

Adapting Traditional Livelihoods in a Transition towards Modernisation

A Case Study of Agricultural Development in Kampung Sebako



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2.0 Abstract (Linzi)

As part of the ILUNRM/SLUSE course, a group of students have produced this report based on fieldwork conducted in Kampung Sebako, Sarawak, Malaysia, among a range of complex issues which transcend academic disciplines. The research is situated in a rapidly changing agricultural context, being driven primarily through national development schemes. This study assesses the environmental, social-economic and cultural implications associated with agricultural development in Sebako. Methods were adopted from both natural and social sciences in order to consider the range of interacting factors within this complex social context. Previous logging activities, technological advancements, agricultural intensification and their associated socio-economic and environmental implications, have altered traditional agro-cultural practices and this is evident in the transition from subsistence based agriculture to large-scale plantations. Sebako villagers pursue highly diversified livelihood strategies, and take advantage of market variations and agricultural schemes to enhance their living standards. With the advancement of modernisation into this Bidayuh Selako community this interaction causes a hybrid of traditional values and development ideals which at present allow for villagers to maintain livelihood security. Finally we provide suggestions on how to sustain the local socio-cultural practices through improved environmental management in an increasingly modernised world.

3.0 Introduction (Jakob)

Through the Interdisciplinary Land Use and Natural Resource Management (ILUNRM/SLUSE) course, this study seeks to explore the socioeconomic, cultural and environmental issues related to agriculture development in Kampung Sebako (Sebako), Sarawak, Malaysia. People of Sebako are for the most part of the Dayak Selako tribe, Bidayuh. Traditional laws, tenure and customs are still being practiced, although a transition towards a modern way of life is appreciated.

The village of Sebako is foremost an agricultural society of smallholder farmers, cultivating traditional paddy and small scale cash crops, mainly rubber, vegetables and fruits. Formerly the villagers relied on traditional agricultural practices involving shifting cultivation. However, village relocation to the other side of the river Sebako, made way for modernization. Furthermore, the movement from longhouse to individual housing (1979-1982), community structure has changed significantly.

The Malaysian government has put forward policies of development to a more industrial, knowledge-based society by the year 2020, including policies to encourage the agricultural sector. Different schemes are being provided to modernize the sector and participate in a market-based economy. (Ministry of Agriculture, 1999 and UN, 2004). In the transition towards modernization, the villagers of Sebako are participating in different schemes, such as the rubber mini-estate and SALCRA plantation scheme, as well as increasing production of cash crops (Ministry of Agriculture, 1999).

This trend toward modernization brings many questions with respect to how villagers are accepting and participating in government agriculture development initiatives, how the local environment is being affected, how culture is maintained and how livelihoods adapt. Through a ten day field study, we attempt to determine the socio-economic, cultural and environmental implications resulting from current agricultural schemes and intensified cash cropping.

Thus, the following objective and research questions have been developed:

Objective: To assess the socio-economic, cultural and environmental changes driven by agricultural development in Kampung Sebako.

In order to meet the study objective, the following research questions will be answered:

1. *What are the underlying drivers of agricultural land use change?*
2. *What is the relationship between the biophysical environment and land use change?*

3. *What is the relationship between agricultural development and socio-cultural aspects of Kampung Sebako?*
4. *How have livelihood strategies in Kampung Sebako adapted to land use change?*

4.0 Background

4.1 Agricultural Development: Adapting to Modernization (Linzi)

Development discourse in Malaysia since the 1960s has been encouraged through rapid land cover transformations promoting large-scale production and commercialisation. *Wawasan 2020* is the current national strategy for development and modernization in Malaysia (Appendix 11.1). With varying emphases over the last decades the current National Agricultural Policy (NAP3) focuses on productivity and market driven growth with the main objectives of maximising income (of both the producer and the national economy) through “optimal utilisation of resources” within the agricultural sector (Ministry of Agriculture, 1999). National policy emphasises a shift from subsistence based agriculture to market-driven large-scale commercialised agriculture (Ngidang, 2002). The establishment of oil palm estates is currently the main driver of land conversions driven alongside multiple agricultural schemes (*inter alia* fruits, vegetables, pineapple, paddy, rubber, cocoa) presented through the narrative of providing initiatives to improve the living standards of local people.

This political-economic context of highly modernist agricultural expansion, which began in the 1970s, gives preference to largescale plantation-type agriculture through transformation and appropriation of community lands (Cramb, 2007). Figures 1A and 1B illustrate changes in area and yields of the primary crops. Using this information we can see there has been a consistent increase in oil palm production indicating its increasing importance as a cash crop. Rubber and cocoa have changed only slightly, while rice as maintained its production. This would be explained by current oil palm plantation expansions, and the fact that rubber and cocoa are established plantations. Shifts within agricultural practices, crop selection and nationally driven priority crops have altered the interaction between the state and *Kampung*.

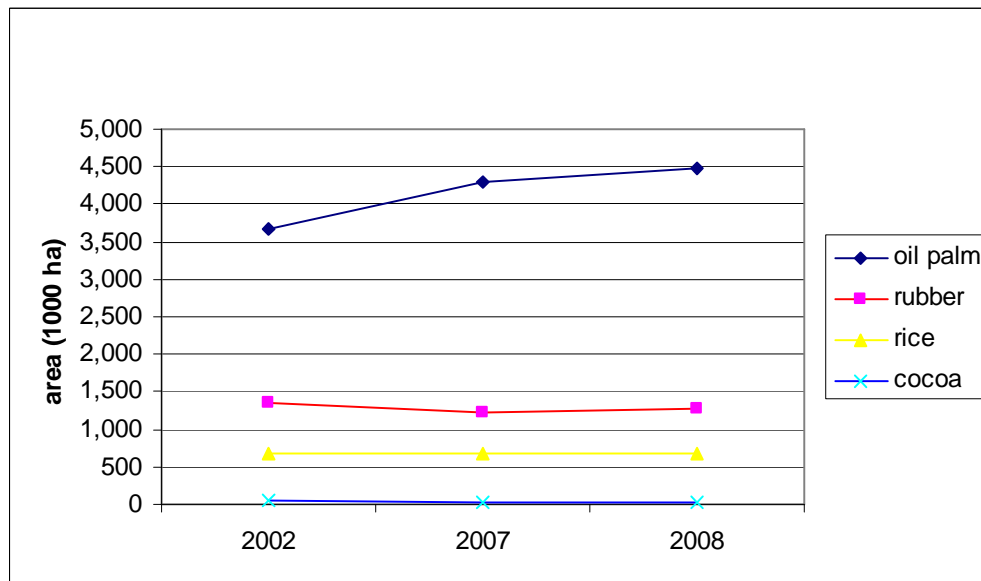


Figure 1A. Area of oil palm, rubber, rice and rubber in 2002, 2007 and 2008

compiled using data from Ali Sabri (2009)

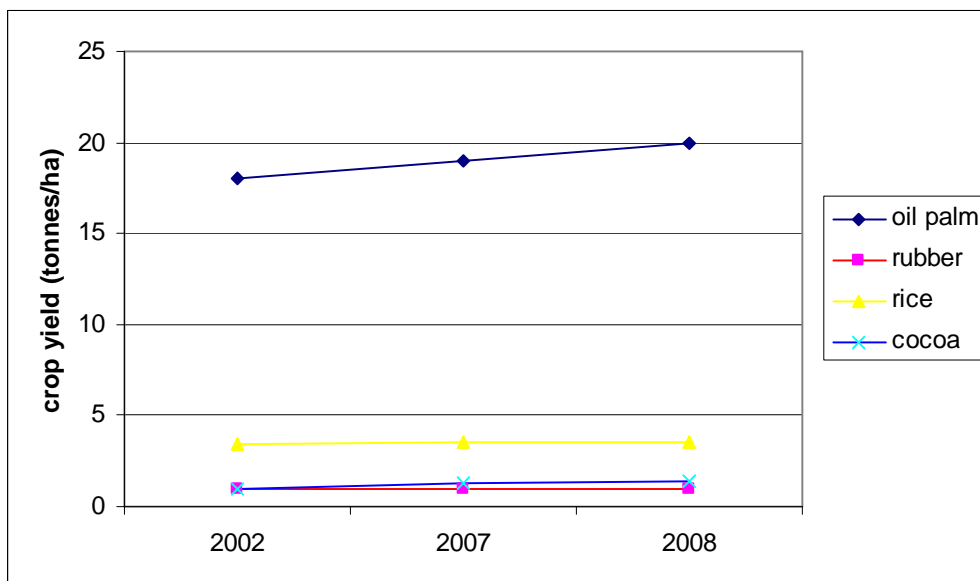


Figure 1B. Yield of industrial crops in 2002, 2007 and 2008

compiled using data from Ali Sabri (2009)

Cramb (2007) suggests that agrarian development in South-East Asia should be more balanced and ensure: the households' ability to adapt livelihood strategies under changing environments; a balance between economic development and cultural endurance; and benefit sharing and participation of all actors involved. In this study we seek to examine current agricultural schemes operating within Sebako

and the way local livelihood practices have adapted and been negotiated within this national modernization ideology.

4.2 Agricultural Intensification

4.2.1 The Green Revolution (Jakob)

Breakthroughs in research of new varieties of crops can increase the yields of agricultural production dramatically. Together with complementary inputs, new varieties of crops can shorten the period between sowing and harvesting, and allow more crops per year and therefore contribute to a more intensified production and increased output per unit of land. Characteristics of the Green Revolution include:

- Development of high yield crop varieties
- Use of industrialized fertilizers, herbicides and pesticides
- Land saving innovations
- Agricultural research towards science-based agriculture
- Investments in delivery systems of inputs
- Credit institutions for farmers to purchase technological innovations and inputs
- Irrigation systems and water control (Szirmai, 2005).

The position of small farmers are threatened because of the price of necessary inputs and become more dependent on government subsidies or multinational corporations for access to fertilizers, herbicides and new seeds. Dependencies on market relations, favors cash crops are created, marginalizing land for as subsistence agriculture (Szirmai, 2005). Although the debate continues, it is widely accepted, that technological innovations and increase in productivity are needed due to population growth (Szirmai, 2005).

4.3 Boserupian View on Agricultural Intensification (Natalia)

In the context of modernization involving adaptation from traditional agricultural methods to increased reliance on agricultural inputs and intensification we have considered Boserup's theory on agricultural intensification as explanatory. Boserup (1965) states that as populations on land grow, the demand for food and marketable crops indeed increase and fallow periods shorten. However, the result was according to her not that the productivity would decline and that the environment would degrade, but rather that application of labour and complementary input per unit of land would increase. The quality of land is instead perceived to improve through seeking out and adopting new technologies, which enhance the yields as well as labour-intensive investments in the soil that helps to maintain the soil. Boserup's perception of the environment therefore opposes the pessimists and neo-

Malthusian conception of the carrying capacity. The carrying capacity is therefore not fixed, but influenced by the application of labour and technology. (Sarre and Blunden, 2000). We will discuss this theory as a way to gain understanding of different factors imposing agricultural change in Sebako.

4.4 Market Factors (Natalia)

In the context of agricultural development market forces play an important role as they can promote shifts towards commercialisation and intensive use of land.

When considering how price developments can motivate farmers to grow cash crops or convert land to SALCRA it is interesting to see that from 2000 to 2007 the price (1990 price levels) on for instance rubber increased with about 198 percent and palm oil with 119 percent. (Figure 2) However, at the same time the use of fertilizers, went up to 120 percent, and the profit may therefore be less in relation to the real income from cash crops.

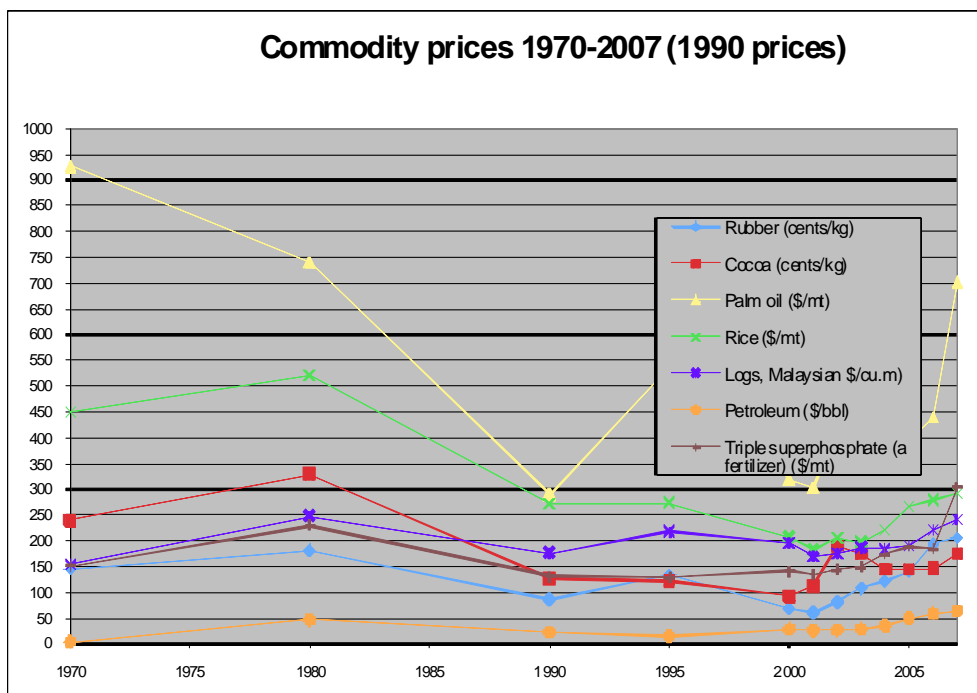


Figure 2. Commodity Prices (World Development Indicators).

Based on data from the World Bank report on World Development Indicators 2008, p. 334 (World Bank, 2008)

If farmers are dependent mainly on a single crop their supply curves will be very inelastic and sensitive to prices in the short run. If price falls on this single crop they will loose out and for this reason be very sensitive to price fluctuations (Begg, 2006). Based on this argument we would argue that diversification may be seen as a

safety-net. Nevertheless, a general shift in price levels in society would cause no real effect on the single crop due to inflation.

Farmers' purchase power also depends on the price on the commodities on which their money income is spent. According to the Department of Statistics Malaysia the prices on basic consumer goods and services have increased with 13,2 percent points since 2005 while prices on food and non-alcoholic beverages even with 22,5 percent points (Figure 3).

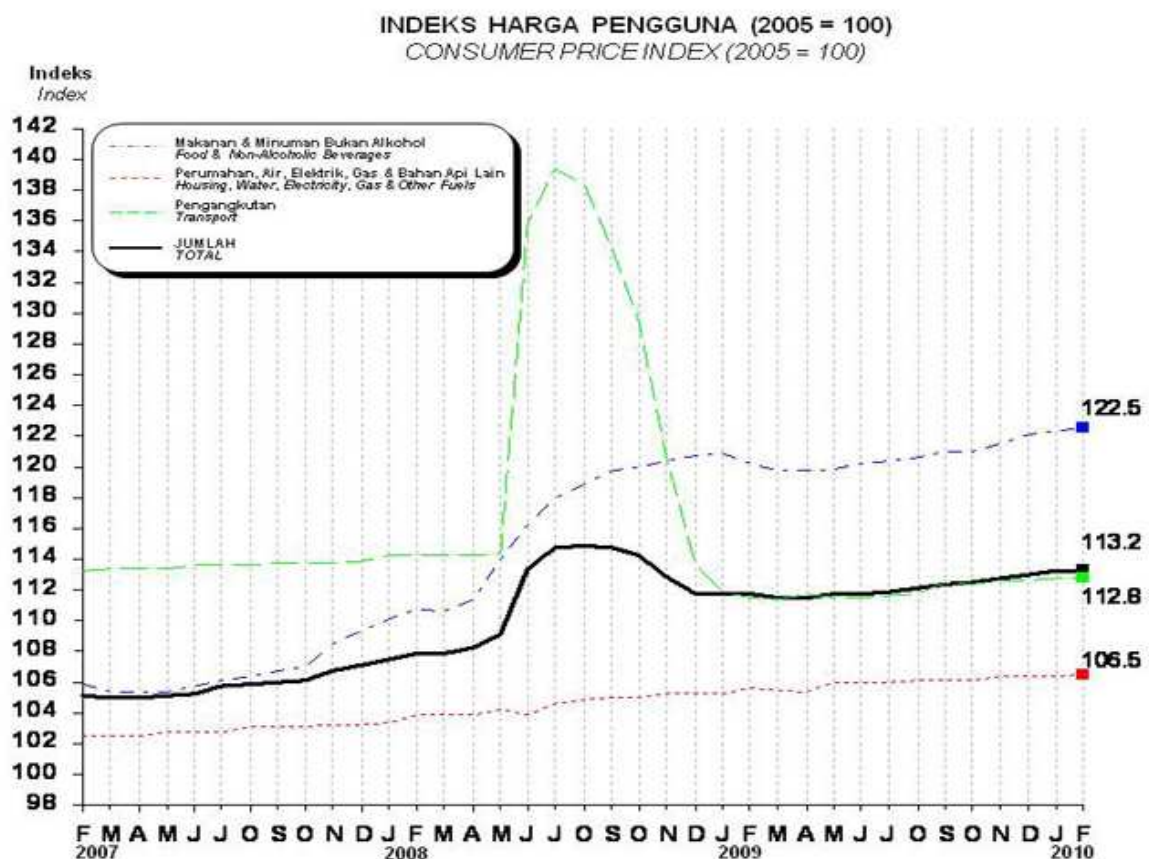


Figure 3. Malaysia Consumer Price Index
(Department of Statistics Malaysia, 2010)

Nevertheless, Sebako is a unique setting and might be less dependent on the consumer products that this chart is based on. In addition, we cannot predict anything about future markets, we can only emphasize that a diversification of cash crops is crucial in order to be less vulnerable. With our field data we will instead attempt to look at how the villagers in Sebako actually cope with modernization issues and what kind of livelihood strategies they have in their current situation.

4.5 Forests and Logging: Altering Resource Quality (Shauna)

The mixed dipterocarp forests, as found in the foothills of Pueh Mountain range, adjacent to Sebako, with their valuable timber species have been subject to intense commercial logging. The government of Sarawak blames swidden agriculture on forest degradation, arguing that logging practices are sustainable and selective (Ichikawa, 2007).

The timber harvesting process in Sarawak, involves the licensing of harvest rights, with harvesting operations being contracted and sub-contracted. This chain of command lends itself to a lack of consideration for conservation issues. With licenses being short term and sub-contractors' income being dependent on high production and cost minimization, there is often neglect for sustainable logging practices (King, 1993).

In further contest to the government's argument, added environmental impacts of commercial logging regimes in the region is an increase of sediment yields, 20 times higher to that of undisturbed rates, in contrast to shifting cultivation, which because of the organic debris that remains, sediment yields are not significant (Douglas, 1996).

(Linzi)

In Sebako, a variety of factors contribute to and drive land use changes and agricultural development. National development strategies, logging and market forces effect local agricultural, environmental, social and cultural practices. Considering these factors, this paper seeks to expose the dynamic livelihood strategies adopted, and adapted within this progressive society.

5.0 Study Site (Jakob)

Sebako is located in the state of Sarawak, and includes 123 households, 749 inhabitants, of which the majority are descendents of the Dayak Selako tribe, Bidayuh. 95 % of the villagers have converted to Christianity (SLUSE Working Paper and Senghi, 2010).

The village is situated at N 01° 43.1, E 109° 43.5, 90 km from the capital of Sarawak, Kuching. It is situated at the foot of the Pueh mountains, which border Indonesia. Two main rivers, the Sebako and the Resen, run through Sebako (Telecentre of Malaysia, Date Unknown).

The majority of the inhabitants are agricultural smallholders, with additional cultivation of SALCRA oil palm and rubber. Important facilities include a nearby mini hydro dam, providing electricity, a primary school and a few sundry shops. Nearby towns of Lundu and Sematan are the commercial and administrative centres for trade and political institutions (Telecentre of Malaysia, 2010).

6.0 Methods

(Shauna)

The research questions posed above require data and information to be obtained from both the natural and social science disciplines. Through using a variety of qualitative, quantitative and literature review methods, we will be able to triangulate acquired information, thus achieving a more comprehensive data set for our cross-disciplinary information needs. (Mikkelsen, 2005) identifies different means of data triangulation. This study will incorporate time, person, investigator, discipline and method triangulation to validate our research.

6.1 Qualitative Methods

6.1.1 Ethnography/Participant Observation (Natalia)

Participant observation, known today as ethnography, describes the immersion of the researcher in the social life of a group studied, by carrying out observations of behaviour and listening to and engaging in conversations (Bryman, 2004).

Informants provide opportunities for the researcher to engage in activities that were not planned. We were invited to join the Sunday church ceremony as well as community work related to the church, which gave us the opportunity to observe certain cultural aspects of the village. After the church we were invited home to peoples houses where we had informal but informative conversations with people. Moreover, we were asked to attend the community work after church as well as join several rice ceremonies. Likewise we achieved possibilities to observe, converse, ask questions and even conduct questionnaires.

6.1.2 Semi-structured Interviews (Shauna)

Semi-structured interviews were used to gain explanatory information on relevant topics to the study. We carried out informal conversational interviews, where questions arose from the context of the conversation. Key informant interviews were carried out in which experts on given topics were interviewed in order to obtain special knowledge (Mikkelsen, 2005).

Informal conversational interviews followed no particular sampling strategy. Opportunity for these discussions developed from our involvement in community gatherings, ceremonies and observation exercises. Selection criteria for identifying key informants were based on our primary topics of farming, community proceedings, development and tenure issues and SALCRA. These informants were identified through the snowballing technique (Oppenheim, 2000), asking the village headman, local translators and other key individuals in the community (Senghi and Kartining). For individual and key informant interviews, appointments were made where the informant had a limited amount of time (such as with government officials). Other means of obtaining these interviews included approaching farmers out to the field and knocking on doors of the villagers homes.

Limitations to obtaining detailed interview data included household distractions, short time availability of the informants, and interrupting the informant's work (farming, cooking).

6.1.3 Focus Group Discussion (Natalia)

Focus group discussions are versions of focused interview that use predominantly open, non-intruding questions to ask interviewees about a specific situation, event, topic or issue that is relevant to them so the researcher can obtain a joint production of meaning through interaction.

Stratifying criteria were used to organize groups reflecting socio-demographic factors, in this case of gender and age in the form of conveniently selected informants with women, men and young people. This helped to reduce overall problems of group effects, where some participants would be overly prominent, in this case domination of men or women.

During our field trip we decided to put the field. We decided to use our focus groups as clarifying in the end of the field trip. As presumed, not all turned up, likely because it was evening and the rice harvest celebrations were occurring. In order to have a meaningful discussion we had to go and find available participants at the last minute.

Certain issues that we asked about were sensitive, so asked these questions towards the end of the interviews. Group effects, were minimised by asking questions on whether people had something to add and sometimes it gave effect. However, there is still a risk that group members come to think about an issue by getting attached to one participants expression and lead to more agreements than group discussions. This might especially be the case when considering differences in knowledge and engagement in topics discussed. (Bryman, 2004: 113, 345-362)

6.1.4 Participatory Rural Appraisal (PRA)

A.) Transect Walk (Xiangfei)

Transect walks were used to collect qualitative data for the general information of the local nature resources (forest), infrastructures, logging road and important community sites in Sebako.

