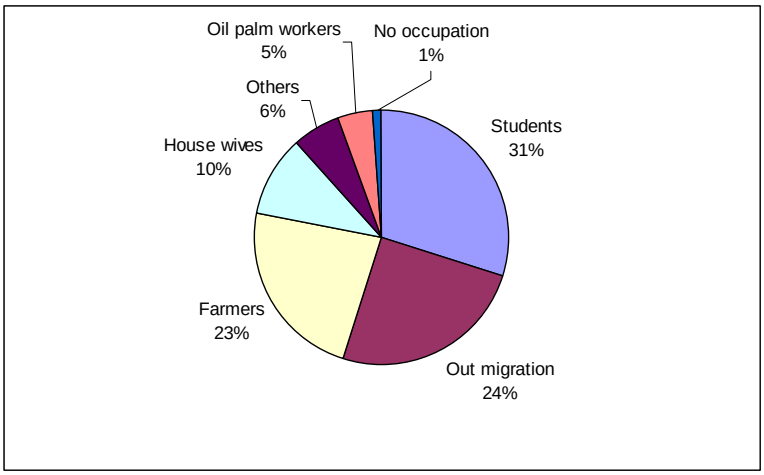

Figure 3.17: Livelihood occupations of Empayang community members with the inclusion of migrants from Empayang.

The group of out-migrants was only exceeded by that of youngsters still attending school. Through interviews we came to know that the large group of students unanimously aspired to out-migrate to urban areas, and was supported in this by the adult community members. It was hoped and expected that out-migration of youth would generate a number of benefits both to Empayang as a community and to the youth as individuals, mainly through well paid and secure job opportunities in urban areas.

It was expected that the by acquiring a high-income-generating employment, the youth would be enabled to send remittances to family members in Empayang, thus increasing the economic capital of the community. It was furthermore expected that at least one out-migrated child of each household would return to live out their retirement in Empayang, increasing the human capital by bringing new knowledge, and that at least one child of the out-migrant would likewise move to Empayang upon retirement.

However, despite that migration was often portrayed in such positive light, when interviews covered the future scenario of the migration trend in its final consequence, a rather bleak picture of Empayang was painted. Firstly, there are no guarantees that the out-migrated community members will in fact achieve the income and skills which can benefit the larger Empayang community. Especially the general lack of education exceeding secondary level, as illustrated in the section ‘Demography’ is probable to restrict the job opportunities of the migrants.

Furthermore, the social and demographic implications of the migration trend serve to suggest a future scenario where Empayang consists only of elders, who lack the vigor and innovation of youth to develop the community, and with a limited feeling of connectedness due to a lifetime of minimal interaction in one another's daily lives. It seems probable that no matter the relative success of the out-migrated youth, at the time of their retirement they will not find the lifestyle available to them in Empayang enticing. The children of the migrants, who do not even have the memory of a childhood in Empayang, can probably be expected to find Empayang even less alluring than their parents. Taking these drawbacks of migration into account, it seems to us that either we have failed to comprehend some vital part of the out-migration trend, or that the high expectations in regards to out-migration are not rooted in careful considerations, but rather hopes and dreams. From our limited understanding we predict that if the current trend of increasing migration continues, the sustainability of the community of Empayang will decrease, and the community members will instead take increased part in the relations outside of the Empayang context..

3.5.4 Redefining Modernity

So forth we have demonstrated that the Empayang community seem to be changing from a traditional lifestyle to a modern one, encouraged by the government as it was noted in the beginning of the section. As the surrounding environment becomes more and more modernized, the livelihood possibilities in turn become increasingly streamlined with the modernization process. However, this process does not seem to correspond with the 'radical mental revolution' implicating a complete replacement of traditions with modernity which the government rhetoric seems to advocate. Rather, the community members of Empayang seemed to not simply take over modern practices and values, but rather creatively reworked modern elements to create the most benefits to their own livelihood objectives. This will following be illustrated through empirical findings on the transition from traditional beliefs to Christianity.

When interviewing the middle-aged and elder community members, the interviewees unanimously agreed the traditional beliefs are unfavorable to uphold, due to the numerous regulations and rituals which must be followed at every stage of crop cultivation in order to avoid displeasing the spirits. These traditional practices are time-consuming and restrict the freedom of the individual. Christianity, on the other hand, is perceived as a belief system

which is meaningful in the development process, and since the 1960s converting to Christianity has been ever-increasing. Interviewees underlined that the motivation for conversion was initially based on the loose guidelines and requirements God prescribes for everyday life, combined with the fact that God was shown to protect them from the wrath of the traditional spirits. The change to Christianity thereby made it more straightforward to partake in modern land cultivation and in doing so build financial capital. One example mentioned was that committing oneself to wage labor at FELCRA becomes possible because the traditional bad omens, such as the sighting of specific birds, cannot prevent you from going to work on unexpected occasions. Words such as 'smart track' and 'convenient' were continuously used to describe the conversion to Christianity, underlining a very practical dimension of the religions shift.

For the younger generation, who had grown up as the practice of traditional beliefs was declining, Christianity entailed differing associations. For the youth, the benefits of being or becoming Christian, specifically related to their aspiration to improve livelihood through migration. Christianity was seen as a means through which to build social capital outside of Empayang. By being committed to Christianity, the younger generation positioned themselves as part of the more mainstream Malaysian religious community, and specifically as part of the Christian community. Thus they avoided any embarrassment of being labeled strange and old-fashioned outside of Empayang. This was expected to have tangible benefits outside of Empayang, one example being that in case of illness one could seek out a church and expect help to get hospital care, as well as expect the religious hospital patients to pray for ones health.