According to Food and Agriculture Organization of the United Nations (FAO)(Waters-Bayer and Bayer, 1994, Thomson and Schoonmaker Freudenberger, 1997, and FAO, Date unknown), a transect walk means a mobile interview processed by research team members and accompanied with local informants who are familiar with this certain area. During a transect walk, research team members can observe interesting objects, ask questions, identify certain problem areas and can even seek possible solutions. GPS systems were used to collect site information during a transect walk.

In the early stage of our PRA, to get an overview of the forest resources, farms, plantations, important infrastructures, social activity sites and roads used by commercial logging companies, etc. we processed transect walks (Appendix 11.2) with GPS system by foot and vehicle. We focused on the most essential places that were totally relevant and involved in the local people's daily life, such as community hall, groceries, headman's house, churches, rivers, kindergarten, pre-primary school, primary school, hydropower station. We tracked through main paddy fields, rubber plantations, pepper plantations, oil palm plantations and roads that some commercial logging companies used to transport logs. GPS parameters of those sites above were collected during the transect walks and maps produced (Figure 6, 7 and Appendix 11.3).

Due to rainy conditions and lack of time, we cut the transect walks short and were unable to reach further into the primary forest during the forest transect walk. Also, each transect walk group only had one local guide. Because of their age, gender, education, social roles and the familiarity level of the local community and natural resources etc, all these factors affected the representativeness and accuracy of the data collection of the transect walk sites. So, different local participants should be involved.

B.) Timeline (Jakob)

The timeline, is a valuable tool to give an impression of the participants own temporal dimension of realities. A chronological description which elaborates on the past, is helpful in gaining knowledge about why and when development have occurred. A timeline can include various information, such as natural events, constructing of infrastructure, social events etc (Selender et al., 1999).

To find out historical events of significance, important to the villagers of Sebako, it was important for the research to identify special occasions in time that could help understand why and when changes in land use strategies and livelihood occurred. Therefore the timeline session were conducted in the beginning of the stay in the field (Appendix 11.4). Moreover, the timeline gave information on issues not evident for the group before the session, and helped direct focus towards the final results in the report.

Having invited a variety of members of the community, strong members of the community took over relatively fast. Although trying to include elders in making the timeline turned out to be a hard task.

C.) Participatory Community Mapping (Jakob)

Community mapping is used for getting information on limited physical space or settlement. Information on natural resources, infrastructure, demography and social services are examples of possible information obtained. Mapping is conducted collectively and is a reliable source of information (Mikkelsen, 2005).

Focusing on land-use change, the participants were asked generative questions to be elaborated on.

E.) Preference Ranking (Jakob)

Matrix ranking is a relational PRA method used to indicate problems, opportunities and preferences. It gives an idea of opinions and interests, that can be compared, as well as importance. Furthermore, it is a fast way to find indicators, compared to for example an time consuming survey (Mikkelsen, 2005).

To get a diverse picture of the community's crop preferences related to land use strategies and livelihood perspectives, both men and women of different age were invited to participate. People were divided to get an understanding of men and women's different preferences. Using seeds, it was possible for the participants to discuss and move the seeds after first attempt to rank importance. The result were noted in a notebook, so that the following group could not see what the former had decided to rank the highest (Appendix 11.6). The preference ranking gave an idea of what types of crops are significant and why to the villagers in Sebako, and the information were used in the research further on in discussions and in semi-structured interviews as a reference point.

Although having an interpreter, the discussion on why certain crops were prioritized higher than others, were sometimes missed because of language barriers. It would have been fruitful to hear the full discussion, but it was not possible to translate the lively debate in all its aspects.

6.2 Quantitative Methods

6.2.1 Questionnaires (Shauna)

A preliminary questionnaire was designed prior to arrival in Sebako, based on the initial information provided by the SLUSE teaching staff and on a literature review. The objective of the questionnaire was to obtain quantitative household information from a number of villagers to answer our research question regarding change in livelihood strategies with land use change. We conducted a pilot survey, and made alterations accordingly.

We revised the questionnaire through using information obtained from our qualitative approaches of semi-structured interviews and various PRA exercises. The updated questionnaire included the present time, and chose the year 1985 as a comparison year. 1985 was selected, as it was identified in the community timeline as a major transition in the village (village relocation, hydro dam development, road development and oil palm plantation commencement). We also included open ended questions to gain an understanding of villagers suggestions for development and environmental protection.

The final questionnaire (Appendix 11.7) was conducted on 33 individuals. Respondents were selected through non-probability sampling. We used purposeful

sampling when selecting houses of varying degrees of wealth, and convenience sampling to approach respondents on their way to the farms, and at community gatherings (Carvalho and White, 1997). When introducing the questionnaire to the respondent, we explained the purpose of the study and asked them if they had any questions they would like to raise.

In some cases, incomplete answers, ambiguous questions and unrepresentative sampling have reduced the validity of our results.

6.2.2 Soil Sampling (Linzi)

The concept of soil quality encompasses a range of complex biological, physical and chemical components which contribute to the ability of a soil to support a specific function or use (Carter *et al*, 1997). Within an agricultural system soil quality can be defined as the soil's capacity to support crop growth without resulting in soil degradation causing harm to the environment (Gregorich and Acton, 1995)

Soil texture is an important physical property as a rather superficial assessment of soil quality. Texture influences crop cultivation and root development caused by effects on water and nutrient storage and drainage (Soong and Lau, 1977)

Sites were chosen through purposive sampling methods in order to get the extent of soil variation across the various agricultural areas. Samples were taken at 6 sites: home- garden, productive paddy field, unproductive paddy field, rubber plantation, oil palm plantation and logged-over forest. These locations seemed optimal to establish soil quality estimates due to the relevance of each site (ie. high cultivation of rubber, recent oil palm expansion and homegardens), and particularly the distinction between paddy fields relating to the effects of sedimentation relocating former paddy fields. Analysis of these sites allows for an indication of whether management practices or other events have contributed primarily to changing soil fertility.

At each site, 2 soil cores were taken, with 3 samples taken to illustrate the soil horizons A, B and C. A soil core is an individual boring or coring at one spot in the field. Horizon depths were taken according to Malaysian standards. The soil was collected using a soil auger, uniformly mixed and air-dried to reduce contamination (Kim, 2005). The soil was ground and sieved to ensure homogeneity (Figure 8). Through laboratory analysis, soil water content, organic content and soil pH were obtained.

In this study few samples were taken and therefore outcomes are not fully representative of the variations at each site.

6.2.3 Water Quality Analysis (Linzi)

In this study parameters were used to assess the water quality of rivers surrounding Sebako in accordance with the Interim National Water Quality Standards For Malaysia (INWQS) (Table 1). The physical and chemical variables used in this

analysis include pH, temperature total suspended solids (TSS), total dissolved solids (TDS), dissolved oxygen (DO), chemical oxygen demand (COD), total/faecal coliform count (TCC/FCC).

Table 1. Adapted from Interim National Water Quality Standards For Malaysia

Parameter	Unit	Classes					
		I	IIA	IIB	III	IV	V
pH	-	6.5-8.5	6.5-9.5	6-9	5-9	5-9	-
Temperature	°C	-	27	-	27	-	-
DO	mg/L	7	5-7	5-7	3-5	<3	<1
COD	mg/L	10	25	25	50	100	>100
TDS	mg/L	500	1,000	-	-	-	-
TSS	mg/L	25	50	50	150	300	>300
TCC	Counts/ 100mL	100	5,000	50,000	50,000	50,000	>50,000
FCC	Counts/ 100mL	10	100	400	2,000-5,000	2,000-5,000	-
Ammonia	mg/L	0.1	0.3	0.3	0.9	2.7	>2
Nitrate	mg/L	-	7	7	-	5	>5
Phosphorus	mg/L	-	0.2	0.2	0.1	-	-

Four sites were chosen for taking water samples. Sites were chosen through purposive sampling to uncover the quality of water sources surrounding the *Kampung*. Samples were taken upstream and downstream of the Sebako River, which is the main source of drinking water for the community, downstream of an oil palm plantation, and along the Resen River where wastewater discharge enters the river. Samples were collected, and on-site measurements were conducted for certain parameters while others required analysis in the laboratory.

Although some distinctive characteristics were exposed between each site from the parameters used, additional chemical and biological variables would have benefited the quality of the data in order to make accurate and valuable outcomes of water quality and ecosystem health.

6.3 Limitations (Xiangfei)

The following limitations to this research have been identified during the field work, which in some content affected the collections and analysis of the data we got from the field work.

There were only 8 days for the practical parts of the field work in Sebako, except for the 2 days' project presentations in Lundu. Furthermore, that period was exactly the local paddy harvesting season. So it was a little difficult to find and gather villagers to do the interviews, questionnaires, focus group discussions and PRA.

For our interpreters, occasionally they mistranslated, asked leading questions or answered for the respondents based on their own views. In these cases, the data was unreliable and unrepresentative.

Due to the rainy conditions during the rice harvesting season, we had to cut the transect walks short and were unable to reach further into the primary forest, and it also ruined some of our participatory observations such as rubber tapping observation and logging observation.

Before the field work, we did not get enough detail information about Sebako. Also, during the field work there was only one local guide originally from Sebako and another one interpreter from outside the village. Because of our limited knowledge about the village, and their age, gender, education, social roles, the familiarity level of the local community and natural resources etc, all these factors affected the representativeness and accuracy of the data collection of the field work. Due to these reasons, some topics were sensitive for the local villagers and government and not be able to be fully explored, for example, income and logging issues.

Our sampling strategy was not entirely random because sometimes we could not which would limit the data collection and the following statistical analysis.

7.0 Results

7.1 Underlying Drivers of Agricultural Development

A complex set of factors has been driving agricultural development in Sebako. The major drivers that we have identified are development of infrastructure, agricultural schemes supporting small-scale farming, SALCRA schemes promoting large-scale plantation agriculture, biophysical factors such as logging and chemical inputs determining for Environment and Land Use Change Relationships, Agricultural Development and Socio-cultural Relationships, Livelihood Strategy Adaptation to Land Use Change. This may indicate an overall trend towards commercialization agricultural intensification.

7.1.1 Infrastructure and the Kick Start of Development (Natalia)

In 1978-1982 Sebako moved due to flooding, limited area to extend the houses and desire for infrastructure and development giving access to better roads, electricity, water and education facilities (Senghi, Community map and timeline, 2010). Village relocation prompted clearing of adjacent forest land for crop cultivation (Senghi, 2010). Since the 1960's the government promoted rubber, but transportation was time consuming and therefore the road development from logging (1979-1985),

and enhanced by SALCRA initiatives, has meant that cash crops can be easier transported (Pengulu Wang, Senghi, men's focus group and timeline, 2010). When the new school was built in 1979, people became motivated to move. (timeline, Senghi, Community map).

7.1.2 Agricultural Schemes Supporting Small Scale Farming (Natalia)

Government agencies such as the Malaysian Rubber Board, RISDA, provides technical advice for rubber tapping, oil palm, fruit, paddy and other agricultural products as well as seed, seedlings and chemical input. For instance RISDA provides cloned rubber seeds that ensure rubber plants with higher yields as well as give fertilizers and insecticides. (Men's focus group, Women's focus group, Akun, Sanong and Britious, 2010). However, very little subsidies on chemical inputs are provided for paddy, despite experiencing an equal or even higher preference for the use of pesticides and fertilizers for rubber and pepper among farmers. (Women's focus group, Preference ranking, 2010)

7.1.3 SALCRA Schemes Promoting Large Scale Plantation Agriculture (Natalia)

The oil palm scheme, SALCRA, started in 1985 and farmers have since been motivated to join by the dividends and land titles that they will get in return (Wang and timeline, 2010). According to the Penghulu the households have not been forced to join. (2010). The villagers in Sebako are instead driven to join SALCRA by the awareness of potential income that they can get from dividends. (Men's focus group). SALCRA only develops NCR land and it must be equal to or bigger than 500 ha. (Anil and Wang, 2010) and as joining SALCRA would mean a conversion of current farm/fallow land to oil palm plantations the villagers' choice to join is in addition driven by their consideration of, whether they want to and are able to give up an area of that size.

7.1.4 Biophysical Factors Determining Agricultural Intensification (Natalia)

Logging and agricultural intensification have driven agricultural development in Sebako through erosion, sedimentation and alteration of the quality of soil and water resources (Anil, 2010), the effects of this will be addressed in section 7.2. One of the deterrents of crop choice is soil quality (Akun, 2010).

A.) Logging (Shauna)

State forest land adjacent to the village has undergone two significant periods of logging. With the initial harvest in 1981, the logging company (name of company was unknown by informants) harvested a variety of different species. The second harvest occurred in 2007. This period differed from the first in that the company illegally targeted remaining high value timber species, such as Belian and Meranti, which were not permissible to harvest in the first rotation (Sujang, 2010).

B.) Chemical Input (Natalia)

Fertilizers, herbicides and pesticides have driven agricultural intensification (Akun, 2010). Chemical inputs increase crop production. The men and women's focus group discussions showed that farmers are aware of environmental effects of chemical inputs, in that they limit use and attempt to avoid that it goes in the river (2010).

7.1.5 Trend Towards Commercial/Cash Crops and Change in Prices (Natalia)

The market determines what cash crops the farmers produce (Anil, 2010). When it comes to rubber it is stable in the sense that it gives income all year around. (Akun, 2010) Rubber is safe to aggravate as it lasts many years. (Women's focus group, 2010) They get a high value, while spending little time. (Sanong, 2010). It is argued that they get 100 percent of the revenue. (Men's focus group, 2010). Pepper prices go up and down. Thus cash crops are risky. (Anil, 2010)

Paddy farming is of major importance with regard to food. (ranking exercise). The price on

The price on rice keep on increasing, however, some villagers only produce enough paddy for 3-4 month while for others the entire year (Anil, 2010). The farmers receive less income if no fertilizers. The same for both old and new, all seeds. (Men's focus group, 2010)

SALCRA gives security in the form of extra income. (Men's focus group, 2010), however, the dividends vary and people cannot appeal for more. The farmers do not have their own oil palm plantations due to lack of capital (e.g. to transportation and seedlings) primarily -, shortage of labour, shortage of land, no market place and no subsidies for small holding. (Headman, 2010)

7.2 Environment and Land Use Change Relationships

7.2.1 Drivers of Environmental Change - Logging and Agriculture Intensification (Xiangfei)

Logging activities and agricultural intensification are found to be the primary land use contributors to long term environmental change in the Sebako region.

According to the headman and Hamdan Sujing, before commercial timber logging, there were no environmental issues at all in Sebako. However, since the access of logging companies, they caused serious soil erosion which was not realized at first until villagers found that the rivers passing through the village became narrower and shallower triggered by sedimentation. For farmer Sanong, due to the soil erosion and timber logging, the quality of the soil and water available in the kampung deteriorated. In some instances, paddy can not be cultivated without the use of fertilizer. In addition to management issues, natural disasters such as flooding, occur more frequently than the past (Britius, 2010).

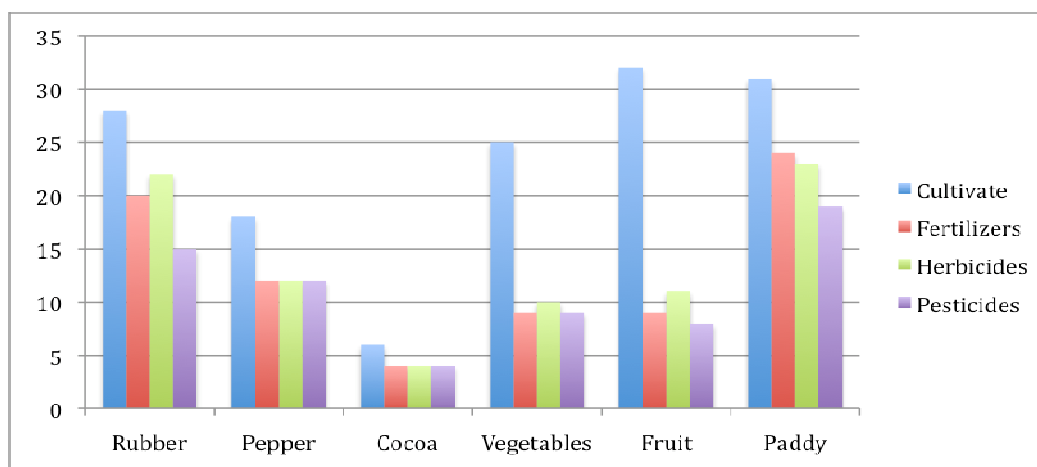


Figure 5. Use of Chemical Inputs in Cultivated Crops (Shauna)

With the development of science & technology and the intensification of the local farming activities, farmers purchase chemical inputs to increase profits or access them through government assistance, though some of them are expensive for the local farmers. Figure 5 illustrates the distribution of chemical fertilizers among priority crops. Chemical inputs are applied primarily to cash crops (rubber, pepper and cocoa), while apart from rice, subsistence crops (fruit and vegetables) use less.

According to the interview with the headman, the use of pesticides and herbicides cause the water in the river quality to decline. The population of the fish in the rivers decreased and it is rare now to see big fish, though the direct cause of this is undetermined.

7.2.2 Water Quality Analysis (Linzi)



Figure 6. Map of Water Sampling Sites (Xiangfei/Natalia)

Table 2. Water Quality Variables Measured at the Four Sample Sites

		Location of water sampling (GPS)			
Parameters	Units	Upstream of Sebako river (site 1)	Downstream of Sebako river (site 2)	Wastewater (Resen river) (site 3)	Plantation (Site 4)
GPS point		N 01°43.200' E 109°42.970'	N 01°44.289' E 109°44.572'	N 01°44.113' E 109°43.968	N 01°44.280' E 109°44.472'
Elevation	m	30	16	21	20
pH		7.18	6.38	5.05	4.51
Temperature	°C	23.25	23.97	25.00	25.20
DO	mg/L	12.44	11.03	5.68	3.82
COD	mg/L	9.50	153	31.00	44.50
TDS	mg/L	0.01	0.01	0.02	0.02
TSS	mg/L	2.00	6.67	3.33	0
TCC	Counts/100mL	1300	2150	2750	1000
FCC	Counts/100mL	1200	1380	1400	240
Ammonia	mg/L	0.024	0.50	2.20	4.75
Nitrate	mg/L	11.55	14.52	8.25	14.19
Phosphorous	mg/L	0.06	0.06	0.04	0.35

Figure 6 shows the location of the water sample sites. From the above results site 1, according to Table 1, upstream of the Sebako river, falls primarily within class 1. Site

2, downstream of the Sebako river may be categorized as class 2B. Site 3, downstream of the entry of wastewater discharge from the village, may be classified as class 3. Site 4, downstream of the Resen River, falls between class 3 and 4. Further study is required to validate this data.

The main findings from this data are that upstream of the Sebako River is very good quality water, and suitable for drinking without chemical treatment, and that the highest chemical concentrations were found downstream of the oil palm plantation. This may be explained by the high use of fertilizers within SALCRA plantations.

7.2.3 Soil Quality Analysis (Linzi)



Figure 7. Map of Soil Sampling Sites (Xiangfei/Natalia)



Figure 8. Soil samples after grinded and sieved through 1-mm prior to chemical treatment and extraction procedure

Soil sample sites (Figure 7) were chosen in order to indicate site specific characteristics examining variations in soil quality along the soil profile. Through the informed knowledge of a soil expert at UNIMAS, the samples illustrate physical characteristics generally of high quality for the area under cultivation surrounding Sebako.

The main outcome of this analysis is the confirmation of sedimentation of soils from logging activities on agricultural land currently covered by unproductive paddy field and rubber plantations. The soil under the oil palm plantation was alluvial soil which may be a result of previous floods. The soil profile at the unproductive paddy site and rubber clearly show sandy soil at the top layers of the soil, while in the B and C horizon display a higher organic content and loamy texture. In this area, the paddy is not cultivated and the rubber has a small diameter and produces limited latex (Sujang, 2010). Therefore although effects of sedimentation are present, with improved management the soil may be regenerated.

7.3 Agricultural Development and Socio-cultural Relationships (Shauna)

According to questionnaire results (Figure 9), the average household has 5 permanent residents, with an additional resident having moved out of the house, but remains in Sebako (married and moved to another house) and 2 members that have migrated out of the village. Of the households whom members have migrated out of the village, 64% of migrant members send home remittances.

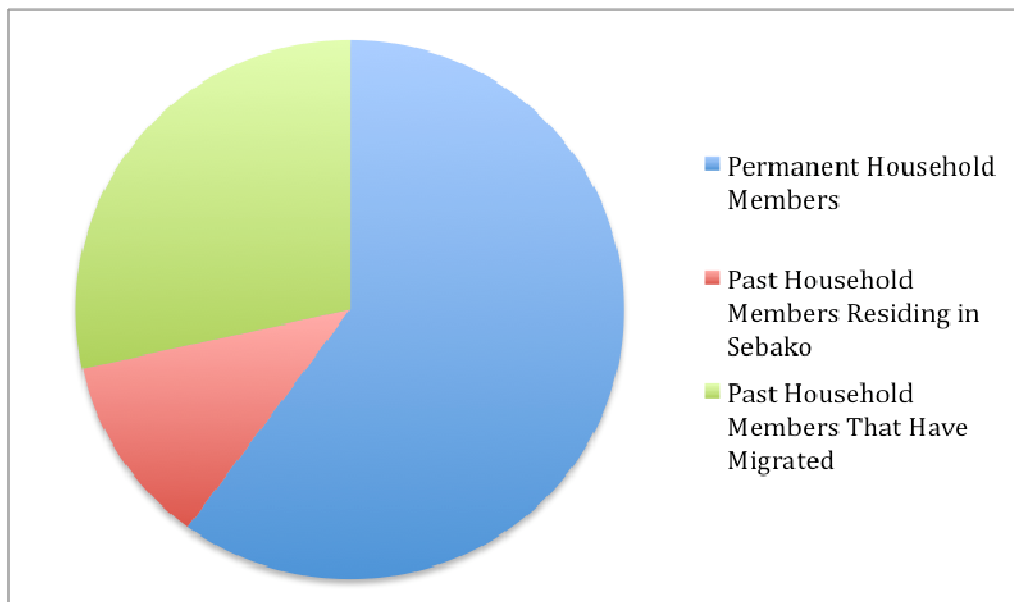


Figure 9. Average Household Composition of Respondents (Shauna)

Figure 10 shows how some products (construction materials, meat and fish) which were previously harvested from the forest are now primarily purchased, while rice is produced almost entirely.