Although Christianity is perceived to be a modern element with origins outside of the Empayang context, the community members seem to have claimed the religion based on local interests. The value and practice of Christianity have been renegotiated so that a conversion implies a probable improvement in livelihood specifically for the community members of Empayang. With the objective of improving ones livelihood, it seems the advantages and relevance modern elements are established and reestablished through both direct and indirect exchanges between the community members of Empayang and the surrounding environment. This is not a trend limited to the context of Empayang. As Heald writes of the Western AIDS intervention in Botswana, the new messages coming from the outsides are worked and reworked in accordance to prevailing cultural idioms at the local level (Heald 2002: 1-2).

3.5.5 Prospects for the Future

At the beginning of this section, we questioned whether a complete change from a traditional lifestyle to a modern lifestyle, as advocated by the government, was probable? Our findings indicate that a change towards a modern lifestyle is probable, due to the interplay between their changing possibilities for action caused by the modernization process in their surrounding environment, and the community members own agency in striving for modernity. However, than is not to say that this will take form as a complete abandonment of traditions and un-reflected embracement of modernity as the government advocates. Rather, the community members will adapt modern elements to be meaningful in their own context, and for creating an improvement of livelihood.

The continuous flow between the differing processes will continue to create new dynamics, which hopefully will bring the community members of Empayang the improved livelihood they strive for. However, this entails that traditions be reevaluated and in many cases discarded, while modern practices are taken on. However, rather than viewing this as a negative loss or disintegration of traditions and community connection, we would like to encourage that this be viewed in a positive light. The increased involvement in the modernization does not simply imply disintegration, but causes community members to reorganize lives and create new relationships to accommodate the marked forces which affects them, and through migration, the community members will bring their social imaginaries, as in the understanding of where one comes from and what one can move towards, to new environments (Vigh 2006: 483). Thereby new values, practices and communities will be generated as a cause of the modernization process. Increased modernization may well result in an improved livelihood, and certainly the community members of Empayang acknowledge this as their best option.

4. Conclusion

The livelihood strategy of Empayang has been impacted by the oil palm existence in the village. The villagers perceive the oil palm beneficial to them and they adjust their livelihood around it. They has been changed their main crops to oil palm.

To make the land use changes realized, there have been different changes in land policies and amendments in legislation as well. Some of the amendments came after the introduction of the land use change and some of them before or together with the introduction of the land use changes. Despite the continuous amendments in SLC, most of the people in Empayang who have got land title feel secured about their land holdings. Among those who have no land title, the result is mixed. Some feel secured as long as they are compensated for they have grown on their land but others don't feel secured as long as they are not compensated. The people will be compensated for they have grown on their land in case of government interruption to their land though they believe it is not adequate. For those who have land title the compensation for the land itself depends for what purpose the land is needed. Most of the people in Empayang have little or no knowledge about legal issues concerning the land.

The management system in the oil palm plantation has at least not affected the soil quality in terms of the chemical property. The land use practices (commercial plantation schemes) have observable impact on the natural environment. The introduction of the oil palm has disturbed the ecology which resulted in a number of rodents like rats and squirrels. The land uses has also influenced one another and hence and the introduction of the oil palm has wiped out the wet paddy cultivation. Quite a large area of forest has been lost in the area which also resulted in loss of different plant species. The loss of biodiversity following commercialization seems very critical as it has irreversible impacts on the environment. Long term pollution effects seem coming following excessive use of pesticides.

A future trend emerged tthrough a discussion of the community's aspiration for intensifying the cultivation of oil palm and migration respectively, and their mode adapting modern elements in the way perceived most beneficial to the livelihood of the community members under their contextual circumstances. The Empayang community members are liable to become increasingly involved in the more mainstream modernization process in Malaysia will

serve to generate new processes, and will hopefully result in the aspired improvement of livelihood.

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Appendix

Appendix 1. Synopsis

Impact of land use changes on communities' livelihood strategies and environment in Kampung Empayang, Sarawak

Synopsis

Interdisciplinary Land Use and Natural Resource Management

February 2008

by
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Table of Content

INTRODUCTION

Malaysia is located in Southeastern Asia with a total area of 329, 750 sq km of which 328, 550sq km is land and 1, 200 sq km is covered with water. Of the total land area 5.46% is used as arable land, 17.54% as permanent crop, and 77% is designated as other land use practices by the year 2005 (CIA 2008). Sarawak is located on the island of Borneo and is the largest state in Malaysia. Sarawak has large tracts of land suitable for commercial agricultural development. The main commercial crops are oil palm, which has been increasing steadily over the years, sago, and pepper (Sarawak State Government 2008). The village Kampung Empayang, the focus of our study, is located in the Sarawak state. It has two longhouses, Rumah Jemat (16 bilik) and Rumah Ayu (30 bilik). The residents of Kampung Empayang depend on agricultural practices as their source of livelihood like most rural Iban communities. Most people in this village are involved in wet rice cultivation. Other sources of livelihood for the area include the fruit orchards which are scattered near the longhouses which include fruits like citrus, rambutan, watermelon, maize, and banana trees. Some individuals from Rumah Jemat also produce vegetables which they sell them in the nearby town Sarikei. Although Coconut plantation is still one of the main sources of income, due to the recent wide expansion of the Oilpalm plantation scheme, the role of the coconut plantation is slowly replaced by the Oilpalm plantation. People in the area also depend on remittance from their children and relatives working in the urban areas. (SLUSE 2008)

The area has practiced different land use practices since a long time. These include traditional farming practices, primeval and secondary forests, and commercial plantations among others. The land use change has been an issue of argument among scholars with some of the land use changes even emanating from these arguments. The political elite consider shifting cultivation as unproductive. Forest fallow Native Customary Land (NCL) does not generate wealth and considered as a source of poverty trap. They perceived it rather as idle or abandoned land and as a result advocated this land to be used for commercial plantations (Nigidang 2002). Another study also mentioned that governments with jurisdiction over tropical rain forest considered the swidden agriculture practiced by the Iban community as the main causes of degradation and loss of tropical forests at the same time advocating commercial logging as a sustainable type of forest use for it is conducted using selective logging (Masahiro, 2007).