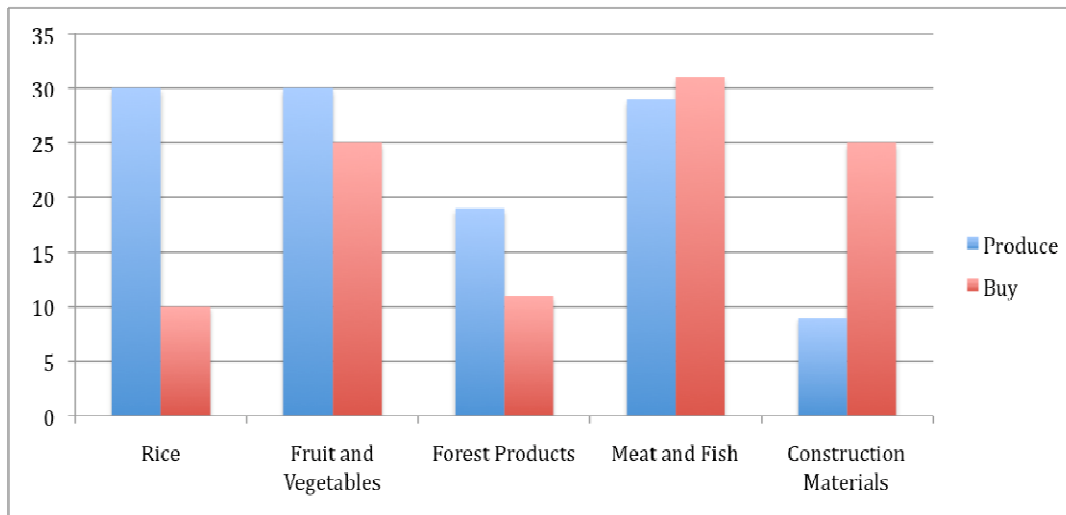


Figure 10. Goods Produced and Purchased (Shauna)

7.4 Livelihood Strategy Adaptation to Land Use Change (Shauna/Natalia)

The primary sources of income are rubber cash crops and wage labour, with other sources diversifying livelihood strategies (Figure 11). These include remittances from migrated family members, SALCRA dividends and pensions (Basuni and Anakun, 2010). The emphasis on each activity has changed over the years, being shaped by fluctuation in market prices, infrastructure development, migration patterns, education, training, technology and capital availability, government support and available land (Ering, 2010). Culture and tradition also play a role in defining the livelihood strategy.

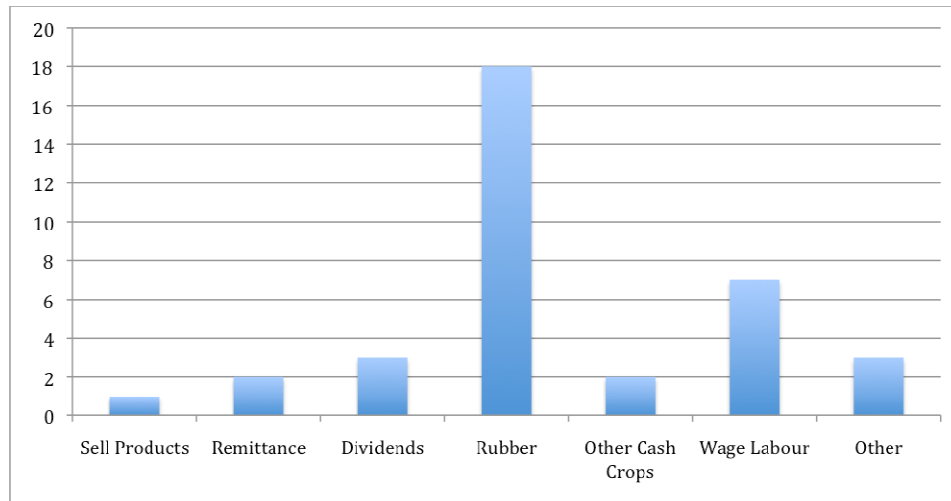


Figure 11. Primary Source of Income

Rubber is considered more important income than oil palm. (Preference ranking, Men's focus group, 2010). The women's focus group suggest that people can earn more income if they make their own plantation, but this requires high capital, technology and labour (2010). Paddy is cultivated and considered very important, more for cultural reasons than cash income (Sanong, 2010).

Respondents listed the primary reasons for wanting to convert to SALCRA as land title, dividends and making use of idle/waste land, while the reasoning behind not wanting to convert to SALCRA is the desire to maintain the current land use (Figure 12, Questionnaire 2010). All respondents replied that they would like to have legal title to their land, and at present this can only can be achieved through conversion to SALCRA (7.1). However securing land title through this process is doubtful (Men's focus group, 2010). Furthermore, villagers are not aware of the fixed profit margin for SALCRA or dividends they are supposed to receive (Men's focus group, 2010). This is consistent with questionnaire results which show that only 37.5% of the respondents would be willing to change their current land use to SALCRA. Rubber and paddy were identified as being the most important crops, with 36% and 29% of these farmers respectively willing to convert this land to the SALCRA scheme. Though fruit, vegetables and pepper are widely cultivated, they are not seen as the most important crops to farmers. However, they are also the crops which farmers are least likely to convert to SALCRA (Figure 12).

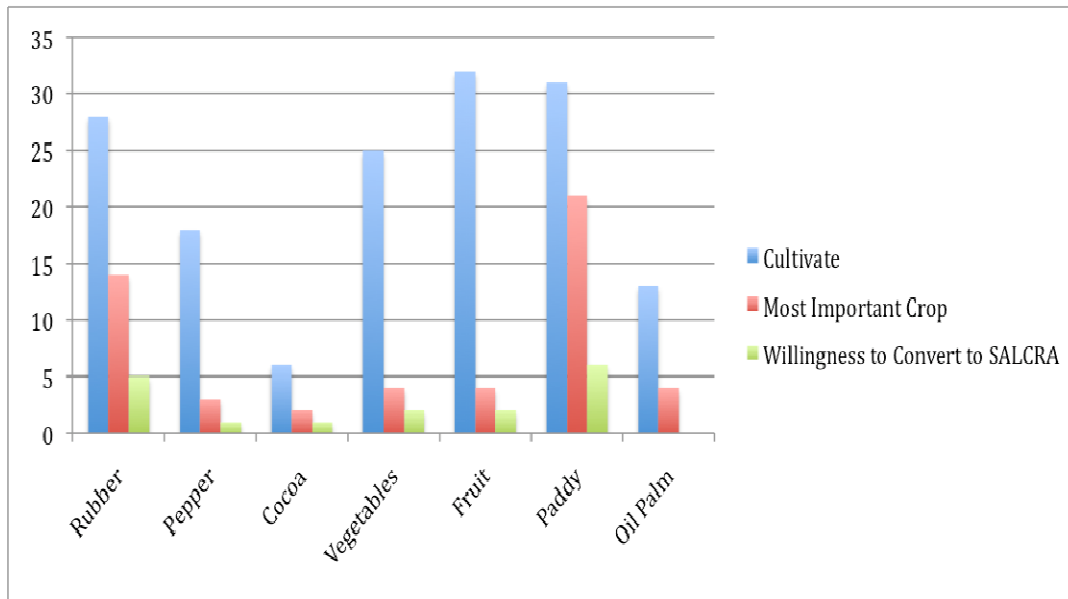


Figure 12. Cultivated Crops and Willingness to Convert to SALCRA (Shauna)

Lack of available arable land and youth modernization desires threaten the future of farming as a livelihood strategy. Education, training, technology and capital are seen as major limitations to participating in the cultivation of different crops (Farida and Men's focus group, 2010).

8.0 Discussion

8.1 Infrastructure Development and Drivers of Local Agricultural Development (Xiangfei)

From 1978 to 1985, there were development projects for infrastructure promoted by the local government, timber company and SALCRA in Sebako, such as roads, water supply system, electricity, mini hydropower station and education facilities. Because of the desire to move out of the longhouses in the flood area and a strong willingness to be involved in modern life, they accepted the suggestion from the government and moved to the current location in 1978-1982 (Anil, 2010). According to the interviews, construction of the main road between the markets in Sematan and Lundu dramatically improved the conditions for the villagers to sell their agricultural products acquire goods. These infrastructure developments have changed the local livelihood strategies and accelerated local modernization.

The introduction of education facilities, for instance the local primary school, helps the local villagers to eliminate illiteracy and gain capabilities for developing agricultural practices to improve their living standards. On the other hand, education promotes migration through access to opportunities outside the village.

Young people increasingly seek jobs elsewhere in nearby cities, and less of the younger generation want to stay in the village to continue agricultural activities, potentially limiting local agricultural development.

When Sebako moved to the new site, villagers cleared certain areas and became involved in rubber, pepper and oil palm plantations and cultivated new paddy fields, thus altering the landscape and, ecological systems. Infrastructural development has been one of the underlying drivers of agricultural development in Sebako.

8.2 Technology Expansion, Livelihoods and Land use Strategies (Xiangfei)

Technology expansion, especially the use of new cultivated varieties and chemical inputs have potential negative effects on the environment in Sebako, and alters the livelihood strategies in this area. The agricultural intensification is an inevitable trend. SALCRA and commercial companies bring new varieties to the villagers and train them to grasp the technologies, to use chemical inputs and manage the farms. On one side, it improves the efficiency of local agricultural production, increases the quantity of the agricultural products and enhances the profits from agricultural activities. However, in another side, this expansion of technology has determined many natural and social issues. They deteriorated the local ecology and made villagers adapt to the outcomes of the modernization, which again caused changes of their own livelihood strategies and local cultural patterns. For instance, one of the results of technology expansion is to improve agricultural labour efficiency and reducing labour demand for agricultural activities, so there are more and more villagers, who are not necessarily staying in the village to process agricultural activities and instead move out to find wage labour. Technology expansion can cause land use change.

8.3 Social Aspects of Agricultural Change and Modernization (Jakob)

In Vision 2020, it is emphasized that in the transition towards a knowledge based society, respect for cultural differences and religious beliefs should be acknowledged (Mohammed, 1992). However, following governmental policies for a modernization of agricultural practices, there is a risk of losing traditional ways in the agricultural sector, which is closely related to culture, social structures and religious beliefs.

Sebako is by large an agricultural society. The village of Sebako has seen large changes in the agricultural practices, from former mostly slash and burn practices towards more cash crops (Anal, 2010) As new knowledge, crop varieties and subsidies, fertilizers and herbicides, mainly provided by governmental schemes, Sebako has moved towards a modernized agricultural sector. Cash crops are playing an increasingly important role in pursuing livelihood strategies. Preference ranking showed that paddy fields are however still of great importance to the villagers of Sebako, and of equal importance as cash crops such as rubber, although it is recognized that the potential in paddy fields are low (Appendix 6). The reason is for

own consumption, but also for cultural reasons (Anil, 2010). Collecting forest products from the forest are still appreciated, for example bamboo. Even if the forest seems to be of less significant in the everyday life now than before, traditions prevail. For some people, although decreasing, forest product are collected and sold on the market, as an additional income to farmed cash crops (Village woman, 2010).

Due to schemes in agriculture, SALCRA plantations and rubber mini estates, joined by a high percentage of the villagers of Sebako, less land for own production is available. As population increases, less land is available for the new generations. However, a large part of the young population of Sebako migrates to the cities. It is a question if such migration takes place due to less opportunities in Sebako (less land available), or new possibilities to work outside the community because of better education, infrastructure etc., and hopes for a modern lifestyle and facilities which the cities provide. In the case of Sebako the latter seems to be the case, since most young people do not see their future in agriculture (Farida, 2010). When asked in the youth focus group, most of young people would like to stay in the village if modern facilities and work opportunities were present (2010). Migration is significant (Figure 10) and contributes to household income through remittances, which are encouraged (Anil, 2010).

Although nearly all villagers are Christian-Catholics, some pagan traditions are kept alive, through merging religious practices. This was encountered when participating in the Panitah (new rice harvest ceremony), to bless the rice and harvest next year. Most young people does not learn these traditional ways, due to the new religious beliefs, which are seen to be more modern. This traditional ceremony is made to ensure the field will be free of diseases and pests, but today, it is largely seen as not being necessary due to modern chemical inputs (Kartining, 2010).

Traditional practices are upheld not only in many aspects of agriculture, but in land tenure systems and legal rights. Even though people have no documentation on land owned, the villagers are very aware of boundaries between land, and conflicts seems to be few. Sebako seems to have come to a balanced development, where traditions are upheld while participating in modernization and seeing the possibilities in agricultural development, for improved livelihood strategies.

8.4 Shift Towards Cash Based Economy (Linzi)

Within this research it is continually emphasized that major changes in the agricultural practices of local people in Sebako have taken place. A main characteristic which becomes clear is that over the last 20 years there has been a shift from farming and harvesting for subsistence use, which has become geared towards commercialisation and generating cash income.

There has been a shift from subsistence-based agriculture to increased dependence on purchasing essential products (female,2010). This is true except for paddy which

is almost solely harvested for subsistence, and seldom purchased (Figure 10) Rice is not commercialised due to local traditional beliefs (Sanong, 2010). Above this, a large percentage of what is cultivated and collected is now commercialised and sold in local markets due to increased priority for cash income. With acceleration into a cash-based economy people shift crop preferences to suit the market, taking advantage of prices, and make maximum profit. This indicates more reliance on cash flow, which determines the type of crops cultivated and driving participation in national agricultural development schemes.

Modernisation ideologies are driving land use change in Sebako. This relates both to national driven economic development strategies, and also to changes in the socio-cultural context in light of introduction of these strategies. Nationally driven agricultural development strategies may have many compounding effects with greater people joining agricultural schemes to obtain benefits such as subsidies, seeds, training and hence creating further dependencies on external subsidies and market forces. The other factor stems from the desire to be included within a modern world by the local villagers. This relates to a variety of social and cultural transformations and local preference changes. The line between nationally driven modernisation and local aspirations becomes blurry when attempting to uncover the underlying motivations behind agricultural expansion.

8.4.1 Implications: Land Cover Change, Socio-economic and Cultural Adaptations (Linzi)

This shift from subsistence-based to commercial, plantation type agriculture has effects on land cover. Land conversion takes place in order to take advantage of government schemes which give financial and technological support for large-scale commercial crop production (Ngidang, 2002). This has effects on the biophysical environment by transforming natural ecosystems or more diverse agricultural systems, into mono-crop plantations as well as associated inputs of pesticides and fertilizers.

When people shift from a subsistence based economy to a cash based economy they are more vulnerable to market variations and increasing commodity prices (Anil, 2010). In Sebako people have had experience with fluctuations in cash crop markets, in particular with rubber, cocoa and pepper. This has ensured their diversification of cash crop cultivation in line with current market trends. Therefore it can be argued that within Sebako, despite increasing reliance on income and purchases, many households are resilient to market variations and are able to support their food and other requirements through subsistence methods. This argument relies on continued divergent farming practices, which may not be the case when the younger generation strays from farming to more skill-based employment.

These findings relate to (Cramb, 2007) who emphasises the need to retain cultural endurance and adaptive livelihood practices in response to agrarian transformation taking place in much of South-East Asia. In this research context it is important that

within current agricultural development, and particularly with regards to expanding oil palm production, that households retain alternative income generating activities as well as culturally significant crops, to ensure the sustainability and security of livelihoods and culture.

8.5 Agriculture Schemes – Participation and Improvement (Shauna)

As previously mentioned, the primary agriculture schemes implemented in Sebako are RISDA and SALCRA, which are attractive to farmers for different reasons. The RISDA scheme provides improved crop variations and chemical inputs to enhance production, while the SALCRA scheme promotes land security and regular cash dividends from commercial crop production through rescinding decision authority over the land for a set period of time (7.1). Both schemes support the shift towards cash-crop agriculture and require a certain minimum area of land to be available for use (Uyu, 2010). Questionnaire results showed that schemes for subsistence (ie. paddy schemes) seem to be less common but are desired by the local people. This exemplifies the contradiction being argued throughout this report; where villagers want to participate in market-based activities, but still seek to maintain their traditional agricultural practices.

The questionnaire results have shown that the reasons for not participating in existing schemes are largely the desire to maintain the current agriculture land use, minimum area requirements and lack of transparency regarding direct benefits of the SALCRA scheme (dividends and physical deed to land). Agriculture schemes that truly aim to improve the standard of living of the local people need to support the small-hold farmer, through providing access to capital (legal loan availability with fair interest rates), education, training, and technology.

8.6 Pressure on land and adaptation through agricultural intensification (Natalia)

As it appears in the current contextual settings of Sebako (the context may change as markets and politics etc. change), which set the conditions for the villagers, this study has disputed the Malthusian claim that as population increases, lands will go beyond their *fixed* capacity to be used for farming. (Ed. Sarre and Blunden, 2000) In contrast we acknowledged that reality is not fixed. Culture and traditional practices are changing; and recent modernization and globalization has accelerated this. Together with the tendencies of change seen in Sebako such as immigration, changes in religion, improvements of infrastructure and education; and commercialisation occur change in farming practices connected to different possibilities to manage and intensify agriculture. Traditional practices – including farming practices – are therefore not fixed and static, but instead have a potential to develop as well as adapt to outside influence as well as pressure on land.

Boserup's theory on agricultural intensification may explain what has happened by stating that though increased demand for food and marketable crops are functions

of population increase, quality of land can improve through new technologies, enhancing the yields as well as labour-intensive investments in the soil that help maintain the soil quality and environment.

Our collected data indicates that agricultural intensification has appeared through land saving innovations, in other words through a combination of new varieties of crops and complementary inputs. As the villagers farm less land for food production (often not enough to be self-sufficient), give up some of their land to SALCRA, use more chemical inputs, get hold of new varieties of crops based on market considerations and technological developments (such as cloned rubber seedlings), it is indicated that less land is used for shifting cultivation and less land is fallow. Modern technologies have given possibilities to use the land more intensive and thus in other ways than having fallow land and shifting cultivation.

However, commercialisation and improvement of agriculture as well as intensification in the Boserupian sense is not inevitable, but – as expressed in the idea of the green revolution - possible through successful adaptation that requires resources, incentives and opportunities to invest in the soil. For instance logging has degraded rivers and soils and therefore promoted incentives for alternative uses of nutrient restrained land for plantations, the government's agricultural schemes have given opportunities for expansion of technology and new varieties of crops, infrastructure has given access to markets and remittances as a result of migration have supported with capital resources. In all pressure on land is therefore not inevitably caused by population increase, but influenced by other factors, such as capital, technologies, privatisation, politics, illegal practices (e.g. with regard to logging), markets and desire for modernization.

Nevertheless, it might be questioned whether this path of agricultural intensification is in the end sustainable, as the agricultural development path that has occurred in Sebako is very much dependent on the use of chemicals, which may have negative effects on the environment. Indications from our water samples (though very insecure due to our limited time and number of samples as well as weather conditions) show that the concentrations of chemicals were higher in the river near the plantation site. Though, the effects of pesticides, fertilizers and herbicides etc. are disputed and could be an entire study in itself. With this study we have simply been able to address and understand the increased use of input and how intensification of agriculture occurs as well as indicate, how management of soil effect the environment and livelihoods of the local people in Sebako.

8.7 Land Use Management (Shauna)

This report has shown that though culture plays a significant role in farming practices, agricultural development in Sebako is making a shift from subsistence to cash crops. In order for such a shift to be possible and sustainable, the land needs to be managed appropriately.

Poor soils and land degradation have resulted from extensive cultivation and poor logging practices. Nair states that on alluvial; sandy and leached; clay soils, as those that characterize Sebako (7.2.3), a minimum of 10-15 years fallow period is required to rejuvenate soil nutrients after a 2-3 year cropping period (1993). Sebako farmers have been addressing the decreased soil quality that results from reduced fallow (currently 2-5 years) (Luie, 2010) with increased fertilizer inputs. However, continuous cultivation, even with supplementary fertilizers, still results in a serious decline in soil productivity (Nair, 1993). One strategy to address this problem could be through the practice of an improved fallow or planted fallow system.

Previous logging in the area has resulted in increased erosion and sedimentation of sandy soils on agricultural lands down-slope (timeline, community map, various interviews, 2010). Villagers have adapted to this through conversion to crops that can tolerate poor soils, for instance oil palm (Britius, 2010). Rehabilitation of the existing logging road, which has experienced severe erosion (over 4m in some places) (direct observation, 2010), could help to prevent further erosion from happening here in the future. Although the lower reaches of the road will require extensive rehabilitation, planting light demanding species that are quick to grow on the existing road way could establish a stabilising root network and vegetation, outgrow vigorous weed species and secure the soil from further erosion (Azani, et al., 1999). Furthermore, rehabilitation work on the unproductive sites suffering from excessive sedimentation of sandy soils could help to increase the productive agricultural land base. A possible strategy here could be tilling of the soil with fertilizers down to a depth where the organic soils located in the B and C horizons could be accessed. This practice has shown significant positive results in similar degraded sites (Ilstedt et al., 2004).

Educating farmers on soil management, fallow importance, alternatives to chemical inputs and training in mechanized farming technologies are critical to sustainable agriculture development. Here it is argued that through education, agricultural scheme development and community cooperation that the available land base can be managed to maintain both cultural and commercial agriculture aspirations of Sebako.

The headman indicated that it is not customary for villagers to join together in agriculture ventures (2010). However, as it was argued previously, community unification could make use of pooled resources. Another joint effort with respect to land use management could be the development of a community land use plan. This would instill ownership in agricultural management decisions, identify key concerns for the community and draw upon local and cultural knowledge and practices.

9.0 Conclusion (Shauna)

Agricultural land use change in Sebako is driven by a combination of factors. These can be categorized as a shift towards modernization in terms of infrastructure development, village aspirations and land conversion to commercial mono-crops; land use management; agricultural intensification and previous logging practices; and the ensuing environmental conditions – namely soil quality.

Soil quality has become degraded from intensified agricultural practices, through the reduction in fallow periods and the use of chemical inputs and previous logging practices, through severe erosion and sedimentation of sandy soils onto the agriculture land base. The present soil quality has defined to a large extent, the location of particular crops and their yields. The poorest soils are being converted into heavily fertilized oil palm plantations. Paddy locations are either being moved to richer sites or suffering and waste land is increasing and remaining vacant because of a lack in productivity.

This agrarian community seeks to maintain traditional values while participating in market-based agriculture development initiatives supported by the Malaysian government. Firstly, this is upheld through participation in various agriculture schemes that promote both agriculture improvements, such as technologies and fertilizers, and a better way of life, for example; land title promises and financial support for education. Secondly, villagers maintain customary farming practices and traditions, such as paddy farming and harvesting ceremonies. However, the younger generation is increasingly finding alternatives to the traditional way of life.

To cope with the contradiction of modernization and maintaining traditional values, Sebako residents have developed highly diversified livelihood strategies. As less land is available to cultivate traditional subsistence crops, more emphasis is being placed on cash income, through combinations of commercial crop production, selling of small scale cultivated and collected products, remittances from migrated children, dividends from participation in SALCRA schemes and other wage labour activities.

9.1 Recommendations (Shauna)

Successful participation in market-based agriculture development should not come at a cost to the traditional customs of Sebako. In order for both of these priorities to be sustainable, the following recommendations are provided:

1. Soil Rehabilitation:

- The rehabilitation of the heavily eroded logging road is critical to ensuring that additional erosion and sedimentation do not further decrease of the arable land base.
- The rehabilitation of soil nutrients through alternative agricultural management practices such as improved fallow systems and tilling of sandy soils.

2. Agriculture Scheme Development:

- The incorporation of job creation programs, avenues for access to capital and enhanced education/training programs for farmers.
- Lobbying for transparent SALCRA agreements and meaningful consultation.

3. Community Cooperation:

- Joint efforts among community farmers in small-scale, independent commercial agricultural ventures to pool resources.
- Development of a community land use plan highlighting management strategies for both subsistence and cash crops that incorporates the knowledge of local farmers and expertise from external sources.

4. Further Research:

- Research on alternative means to chemical inputs for agriculture intensification and soil rehabilitation procedures.

10.0 References

ANRPC, 2010 - Association of Natural Rubber Producing Countries, "Natural Rubber Trends & Statistics - A monthly bulletin of market trends and statistics", see http://www.anrpc.org/html/monthly_statistics.aspx, read 03.27.2010

Azani, A.M., Majid, N.M. and Meguro, S. 1999. Rehabilitation of Tropical Rainforests Based on Indigenous Species for Degraded Areas in Sarawak, Malaysia. Rehabilitation of Degraded Tropical Forest Ecosystem Workshop Proceedings. CIFOR. 2-4 November 1999. Bogor, Indonesia.

Begg, 2006 – "Foundations of economics", 3rd edition, published by the MacGraw-Hill Education, UK, 2006

Bernama.D.O Isnin, 2010, *A New Milestone For Rural And Regional Development*, Ministry of Rural and Regional Development, http://v2.mampu.gov.my/index.php?option=com_content&view=article&id=305%3A2010-a-new-milestone-for-rural-and-regional-development-ministry&catid=62%3Arural-basic-infrastructure&Itemid=133&lang=bm, 28-03-2010

Bryman, 2004 – Bryman, "Social research methods", second edition, Oxford University press

Carter, M.R., Gregorich, E.G., Anderson, D.W, Doran, J.W, Janzen, H.H and Pierce, F.J. (1997): Concepts of soil quality and their significance. Soil quality for crop production and ecosystem health. Gregorich, E.G and Carter, M.R (Eds). *Development in Soil Science*, 24, pp 1-19

Carvalho, S. and White, H. 1997. Combining the quantitative and qualitative approaches to poverty measurement and analysis: the practice and the potential. The World Bank. Washington D.C. 30pp.

Chan, H.Y, Pushparajah, E.,Nordin Nib Wan Daud, M., Wong, C,B., and Eusof, Z. (1977) Parent material and soil formation. *Soils under Heva in Peninsular Malaysia and their management*. Pushparajah, E. and Amin, L.L. (Eds). Rubber Resaerch Institue of Malaysia. Kuala Lumpur.

Cramb, R.A. (2007): Land and longhouse: agrarian transformation in the uplands of Sarawak, NIAS press Copenhagen, Denmark

Dato. Sri Mohd Najib bin Tun Haji Abdul, 2010, *Government Transformation Program*,

Razak http://v2.mampu.gov.my/index.php?option=com_content&view=article&id=138&Itemid=133&lang=en, 29-03-2010

Department of Agriculture, 1992, *National Agricultural Policy 1992-2010*, [www.digitalibrary.my/.../006 the%20national%20agricultural%20policy%201992-2010.pdf](http://www.digitalibrary.my/.../006_the%20national%20agricultural%20policy%201992-2010.pdf), 28-03-2010

Department of Statistics Malaysia, 2010, (1) - "Consumer Price Index" http://www.statistics.gov.my/portal/index.php?option=com_content&view=article&id=661%3Aconsumer-price-index-updated-19032010&catid=38%3Akaystats&Itemid=11&lang=en, Updated 03.19.10, read 03 28.10

Douglas, I. 1996. The impact of land-use changes, especially logging, shifting cultivation, mining and urbanization on sediment yields in humid tropical Southeast Asia: a review with special reference to Borneo. *Erosion and Sediment Yield: Global and Regional Perspectives* (Proceedings of the Exeter Symposium, July 1996). LAHS Pub. No. 236.

FAO. Date Unknown. Annex: Facilitator's reference material. ftp://ftp.fao.org/agl/agll/farmspi/FARM_refmat.pdf. [Retrieved by 28th, March, 2010]

Gregorich, L.J., and Acton, D.F. (1995): Understanding soil health. *The health of our soils: towards sustainable agriculture in Canada*. Centre for Land and Niological Resources Research, Research Branch, Agriculture and Agri-food Canada, Ottawa, Canada

Ichikawa, M. 2007. Degradation and loss of forest land and land-use changes in Sarawak, East Malaysia: a study of native land use by the Iban. *Ecological Research*. 22:403-413.

Ilstedt, U., Malmer, A., Nordgren, A., and Liau, P. 2004. Soil Rehabilitation Following Tractor Logging. Early Results on Amendments and Tilling in Second Rotation *Acacia mangium* Plantation in Sabah, Malaysia. *Forest and Ecology Management*. 194:215-222.

Kim H. T. (2005). *Soil sampling, Preparation, and Analysis* (Second Edition). University of Georgia. Greensboro, Georgia

King, V.T. 1993. The Political Economy of Rainforest Exploitation and Development in Sarawak, East Malaysia. *Global Ecology and Biogeography Letters*, Vol.3, No.4/6, The Political Ecology of Southeast Asian Forests: Transdisciplinary Discourses (Jul-Sep-Nov.1993), pp. 235-244.

Malaysian Rubber Board, 2010 - Malaysian Rubber Board, Natural Rubber Statistics, <http://www.lgm.gov.my/nrstat/NRStatisticWorld.aspx>, read 03.27.2010

Mikkelsen, B. 2005. Methods for development work and research. A new guide for practitioners. Sage publications, India. Second edition. Pp. 169-180.

Ministry of Agriculture (1999): *Third National Agricultural Policy (1998-2010)*, Malaysia

Mohammad D.M.Seri, 2010, *The way forward – vision 2020*, Malaysian Business Council, <http://www.wawasan2020.com/vision/index.html>, 27-03-2010

Nair, P.K.R. 1993. An Introduction to Agroforestry. Kluwer Academic Publishers. The Netherlands. Pp. 67.

www.mongabay.com, read 03.28.10

Ngidang, D. (2002) Contradictions in land development schemes: the case of joint ventures in Sarawak, Malaysia. *Asia Pacific Viewpoint*, Vol 43(2), pp 157-178

Oppenheim, A.N. 2000. *Questionnaire Design, interviewing and Attitude Measurement*. Biddles Ltd UK. pp.5-46.

PMR, 2008, *Third national agricultural policy*, pmr.penerangan.gov.my/index.php?...third-national-agricultural-policy, 28-03-2010

RISDA (2010): <http://www.risda.gov.my> (28 March 2010)

SALCRA (2007): <http://www.salcra.gov.my/> . (28 March 2010)

Sarre and Blunden, 2000 – Ed. “An Overcrowded World? – Population, Resources and the Environment”, 2000, Oxford University press

Selener, D., Endara, N, Carvajal, J. 1999. Participatory Rural Appraisal and Planning. International Institute of Rural Reconstruction. Quito. Pp 3-7, 18, 29-42, 46-51, 56-84.

SLUSE Working Paper. 2010. Background information on Kampung Sebako from Preliminary Field Visit.

Soong, N.K., and Lau, C.H. (1977): Physical and chemical properties of soil. *Soils under Heva in Peninsular Malaysia and their management*. Pushparajah, E. and Amin, L.L. (Eds). Rubber Research Institute of Malaysia. Kuala Lumpur.

Szirmai. Adam, 2005, *The dynamics of Socioeconomic Development*, Cambridge University Press, New York, USA

Telecentre of Malaysia. Date Unknown. www.telecentre.my, Viewed on 20-02-2010.

Thomson, J.T. and Schoonmaker Freudenberg, K. 1997. Crafting institutional arrangements for community forestry. FAO Corporate Document Repository. <http://www.fao.org/docrep/w7483e/w7483e00.htm#Contents>. [Retrieved by 28th, March, 2010]

UN, 2004, *Malaysia: 30 Years of Poverty Reduction, Growth and Racial Harmony*, unpan1.un.org/intradoc/groups/public/documents/.../UNPAN021601.pdf, 28-03-2010

Waters-Bayer, A. and Bayer, W. 1994. Planning with pastoralists: PRA and more-A review of methods focused on Africa. <http://www2.gtz.de/dokumente/bib/95-0400.pdf> [Retrieved by 28th, March, 2010].

World Bank, 2008, "World Development Indicators 2008", by Development Data Group, volume 8, Washington D.C., USA

11.0 Appendices

11.1 Vision 2020 (Jakob)

The following text is put forward to show the political context in which the community of Sebako is navigating, and agricultural goals the village face. These visions of modernization has, and will in the future, influence on landuse and livelihood strategies for the villagers of Sebako.

Vision 2020 is a strategy plan for the future, conducted in 1991, and complementing former policy strategies such as the New Economic Policy (1970-90) and the National Development Policy (1991-2000). The overall political aim is unity of the society and to become an industrialized knowledge based society by 2020. To achieve this goal, eradication of poverty and restructuring of the society has been the two main strategies in the New Economy Policy on which Vision 2020 is build upon (UN2004:1)

Vision 2020 is characterized by 9 main objectives to ensure Malaysia as a fully developed country by year 2020. The objectives are a wide range of politically, economically, social and cultural goals for the future, including a united Malaysian nation, a fully developed democracy, a scientific, innovative, progressive and economically just society. Cultural and social aspects includes a welfare system revolving around a family system, and a moral and ethical society strong in religious and spiritual believes (Mohammad1992:2).

To reduce poverty, the government of Malaysia has introduced programs the last few decades to develop the country, including programs to deliver appropriate assistance to improve the situation of the poorest, increase productivity and diversify sources of income, provide infrastructure and amenities such as piped water, schools in rural areas, electricity and health services, involving the private sector and NGO's (UN2004:2).

Although vision 2020 emphasize on how to develop Malaysia in various ways, in its introduction by Mohammed¹ the development of a unified nation is the core element. In governmental documents it is emphasized that the foundation of development is a population that respect the diversity in ethnicity, religion and beliefs. Support and opportunities are provided by merit and needs (Mohammad1992:4).

It is emphasized that Malaysia should be able to produce sufficient food so that no citizens are undernourished and all have shelter, access to healthcare facilities and

¹ YAB Dato' Seri Dr Mahathir Mohamad: Primeminister of Malaysia 1981-2003

all basic essentials. To ensure these goals, Malaysia needs a wide and vigorous middle class and provide opportunities for the bottom third to escape relative poverty (Mohammad1992:3).

For the future, in short, medium and long terms, political goals has been put forward (horizon 1, 2 and 3).

Horizon 1 (2010-12) includes National key result Areas (NKRA) for the rural and regional development. In the short term strategies are focused on development of infrastructure, eradication of corruption, provide better education, reducing crime and improvement of public transportation. Sub categories are electricity, water supply, connecting roads and household aid program (Bernama, 2010).

In Horizon 2 (2012-2015) the goals put forward in Horizon 1 as NKRA's should be improved significantly, and the economy evolved into higher value added sectors. The society should by now see the first indications of a higher income nation.

It is predicted by the government that in Horizon 3 (2015-2020), the visions for 2020, an fundamental change in the malaysian society has come through, including better opportunities for prosperity and better social services. In addition, the government should be reduced and have a higher degree of corporation with the private sector (Dato, 2010).

To narrow the income gap between social classes it is necessary to develop an appropriate economic culture and human resources through provision of opportunities (Mohammad, 1992,).

To fulfill the development goals it is emphasized by the government, that a fair balance of contribution from all ethnic groups is needed, including the states of Sabah and Sarawak, if Malaysia is to develop high growth modern sectors of the economy. To fulfill this a fair distribution of control, management and ownership. Also, a mental and cultural transformation is needed. The needed advances is to be achieved with speed and with productive results at the lowest economic and social cost (Mohammad,1992).

The national agricultural policy (NAP) were presented in 1992. The main concerns was the lack of labour saving machinery and low human capital in the sector, as well as decline in output and export of cash crops such as rubber. The solution to such problematic were a market driven and highly modernized agricultural sector. To create a vibrant agricultural sector, emphasis was put on innovation in products and processes to increase productivity. Intensification in research and development and change in agricultural production structure were to be the main drivers for transformation. Maximisation of income through optimal utilization of resources, together with a balanced development between agriculture and the manufacturing sector was to ensure progress. Linkage between sectors was important in choice of crops, development of land and production methods (Department of Agriculture, 1992).

Strategies for the agricultural sector focused on the competitiveness on domestic as well as world markets. To ensure this, the private sector should, according to 1992 government, play a significant role. Also, land categorized as abandoned, were to be targeted with a comprehensive land use plan which inter- sectoral incorporates needs. Special strategies was put forward for different crop types. Especially fruits, vegetables, oilpalm and rubber. For Sarawak, special emphasis were put on expansion of pineapple and oilpalm on new areas. Oilpalm were to be intensified on idle lands, or by conversion of other crops. Rubber production should be improved by management systems on estates or mini estates. High yielding clones, improved management and improved production. Other crops highlighted, are cocoa, sago, coconut, livestock, rice to sustain Malaysia own consumption and pepper. (Department of Agriculture, 1992).

The national agricultural policy, NAP3(1998-2010) , has been formulated to ensure that the agricultural sector plays its role in the national vision for progress and modernization, following the vision 2020. As former policies on the agricultural sector, it is emphasized, that the linkage to other sectors and conservation and utilization of natural resources happens on a sustainable basis. The strategy is to promote growth in the agricultural sector in a market driven society. Oil palm, saw logs and fisheries continues to be the main contributor of the agricultural sector to overall economy. However, limited availability of suited land, increase in cost of production from inter-sectoral competition are limiting the agricultural sector (PMR, 2010).

The agricultural sector are facing challenges. Shortage of labour in the agricultural sector has led to immigration from neighboring countries, and led to substantial areas of oilpalm and rubber not being fully harvested. The smallholder sector continues to have problems due to low productivity, and uneconomic sizes of holdings. Low commodity prices and shortage of labour are resulting in a substantial amount of idle land and abandoned holdings. Small and medium scale agricultural units continues to serve the domestic market in paddy, livestock, vegetables and fruits, whereas the agricultural industrial sector shows signs of larger scale operations and commercialization (PMR, 2010).

11.2 Transect Walk

Figure 1: Transect walk (Village)

The transect walk was guided by Hamdan Sujing (local interpreter) and supervisor Dr. Wang on 8th, March 2010, in Kampung Sebako, Sarawak, Malaysia; diagram was drawn based on the group discussion after the transect walk.

Purpose: To get the overview of Kampung Sebako and identify the important social activity sites, infrastructures and main farm land distribution.

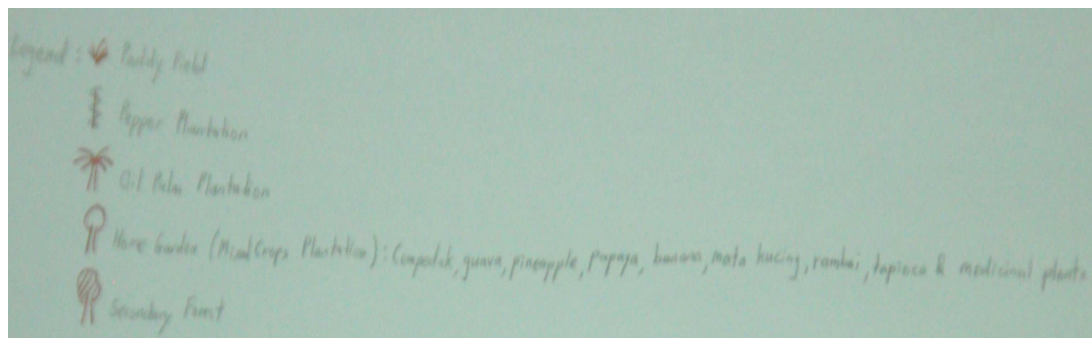
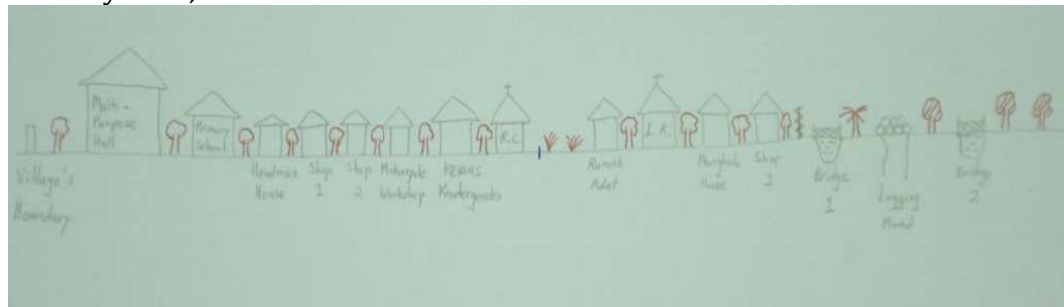


Figure 2: Transect walk (Forest)

The transect walk was guided by Jefri Sujing (local interpreter) on 8th, March 2010, in Kampung Sebako, Sarawak, Malaysia; diagram was drawn based on the group discussion after the transect walk.

Purpose: To get the overview of forest resources in Kampung Sebako and identify the plant and animal species in the forest, and come up with some questions.



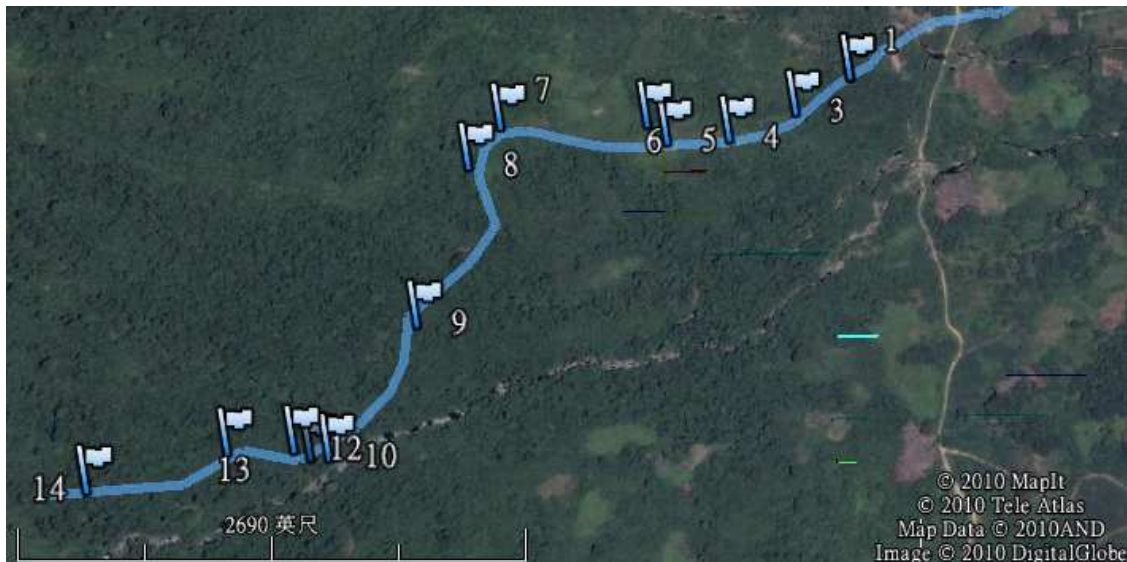
Place	Sebako River	Wayan hill - Jungle track (Beginning)	Wayan hill - Jungle track (Middle)	Wayan hill - Jungle track (End)	Wayan hill (top)	Jungle track
Forest/ Ecosystem	River (Aquatic ecosystem)	Secondary forest (22 years)	Forest reserve (right), Private paddy field (left)	Secondary forest (22 years)		
Soil	Silt brownish clay + Sandstone					
Crops		Rubber tree (Private)		Hill rice (Private/Pn. Erip) – Plant twice a year and wait to fallow 4 years		
Timber tree		Belian, Pelaik (Furniture), Bakuan (Build house), Engkabang, Kelampai, Meranti				
Fruit tree		Jering, Asam, Kelampai, Ampepeng, Peluntan, Tekang, Tepok, Durian, Rambai, Rambutan, (Food), Mata kucing Terap, Takang, Fig, Buan (Animal food), Wild banana				Jering, Asam, Kelampai, Ampepeng, Peluntan, Tekang, Tepok, Durian, Rambai, Rambutan, (Food) Terap, Takang, Fig, Buan (Animal food), Wild banana Engkabang, Raba, Guava
Tree (Others)		Resam (Handicraft, Cover small black pepper plant), Laban (Firewoods), Riyung (Handicraft, Bird cage), Kelampai, Baman (Fish cage, Handicraft), Maban, Bararan (Poisonous), Amping (House floor), Sampuan (Honeybee), Nibong (House floor), Berangan, Empaning, Nanggu (Honeybee)			Bamboo – rare (Fish trap, Handicraft, House floor), Duri, Tepok (Build hut),	Kelampai, Baman (Fish cage, Handicraft), Maban, Bararan (Poisonous), Amping (House floor), Sampuan (Honeybee), Nibong (House floor)
Vegetables		Buan (Leaves to wrap rice), fern, Mamaie (Leaves for food), Tampurenget, Anyaik (Drinks), Kecapok, Tapioca				
Flower plants		Orchids				
Medicinal plants				Ampepeng (heal skin disease)		
Plants (Other)	Mimosa pudica, Wild mushroom				Pankirabun (Used when people die)	Wild mushroom, Mata babi mushroom

				and festival), Pitcher (Cook rice), Rattan (Handicraft, Furniture), Mushroom	, Jemir mushroom , Rattan (Handicraft, Furniture),	
Animals	Uncit birds, Monkey, Squirrel, Belatuk birds, Sawing birds, Murai batu birds, Frog, Keto birds, Leeches					
Insects	Ants (Semadak), Butterfly, spider etc.					
Use	Fishing, bathing, aesthetic value	Access				
Problems	Most of the species die after logging in upper part of the mountain (Sedimentation)			Forest fire, Hill erosion		Hill erosion
Water sources	Kanyin hill and Barumput hill					
Biodiversity	Low	High				
Infrastructure	Bridge, Sebako Mini hydro	Mini hydro pipeline			Used to be a site to build dam by SESCO in 1982 (Abandoned)	House farm (Destroyed by forest fire) Mini hydro filter, Drainage system, Mini hydro pipeline leakage
Opportunities						
Other description	Track build by Tiongkong Company&SESCO					Poor GPS Coverage at certain place
Place		Sipatung river			Dam	Hunting track
Forest/Ecosystem		Secondary forest			Waterfall (Lowest part)	Secondary forest (Used to be paddy farm)
Soil		Silt brownish clay + Sandstone				
Crops						
Timber tree		Sampuan, Pakuan, Belian, Pelaik (Furniture), Bakuan (Build house), Engkabang, Kelampai, Meranti				
Fruit tree		Pantu, Baunge, Jering, Asam, Kelampai, Ampepeng, Peluntan, Tekang, Tepok, Durian, Rambai, Rambutan, Mata kucing (Food) Terap, Takang, Fig, Buan, Wild banana, Ampianing (Animal food),				
Tree (Others)		Resam (Handicraft, Cover small black pepper plant), Laban (Firewoods), Riyung (Handicraft, Bird cage), Kelampai, Baman (Fish cage, Handicraft), Maban, Bararan (Poisonous), Amping (House floor), Sampuan (Honeybee), Nibong (House floor), Berangan, Empaning, Nanggu (Honeybee)				
Vegetables		Paku raja				

Flower plants			
Medicinal plants			
Plants (Other)	Rattan, Aping, Minyak leaves (Wrap rice), Wild mushroom, Mata babi mushroom, Jemir mushroom, Rattan (Handicraft, Furniture),		
Animals	Catfish	Uncit birds, Monkey, Squirrel, Belatuk birds, Sawing birds, Murai batu birds, Frog, Keto birds, Leeches	
Insects	Ants (Semadak), Butterfly, spider, termite etc.		
Use			
Problems			Hill erosion
Water sources			
Biodiversity			
Infrastructure	Bridge, Logging camp, Old logging track		Camping site
Opportunities	Tourism, Jungle tracking		
Other description	Illegal logging in 2009		Some forest mark by villagers – Cannot disturb to preserve clean water

11.3 GPS Maps (Forest Transect Walk) and Relevant GPS Points

Our transect walk in the forest gave us an idea of the location and sites of the forest as well as what products that may have interests for villagers as well as illegal loggers. In this map, which covers an observed forest track, we have limited ourselves from marking GPS points of all forest products that we encountered that the villagers make use of in their daily life. Instead we have indicated changes in landscape and where there are any valuable trees of significance for logging as well as whether there have been signs of illegal logging. This may indicate whether the forest still has trees, normally used for logging, that are not cut down and thus the condition of the forest.