There are counter arguments and research results too, however. Bowden in Butler (2007) recognizing the poverty alleviation role of oil palm plantation in both Sarawak and Sabah, he

also underlined the poverty alleviation role of oil palm plantation is exaggerated. He found that despite low oil palm plantation coverage in Sarawak than Sabah, better poverty reduction achievements were registered in the former than the latter indicating that the causal relationship is not as strong as broadly assumed. In another study, Masahiro (2007), comparing the ecosystem and biodiversity conservation role of the 'Iban territory' against other land use practices, found that the Iban land use practices were superior than the state land uses for the former involves small scale disturbance to the forest at relatively long periods than the latter. The Iban land use practices are also supported by the social institutions of the Iban, such as inheritance and their system of land and natural resource tenure. Despite these extreme positions among scholars, Ole Mertz and Reed (2005) showed how the different land use practices can be used complementarily as livelihood strategies. They found that swidden cultivation was used as a buffer during times of crisis in Pepper and Rubber markets. Combining the two systems also led to longer fallow periods for the swidden agriculture making the whole system more sustainable than the case with each system standing alone.

This study will combine both the poverty alleviation as well as the environmental and societal issues as a result of changes in land use unlike the above studies focusing mainly on a single theme only. We believe that these changes in land use practices will have impacts in the poverty alleviation endeavor and thereby led to changes in the livelihood strategy of the society in general and the individual in particular. Moreover, these changes in land use practices can also bring or led to changes in the societal structure and sense of community among the different members of the society. The study will also consider environmental issues like soil fertility, soil erosion, land quality, and water management.

RESEARCH QUESTIONS

Our main research question is as follows:

What are the impacts of the changing land use practices on the community's livelihood strategies and environment?

Accordingly, the sub research questions for the study are:

- How is the land use changes related to the land tenure system?
- How do the land use changes affect the village livelihoods strategies?
- What are the impacts of the land use changes on the natural environment?

- How are the villagers sense of community related to their land use practices?
- How is the land use changes connected to the villagers' future aspiration?

COLLABORATION

In this study we will learn to collaborate with local counterpart, the Universiti Malaysia Sarawak (UNIMAS) students, who will strengthen our international multi-disciplinary research experience. As Malaysian, they have closer connection with the Empayang community, for example in language, culture, climate, etc. They also have better access to information needed in the study but only locally available.

Due to different course timetable, communication and sharing information among us might be possible only when the joint course starts in Kuching on 6 March 2008. We will use the first two days in Kuching, before our departure to the village, to merge both of our synopsis into one which will guide us in doing our field study as a multi-national and multi-disciplinary team.

METHODS

In our area of study the social and environmental issues are intertwined, which makes it viable to combine social- and natural scientific methods in our research approach. Through triangulation we will be better suited to explore the complexity of the local context, as differing methods will access differing data. Nonetheless, our data will be complementary to each other, as they can be used to enrich our ways of approaching and analysing the field. In this section follows an overview of the methods we intend to use. Note that we expect to blend the difference methods when this is beneficial to our research objective. Details of data required and proposed methods are summarised in Appendix 1, and our timetable of planned activities are summarised in Appendix 2.

Observation

While in the field, it is important that we maintain observant of our surroundings, which implicates an intellectual detachment from the field. Both when we are visibly engaged in collecting or processing data and when we to outward appearance are simply hanging out, that

which we see, hear, smell, participate in etc, acts to further our research objective. By taking field notes we can ensure that such valuable data will not be dismissed or forgotten. (Cohen: 227; Staunaess 2004: 76).

Participation

As outsiders we intend to participate in activities which are familiar to the insider locals, such as farming activities and preparing food. This will put us under the instruction of the villagers, and break down the barrier between the stereotyped roles of researcher-researched, subject-object, observer-observed. This method enables us to gain insider knowledge and understanding, as well as opens up for dialogue. (Mikkelsen 1995: 83).

Secondary data

In addition to the primary data, we will consult secondary sources to complement our primary data sources. Possible secondary data sources include studies made previously by other people on same topic, legal documents and reports from government offices, etc. We depend on this source for information like land use changes that has taken place in the study area, soil erosion and land degradation, legal issues pertaining to land, and general information about the study area as well.

Semi structured interview

The paper highly depends on this method as it allows us to go deeper into the issue under consideration. In addressing almost all the research questions, we employ this method. By using this method we would like to acquire information on the different livelihood strategies, the community's and local government officials perception on land tenure and development schemes, the perception of the different groups of the society, say the elders and youngsters, on the changing land use practices and their sense of community, and the future aspirations/expectations of the different groups the society. In addition to the above comparisons, this method is also used to go deep in issues like pesticide use from the local community's perspective, conflicts within the local community or among the different segments of the society pertaining to land use changes, etc. The method has high practical relevance not only because of

its deeper investigation of the different issues at stake but also it can be used to triangulate information collected by others methods.