In several plots (for instance in GPS point 1, 2 and 3 and other plots not GPS marked) we could observe that timber trees still exist in the forest near Sebako – even rare species. As we could observe in point 9, illegal logging has taken place, illegal logging still takes place and there are several valuable trees left to log, however, the last logging that appeared in 2009 it had been stopped. This indicates that there are still interest in logging, however, the land is regarded as necessary to protect also in the future. This is underpinned by the blockade that has been used to block the logging company still exists at the edge of the forest.

Forest walk map GPS points

Name	Position	Altitude
1. Starting point for forest walk.		
Hydrostation. Pelai - light timber tree (furniture).	N1 43.286 E109 42.917	49.4 m
2. Belian tree ("diamond" tree) - its timber is the most expensive in Borneo, very rare. E.g. used for house construction	N1 43.286 E109 42.917	49.6 m
3. Bekuan timber tree	N1 43.251 E109 42.864	55.6 m
4. Intercropped hill side paddy field. Limestone mining not operating anymore, 22 years old, but burnt	N1 43.226 E109 42.802	108 m
5. Old dam site. Broke in 2002 and wiped out of fish stocks	N1 43.224 E109 42.744	149 m
6. Pareng bamboo. Is rare in mountain ranges, so may have been planted	N1 43.241 E109 42.725	148 m
7. Junction of trails. Ramba timber tree (mango family)	N1 43.239 E109 42.587	135 m
8. Filter tank for hydro	N1 43.202 E109 42.560	148 m
9. Waterfall. Illegal logging hut	N1 43.051 E109 42.509	213 m
10. Jungle hunting trail. Start of	N1 42.927 E109 42.430	213 m
11. Iron wood stump	N1 42.927 E109 42.413	211 m
12. Opening. Old trees have all been cut. Hill paddy was here in the 1980's	N1 42.935 E109 42.398	204 m
13. Primary forest	N1 42.936 E109 42.341	231 m
14. Nagok tree. The only left in the area. Inhabited by honey bees.	N1 42.908 E109 42.225	265 m

Soil Sampling Site Map

Name	Position	Altitude
1. Home garden	N1 44.281 E109 44.282	27.0 m
2. Rubber plantation	N1 43.912 E109 42.941	33.0 m
3. New paddy field	N1 43.940 E109 44.253	25.0m
4. Old paddy field	N1 43.778 E109 42.935	30.0 m
5. Oil palm plantation	N1 40.648 E109 42.675	34.0m
6. Logged-over forest	N1 43.289 E109 42.897	46.0 m

Water Sampling Sites Map

Name	Position	Altitude
1. Upstream of Sebako River	N1 43.200 E109 42.970	30.0 m
2. Downstream of Sebako River	N1 44.289 E109 44.572	16.0 m
3. Waste water, Resen River	N1 44.113 E109 43.968	20.0m
4. Plantation	N1 44.280 E109 44.472	21.0m

11.4 Historical Timeline PRA Results

TIME LINE

YEAR	EVENT	DESCRIPTION	IMPACT/COMMUNITY RESPONSE
1885	Oldest record of Kampung Sebako	<ul style="list-style-type: none"> - During 2nd Rajah; - 1st site along Sebako river; 	<ul style="list-style-type: none"> - Agrarian community; - Income source: bird nests; - Damar (amber) production to mend cracked wood; - Shifting cultivation – hill paddy;
1950	Small scale rubber farming started	<ul style="list-style-type: none"> - Rubber, paddy and some coffee are the main cultivated products; - Rubber price RM 0.25 per 0.6kg (1 kati); - No road, transportation by boat to Kuching - Wood used for houses; 	<ul style="list-style-type: none"> - Paddy farming involves many people, but rubber is only a few people; - Rubber government controlled; - Had to carry rubber by foot to Lundu (13 hours each way), also to Sematan by boat (row) on Sebako river; - Lots of mosquitoes (because of rudder on boat) and monkeys (because of forest around) - Lots of crocodiles in Sematan river; - Airstrip in Sematan & Lundu; - Cut trees with hand saw; - Palm for roofing; - Still long house; - Women made baskets and mats (handcraft);
1963	Local council development independence; confrontations; B. Sarawak & Indonesia		<ul style="list-style-type: none"> - School, roads (jungle track) beside the river; - 5 villagers went to Biawak to work during the confrontation with British Amary;
1965	Communist attack	2 groups (Chin Peng & Mister Beng)	<ul style="list-style-type: none"> - Villagers scared to go to the farm; - The villagers hid themselves on the roots of their houses;
1978-1982	<ul style="list-style-type: none"> - The surrender of the communist leader; - Water supply; - Migration to new settlement from old long house; - Mini hydro; - Community hall; 	<ul style="list-style-type: none"> - Community free to move around; - Gravity feed (Sg. Penindin); - Electricity; - Lots of vegetables; - Employment opportunity because of the logging; 	<ul style="list-style-type: none"> - Living standard became better; - TV, entertainment; - Sell vegetables; - Cleanliness (environment of the community); - Affected the crops (died); - Paddy field, etc; - Landslide;

	<ul style="list-style-type: none"> - Primary school; - Better health condition because of malaria and other diseases (Flying doctor); - Logging; 	<ul style="list-style-type: none"> - Logging company stole the timbers from villager land; 	<ul style="list-style-type: none"> - Gradually decrease of wild animals because of hunting and logging; - Siltation; - Few fish (deplete);
1983	<ul style="list-style-type: none"> - Bridge built to hydro; - Rubber prices decrease; - Pepper prices increases; 	Continue cultivating both (change – consumption decrease, mix rice, tapioca and small corn when both prices are low)	Bamboo shoot, rattan, dawn sabung, pantu shoot, aping (palm shoot), vegetables and serunai/olan medical plants were very rare;
1985	<ul style="list-style-type: none"> - Building of the road; - SALCRA estate; - Mini hydro leakage; - Cocoa plantation; - Rubber plantation-scheme from SALCRA; 	Completed by government;	<ul style="list-style-type: none"> - Start livestock (pigs); - Petai, buy from outside; - No more wild bears; - Fern & “lemidin” decrease, need to buy;
1997	Nina	Strong wild	<ul style="list-style-type: none"> - House collapse (4 houses); - Replanting of fruit trees; - Disturbed paddy fields;
2007	Logging blockade	Neighbouring communities involved	<ul style="list-style-type: none"> - Peaceful protest, the logging stop; - Few were arrested;
2009	Road completed (far) to the school		

11.5 Trend Analysis PRA Exercise Results

TREND ANALYSIS (FEMALE VILLAGER)

	Rice/Fruit/Vegetable	Cash Crop	SALCRA	Soil /Water
What happened before?	- Rice quality not so good; - Fruit & vegetable good;	- No oil palm; - Traditional rubber less latex;	NIL	- More fertile; - More clean;
What happens now?	- Rice better; - Fruit & vegetable better;	- New rubber breeds bud grafting; - Government supplies chemicals and fertilizers;	Dividend receivers are happy and those who did not participate yet would like to join	- Less fertile; - More polluted;
Causes	- Flood (- rice); - Fertilizer (- fruit & vegetable)	Less fertile soil due to sand;	Those not participatory is because their land is not close to the plantation;	Logging activities
Problems	Siltation/sedimentation in paddy field	Less production	No major problem	Pollution
Future	- Fertilize rice paddy and clear surrounding area; - Fruit trees more fertilizers; - Vegetable fertilizer and poison around to stop snails;	Less latex if no fertilizer	Would like SALCRA to extend to their marginal lands;	Soil fertility will improve;
Desired Future	Same as above	More subsidy for fertilizers/chemicals from government on regular/annual basis because now it is not regular;	Would like SALCRA to build access roads to farms and gardens;	No more logging
Comments	Improve all	- Would like a bush cutter to clean around the rubber; - Would like new bowls to collect latex;	Hopeful for social services (ie. seedlings) and increase dividends;	Want to protect the rivers;

TREND ANALYSIS (MALE VILLAGER)

	Rice/Fruit/Vegetable	Cash Crop	SALCRA	Soil /Water
What happened before?	- Rice paddy good; - Fruit and vegetable good;	Cash crops better	NIL	- Both good; - Lots of fish in Sebako river;
What happens now?	All less productive	Almost all less productive	- Survey and perimeters; - Extra income for villagers;	- Depletion of bigger fish (ex. Dungan); - Shallow river;
Causes	- Infertile soils; - Illegal logging;	- Infertile soils; - Illegal logging;	NIL	Thick sedimentation
Problems	Less harvest	Erosion affects rubber and pepper;	NIL	- Depletion of all types of organisms in the river (ex. Crabs, prawns, turtles and rare fish species); - River over flows fast and affects vegetable gardens;
Future	Integrated agric system with bigger plot of land;	- Minimize cutting and bulldozing mountain land; - Move logging far away from water catchment and hydro dam area;	Future expansion	- Deepen river by extracting sand by licensed company; - Extracted sand income- portion goes to village;
Desired Future	Integrated agric system with bigger plot of land;	- Minimize cutting and bulldozing mountain land; - Move logging far away from water catchment and hydro dam area;	Future expansion	
Comments	- Commercialize all 3; - Attract tourists	- Rubber plantation size increases for everyone; - Small pepper holding for everyone;	- Expect abundant income; - Employment opportunities; - Development of waste land; - Construction of roads to gardens; - Education incentive (SALCRA contributes for children); - Welfare fund for village exists;	- Want land & survey department to survey individual land for title; - Development for wasteland wanted (ex. Pineapple and paddy scheme) which involves various government agencies: DID, Agriculture Department, RISDA(rubber) and FAMA;

11.6 Preference Ranking PRA Results (Men and Women)

	Paddy		Rubber		Oil Palm		Pepper		Cocoa		Fruits		Forest Products		Animals and Fish	
	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W
Food	4	4	0	0	0	0	1	1	0	0	2	2	1	1	2	2
Income	0	1	3	2	2	1	1	1	1	1	1	1	1	1	1	2
Land size	2	3		2	2	1	1	1	1	1	1	1			1	1
Management	2	2	2	2	1	0	1	1	1	1	1	1		1	2	2
Fertilizer	2	2	2	2	1	0	2	2	1	1	1	1			1	2
Pesticides	3	2	2	2	1	0	2	2	1	2	1	2				
Potential	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1

11.7 Questionnaire

We are here from the University of Copenhagen and University of Sarawak on an Integrated Land Use and Natural Resource Management Course. We would like to ask you a few questions regarding land use and life in general in Sebako. This study will be used for our own learning purposes and we will share with you what we learn. If you have any questions or concerns, please feel free to ask. We hope that we can both learn from each other.

A. Introduction

Name		Ethnicity	
Gender		Religion	
Age		Education*	
Years in Village		Job	

*Indicate your education qualification (primary school, secondary school, STPM holder, Diploma holder, others: certificate)

B. Household Information

- How many people live in this house permanently?
- How many people that used to live in this house, now live in another house in Kpg. Sebako? (Married)
- How many people that used to live in this house, have moved to town?
 - Do they send remittances? (Yes/No)

C. Land use strategies

- Do you have farmland?
 - If yes, how many different areas of farmland do you have?
 - If yes, how big are your farmlands (each one)?
- Do you have legal title to your land? ☐ Yes ☐ No
 - If No, do you want your land to be titled? ☐ Yes ☐ No
- Does anyone in your house hunt wild animals? ☐ Yes ☐ No
 - If Yes, what?

- Which crops do you grow and inputs do you use (check if applicable)

	Rubber	Pepper	Cocoa	Vegetables	Fruit	Paddy	Oil palm	Other*	None
Crop									
Fertilizer									
Herbicide									
Pesticide									

*Specify

- Would you change any of these crops to SALCRA (check if applicable)

Rubber	Pepper	Cocoa	Vegetables	Fruit	Paddy	Other*	None

b) Why?

- What is your most important crop?
- Do you farm livestock? (Yes/No)
 - If so, what animals?

8. a) Currently, what is the main source of your food (check one)?

From own farm	Market	Trade/Barter	From forest	Other (Specify)

b) Was this the same or different before 1985?

c) If different, where was the main source of food (same categories as above)?

1. a) What do you produce by yourself, what do you buy

Rice	Fruit/Veg	Forest Products	Meat/Fish	Construction Materials	Other*

b) Did you buy ☐ Less ☐ More ☐ Same before 1985?

D. Livelihood Strategies

1. What is your main source of income (circle one)

- Selling forest, garden products and livestock
- Remittances from household members living outside of Kpg. Sebako
- Dividends from SALCRA
- Rubber farming
- Other cash crops (pepper, cocoa, oil palm – underline appropriate crops)
- Other (specify)

2. a) How much average income does your household bring in every month:

☐ Less than RM500 ☐ Between RM501-1000 ☐ Between RM 1001-1500 ☐ Greater than RM1500

b) Was this amount ☐ Less ☐ More ☐ Same before 1985?

3. a) How much does your household save every month on average:

☐ No savings ☐ RM1- RM200 ☐ RM 201-RM400 ☐ Greater than RM400

4. Do you own the following:

- Car
- Motorcycle
- Bicycles
- TV
- Astro/Parabola
- Computer
- Washing machine
- Refrigerator
- Cooking gas stove
- Musical instruments
- Stand/ceiling fan
- Cooking utensils
- Telephone/Handphones
- Others (specify)

5. What kind of development / projects or public facilities is urgently needed in Kpg. Sebako today and the near future?
6. What are your suggestions to upgrade the standard of traditional agricultural activities, commercialized agriculture or poultry farming?
7. What are your suggestions to improve the living standard of community in Kpg. Sebako?
8. What are your practical suggestions to maintain the existing environment clean and a healthy living area at your village now and in the future?

11.1 List of Interview Informants

Date	Name of Informant	Age	Gender	Interviewers	Translator	Notes
06/03/2010	Encik Anil	47	Male	Kollisa Linzi Natalia	N/A	Headman
06/03/2010	Wang	Unknown	Male	Jakob/Shaua	Geri	Pengulu
06/03/2010	Encik Anil	47	Male	Meng	N/A	Headman
06/03/2010	Enchalis Ak. Kartining	Unknown	Male	All group members	N/A	Science teacher
07/03/2010	Senghi Ak. Kutong	Unknown	Male	All group members	N/A	Chairman of the catholic church
07/03/2010	Agnes (Doreen)	Unknown	Female	Natalia	Zulfaqar	Farmer, Senghi's wife
07/03/2010	Hamdan Sujang	Unknown	Male	Natalia	N/A	Works in Kuching, our translator
07/03/2010	Lassan Ak. Rajak	Unknown	Male	Shauna and Zulfaqar	Zulfaqar	Expert Rubber farmer
07/03/2010	Achee Ak. Sanong	Unknown	Male	Meng and Jakob	Geri	Farmer
08/03/2010	Unknown	Unknown	Female	Natalia	Geri	Bamboo informant
08/02/2010	Unknown	Unknown	Males	Natalia	Geri and Hamdan	Community map info
08/03/2010	Bunak Luie	Unknown	Male	Meng	Geri	Shopkeeper
08/03/2010	Unknown	58	Male	Jacob /Meng	Geri	Pengulu
09/03/2010	Unknown	Unknown	Male	Meng and Jacob	Geri	Rubber farmer
09/03/2010	Farida	25	Female	Linzi and Jakob	Hamdan	Woman - migrated
09/03/2010	Anal	45	Male	Natalia and Jacob	Geri	Farmer
10/03/2010	Migi Lepar	62	Female	Linzi and Jakob	Jefri	Collector of forest products
10/03/2010	David Ak Britius	Unknown	Male	All group members	Geri	Rubber Farmer
10/03/2010	Punah Ak L.	Unknown	Male	Natalia	Geri	Fallow and population relevant info
10/02/2010	1)	Unknown	Male	Natalia, Linzi,	Zulfaqar	Morning

10	Unknown 2) Mr. Karop	1) > 65 2) > 40		Zulfaqar and Kollissa		pagan, ceremony, 1)pagan ceremony conductor
11/03/2010	Emak Ak. Uyu	Unknown	Male	Shauna and Natalia	N/A	Department of Agriculture
11/03/2010	Normin Sujing	Unknown	Male	Shauna and Zulfaqar	Zulfaqar	SALCRA employee
11/03/2010	Billy Sujang	Unknown	Male	Natalia	N/A	Environmental health officer, SLUSE master student
12/03/2010	Azni Haji Bujang	Unknown	Male	Linzi and Shauna	N/A	Lundu district Officer, Tenure and agriculture development
12/03/2010	Punah Ak Luie	77	Male	Shauna and Natalia	Jefri	Farmer
12/03/2010	Miki Akun	62	Male	Natalia	Geri	Farmer that has his own oil palm plantation
12/03/2010	Enchalis Ak. Kartining, (Charles)	Unknown	Male	Natalia	N/A	Science teacher, conversation in the school
13/03/2010	Senghi Ak. Kutong	Unknown	Male	Natalia	N/A	During Gotong Royong, (community work)
13/03/2010	Unknown	Unknown	Women	Natalia	Geri	Clarifying interview with two women, during Gotong Royong
14/03/2010	Encik Anil	Unknown	Male	Kollisa, Zulfaqar and Natalia	Kollisa and Zulfaqar	Headman. Final clarifying.
14/03/2010	Encik Anil	Unknown	Male	Natalia	N/A	Headman. Informal reflections

11.2 Overview of Applied Methods

Applied Methods	Respondents
Questionnaires	33 participants
Semi-structured Interviews	
In-depth Interviews	Pengulu Wang, headman Anis, agriculture department in Lundu, district officer,
Focus Group Discussion	Men/Women/Youth
GPS Mapping	Village/Forest
Transect Walk	Village/Forest/Logging road
Soil Sampling	6 sites: old paddy field, new paddy field, home garden, oil palm plantation, rubber plantation and logged-over forest
Water Sampling	4 sites: upstream of Sebako river, downstream of Sebako river, waste water in Resen river and plantation
Participatory Observation	Rice ceremony, church gathering, rubber tapping, rice harvesting, school visiting and gotong royong (community work), etc
PRA (Historical timeline, preference ranking, community mapping, trend analysis matrix)	Relevant villagers on issues at hand

Environmental and Social Impacts of Land Use Change in Kampung Sebako



Synopsis

Research Design for Kampung Sebako

February 24, 2010

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13.0 1.0 Introduction

Through an interdisciplinary approach, this study explores the socioeconomic and environmental issues related to land-use changes in Kampung Sebako in Sarawak, Malaysia. Agricultural development in Sarawak has been of great importance to Malaysian governmental strategies, which is facilitated by tenure and land zoning legislation. This study aims to gain an understanding of how the ensuing land use changes are shaping the community. It is understood that Kampung Sebako can gain from development in the agricultural sector. However, This study will determine both the positive and negative environmental and socioeconomic implications resulting from intensified mono-cropping in the plantations and intensified cash cropping in the area.

Sebako is located in the state of Sarawak, and includes 123 households, 749 inhabitants, of which the majority are from the Dayak Selako tribe, Bidayah. The village is situated at N 01° 43.1, E 109° 43.5, 90 km from the capital of Sarawak, Kuching. The socio-economic and administrative centres of the region are the towns of Lundu and Semantan. Recently, a bridge has been built across nearby Sungai Lundu river to include Sebako and the surrounding area in road networks (www.telecentre.my, 20-02-2010).

Most people in Sebako are subsistence farmers, cultivating rice and earn their income from small scale cash crops such as fruits, pepper and rubber. Poor soil fertility has according to the Penghulu² resulted in a decrease in yields the last 15 years. Former cropping of cocoa has been abandoned because of pests and diseases (SLUSE Working Paper, 2010).

² Chief of several villagers in the area

14.0 2.0 Background

14.1 2.1 Political economy driving land use and land cover change

Development discourse in Malaysia since the 1960s has been encouraged through rapid land cover transformations aiming to increase productivity in the agricultural sector. Land-use change drivers have varied over the years from swidden agricultural practices; logging incentives; and the relatively recent explosion of monocropping estates. The establishment of oil palm estates is currently the main driver of land conversions, presented through the narrative of improving the living standards of local people, and in many ways extends state power and control over land and natural resources (Cooke, 2002). These large scale agricultural projects are primarily the responsibility of the state agency SALCRA (Banerjee and Bojsen, 2005) and joint venture agreements with the private sector (Cramb, 2007). As many other villages, Sebako has joined the SALCRA scheme. The oil palm plantation covers an area of more than 600 ha, and most of the farmers have leased their native customary right lands to the plantation, from which they receive dividends twice a year. Another plantation in Sebako, produces rubber. This is state owned, but 62 farmers are involved in production (SLUSE Working Paper, 2010 and www.telecentre.my, 20-02-2010).

Such rapid and aggressive agricultural expansion processes are driven by global economic forces, and involve multiple levels of negotiation and contestation between multiple actors (Cramb, 2007). Various state supported schemes related to intensive logging, hydroelectric infrastructure development, and primarily oil palm plantation expansions have expropriated land under the Land Code (Colchester, 1993), of which Native Customary Land is one (Cramb, 2007). In Sebako, the nature of land use negotiation and resistance occurring in the inter/intra community relationships, as well as the respect for traditional land rights is unknown at this stage.