Key informants interview

The key informants are important for their special knowledge, skill or experience on the different issues we would like to investigate. This method has more practical relevance to complement other methods like the transact walk and Global Positioning System (GPS) mapping where the key informants will provide us information on the major land use changes that has taken place in the different areas of the village, types of soil in the village and their characteristics, the history of the village in general, etc.

Focus group

For conducting focus group interviews, we intend to assemble people which are relatively homogeneous in regards to social standing and their point of reference to the interview topic. For our research objective, one distinguishing factor will between younger and elder individuals. We aim restrict the number of individuals in the interview to a maximum of four, as to limit the confusion caused by the need for translation. By conducting focus group interviews we hope to observe group dynamics and the obtain knowledge of conflicting and complementary views on a particular subject (Mikkelsen 1995: 106).

Informal, conversational interview

Although wording and topics in informal, conversational interviews emerge naturally from the individual and situational context, by remaining focused on directing the conversation towards fulfilling our research objective, we can procure highly relevant information. We especially aim to use this method to procure information on more sensitive issues, such as conflicts in regards to land use, which we anticipate could be relevant between the elder and younger village members as well as between government officials and villagers. The friendly atmosphere of informal, conversational interviews is better for inducing this sort of disclosure than more structured, formalized interviews (Mikkelsen 2005: 11-12).

Questionnaire

We intend to quantify some of the issues under our study by designing a questionnaire which will be pre-tested by fellow students and translators, and subsequently carried out shortly after our arrival in the field. The population of our study will be the two long houses and the unit of analysis will be the '*Bilik*'. We will interview all the '*Bilik*' in the two longhouses. The questionnaire will be designed to provide us with a statistical overview of land use and livelihood strategies practiced in individual '*Bilik*', which we hope will expose some variables and correlations between villagers. The results from this method will furthermore be used to identify issues for further investigation and potential key informants.

Participatory Rural Appraisal (PRA) techniques

We will use some of the PRA techniques to collect data in an interactive manner. Whenever possible all different groups (elders and youngsters, woman and man) will participate in the PRA exercises. The PRA tools that we will use are:

Transect walk

At the start of our study to get an overview of the village at landscape level we will use Transect walk guided by one or two local key informants (man and woman). During this exercise we will take some GPS points of important landmarks, which will be incorporated with the GPS points collected in other exercises (i.e. land use, resources mapping).

History time line

To know the most important events occurred in the village and to see how these influence or relate to the community livelihood strategies and land use changes we will use the History time line exercise.

Scoring

To get villagers preference of the different livelihood strategies (such as their agriculture practices, source of income and food, and forest resource use) in coping with the land use changes, we will use Pebble Distribution Method (PDM) scoring exercise (see Sheil et al. 2003).

With the PDM we will be able not only to rank the preference, but also to assess the relative magnitude of their preference (Sheil and Liswanti 2006).

Trend analysis

To know the trends of some events or activities such as migration, availability of work, use of pesticide and fertilizer in the village we will use the Trend analysis exercise.

Seasonal activities calendar

To identify and characterize the annual agricultural activities and other livelihood activities done by the villagers, they will put the information in the seasonal activities calendar. It will help us to predict the possible income diversifying options such as off-farm incomes or other job opportunities under the existing scenario of the land use practices and changes.

Soil analysis

We will identify major land practices which include traditional farming system (rice and vegetable), commercial plantation (oil palm and coconut) and secondary forest. From each of those land use systems, we will collect soil samples considering field slope, soil colour, field history, age of plantation trees (old vs. new), crop management practices (oil palm managed by farmers and oil palm managed by the government scheme), and other recommended criteria to capture the variation. We will analyse both physical and chemical properties which will provide nutrient status of the soil. Top soil (0-30cm) will be taken using soil auger and will be labelled with a short description of the field before going to laboratory analysis for pH, Nitrogen and Phosphorus, soil organic matter (SOM), colour and texture analysis. We will also record notes from each sampling field.

In addition to the field soil investigation, we will consult secondary sources to find out the quality of land. Erosion indicators could also be inferred for reducing quality of land as a result of the dynamics of the changing land use in the study area.

Water quality analysis

We will sample some of water sources (upper and lower streams) which are going in and out the different land use practices in the village to be able to identify the factors that might be affected by land use changes. The parameters will include nutrients (nitrate, ammonium and phosphate), organic content, pesticides and coli forms.

Data analysis

We will organize the qualitative information from the interviews and categorise the different issues or information around our major themes of the study. We will use Excel and SPSS programs for quantitative data analysis.

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Appendix 1

Summary of major issues, research questions, data required and proposed methods.
We aim to investigate the impacts of the changing land use practices on the community's livelihood strategies and environment.

Issue	**Research question**	**Data required**	**Proposed methods**
Land tenure	How is the land use changes related to the land tenure system?	-Major land use changes- what major land use changes take place in the area? -Tenure security- are the people in Empayang feel secured about their land? The community's and government officials' perception towards the NCL; incentive to invest, migration, conflict as a result of the land use changes -Legislation- are there any changes in legislation as a result of or made for land use changes, if not, are there any changes in interpretation or application of the existing law -Compensation- adequate compensation for their land, and from the development scheme, criteria for compensation	-Secondary source, Key informant interview, transact walk, land use map -Questionnaire, semi- structured interview (local community, individual investors, government officials) -Secondary sources, semi-structured interview with government officials (SALCRA, FELCRA) - Questionnaire, semi-structured interview with local people and government officials as well as investors, secondary sources

Natural environment	What are the impacts of the land use changes on the natural environment?	- Village map - Soil fertility status on different land use practices, (Nitrogen and Phosphorus, soil organic matter (SOM), colour and texture) - Quality of water in connection to land use changes (nitrate, ammonium and phosphate), organic content, pesticides and coli forms). - quality of the land on different land use practices - information on pesticide use	-**GPS/GIS map** of the village GPS points of sample points -**Soil analysis** with different test kits, - **Water analysis** -**Semi-structured interview** with people inside or outside of the village who are knowledgeable, **secondary data sources, own observation, transect walks**
Livelihood strategies	How do the land use changes affect the village livelihoods strategies?	village demography	Questionnaire/semi structure interview with village head
		Village infrastructure	Questionnaire/semi structure interview with village head
		Village history	History time line with elder people
		Important agriculture & plantation types	PDM Scoring
			Questionnaire/semi structure interview
		Sources of income	- Questionnaire/semi structure interview - PDM scoring
		Livelihood/occupation	Questionnaire/semi structure interview
		Agriculture skill & knowledge	Questionnaire/semi structure interview

		Village map	- Village Mapping (PRA) - Transect walk with 2 key informants (man & woman) & GPS points
		House hold land data	- Questionnaire/semi structure interview
		Seasonal calendar of livelihood activities	Focus group discussion/PRA
		Forest resources use	- focus group discussion (young vs. old) - PDM scoring
		Market availability	Questionnaire/semi structure interview
		Source of food	- Questionnaire/semi structure interview - PDM
		Type of oil palm plantation (SALCRA, FELCRA, private)	Questionnaire/semi structure interview
		Perspective toward oil palm plantation	Questionnaire/semi structure interview
		Young people perspective of their future relate with the agriculture practices	Questionnaire/semi structure interview with village head
		Migration trend	Trend analysis (PRA)
Social environment	How are the villagers sense of community related to their land use practices?	Current perception of local sense community in relation to land use -common values towards crops, land usage, land ownership, shared activities. - the importance of different sorts of land usage - When and why do locals interact in matters related to land use?	-Semi-structured interview with local people -PDM of different crops and land

			usage with local people.
		Perception of local people on past changes: -Has land use change affected the community sprit and structure Specifically in regards to the change from small-scale agriculture towards large-scale plantations and commercial crops -Has a changing sense of community affected land use in regards to Which factors inside of the village could be reasons for the villagers' current land use changes? Has a change in the sense of community inclined people to change land use e.q. abandon land in order to migrate, change land to plantations, etc.?	Focus group interview with elders of the village with a narrative/life story of the village land use approach. PRA – time line with elders of the village focused on changing land use.
		Conflicts related to land use: Specifically, are there conflicting views of the importance of different land usage? Is there any conflict between the elder and younger members of the village in regards to land use?	Since conflicts might be a sensitive issue, it will be investigated through: -semi-structured interviews where this is not the only/main topic of discussion. -by noting differences in answers from different individuals, specifically expected to be noticeable when comparing the statements of elder and younger individuals.

			-informal, conversational interview. -observations.
Future scenario	How is land use changes connected to the villagers' future aspiration?	Villagers hopes and aspirations of their own and the next generation future -how do villagers hope for their future to look like? -Is land use and land tenure significant in the future scenario they hope for, if so, in which way?	PRA – future scenario workshop with old and young people.
		Which livelihood strategies do villagers employ in order to attain the future they aspire? -which role (if any!) does land use and land tenure play for the attainment of their aspirations? -which livelihood strategies connected to land use and tenure do they see as enhancing the likelihood of attaining their aspirations? -which livelihood strategies connected to land use and tenure do they currently employ in order to attain their aspirations? -Which obstacles (conflicts?) connected to land use and tenure are there for employing the livelihood strategies which will enhance the possibility for achieving optimal future? -how do the villagers cope with the obstacles for the attainment of the future they hope for?	Future time line with young and old generations. -Semi-structured interview with young and old generations.
		Villagers expectations on -the changing land use and land tenure to affect their sense of community and vice versa in the future	Semi structured interview Future time line with young and old

			generations.

Appendix 2

Preliminary work schedule of Empayang team

Day Date	Activities		
	Morning	**Afternoon**	**Evening**
Thursday, 6 March	• Working together with Malaysian partners in synchronising research questions, methods, work plan, etc. • Shopping for field supplies		
Friday, 7 March	• Travelling to Kampung Empayang • Settling down in our 'new home'	• Brief introduction with Empayang leaders • Initial observation of surrounding and community	• Night briefing*
Saturday, 8 March	• Community meeting • Identification of key informants and other respondents •	• Transect walk with GPS • Finalising research questions • Finalising methods/tools: questionnaires, interview, sampling, etc.	• Finalising basic map • Night briefing
Sunday, 9 March	• Visit to local government, agriculture offices for secondary data and semi-structured interview with the staff	• Visit to local government, agriculture offices for secondary data and semi-structured interview with the staff •	• Focus group discussion • Night briefing
Monday 10 March	• History / time line interview / focus group interview with village leaders & old people Matrix-ranking exercise	• Seasonal activities calendar, • Trend analysis • Participatory land use (& land tenure) mapping	• Resources map • Night briefing
Tuesday 11 March	• Soil sampling and interview with land owners • Household interview	• Soil sampling and interview with land owners Finalising land use (& land tenure mapping) with GPS points	• Household interview • Night briefing
Wednesday	• Soil sampling &	• Soil sampling &	• Focus group