14.2.2.2 Land rights

The Land Code fails to recognise indigenous tenure arrangements and territorial rights of the community (Cramb, 2007). Local people often lack the administrative

capability in legal conflicts and are marginalised as a result (Colchester, 1993). The difficulties regarding procedures required to gain secure rights on customary land, have resulted in many village relocations, often to smaller and less productive land, to allow for further exploitation of the land by government schemes and foreign investors. Sebako village has gradually moved across one of the local rivers (SLUSE Working Paper, 2010), but it is unknown at this stage if this is a result of relocation strategies.

Native Customary Rights fail to take into account the extent of land actually used by local people which includes areas of shifted agricultures, swamps, virgin forest for hunting and collecting NTFPs, fallow sites and streams and rivers (Cooke, 2002). Current expansion of monocropping plantations have excluded local people from many of these livelihood resources (Colchester, 1993). There is evidence of this occurring in Sebako. With its location at the foothill of the Pueh mountain range, zoned as forest reserve, combined with land leased under the SALCRA scheme, and other government owned land, the inhabitants of Sebako have been forced to crop the limited remaining land – sometimes even state owned lands (SLUSE Working Paper, 2010).

14.3.2.3 Implications on local environment and small-scale farmers

National and International development strategies, combined with insecure traditional territory rights have inarguably lead to land use change, which is felt through many ways at the local level. This study assumes that such land use changes have influenced the livelihood strategies and agricultural practices within the local community, which in turn alter local community interactions with each other, external actors, and their surrounding environment.

It is within this context in Kampung Sebako, that this research attempts to look through the lens of small-scale farmers and village-based agriculture practices, observing the coping mechanisms adopted due to these rapid land use transformations across Sarawak's customary land. Hansen (2005) suggests that local communities previously self-sufficient and reliant on forest resource, are able to minimise risks through highly diversified agricultural practices, are increasingly vulnerable and

dependent on state run plantation schemes. Therefore a village-level account will uncover how local people may negotiate their roles through their everyday activities.

15.0 3.0 Problem Formulation

An understanding of the changes in local livelihood strategies, the relationship between these changes and surrounding land use and land cover transformations is required to qualify whether such variations are seen as beneficial or detrimental to the people of Kampung Sebako.

Through exploring how access to land and resources (in terms of human, natural, financial, physical and social resources) has changed with land use intensification, we may determine how the people in Kampung Sebako respond within these changing socio-economic, environmental, cultural, and political conditions.

We presume that conflicts over land occur and that adequate land and resource availability are declining. Based on assumptions that land use change has altered the socio-economic, cultural and biophysical environments surrounding Kampung Sebako we have arrived at the following underlying question:

What are the local social and environmental impacts of reduced land and resource access in Kampung Sebako?

To answer this question, we will address the following sub-research questions:

1. How are villagers **land-use** strategies defined by current land use restrictions? (encroachment on non-NCR lands, change in crops/products or source of these)
2. How have land cover transformations and local land use strategies affected the **biophysical environment** in Kampung Sebako?
3. How has land use change impacted the community structure of Kampung Sebako and intra/inter **community relationships**? (community-community,

community-external communities, community-government, community-corporation).

4. How have **livelihood strategies** in Kampung Sebako changed with land use change? (Subsistence farming, wage labour, migration, remittance; agricultural practices).

4.0 Methods

The research questions posed above require data and information to be obtained from both the natural and social science disciplines. Through using a variety of qualitative, quantitative and literature review methods, identified in the project matrix (Appendix 1) we will be able to triangulate acquired information, thus achieving a more comprehensive data set for our cross-disciplinary information needs. Mikkelsen (2005) identifies different means of data triangulation. This study will incorporate time, person, investigator, discipline and method triangulation to validate our research.

The personal nature of this study raises a number of ethical questions. In all methods carried out we will maintain morality through informed consent of our participants and transparency and clarity of our research findings.

15.1 4.1 Literature Review

Relevant documents, in the form of journal articles, national statistics, legislation, newspapers, websites and aerial photos will be assessed to acquire the relevant background knowledge for defining the context of our problem and designing our research.

15.2 4.2 Study Site and Sampling Strategy

The study site was selected because it reflects a variety of inter-disciplinary issues in the context of developing studies in Malaysia. Because of the time limitations of the study (10 days in Sebako) for which we have constructed an activity timeline (Appendix 2), we will use strategic sampling techniques, where the sampled populations will be selected from a variety of sources. In qualitative terms, this will involve identifying relevant groups and individuals for assessment. Quantitatively, we will ensure that a representative sample of environments are selected, and maintain validity through a structured sampling design. The sampling design will differ depending on the variables being measured. Where they have already been determined, they are listed in the appropriate survey methods in the appendix. We will review survey methods when we get to the field with our counterpart Malaysia students and the experts on various scientific sampling methods.

15.3.4.3 Qualitative Methods

15.3.2 4.3.1 Direct Observation

Observation of the physical surroundings and social interactions will be conducted throughout the duration of the study. Observations will be documented through identified tools (Appendix 3). A key observation exercise will be the orientation walk upon arrival in the village, where a knowledgeable member of the community, like the village headman will lead the team on a walk around the village. Wherever possible, we will try to incorporate an interview into the observation exercises.

15.3.3 4.3.2 Semi-structured Interviews

Key informants have been identified (Appendix 4) which are deemed to have particular insight to certain aspects of our research. This list will be verified through communications with the Malaysian members of the group. Interviews and Focus group discussions will be structured in such a way that open-ended questions are designed to gain explanatory information on relevant topics to the study (Appendix 5 and 6). Semi-structured interviews will be used to identify key indicators and variables to incorporate into questionnaires, for which more quantifiable data can be obtained.

15.3.4 4.3.3 Questionnaires

A questionnaire has been designed (Appendix 7) and will be carried out by the research team. We will aim to sample approximately 30 households in Sebako. We realize that a higher number of respondents would generate more quantifiable results, however, due to time limitations, the number has been reduced. Efforts will be made to choose respondents which have differing roles in the community as to gain a variety of information. Certain components of the questionnaire will need to be refined upon completion of the semi-structured interviews once critical variables have been identified.

15.3.5 4.3.4 PRA techniques

We will use various PRA techniques to gain a better understanding of public perceptions and expectations on various aspects of their involvement in the community. A critical part of implementing the various techniques is in determining who is involved in the exercise. In each case, groups will be selected to maximize participation and categorize priorities/perceptions (ie. powerful members of households will not be grouped with more submissive members).

Participatory Mapping

This will be used to determine community perceptions on the physical space of the community (land use, ownership, infrastructure, natural resource location and landscape features). This technique will also be used to identify access to social networks and services as well as wealth distribution amongst and external to the community. A set of PRA tools has been identified (Appendix 3) which will be used in the mapping exercise.

Timeline

The PRA tools will be used to construct a timeline that shows land-use change over time, infrastructure and technological developments as well as key historical events.

Ranking and Trend Analysis

Ranking and trend analysis exercises will be used in the assessment of preferences (crops and goods produced, income generation, expenditures) as well as problem

identification (environmental resources) and determination of wealth and power disparities. Examples with steps to take have been put together (Appendix 8), but will need to be refined, as the value in this exercise comes from the participating groups selecting the variables.

Diagramming

Venn diagrams will be used to identify stakeholders within and external to the community. These methods will uncover the relevance and relationships of certain parties to others and also identify conflicts (Appendix 10).

Seasonal mapping will be used to determine what crops are cultivated/harvested in what seasons and by whom. Activities and income generation will also be categorized by month. Examples can be seen in Appendix 9.

Theatre

Participants will act out community interactions by taking on the roles of different members of the community. This will be an affective means of understanding community interactions in Sebako. This exercise will be carried out toward the end of the field work, once the research team is more aware of relevant interactions we want to explore, and we have established trust within the village. A description of the method is found in Appendix 11.

15.44.4 Quantitative Methods

We will carry out water, soil, animal and vegetation surveys with perspective experts in these fields (Appendix 12-15). Sites will be selected to obtain information on how these biophysical indicators have changed with land use change. These will involve a chemical analysis of water and soil samples taken at various locations:

- Water sites – up and down stream of hydro dam and plantation sites, ponds, wells
- Soil sites – commercial plantations, subsistence farms, up and down slope from commercial plantations, forest-fallow, forest reserve

Visual assessments of water will consist of observed pollution, water turbidity and examination of water microbial activity. For soil, we will assess the soil type through assessing the soil horizons and texture.

Vegetation surveys will involve a calculation of above ground biomass and species distribution (spatial and abundance) in different ecosystems, similar to those selected for the soil samples for cultivated rice and forest vegetation. Although the ecosystems will be strategically selected, systematic transects will allow for randomness in the sample and the ability to draw statistical representation of vegetative cover.

Animal surveys will involve non-destructive trapping of small animals (birds and insects) at various sites (similar to the soil selection sites) and observation of larger animals that are present. Species distribution (spatial and abundance) will be assessed for both the trapped and observed animals.

15.54.5 Limitations

The following limitations to this study have been identified and will have their own implications. These will be addressed in the relevant sections of the final report and incorporated into any conclusions that are drawn.

- Time (there is only 10 days for village field work)
- Limited local knowledge
- Ethical and cultural barriers (some topics are sensitive and will not be able to be fully explored)
- Sampling strategy is not entirely random which will limit statistical analysis

16.0 5.0 References

Banerjee, N. and Bojsen, K.P.M. (2005): Negotiability and limits to negotiability - land use strategies in the SALCRA Batang Ai Resettlement Scheme, Sarawak, East Malaysia. *Danish Journal of Geography*, 105(1): 17-28

Cooke., F.M. (2002): Vulnerability, control and oil palm in Sarawak: Globalization and a new era. *Development and Change*, 33(2): 189-211

Colchester, M. (1993): Pirates, squatters and poachers: the political ecology of dispossession of the native peoples of Sarawak. *Global Ecology and Biogeography letters*, 3 (4/6): 158-179

Cramb, R.A. (2007): *Reinventing dualism: policy narratives and modes of oil palm expansion in Sarawak*. Paper presented to Conference of Canadian Council of South-East Asian Studies, Laval University, Quebec City, 19-21 October

Hansen, T.S. (2005): Spatio- temporal aspects of land use and land cover changes in the Niah catchment, Sarawak, Malaysia. *Singapore Journal of Tropical Geography*, 26(2):170-190

Mikkelsen, B. 2005. Methods for development work and research. A new guide for practitioners. Sage publications, India. Second edition.pp. 87-123.

SLUSE Working Paper. 2010. Background information on Kampung Sebako from Preliminary Field Visit.

Tauli-Corpuz, V. and Tamang, P. (2007): *Oil palm and other commercial tree plantations, monocropping: impacts on indigenous peoples' land tenure and resource management systems and livelihoods*. Permanent forum on indigenous issues. Sixth session. New York

17.0 6.0 Appendices

17.1 Appendix 1. Project Matrix

Representation of Research Question, topics, data/information required, proposed methods and tools/planning required.

Research Question	Topic	Data/Information Required	Methods	Tools/Planning Requirements
1	1a. Legal tenure arrangements	<ul style="list-style-type: none"> • Appropriate sections of legislation • Institutional structures • Means of transferring tenure/changing zonation 	• Literature Review	<ul style="list-style-type: none"> • Email Malaysian students to confirm correct ministry • Email or phone to make appointment • Visit SALCRA office in Sebako for information
		<ul style="list-style-type: none"> • Level of tenure security/flexibility • Land categorization in the Sebako area (State, SALCRA or other corporate, NCR, reserves, parks, etc.) 	• Interview (department of land development)	
	1b. Customary land-use/tenure arrangements	<ul style="list-style-type: none"> • Adat – how land use decisions are made • Means of documenting tenure arrangements • Organization (inheritance and specific resource rules/norms, gender issues) 	<ul style="list-style-type: none"> • Literature Review • Interview (village headman, resident elder) 	• Make appointment with village elder upon arrival
		<ul style="list-style-type: none"> • Land categorization (ownership and land use) 	<ul style="list-style-type: none"> • Participatory Map (male and female residents) demarcate land ownership and land use on map • Orientation walk with resident guide 	<ul style="list-style-type: none"> • Make appointment for community mapping exercise • PRA tools • Observation tools
	1c. Crops and Products (past and present)	<ul style="list-style-type: none"> • Economic/trade policies driving land use change 	• Literature review	<ul style="list-style-type: none"> • Appointment for Interviews • Appointment for community timeline • Crop/product/seed samples • Observation tools • PRA tools
		<ul style="list-style-type: none"> • Species of crops/products grown and yields • Technological advances driving land use decisions • Local nomenclature for crops/products • Preference of crops/products 	<ul style="list-style-type: none"> • Interview (farmers) • Questionnaires (farmers, market keepers – after interview so that we can establish appropriate crops/products) • Community timeline (tracking land use change over time) • Observation • Ranking of crops/products (different community groupings) 	
	1d. Infrastructure	<ul style="list-style-type: none"> • Extent of road network, hydro-electric dam • Extent of technology (processing plants) • Public transportation 	<ul style="list-style-type: none"> • Interview (village headman) • Timeline of Infrastructure and technology developments • Observation 	<ul style="list-style-type: none"> • Appointment for Interviews • Appointment for community timeline • Observation tools • PRA tools
	1e. Area (past and present)	<ul style="list-style-type: none"> • Physical area of territory, cultivation, commercialization, reserve, leased, state, forest-fallow • Proximity to markets, processing plants, inputs 	<ul style="list-style-type: none"> • Participatory Map include relevant infrastructure external to community • Orientation Walk • Aerial photo/GPS/GIS analysis • Trend analysis in area change over time 	<ul style="list-style-type: none"> • Appointment for community timeline • Observation tools • PRA tools • Aerial photos
	1f. Local perceptions and expectations of above	<ul style="list-style-type: none"> • Village headman, men, women, elders, children, youth, shop keepers, traders, other perceptions and expectations of land use, tenure and 	<ul style="list-style-type: none"> • Interviews of various community members • Questionnaires (representative members of 	• Appointment for interviews

		land-use schemes	community)	
Research Question	Topic	Data/Information Required	Methods	Tools/Planning Requirements
2.	2a. Change in Water Use	<ul style="list-style-type: none"> Extent of water use for commercial/subsistence agriculture, irrigation, drinking, transport, fishing, hydro-electricity, food preparation, hygiene 	<ul style="list-style-type: none"> Literature review Observations Participatory mapping (distances to various water sources) Problem ranking? (what factors have the greatest effect on water quality) 	<ul style="list-style-type: none"> Appointments for PRA activities PRA tools Observation tools
	2b. Change in Water quality	<ul style="list-style-type: none"> pH, electro-conductivity, oxygen, nitrogen, pesticide/herbicide/fertilizer content of water Indicator species present Extent of physical pollution 	<ul style="list-style-type: none"> Observation Sampling (rivers – up and down stream, ponds, wells) Assess water fauna 	<ul style="list-style-type: none"> Ask for input from Malaysian students re: measurement techniques Meet with water sampling team Water sampling tools Observation tools
	2c. Change in Soil Quality	<ul style="list-style-type: none"> Nitrogen, pH, phosphorous, Aluminum, Iron levels Soil type (parent material, texture) Soil condition in various sites (commercial, subsistence, up/down slope, forest-fallow, forest reserve) Prevalence of erosion 	<ul style="list-style-type: none"> Literature Strategic Transect Sampling (low-land, mid slope, up-slope, flood plane, forest, agric sites, plantation sites) 	<ul style="list-style-type: none"> Ask for input from Malaysian students re: measurement techniques Meet with soil sampling team Soil sampling tools Observation tools
			<ul style="list-style-type: none"> Observation of Erosion 	
	2d. Change in Flora (natural and cultivated species and abundance)	<ul style="list-style-type: none"> Above ground biomass % Canopy cover Species (abundance, spatial distribution) Crop species (yield, spatial distribution) Valuable products Local perception on how this has changed Account of pre-development species abundance and distribution 	<ul style="list-style-type: none"> Literature Sampling (transect plots forest and rice) Questionnaires Observations and orientation walk 	<ul style="list-style-type: none"> Identification book Biomass Sampling tools Specimens
	2e. Change in Fauna (natural and cultivated species and abundance)	<ul style="list-style-type: none"> Biodiversity measurement of birds, insects, mammals, reptiles, fish Livestock species (number, spatial distribution) 	<ul style="list-style-type: none"> Literature Expert consultation Questionnaires Trapping Observation 	<ul style="list-style-type: none"> Contact Malaysian students regarding set up with experts to consult Animal sampling tools Specimens Identification book Observation tools
	2f. Local landscape	<ul style="list-style-type: none"> topography, rivers, swamps, aspect, infrastructure 	<ul style="list-style-type: none"> Orientation walk Participatory map (landscape features) Observations Aerial and satellite imagery 	<ul style="list-style-type: none"> Observation tools Aerial photos PRA tools
	2g. Climate	<ul style="list-style-type: none"> Seasons, rainfall, temperatures, extreme events Cultivation/Harvesting seasons 	<ul style="list-style-type: none"> Literature Interviews (various community members) PRA Season Calendar 	<ul style="list-style-type: none"> PRA tools Seeds

Research Question	Topic	Data/Information Required	Methods	Tools/Planning Requirements
3	3a. Stakeholders	<ul style="list-style-type: none"> Identify all stakeholders Identify stakeholder networks 	<ul style="list-style-type: none"> Venn diagram with stakeholders 	<ul style="list-style-type: none"> PRA tools
	3b. Households	<ul style="list-style-type: none"> Labour division (demography of who does what work) Organization (size, structure) Gender relations Who owns the land/trees? Who is the decision maker/head of household? 	<ul style="list-style-type: none"> Interview Questionnaire Observation 	<ul style="list-style-type: none"> Observation tools
	3c. Community	<ul style="list-style-type: none"> Ethnicities/religions Community hierarchy (power, wealth distribution, gender relations, division of labour, division of land) Extent of conflict and conflict resolution mechanisms that exist Social institutions that exist (welfare, decision making, distribution of benefits from schemes) Cultural traditions Communal land Local perceptions of community relations 	<ul style="list-style-type: none"> Focus Group (women, men, elders, youth) – might need to separate these into groups. Theatre/role play (get children to act out family functions) Ranking (wealth and power indicators) Participatory map (indicating wealth) Interviews, questionnaires Problem mapping/mind map 	<ul style="list-style-type: none"> Focus group appointment Costumes for children PRA tools Seeds for wealth/power ranking
	3d. Inter-Community Relations	<ul style="list-style-type: none"> Economic exchange Conflict resolution mechanisms Proximity and number, which communities Extent of migration Extent of conflict Local perceptions of inter-community relations 	<ul style="list-style-type: none"> Focus Group (women, men, elders, youth) – might need to separate these into groups. Ranking (wealth and power indicators) Participatory map Interviews questionnaires Problem ranking mapping/mind map (conflict identification) Venn diagram 	<ul style="list-style-type: none"> Focus group appointment PRA tools Seeds for wealth/power ranking
	3e. Corporate-Community Relations	<ul style="list-style-type: none"> Conflict resolution mechanisms Distribution of dividend benefits Negotiation proceedings (who is involved? How does it work?) Extent of conflict Local perceptions of corporate power 	<ul style="list-style-type: none"> Focus Group (women, men, elders, youth) – might need to separate these into groups. Ranking (wealth and power indicators) Participatory map Interviews (community and corporate representatives) questionnaires Problem ranking mapping/mind map (conflict identification) Venn diagram 	<ul style="list-style-type: none"> Focus group appointment PRA tools Seeds for wealth/power ranking
	3f. State-Community Relations	<ul style="list-style-type: none"> Conflict resolution mechanisms Negotiation proceedings Extent of conflict Local perceptions of government (power, democratic) 	<ul style="list-style-type: none"> Focus Group (women, men, elders, youth) – might need to separate these into groups. Ranking (wealth and power indicators) Participatory map Interviews, questionnaires (community and state representatives) Problem ranking mapping/mind map (conflict identification) 	<ul style="list-style-type: none"> Focus group appointment PRA tools Seeds for wealth/power ranking

			<ul style="list-style-type: none"> Venn diagram 	
	3g. Land-use change over time	<ul style="list-style-type: none"> History of land use in the area and major change events. Wawasa 2020 goals 	<ul style="list-style-type: none"> Timeline of Land use change 	<ul style="list-style-type: none"> PRA tools
Research Question	Topic	Data/Information Required	Methods	Tools/Planning Requirements
4	4a. Source of Income	<ul style="list-style-type: none"> All types of income (ie. wage labour, remittance, dividends, cash crops, NTFP) Level of poverty/wealth Change over time 	<ul style="list-style-type: none"> Questionnaires Observations Participatory mapping/ranking with wealth distribution/sources of income 	<ul style="list-style-type: none"> PRA tools Observation tools
	4b. Expenditures	<ul style="list-style-type: none"> Extent of self-sufficiency versus purchase What do they buy? Costs of social services? Priorities of spending (allocation to savings, goods, services, 	<ul style="list-style-type: none"> Observations (car, house) Interview shop keeper (what does he/she sell) Questionnaire Ranking expenditures/saving (What would you spend your money on in a time of plenty vs time of scarcity) 	<ul style="list-style-type: none"> PRA tools Observation tools
	4c. Agricultural Practices	<ul style="list-style-type: none"> Crop selection Level of intensification (labour, fertilization, irrigation, relocation of cultivation etc) 	<ul style="list-style-type: none"> Questionnaire Participatory mapping Focus group 	<ul style="list-style-type: none"> Set up focus group meeting PRA tools
	4d. Livelihood Strategy	<ul style="list-style-type: none"> How do demographics determine livelihood strategies choice (ie. migration, farming) Coping mechanisms/risk minimization (how do they diversify their livelihood strategies to deal with change? Maintain food security?) Education (extent, access, impact) Perception of own livelihood strategy 	<ul style="list-style-type: none"> Questionnaire Focus group Interviews (villagers) 	<ul style="list-style-type: none"> Set up focus group meeting

- Indicates required planning
- Indicates required tools

17.2

17.3 Appendix 2. Timeline of Scheduled Events

Timeline for Sarawak Fieldwork March 4 - March 19, 2010																	
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Thursday 4																	
Shauna																	Observation
Linzy																	Interview/FG
Jakob																	Questionnaire
Natalia													Arrival				PRA
Meng																	Scientific
Kollisa																	Analysis
Zulfagar																	Group Mtg
Friday 5																	
Shauna																	
Linzy																	
Jakob																	
Natalia						Group Work											
Meng																	
Kollisa																	
Zulfagar																	
Saturday 6																	
Shauna										Transect Walk				V.Headman		Sum	
Linzy							Sebako							V.Headman		up	
Jakob							Arrival and welcome							Elder		notes	
Natalia							ceremony							Sum. Walk		from	
Meng							Informal discussions							Elder		interviews	
Kollisa														Farmer			
Zulfagar														Farmer			
Sunday 7																	
Shauna		Market GPS				Farmers		Rice					Timeline			Plan	
Linzy		Market				H Garden	Village Women						Mapping			2mrw	
Jakob		Market				Farmers		SALCRA stn & oil palm					Village Men				
Natalia		Market				Village Women		SALCRA stn & oil palm					Mapping				
Meng		Market				Market	Village Women						Mapping				
Kollisa		Market GPS				H Garden	Village Women						Village Men				
Zulfagar		Market				Village Women		Rice					Timeline				