12 March	interview with land owners • Finalising resource map with GPS points	interview with land owners • Household interview	discussion • Night briefing
Thursday, 13 March	• Water sampling • Semi-structured interview	• Water sampling • Focus group discussion	• Household interview • Night briefing
Friday, 14 March	•	•	•
Saturday, 16 March	• Continue the unfinished previous activities	• Focus group discussion/interview	• Last Night briefing to make sure that all planned required data are obtained
Sunday, 17 March	• Last check	• Last check	• Farewell with communities
Monday 18 March	• Return to Kuching		
Tuesday 19 March	• Last meeting with Malaysian partners to		

* Night briefing is a short meeting for all group members to share today's activities, main findings and problems, and to finalise next day activities. If the evening will be occupied with household interview/focus group discussion, etc., this briefing can be moved to the next morning.

Appendix 3

Questionnaire

1. Background information:

Date	March 2008	Interviewer				
Respondent name		Gender	Age	Ethnic	Rumah	Bilik No.

Number of individual in the bilik	Gender		Occupation				Remarks
			Primary		Secondary		
	F	m	F	M	F	m	

1. How much land do you have?
   i) Less than 0.5
   ii) Between 0. 5 and 1.5ha
   iii) Greater than 2ha

2. Do you feel secured about your land holding?
   i) yes
   ii) no
   iii) not sure

3. Which major agricultural activity do you practice?(For more than one answer please rank where 1 is the most important)
   i) Rice
   ii) vegetable garden
   iii) oil palm
   iv) coconut
   v) fruit orchard
   vi) Other(s)_____

4. On average how much land do you allocate to your 1st choice of agriculture activity above?
   ……..

5. Are you involved in a plantation scheme?
   i) Yes
   ii) No

6. If your answer to question 6 is yes, in which type of scheme are you involved?
   i) Private
   ii) SALCRA
   iii) FELCRA

iv) Other(s) _____

7. Do you receive enough compensation for your participation in SALCRA or FELCRA?
    i) yes
    ii) No

8. If no, what is the reason?
    i) Wrong criteria as a basis for compensation
    ii) Corruption of the concerned officials
    iii) Deliberately underestimate compensation for the victims
    iv) Don't know
    v) Other(s) _____

9. Which major plantation types do you practice much?
    i) oil palm
    ii) coconut
    iii) rubber
    iv) Other(s) _____

10. For how long have you been involved in the plantation scheme?
    i) Less than 5 year
    ii) 5- 10
    iii) Greater than 10 years

11. Do you apply fertilizers?
    i) Yes
    ii) No

12. If yes, which type of fertilizers?
    i) Manure
    ii) artificial fertilizer
    iii) crop residue
    iv) other(s)_____

13. If yes to question number 9, when did you start applying the fertilizer?
    i) Before 10 years ago
    ii) 5 to 10 years ago
    iii) Less than 5 years ago

14. What do you think is the soil status of your farm currently?
    i) Improved
    ii) same
    iii) worsened

15. Do you have skill or knowledge in managing oil palm plantation?
    i) Yes

ii) No

16. What do you think about your living condition now?
    i) Much better
    ii) better
    iii) same
    iv) Worse

17. What are the major household sources of income (if you have more than one answer, rank them where 1 is the most important)?
    i) Rice
    ii) vegetable garden
    iii) oil palm
    iv) coconut
    v) remittance
    vi) off-farm activities in rural area
    vii) Other(s) _____

18. What coping options do have during times of agricultural failure?
    i) Remittance
    ii) Saving
    iii) Working in other's farm
    iv) off-farm activities in rural area
    v) Other(s) _____

19. Do you want to involve in any plantation scheme in the future?
    i) Yes
    ii) No
    iii) Don't know

20. If yes, what is the reason?
    i) To get land title
    ii) good land for oil palm
    iii) better income
    iv) to reduce the pressure from the government
    v) to cope during times of crop failure
    vi) other(s) _____

21. If no what is the reason?
    i) Have no suitable land
    ii) Small land
    iii) No skill
    iv) No interest
    v) Other(s) _____

Appendix 4

PRA sheets

Data Sheet 1: History of village
With Village/rumah Heads/Traditional Leader

Date	March 2008	Facilitator			
No.	Respondent	Gender	Age	Ethnic	Rumah
1.					

Question: Please tell us when there have been important events for the village, causes thereof and special remarks if any!

No.	Year / month	Important events	Remarks

Data Sheet 2: Village demography – (each Rumah or combination of 2 Rumahs?)
With Village/Rumah Heads/Traditional Leader

Date	March 2008	Facilitator			
No.	Respondent	Gender	Age	Ethnic	Rumah
1.					

Question	
1. Number of rumahs	
2. Number of population	
3. Age distribution	
4. Education distribution	
5. Occupation distribution	

Data Sheet 3: agriculture type
Community meeting / PRA/ Focus group discussion (FGD)

Date	March 2008	Facilitator			
No.	Respondent	Gender	Age	Ethnic	Rumah
1.					

22. Question: What are the important types of agriculture/plantation for the villagers? (e.q. rice cultivation, home garden, coconut plantation, forest gathering/hunting, etc.)

No.	Agriculture type	Remarks
1.		
2.		
3.		
4.		
5.		

2. How important are those agriculture/land use practice in the now, past, future? (PDM)

Appendix 5.

Semi Structured Interview guides

Data Sheet 1: Urban worker
Interview with urban worker

Date	March 2008		Interviewer						
Respondent			Gender		Age		Ethnic		Rumah	

1. What are the jobs?
2. Why do they take urban labour?
3. Do they landless? If not, how big is their land?
4. What are their previous jobs before urban labour?
5. What are their educations?
6. What is their status (single, married)?
7. Do you want to be farmer? Why?
8. How much percentage cash they contribute to the household from this urban work?

Data Sheet 2: Young people perspective of agriculture
Interview with young people

Date	March 2008		Interviewer						
Respondent			Gender		Age		Ethnic		Rumah	

1. Occupation
2. Do you want to be farmer?
3. Why?

Sheet 3: Interview with land owner and villagers

Land or field condition

How large is your land?
What do use the land for?
What do you grow on this land before?
What do you call the soil on your field or land?
How do you cultivate your land?
What do you think the fertility of your land?
What is your indicator for fertility?
What will you do if your land is not fertile?
Do you use fertilizers? Which ones?
When did you start applying fertilizers?

Water quality

Are you involved in fishing?
Is quality and quantity of fish from the water source increased or decreased? What about the number of species from time to time?
Do you use the river for irrigation, bathing?
Do you think the river is safe for health?
Do you think there is pollution in the water source?
What do you think the cause of pollution?

Pesticide

Do you have your own oil palm plantation? How large is it?
Do you use pesticides? Which types of pesticides?
Where do you get the pesticides?
How much do you apply and how often do you apply?
Do you have skill in pesticide application?

Quality of land

Do you see any erosion or similar situation in your field or surrounding?
What do you think is the cause?
What do you think is the best way to solve or prevent the problem?
Can you list period, land use changes and impacts on land?

Appendix 2. Questionnaire

Name of Respondent:	**Name of interviewer:**	**Longhouse: Ayu /Jemat**	**Bilik number:**

PART A: BIODATA:

A1. For Family Members that Lives Together

No.	A1 Relation with family head	A2 Ethnic Group	A3 Religion	A4 Gender	A5 Age	A6 Education level	A7 Boarding school?	A8 Marital Status*	A9 Occupation	A10 Income
1	Respondent									
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

*Marital status: S = Single, M = Married, W = Widow/Widower

A2.For family members that have migrated, work or reside in other place.

No.	M1 Relation with family head	M2 Ethnic Group	M3 Religion	M4 Gender	M5 Age	M6 Education level	M7 Marital Status*	M8 Main Occupation	M9 Recent home (name of city)	M10 Reason for migrating
1										
2										
3										
4										
5										

B.1 Please give the information about all land that use and/or own:

Plot	Locality of land	Acreage (acre)	What is the major crop (include fallow)	Acquired method*	Land Category **	Involved in development scheme*** (If yes, specify)	If rent/borrow, what is the reason?
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

* 1 = Inheritance, 2 = bought, 3 = borrow, 4 = rent

** 1 = Native Customary Land (NCR), 2 = Native Communal Reserved, 3 = Native Area Land (NAL), 4 = mixed zone land, 5 = interior Area Land

*** 1 = private oil palm, 2 = FELCRA, 3 = SALCRA, 4 = IADP, 5 = other

B.2 In relation with oil palm, fill the table below:

How many member of family work in that?	Type of occupation	Work days per week	How many years have you worked?

B.3. If involve in FELCRA/SALCRA, Are you satisfied with the dividend received? A. Yes
B. No

Why?
……
……

……
……

B.4. Why do you choose SALCRA or FELCRA or private? (Plot number: ……..)
If you have more than one reason, please rank where 1 is most important.

a. Profit
b. Land title
c. Lack of labour
d. External influence:
e. Other(s) _____

C.1. After oil palm plantation is the land still suitable for the purposes below?

Purpose	Yes	No	Remark
Rice			
Vegetables			
Fruits			
Fish/prawn pond			
Others:_____ _			

C.2 In your opinion, what is/are the effect of the oil palm plantation?

	1. Increased significantly	2. Increased	3. No changes	4. Decreased	5. Decreased significantly
Crops yield					
Soil fertility					
Plants diversity					
Aquatic lives					
Wildlife					

PART D: EXPENDITURE AND ECONOMIC ACTIVITIES

D.1. Please states the total amount of household expenses for the detail below:

Expenditure	**Total (RM)**	**(%)**	**Expenditure**	**Total (RM)**	**%**
a. Food			f. Loan instalment		
b. Transportation			g. Input of agriculture		
c. Education			h. Other:		
e. Medical check-up			Total		100

D.2 Please state the source and amount of income:

Source of income	1. Yes 2. No		Use of the product 1 = for sale, 2 = eat, 3 = both			if for sale, how much income RM	
						Annually	Monthly
1. oil palm	1	2					
2. paddy	1	2	1	2	3		
3. coconut	1	2	1	2	3		
4. cultivated vegetables	1	2	1	2	3		
5. Livestock (chicken, duck, etc.)	1	2	1	2	3		
6. Forest plants(midin, bamboo shoot, rattan, bamboo, etc)	1	2	1	2	3		
7. Wild animal	1	2	1	2	3		
8. Aquatic produce	1	2	1	2	3		
9. Money remittance	1	2					
10. Others: _____	1	2	1	2	3		
Total							

D.3. Do you have any savings ? (Circle your answer)

Savings	1. Yes	2. No	Purpose:

PART E: ASSET OWNERSHIP

E.1 Please state the equipment and facilities owned by your family:

1. Types of transportation	Yes	No	2. Types of equipment	Yes	No
a. Car	1	2	a. Radio	1	2
b. Motorcycle	1	2	b. Television	1	2
c. Bicycle	1	2	c. Gas stove	1	2
d. Van	1	2	d. Video/VCD	1	2
e. Others (please state:_____)	1	2	e. Refrigerator	1	2
			f. Sewing machine	1	2
			g. Telephone	1	2
			h. Computer	1	2
			i. Other (please state:_____)	1	2

F. Perception on livelihood

1. How your livelihood change after the oil palm?:
    a. Much better
    b. Better
    c. Same
    d. Worse

2. Do you want to involve in any oil palm plantation scheme in the future?
    a. yes
    b. no
    c. don't know

    Why?