Timeline for Sarawak Fieldwork March 4 - March 19, 2010																	
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Monday 8																	
Shauna				Elder				Pepper		Sundry shop			FG Men			Plan	Observation
Linzy				Village Woman			Village Men			Youth			FG Women			2mrw	Interview/FG
Jakob	Farmers			Duck			Village Men						FG Men				Questionnaire
Natalia							Village Men			Youth			FG Women				PRA
Meng	Farmers			Duck			Village Men			Sundry shop			FG Men				Scientific
Kollisa				Elder				Rubber					FG Women				Analysis
Zulfagar				Village Woman				Rubber					FG Men				Group Mtg
Tuesday 9																	
Shauna														FG Farmer		Plan	
Linzy				Presentations										FG Farmer		2mrw	
Jakob				in Lundu										FG Youth			
Natalia										Interviews with				FG Youth			
Meng										Government Officials				FG Youth			
Kollisa										SALCRA office				FG Farmer			
Zulfagar														FG Youth			
Wednesday 10																	
Shauna				Farmers					Forest Manager					Village Men		Plan	
Linzy				Water										Wealth/transect/copin		2mrw	
Jakob				Farmers					Forest Manager					Village Men			
Natalia				Farmers					Forest Manager					Village Men			
Meng				Water										Wealth/transect/coping			
Kollisa				Water										Wealth/transect/coping			
Zulfagar				Water										Wealth/transect/coping			
Thursday 11																	
Shauna				Soil										Ranking and Seasonal		Plan	
Linzy				SALCRA Employee					Plantation Manager					Venn Diagram		2mrw	
Jakob				SALCRA Employee					Plantation Manager					Ranking and Seasonal			
Natalia				Soil										Venn Diagram			
Meng				Soil										Ranking and Seasonal			
Kollisa				Soil										Venn Diagram			
Zulfagar				Soil										Ranking and Seasonal			

Timeline for Sarawak Fieldwork March 4 - March 19, 2010																	
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Friday 12																	
Shauna				Youth												Plan	Observation
Linzy				Youth												2mrw	Interview/FG
Jakob				Animal													Questionnaire
Natalia				Animal													PRA
Meng				Youth													Scientific
Kollisa				Animal													Analysis
Zulfagar				Animal													Group Mtg
Saturday 13																	
Shauna				Vegetation												Plan	
Linzy				Vegetation												2mrw	
Jakob				Vegetation													
Natalia				Outstanding													
Meng				Outstanding													
Kollisa				Vegetation													
Zulfagar				Vegetation													
Sunday 14																	
Shauna				GPS Mapping									Theatre?			Plan	
Linzy				Shop keeper				Outstanding					Theatre?			2mrw	
Jakob				Shop keeper									Theatre				
Natalia													V. Headman				
Meng													V. Headman				
Kollisa				GPS Mapping									V. Headman				
Zulfagar				Shop keeper									Theatre?				
Monday 15																	
Shauna				Outstanding													
Linzy																	
Jakob																	
Natalia																	
Meng				Outstanding													
Kollisa																	
Zulfagar																	

Timeline for Sarawak Fieldwork March 4 - March 19, 2010																	
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Tuesday 16																	
Shauna				Good-byes					Depart	Sebako							Observation
Linzy																	Interview/FG
Jakob																	Questionnaire
Natalia																	PRA
Meng																	Scientific
Kollisa																	Analysis
Zulfagar																	Group Mtg
Wednesday 17																	
Shauna				Lab Analysis back in Kuching													
Linzy				Government													
Jakob				Government													
Natalia				Other													
Meng				Other													
Kollisa				Lab Analysis back in Kuching													
Zulfagar				Lab Analysis back in Kuching													
Thursday 18																	
Shauna				Report Work and Presentation All													
Linzy																	
Jakob																	
Natalia																	
Meng																	
Kollisa																	
Zulfagar																	
Friday 19																	
Shauna				Departures													
Linzy																	
Jakob																	
Natalia																	
Meng																	
Kollisa																	
Zulfagar																	

17.5 **Appendix 3. Tools**

Observation Tools:

- Digital Camera
- Note books
- Binoculars
- Sample container
- Tags for Samples
- GPS

PRA Tools:

- Poster paper
- Coloured markers
- Sticky tape
- Coloured Post-its
- A1 size transparencies
- Scissors
- Coloured paper

Biomass measurement Tools:

- Distance chain
- Compass
- Clinometer
- DBH tape
- Measuring tape
- Sample container
- Tags for Samples
- GPS
- Species guidebook / Local botanic expert

Soil and water measurement Tools:

- Soil kit
- Water kit
- Containers for samples
- Microscope
- GPS

17.6 Appendix 4. Key Informants

Key Informant	Interview Topics
1. State Officials	<ul style="list-style-type: none"> • Legal tenure arrangements (means of transfer, governance structure for land use/tenure, Sebako land categorization) • State-community relations • Area of state land around Sebako
2. Village Headman	<ul style="list-style-type: none"> • Initial interview – community overview • Customary tenure arrangements, categorization • How does scheme work? • Adat, land use/tenure record-keeping • Inheritance laws and specific resource rules/norms, gender issues • Change in infrastructure (roads, hydro dvpt, public transport) • Social organization • ethnicity/religion differences • division of land, • conflicts/ conflict resolution mechanisms • local social institutions- welfare, decision making, • relations with close communities- proximity and number, economic exchange, conflicts/resolutions mechanisms, migrations • corporate-community relations : conflict resolution mechanisms, distribution of benefits, negotiation process, power dynamics • state community relations: conflict resolution mechanisms, distribution of benefits, negotiation process, power dynamics • Perspectives of LUC • Area of different land use zones(Sebako ha's, communal, leased land, fallow, state land) • Community infrastructure
3. Resident Elder	<ul style="list-style-type: none"> • Customary tenure arrangements • Adat, land use/tenure record-keeping • Inheritance laws and specific resource rules/norms, gender issues • Perceptions on land use change • Water quality change • Climate change over the years
4. Farmer	<ul style="list-style-type: none"> • Past and present land changes and crops and products/animals cultivated, and seasonality • Change in area of own land, cultivated land-subsistence crops/cash crops, proximity to markets, processing plants • Agricultural practices • What technologies do you use and how have they changed,

	<p>where did they come from?</p> <ul style="list-style-type: none"> • Water usage and quality change – for subs/cash crops • Soil quality change • Distribution of benefits from the scheme • Change in farming practices: intensification?, labour changes, fertilizer usage, irrigation methods, change in location of cultivation • Perceptions on land use change
5. Female Villager	<ul style="list-style-type: none"> • Past and present land changes crops and products/animals • Perceptions on land use change • Household information • Community organization • Distribution of benefits from the scheme • • Within and external community relations • Livelihood strategy • Water usage and quality change- drinking, hygiene, fishing, transport, food prep • Expenditures
5. Male Villager	<ul style="list-style-type: none"> • Security/flexibility of land tenure • Past and present land changes crops and products/animals • Perceptions on land use change • Household information • Water usage and quality- drinking, hygiene, fishing, transport, food prep • Within and external community relations • Distribution of benefits from the scheme • Livelihood strategy • Expenditures
6. Youth	<ul style="list-style-type: none"> • Perceptions on land use change • Household information • Within and external community relations • Livelihood strategy • Expenditures
7. Shop Keeper	<ul style="list-style-type: none"> • Expenditures
8. Plantation Manager	<ul style="list-style-type: none"> • Labour on plantations • Community/Corporate relations • Processing plant technology • Change in infrastructure and plans for future (roads, processing facilities) • Area under plantation/leased
9. SALCRA Employee	<ul style="list-style-type: none"> • Legal tenure arrangements • Legal SALCRA arrangements • Community/State relations processing plants

	<ul style="list-style-type: none"> • Distribution of benefits to community in scheme
10. Forest Reserve Worker	<ul style="list-style-type: none"> • Permitting? • Access rights • Products gathered and frequency • Area of reserve
Focus Group	<ul style="list-style-type: none"> • Local names for plants/animals • Stakeholder identification • Gender relations (male/female groups), • division of land (farmers) • intra-community relations (male/female)- migration impacts, demographics, and how determines livelihood strategies • coping mechanisms- how do they diversify livelihood strategies to deal with change? (male/female/farmer) • How do they maintain food security? (male/female/farmer) • inter-community relations (male/female) • distributions of benefits (male/female) • SALCRA-community relations (male/female) • Other corporate- community relations (male/female) • State-community relations (male/female) • Social services – costs, access (male/female) • Education- access, extent, impact (male/female/youth) • Perception of livelihood strategies (male/female/farmer/youth)

17.7

17.8 Appendix 5. Semi-Structured Interview Questions

17.8.6 5.1 State Officials

17.9

Can you describe legal tenure arrangement between the state and local villages?
how does transfer of land titles take place? And particularly between the state and native customary land?
what are different levels of governance and administration involved?

Can you describe formal land categorisation?
does this conflict with customary land classifications?
how much of the land in this area is considered state land?
in the context of 'Vision 2020' how does Kampung Sebako fit in?
- are there contextual factors taken into account when implementing development goals?
What is the relationship between the state and local community?
- how does communication and negotiations take place? (community meetings, only headman, someone outside community... etc)

How does 'joint ventures' work in practice? How is it implemented? And what are the goals of these programmes?
Future national objectives around Sebako? Reserves, plantations, etc? and how is the community involved in these projects?

17.9.7 5.2 Village Headman

A. Background

1. How did you become the chief?
2. What is your role? And responsibilities?

B. Land

3. Can you describe the local customary tenure systems? Adat? (Inheritance laws and specific resource rules/norms, gender issues, ethnicity, religion, divisions of land/labour, decision-making procedures)
 4. Is there communal land shared by different communities?
 5. How do you categorise different land types?
- Does this conflict with official land classifications/systems
6. How big is the land of your chiefdom?
 7. Do you have any records of land use in the area?
 8. Has this land been given Native Customary Rights? How does this work under different community land?
 9. Are you involved in a SALCRA scheme? When did that start? How did that get decided? What is the area of leased land?
 10. Why did you get involved? What benefits come from participating in these schemes?
 11. What is the relationship with communities within your chiefdom?
 12. What is the relationship with corporations ? which corporation?
How does economic benefits get distributed across different communities?
 13. What is your relationship with the state? (ie gov officials, forest reserves and others...with regards to land rights and resource access)
 14. Are there any conflicts regarding land rights, agriculture and resource access? If so, with who?
 15. How does the community deal with conflicts within the community and with outside interests? And what is your role in resolving conflicts?

C.Changes

16.Do you think there has been changes in the availability of arable land?

17.Do you think there has been changes in the availability of important products?

18. How do these changes relate to changes in Infrastructure? (roads, hydropower...)

19.How do you see land use changes affecting the community?

20.Has there been any changes in access to arable land?

If so, how has this changed the cultivation practices?

21. How do you see land use changes affecting the local environment?

If so, how? And how does this effect the community

17.9.8 5.3 Resident Elder

17.10

1. How long have you lived here?
2. Can you describe the local customary tenure systems? Adat? (Inheritance laws and specific resource rules/norms, gender issues, ethnicity, religion, divisions of land/labour, decision-making procedures)
3. Do you have any records of land use in the area? How do you keep information ?
4. Do you feel there has been any change in the way land rights are organised?
If so, how?
5. How has changes in customary land affected the community structure? And community practices?
6. Could you explain if there has been a transition on
agricultural practices/intensity
crops grown, and shifts from subsistence to cash cropping (and buying)
types of lands used for cultivation,
livelihood strategies
local values?
7. Do you see any change in forest products harvested/consumed/use? (availability, quality, access, distance, conflicts)
8. Have your dietary patterns changed? If so, how?
9. Do you see changes in the local biophysical conditions (water, soil, forest...), and if so, why do you think so? And what are the impacts of this?
10. Do you think your quality of life has improved ?

A.) Land-use Strategies

1. Which crops/products/animals do you cultivate?
2. How has this changed over time?
 - Species, abundance
3. When do you cultivate and harvest these crops?
4. How the size of your farm land changed over the years?
 - Home products vs cash crops
5. Has the location of your farm changed over the years? If so, where was it before?
6. Why?
 - own choice, adat, state, commercial pressures, family
7. How close are you to the market or any processing facilities that you need to produce your farmed goods?
8. What are the condition of roads, processing facilities?
9. Are you involved in any government or commercial land-use schemes?
 - SALCRA, joint ventures
10. How has this determined at all which crops you grow?

B.) Biophysical Environment

1. Where do you get it from? How this changed over the years?
2. How has water quality has changed over the years?
3. Do you use irrigation for your crops? If so, when did you start?
4. Where does your waste water go?
 - Sewage, bathing
5. How has the soil quality of your farm land changed over the years? If so how?
 - Location, nutrients, technology impacts, erosion
6. Do you use any fertilizers, herbicides, pesticides? If so, what?
 - Farm manure, chemicals

C.) Livelihood Strategies

1. Where do you sell or trade your farmed goods?
 - Market, neighbouring communities, SALCRA schemes
2. What kind of transportation do you use? How has this changed?
 - Boat, car, taxi
3. What kind of farming technologies do you use? How has this changed?
 - Tractor, animal tilling, other
4. How are the tools, animals and seeds financed?
5. How is the farming labour divided?
 - Who, season, hired/household, full/part time
6. What are your main sources of income?
7. Where do you obtain goods and products you don't grow yourself?

D.) Community Relationships

1. Who are your neighbours? How have these changed over time?
 - Other farmer, relatives, plantation, forest reserve
2. Do you farm on any community land? How does this work?
3. What role (good and bad) do the following play in your farming practices:
 - Government
 - Company
 - Other farmers
 - Markets and local retailers
4. What are your perceptions on land use change in Kampung Sebako on your farming practices?
5. How do you perceive the corporate actors in the management of plantations?

17.10.10 5.5 Village Woman/Man

Livelihood strategies

1. Who lives in your house? Do they live there permanently?
2. What's is your main source of income ? how much per month approx?
3. Have your livelihood strategies changed over the last 10 years years?
 - if so, how? And why?
4. How does income get distributed by household members?
5. Do you have a homegarden?
 - if so what do you produce?
 - for subsistence or trade ?
 - how has the role of the homegarden changed over the last 10 years?
6. Does any family member migrate to the city for work?
 - Who, for how long, why and what do they do?
 - how has this phenomenon changed over the last years
7. What role does the forest play in generating income?
 - how has this changed over the last 10 years?
8. Do you participate in the SALCRA scheme? If so, how?
9. How is labour divided in the household? (woman, man, elder, children)
10. How does income expenditures get distributed in the household-
(food, fertilizers, other inputs, school... etc)
11. How is labour divided amongst the community (woman, men, elders, youth...etc)
12. Is there communal land?
 - How is it managed?
 - And how decisions get made?
13. What transportation do you use? Has it changed over the last 10 years?
14. has there been improvements in social infrastructure – (schools, health ,etc)

Land use change

15. Has there been any major changes in physical arrangements of the community ?
 - is so how and why?
 - (e.g.due to adat, state legislation, privatisation, leasing land, roads, hydropower construction and forest logging)
16. How have these changes affected (pros and cons)
 - household structure
 - income earning strategies
 - your community?
17. Do you have any documentation of land tenure arrangements?
18. Has there been changes in roads in the last 10 years?
 - how has this impacted your income earning strategies?
 - how has this impacted your relationship with other communities

Relationships

19. how are decisions over land use made? (conflict resolution mechanisms, distribution of dividend benefits)
20. How does the village engage in other communities?
21. Does the local community engage in political matters? How, why?
22. What is your relation to:
 - the Sarawak federal Government?
 - The Malay state government?
23. What role do the corporations have in your community?
24. how does the community negotiate with corporations over land use?
25. What role do immigrants have in your community? (possibly sensitive question)
26. What role do social institutions have in distribution of goods to the community? (governmental schemes, government subsidies, health care, education system)
 - how do benefits gets distributed? If so, why? Who participates in these institutions?

Biophysical environment

1. Where does your water come from?
2. Where does your wastewater go?
3. Has the quality of water improved or decreased over time? Why do you think so?

17.10.11 5.6 Youth

1. What education do you have?
2. Where did you go to school?
3. age?
4. Where do you work?
(if work in city go to No. 5 if not then go to No. 11)
5. How often do you go to the city to work in one year?
6. On average how long do you stay there?
7. Why do you go there?
8. How much do you earn there?
9. And do you send money home? If so, how much?
10. Do you return to the village at certain times (ie harvests, sowing etc)
11. What do you do in the village?
12. Where do you see your future?
13. How do you see land use change effects on the community?
14. Do you see land use changes as economic potential or restricting possibilities?
Why?

A.) Land-use Strategies

None

B.) Biophysical Environment

None

C.) Livelihood Strategies

1. How long have you owned this shop?
2. What are the most common things that you sell, and how has this changed over the years?
3. Where do you get the things that you sell?
 - Local farmers/producers, other villages, import
4. What other sources of income do you have?
5. How do people's purchases change over the year?

D.) Community Relationships

1. Do you hire any employees?
2. How are the employees hired?
3. Who usually buys goods from your shop, and what do they buy?
 - Women, Men, Children
4. How has your business changed since the oil palm plantations have developed in the community?

17.10.13 5.8 Plantation Manager

A.) Land-use Strategies

1. Who owns the plantation land?
2. Who has the legal title to the land?
3. How has ownership of land changed since the Oil Palm Plantation has started?
4. Where is the nearest processing plant located?
5. How have the roads or other means of access changed since the Oil Palm Plantation has been established?
6. Are there plans for future road, processing or plantation developments? If so, what are they?
7. If the plantations will grow, which land will they use?
8. How much area is under oil palm plantation in Kampung Sebako? How has this changed over the years?

B.) Biophysical Environment

1. What fertilizers, herbicides, fertilizers do you use on the plantation?
2. How do you determine how much of these to use?
3. How is the plantation irrigated?
4. How has ownership of land changed since the Oil Palm Plantation has started?
5. What are common pests/diseases/weeds to the plantation? How have these changed over the years?

C.) Livelihood Strategies

None

D.) Community Relationships

1. How many employees work on this plantation?
2. How are the employees hired?
3. How does the labour required on the plantation change throughout the year?
 - Tending the plantation, harvest, etc.
4. Is it mostly Indonese, Chinese, locals or other who work in the plantation? Why?
5. How was the Kampung Sebako consulted before the plantation was established?
6. How are the profits from the plantation distributed?
 - Community, NCR owners, government, corporation
7. How have community services changed since the plantation was established?
 - Schools, medical centres, roads, etc.

17.10.14 5.9 SALCRA Employee

C.) Livelihood Strategies

1. How long have you had this job?
2. What are your duties as a SALCRA employee?
3. What are your other income generating activities? How has this changed over the years?
4. Where do your wages from this job come from?
 - Dividends from own land
 - Hourly wage for labour
 - Production based wage labour

A.) Land-use Strategies

1. How much land do you have? Has this changed over the years?
2. Do you hold legal title to your land?

B.) Biophysical Environment

1. How do you perceive the environmental condition of the forest?
2. Has the condition of the forest changed over the years?
3. What advantages and disadvantages do you see about logging?
4. What advantages and disadvantages do you see about plantations?
5. What advantages and disadvantages do you see about traditional swift farming?
6. Why do the government create estates in the Sebako and other areas?
7. What do you think about villagers leasing their land to SALCRA?
 - Why do Salcra want to villagers to lease the land out? Can the villagers not manage their land well according to you and the state?
 - Why do villagers engage in land leasing?
 - What arguments do you use to make villagers land leasing out their land?
 - What kinds of villagers that lease out their land?

D.) Community Relationships

1. How did you get this job?
2. How do you rate the management of the plantation?
3. How is your involvement in the village? Do you live there? Why/why not? Do you have friends and relatives in the village? Who/why not?
4. How do you wish the local area and Kampung Sebako to look in the future? Why?

1. When was the reserve established?
2. What is the size of the reserve?
3. Can people get permits to enter into the forest to collect or hunt?
4. Does this result in illegal harvesting?
5. Do you know what products are gathered? And how often?
6. How do you patrol the area?
7. Have there been any conflicts with local communities and the state?
8. How do these get resolved?
9. Do you see any changes in the biodiversity within the forest?

17.11 Appendix 6. Focus Group Discussions

17.11.16 6.1 Farmers

1. How do you perceive land use change in the area effecting local agricultural practices (please describe the main changes that are in effect)

2. Do you think that land use change (plantations, etc) has resulted in limited lands for agriculture?

-If so, how have you changed farming practices due to less land available?

3. Has there been any changes in cultivation sites (proximity/lower quality land/acidic soils/ steep slope/etc)

- if so, which crops are grown where?

4. What impacts has these location changes had on

- choice on crops

- relationships with other farmers in the community, other communities, officials, and others (explain)

- commercialization of crops versus subsistence use

5. Which land has been the most absorbed into new agricultural practices? (impacts on forest, communal lands, swamps, etc) and why?

6. How would you compare new sites to former agriculture sites (size, soil quality, distance, pests/pesticides/fertilizers, etc)

7. Do you receive any benefits from these changes (plantations, roads, processing mills, markets, technologies, education etc)

8. What negative impacts have occurred due to these changes (water quality, soil quality, erosion, pollution, degraded lands, migration, etc....)

1. Cultural attachments? What is your relationship with local culture? Do you think that this has changed compared to your parents and elders?
2. Does your aspirations/ life perspectives differ from your family? How? And what impacts does this have on your household and community relationships?
3. What are your opinions on farming? How important is farming for you? Why?
4. Do you want to continue living here? Why?
5. How do you view the plantation schemes? Positive or negative?
6. How do you perceive the implications of plantations on your community?
7. Do you see any significant changes in the community (values, types of products available, transport, facilities, schools, etc)?
8. How do you see the future of Kampung Sebako?

17.11.18 6.3 Village Men and Women

1. Division of labour in household and community
2. Does everyone participate in leasing land to SALCRA schemes?
3. How do economic benefits get distributed in the community.
4. How does income expenditures get distributed in the household- food, fertilizers, other inputs, school... etc?
5. How has income earning strategies changed with changed land use?
 - and with changes to land and resource availability
6. Is there communal land?
 - How is it managed?
 - And how decisions get made?
7. Has there been improvements in social infrastructure – (schools, health ,etc)
 - if so, who is driving these improvements

17.12 Appendix 7. Questionnaire

QUESTIONNAIRE

We are here from the University of Copenhagen and University of Sarawak on an Integrated Land Use and Natural Resource Management Course. We would like to ask you a few questions regarding land use and life in general in Sebako. This study will be used for our own learning purposes and we will share with you what we learn. If you have any questions or concerns, please feel free to ask. We hope that we can both learn from each other.