……..

3. Do you feel secure about your land?
    a. Yes
    b. No
    c. Not sure

    Why?

    …….

    .

Appendix 3. History time line of Empayang

Year	Event
1912	Udin came from Krian around Saratok to the Empayang area with two biliks and after opening the primary forest ("berimba") he built farming hats (houses). He came to this area to cultivate coconut, which knowledge he got from Indonesia, and sell the raw coconut to the Malays. Jamin the son of Udin took over his father's position when Udin passed away
1960-1970	Rumah Jemat and Rumah Ayu was still together as Rumah Bugey living in huts and makeshift shelters.
1962	- Drainage And Irrigation Department (DID) surveyed the Empayang area. - Coconut scheme was introduced by Department of Agriculture (DOA).
1965	Drainage system completed
1971	Rumah Bugey split into two longhouses: Rumah Ayu (Empayang atas) and Rumah Jemat (Empayang baroh).
1973	- Rumah Ayu stayed at wood longhouse (rumah papan) with 30 biliks until 2003. - The first church of Empayang was built
1975 - now	- The head man (*Tuai*) Jemat appointed as the headman of Empayang baroh - sago scheme was introduced
1977-1979	Paddy scheme was introduced
1978-1985	Peak of coconut production
1980	Pig rearing scheme was introduced
1982	- Current church of Empayang was built next to Rumah Jemat. - Rumah Ayu still used well-water (air perigi)
1982-1985	Cocoa was introduced to Rumah Jemat by DOA. It was unsuccessful.
1984	Rumah Jemat moved to the current longhouse
1988	- Maize planting scheme was introduced - Rumah Jemat had well water
1993	Salcra came to develop state land. The local people work as labours

1995	- FELCRA came to Empayang
	- The head man of Rumah Bugey passed away and replaced by his son Tuai Ayu
1996	Electricty came into Rumah Jemat
1997	- FELCRA Phase II was introduced to Empayang I, involving seven families and a land area of about 10 hectares.
	- Electricity came into Rumah Ayu
1998	Many oil palm trees destroyed by the *jerebu* (haze)
1999	Pepper planting scheme was introduced by agriculture department. The outcome was unsuccessful.
2000	Flood in Rumah Ayu's area, but the water did not reach the house, only at the garden (kebun) areas.
2000	Nasa ak Bugey of Rumah Ayu planted the oil palm as the first person in the Rumah Ayu
2003	Rumah Ayu changed into concrete house (rumah batu) with 36 biliks and with pipe water.
2004	- Flood in Rumah Jemat destroys nearly all crops
	- Pipe water was installed for Rumah Jemat
2005	Main road in front of Rumah Jemat was aspalt

Appendix 4. Overview of research question, collected field data and applied methods

Issue	Research question	Collected field data	Applied methods
Livelihood strategies	What is the impact of land use changes on the community livelihood strategies?	-In and out labour Migration, and rough sketch of the graph by the participants -village demography -Agricultural production-consumption or selling: Fruit orchards, rice farming, vegetable gardening -Cash plantation crops-oil palm, rubber, coconut trees -Forest resource uses -Off-farm activities-work in cities, petty trading, other income diversifying options, job opportunities -sources of income for the household -shared labour activities, helping out other members in the *bilik* -calendar of activities, income , expenditure and time allocation graph for both men and women group -structure and size of the household or *bilik* -infrastructure, market availability, policy situation Villagers attitude for the changing livelihoods Venn diagram map showing important institutions , their role and interaction between then	questionnaire semi-structured interview key informant interviews Focused group discussions **PRA techniques** -transect walk -PDM scoring -trend analysis -history, resource maps -seasonal activity calendar Venn diagram
Land Tenure	Will land use changes affect land tenure?	-Legislation-whether there are changes in legislation in relation to land use changes	**-Questionnaire** **-semi-structured/in-depth**

		Tenure Security-whether the local community feel secured about their land holdings Compensation- availability and sufficiency of compensation to their land when needed by the government Awareness-the awareness of the local people about legal issues pertaining to land	**interviews** with elders and experts -Informal Conversation -**Secondary data**
Natural environment	What is the impact of land use changes on the natural environment?	GPS points for the village and sampling points 12 soil samples taken and analysed from four land uses List of plant species known locally and knowledge of their uses by local community We measured the height and diameter of trees from A 10x10m plot of secondary forest History and soil characteristics of the sampled soils Some case and practical evidences of impacts of major land uses	**GPS** **Soil analysis** **Forest inventory** **Semi-structured interview** **Group interview** S**econdary data sources** **Key informant interview**
Social impact	What is the future aspiration and expectation of the community in relation to land use changes?	Government promotions Traditional-modernity Oil palm Migration Future sustainability of Empayang	**Semi structured interviews** **Group interviews** **Informal interviews** **Questionnaire** **Secondary source** **PDM**