Introduction

Name		Ethnicity	
Gender		Religion	
Age		Education*	
Years in Village			

*Indicate last year of education (education in the home, primary education, secondary education, post-secondary education, other – specify)

Household Information

4. A.) Household Members

Member	Full time /Seasonal	Sex (M/F)	Age	Household Responsibility (Subsistence, cash crops, wage labour, forest collection, fishing, trade, house-work, construction, other) *write primary responsibility

B.) Who is the head of the household? _____

5. Do you farm crops ☐ Yes ☐ No

Which crops do you grow (1 being the least, 7 being the most)

Year	Rubber	Pepper	Cocoa	Vegetables	Fruit	Rice	Other
Last year							
5 years ago							
10 years ago							
20 years ago							

Other (specify): _____

6. Do you farm Livestock ☐ Yes ☐ No

Which Livestock do you farm (1 being the least, 7 being the most)

Year	Cattle	Goats	Pigs	Ducks	Chickens	Other	
Last year							
5 years ago							

10 years ago							
20 years ago							

Other (specify): _____

7. What do you buy (1 being the least, 7 being the most)

Year	Fruit	Vegetables	Meat/Fish	Rice	Spices	Forest Products	Other
Last year							
5 years ago							
10 years ago							
20 years ago							

Other (specify): _____

8. Indicate how your household gets its food (1 being the least, 6 being the most)

Year	Cultivation	Market	Trade	Collection	Sent from city	Other
Last year						
5 years ago						
10 years ago						
20 years ago						

Other (specify): _____

9. Indicate how your household gets its income (1 being the least, 6 being the most)

Year	Subsistence (no income generated)	Market (selling goods)	Wage labour	Remittances from household members living outside of Sebako	Dividends from plantation schemes	Other
Last year						
5 years ago						
10 years ago						
20 years ago						

Other (specify): _____

10. A.) How much income did your household bring in last year:

☐ Less than X RM ☐ Between X and Y RM ☐ Greater than X RM

B.) Was this amount ☐ Less ☐ More ☐ the Same 5 years ago?

C.) Was this amount ☐ Less ☐ More ☐ the Same 10 years ago?

D.) Was this amount ☐ Less ☐ More ☐ the Same 20 years ago?

11. Indicate how most of your household income gets spent (1 being the least, 7 being the most)

Year	Food	Housing	Transport	School	Healthcare	Taxes	Other
Last year							
5 years ago							
10 years ago							
20 years ago							

Other (specify): _____

Land Use

- | | | |
|--|------------------------------|-----------------------------|
| 1. Do you have legal title to your land? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Do you use communal farm land? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| If Yes, What for _____ | | |
| 1. Do you collect forest products? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| If Yes, What _____ | | |
| 2. Do you hunt wild animals? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. If Yes, What _____ | | |

Comments: _____

17.13 Appendix 8. Ranking Exercises

17.13.19 8.1 Income Generation Preferences

	<i>Plantation schemes</i>	<i>Cash crops</i>	<i>Timber</i>	<i>Wage labour</i>	<i>NTFPs</i>	<i>Remittances</i>	<i>Other</i>
<i>Good earner</i>							
<i>Easy work</i>							
<i>Education required</i>							
<i>Transport</i>							
<i>Flexibility</i>							

The participants will place seeds or stones in each category with their preferences. Each participant will only be given twenty stones or seeds per row and has to allocate them with their preference. We will review income generation variables once we have more information from the field.

17.13.20 8.2 Crops and Goods Produced

	<i>Rice</i>	<i>Rubber</i>	<i>Oil palm</i>	<i>NTFPs</i>	<i>Vegetables</i>	<i>Fruit</i>	<i>Timber</i>	<i>Pepper</i>
<i>Consumption</i>								
<i>Income</i>								
<i>Household materials</i>								
<i>Storage</i>								
<i>Market</i>								
<i>Pest & disease</i>								
<i>Rate of success</i>								
<i>Ease of cultivation</i>								
<i>Palatability</i>								

The participants will place seeds or stones in each category with their preferences. Each participant will only be given twenty stones or seeds per row and has to allocate them with their preference. We will review crops and goods produced variables once we have more information from the field.

17.13.21 8.3 Trends and Problem Analysis of Environmental Resources

	Agricultural Water	Drinking Water	Soil	Agricultural Plants	Other Plants of Use	Domestic Animals	Wild Animals
Conditions in the Past							
Current Conditions							
Cause							
Problems							
Future							
Desired Future							
Comments							

The table will be filled in by community members in a participatory setting. Women will conduct the exercise separately from the men.

17.14

17.14.22 8.4 Land use and Land cover transect

Step 1: Draw a transect of land cover from point A to B from previous transect walk (orientation), and discuss the diagram with local people

A-----B

Step 2: Identify categories and uses at different areas along the transect

Use/cover					
Soil					
Water					
Crops- and products					
Animals- and products					
Forest prods collected					
Biodiversity					
Infrastructure					
Problems					
Solutions					

17.14.23 8.5 Livelihood and coping strategies

Step 1: Name and list different livelihood strategies (included information received through questionnaires and interviews)

Step 2: Compare and score through a calendar. Scores from 1- least important to 5- most important. This will uncover the periods in the year where certain livelihood strategies become more important, either due to availability or lack of certain income opportunities at present time.

Livelihood Strategy:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rice farming												
Rubber farming												
Home garden												
Wage labour												
Pepper farming												

The livelihood strategies given are examples only and will be identified by the residents themselves.

**17.14.24 8.6 Well-being status / wealth and power
distributions**

Step 1: Identify criteria which local people use to determine wealth

Carried out in public space for inclusion of all people.

Wealthy	Average	Poor	Very poor
Condition 1 : Ex 5 pigs	Condition 1: Ex 3 pigs	Condition 1: Ex 1 pig	Condition 1: no livestock
Conditions 2: Ex high yield of particular cash crop	Conditions 2: Ex good yield of particular cash crop	Conditions 2: Ex harvest of particular cash crop, mostly live on subsistence crops	Conditions 2: only subsistence crops
Condition 3: Ex family members working in Kuala Lampur	Condition 3: Ex family members working in Kuching	Condition 3: Ex 1 family member working in Kuching	Conditions 3: seasonal labour only
Condition 4:	Condition 4:	Condition 4	Condition 4

Step 2: Relate information on wealth criteria and wellbeing status to community map previously done. This will allow for relations to household structures, distribution of households wealth status to biophysical characteristics (ie water sources, fertile soil, etc)

17.15 Appendix 9. Seasonal Mapping

17.15.25 9.1 Monthly Agricultural Activities



Seasonal Calender of Agricultural Factors in Sebako, Sarawak, Malaysia

	Name	January	February	March	April	May	June	July	August	September	October	November	December
Subsistence Crops													
Cash Crops													
Plantation Crops													
Forest Products													
Seasonal Labor													

	Cultivation
	Harvest
	fallow

17.15.26 9.2 Monthly Livelihood Strategies and Income Generation

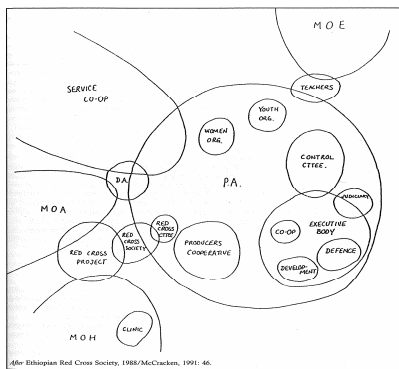
Seasonal Calender of Activities & Income Generation in Sebako, Sarawak, Malaysia

Categories	January	February	March	April	May	June	July	August	September	October	November	December
Subsistence Farming					X	X	X	X				
Wage Labor	X	X	X	X					X	X	X	X
Cash Crops (to market or trade)	X	X	X	X	X	X	X	X	X	X	X	X
Other(NTFPs, Medicine collecting or goods)						X	X	X	X			
Income												
Expenditure												

17.16 Appendix 10. Venn Diagram Methods

Venn diagrams will be conducted to make it possible for the villagers to visually show relations between different stakeholders, in particular on institutional relationships. The venn diagrams will be introduced in focus group meetings, and the aim is to elaborate on the weight and connectedness with organizations such as SALCRA, governmental representatives from the forest reserve and in land right issues etc., which are relevant to answer questions on land use changes. The diagrams will be used to see the villagers sense of these relationships, and be compared with interviews conducted with state officials, forest reserve workers and SALCRA officials (Mikkelsen2005:92).

In practice, the village participants will be provided with circular pieces of paper in different sizes and shapes, representing institutions and stakeholders of choice. It is the goal that the villagers from different focus groups (farmers, women etc) will provide a mosaic of relevant stakeholders emphasizing on relations, or the lack of such.



Example of venn diagram

17.17 Appendix 11. Theatre Methods

Forum theatre in Sebako, Sarawak

Boal's (1995 p.15) definition of *forum theatre* – is: 'a system of physical exercises, aesthetic games, image techniques and special improvisations whose goal is to turn the practice of theatre into an effective tool for the comprehension of social and personal problems and the search for their solutions.' (Mangham and Clark, 2003) . Through such dramatization the play explores problem situations of the audience's daily life, confronting hidden conflicts and subconscious behavioural patterns, and routines of a particular organization. It is a process of deconstruction and reconstruction, whereby the audience identifies critical problems, and finds solutions, generating different forms of knowledge (Sliep *et al*, 2004).

In Forum Theatre, the audience generates the scene or the facilitator can propose a scene that is recognizable to all. Scenes are replayed at the audience's request. The audience participates as "spect-actors" in that they can replace any of the actors at any point (Sliep *et al*, 2004).. Discussion is encouraged when an interruption occurs, thus creating an awareness of the different elements of the scenario, and different possible pathways.

In Sebako, Sarawak, we may encourage such a participatory performance in order to uncover local coping mechanisms to changes in local socio-economic and cultural contexts by engaging in a storytelling exercise with various members of the community. Language barriers may be overcome through the use of recognizable objects or symbols. Once initial research has been conducted the most appropriate target groups and agendas will be determined.

References:

Mangham, I. and Clark, T. (2003): *Stripping to the undercoat: Organisation theatre and forum theatre*. Stream 4: Theatrics of Capitalism.

Sliep, Y., Weingarten, K and Gilbert, A. (2004): Narrative theatre as an interactive community approach mobilizing collective action in northern Uganda. *Families, Systems and Health*, Vol 22(3): 306-320

17.18 Appendix 12. Water Sampling Methods

The purpose of water sampling is to test if the water quality is affected by the current land use in Sebako. In order to do so, samplings will be conducted and compared with water quality standards of Malaysia. The results will be triangulated with interviews and observations of how the population of Sebako use various water sources, to find if possible reduced water quality due to change in livelihood strategies and agricultural intensification affects health and environment. Test kits will be provided by UNIMAS, and samplings conducted under supervision of expert assistance from the University of Kuching. Results from water samplings will take into account possible other reasons than the above mentioned of quality changes in water.

PROPOSED NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

Parameters	Unit	Classes					
		I	IIA	IIB	III	IV	V
Ammoniacal-N.	mg/l	0.1	0.3	0.3	0.9	2.7	>2.7
BOD	mg/l	1	3	3	6	12	>12
COD	mg/l	10	25	25	50	100	>100
DO	mg/l	7	5-7	5-7	3-5	<3	<1
pH		6.5-8.5	6-9	6-9	5-9	5-9	-
Colour	TCU	15	150	150	-	-	-
Elec. Cond*	µmhos/cm	1000	1000	-	-	6000	-
Floatables		N	N	N	-	-	-
Odour		N	N	N	-	-	-
Salinity*	‰	0.5	1	-	-	2	-
Taste		N	N	N	-	-	-
Tot. Diss. Sol.*	mg/l	500	1000	-	-	4000	-
Tot. Susp. Sol.	mg/l	25	50	50	150	300	>300
Temperature	°C	-	Normal± 2	-	Normal± 2	-	-
Turbidity	NTU	5	50	50	-	-	-
F. Coliform**	counts/100 ml	10	100	400	5000 (20000) ^ε	5000 (20000) ^ε	-
Total Coliform	counts/100 ml	100	5000	5000	50000	50000	>50000

N = No visible floatable material / debris,
or No objectionable odour,
or No objectionable taste.

* = Related parameters, only one recommended for use

** = Geometric mean

ε = Maximum not to be exceeded

<u>CLASS</u>	<u>USES</u>
---------------------	--------------------

- | | |
|---------|--|
| I | represents water body of excellent quality. Standards are set for the conservation of natural environment in its undisturbed state. Water bodies such as those in the national park areas, fountainheads, and in high land and undisturbed areas come under this category where strictly no discharge of any kind is permitted. Water bodies in this category meets the most stringent requirements for human health and aquatic life protection. |
| IIA/IIB | represents water bodies of good quality. Most existing raw water supply sources come under this category. In practice, no body contact activity is allowed in this water for prevention of probable human pathogens. There is a need to introduce another class for water bodies not used for water supply but of similar quality which may be referred to as Class IIB . The determination of Class IIB standard is based on criteria for recreational use and protection of sensitive aquatic species. |
| III | is defined with the primary objective of protecting common and moderately tolerant aquatic species of economic value. Water under this classification may be used for water supply with extensive / advance treatment. This class of water is also defined to suit livestock drinking needs. |
| IV | defines water quality required for major agricultural irrigation activities which may not cover minor applications to sensitive crops. |
| V | represents other waters which do not meet any of the above uses. |

Source: www.sabah.gov.my/jpas/Assessment/eia/sp-eias/.../AnnexB_1.pdf

17.19 Appendix 13. Soil Sampling Methods

In order to demonstrate how the local land cover transformations and land use strategies affected the soil quality, and to compare the soils under different land use systems in Kampung, Sebako, we choose soil respiration, infiltration, bulk density, electrical conductivity(EC), soil pH, soil nitrate leaching, aggregate stability, soil slaking, earthworms, water-filled pore space, water nitrates and water electrical conductivity as main indicators, which can be used to interpret in different qualitative& quantitative aspects, such as productivity, water, habitat and filtering to test the local soil quality. We will consult the local soil experts during the field work in Malaysia. As to be in practice, , we will choose measure sites under different land use strategies, such as home gardons, rice land (hill and paddy), forest (fallow and reserve), oil palm plantation (upslope, downslope, adjacent area and within the plantation), rubber tree plantation (upslope, downslope, adjacent area and within the plantation). For sampling, we also want to focus on the comparisons between measured values of pro- and post- land cover transformations and land use strategies, but due to the impossibility to measure soil prior to the plantation, so we choose to measure nearby sites. If time allows, we plan to measure the changes of the local forest to find out the pressure on it by the local land cover transformations and land use strategies. Because of the local uneven landscape, we choose to use □ type sampling method. According to the different land area, 1-2kg mixed soil sample is need for each measure plot.

Indicator	Productivity	Water	Habitat	Filtering
Respiration	X		X	
Infiltration	X	X		X
Bulk density	X	X		
Electrical conductivity				X
pH	X		X	X
Nitrate leaching				X
Aggregates	X	X	X	X
Slaking	X	X		
Earthworms	X		X	X
Water-filled pore space		X		
Water nitrates			X	X
Water electrical conductivity			X	

Indicators Tested to Evaluate Soil Function in Humid Regions

References

Natural Resources Conservation Service(NRCS), United States Department of Agriculture website: http://soils.usda.gov/sqi/assessment/test_kit.html, retrieved in 22nd, Feb, 2010.

Soil Quality: The Functional Value and Stability of Soil Resources website: http://soilquality.org/tools/test_kit.html, retrieved in 22nd, Feb, 2010.

17.20 Appendix 14. Vegetation Sampling Methods

17.20.27 14.1 Cultivated Rice Sampling Methods

- 1.) Select rice cultivation sampling locations based on the following characteristics and for each hill rice and paddy rice:
 - Variation in cultivation intensity (fertilizers, pesticides, herbicides, tillage, minimal inputs, etc.)
 - Variation in size of field
 - Similar biophysical conditions (proximity to adjacent land use, rice species, topography, elevation, etc.)

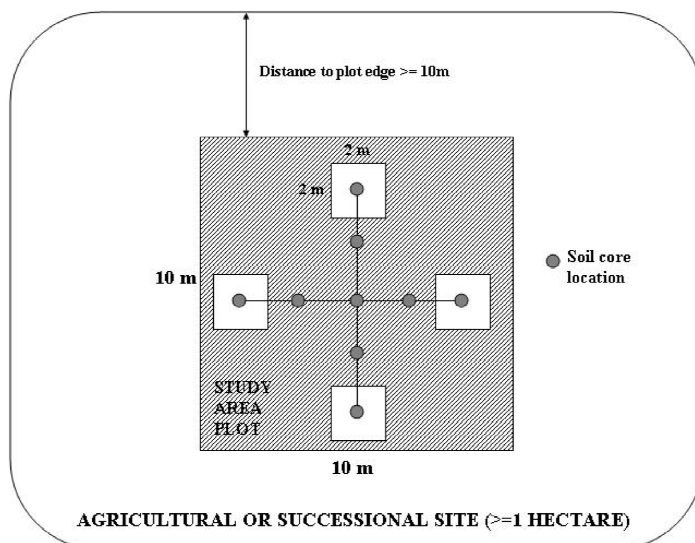
Note that the number of locations will be dependent on site variability. At least one sampling location per type will be measured.

- 2.) Field sampling techniques and design have been adapted from Dobermann et al., 1995 as modified in the points below:
 - A starting point within the sampling location will be randomly selected and the first 2x2m plot will be established. 20m intervals will be used to establish subsequent plots, located at a bearing that will allow the greatest number of plots along the transect. 4 plots per transect will be established. Within each plot, 16 height measurements will be taken (4 per 1m² – randomly selected). Each plot will be photographed and the plot center recorded with the GPS.
 - Qualitative notes will be taken on the condition of the rice plants: colour, indication of pests/disease, depth of water (for paddy rice), indication of farmer inputs (ie. tiller)
 - Sampling techniques will be the same for both hill rice and paddy rice.
- 3.) Plot data will be compared to those in the other cultivated rice locations to determine the variability plant growth, distribution and abundance with varying cultivation intensity and proximity to other land uses.

References

Dobermann, A., Pampolino, M., and Neue, HU. 1995. Spatial and Temporal Variability of Transplanted Rice at the Field Scale. *Agronomy Journal* 87(4): 712.

- 1.) Select forest locations based on the following characteristics:
 - Variation in forest land use (fallow secondary, forest reserve, protected forest)
 - Similar proximity to community
 - Similar biophysical conditions (forest type, topography, elevation, etc.)
- 2.) Field sampling techniques will use the nested strategy (Read and Lawrence, 2003). Selection of plot samples will follow that of Chowdhury, 2007 as below and indicated in the following diagram:
 - 10x10m plots randomly located within the selected forest site (at least 1ha in size and no less than 10m from the edge of the forest). Within these plots, measure the DBH and record the species (with help of local botanical expert) of every tree > 5cm. Record the location of the plot centre with the GPS.
 - Four 2x2m quadrats will be systematically located within the plots for intensive measurement of smaller trees (DBH > 1cm) and other vegetation species and spatial cover. Each quadrat will be photographed and the location of the quadrat centre recorded with the GPS.



3.) Plot and quadrat data will be compared to those in the other forest locations to determine the variability in species diversity, distribution and abundance with varying land use.

References

Chowdhury, R. 2007. Household Land Management and Biodiversity: Secondary Succession in a Forest-Agriculture Mosaic in Southern Mexico. *Ecology and Society* 12(2):31

Read, L., and Lawrence, D. 2003. Recovery of biomass following shifting cultivation in dry tropical forests of the Yucatan. *Ecological Applications* 13(1):85-97

17.21 Appendix 15. Animal Sampling Methods

In order to get a grasp of the biodiversity or at least have an idea of human impact in the area surrounding Sebako, we will make samples measuring the animals, which will make us able to make a **comparative** analysis. The comparison will be based on variations in **locations**, the proximity to the community as well as **biophysical characteristics** such as **forest type, topography and elevation**, which reflects the vegetation, the **soil type** and **fertility** conditions and the life of animals.

In order to be able to map, we will also **mark the points** that we measure with a GPS. Dependent on the **expert advice** we get in the field, we will decide upon what animals we want to measure, the amount of samples that we will make and more precise were to locate them.

When it comes to **location** we will compare along a **gradient of disturbance in woody habitants**, overall fallow secondary (if it is to be found in the area), secondary forest, forest reserve/protected forest and oil palm plantation. We also need to consider habitats of about the **same size**, in order to be able to compare.

At each point we will attempt to measure the **variability in species diversity, distribution and abundance** with varying land use. However, this task might be too comprehensive, so instead we might choose species, which are **top predators**. However, **isopods and butterflies** might also be good indicators of changes in biodiversity.

Hassal et al. Argue that if disturbance is uniform and severe it can result in a relatively simple community of pioneer species with good colonizing ability. When the disturbance is variable in time and/or space it may result in a mosaic of habitat patches at different successional stages. Thus at a landscape scale such patchy communities are often more diverse than either uniformly heavily disturbed ones or completely undisturbed communities dominated by fewer highly competitive species.

Hassal et al. use this as the argument for their study of isopods. The study of the **relative abundance** of isopods on five sites showed that least individuals were collected from the samples of primary forest sites and that significantly more from oil palm plantations site, which represent the most disturbed sampling site, as special conditions than certain species are able to adapt to.³ In other words the **“richness”** (different kinds) of isopods were higher at oil palm plantations than at the primary forest.

³ “Multiple regression analysis showed that of all the environmental variables, the total number of isopods collected per plot was only significantly related to depth of litter layers ($b = -0.366$, $df = 61$, $P < 0.001$), confirming that the abundance of isopods was lowest where the litter layer was thickest in the three forest sites.” (... : 203)

However, when it comes to general terms the **mean number** of the isopod species found per sample plot did not differ significantly between any of the disrobed sites. In fact the highest total number of species was found in one of the primary forest sites.

This might be explained by the primary forests higher diversity of larger trees, which can be characterized by climax vegetation with deeper litter layers and less ground layer vegetation than disturbed sites where there is a more open canopy and more fluctuating micro-climatic conditions at the soil surface.

The reasons behind the relative abundance of isopods at the oil plantation site is explained by Hassal et al. arguing that *"taxa disturbance can lead to an increase in diversity due to disruption of the complex competitive interactions that can develop in undisturbed systems and creation of opportunities for invasion of the community by generalist species replacing specialist endemic species characteristic of intact systems."*

E.g. Hassal et al. Explain: *"Of the species at the logged secondary forest site, 55% were not present in the corresponding primary forest site and of those at the orchard and oil palm sites 86% and 75%, respectively, were not found on the nearest primary forest site studied (Table 2). This suggests, considering the low colonising potential of this group, that species which may have existed below detectable levels in the primary forest, perhaps in gaps and were better adapted to the harsher conditions, increased as the closed canopy specialists declined when the canopy opened."*

Hence, according to the research by Hassal et al., disturbance might appear to increase biodiversity at a small scale (a richness of an individual species), however, at larger scale diversity appear to decrease due to the same level of disturbance. This might be because invading generalists species have had a wider distribution within the disturbed habitat than more specialized endemic species restricted to smaller patches in the undisturbed sites.

On basis of this we must bear in mind that when measuring biodiversity some old-growth forest specialist species may be replaced in the disturbed forest and converted forest sites by open-habitat specialist and generalist species. So though there might be more of one kind of species in a disturbed area than in a forest, it does not necessarily mean that we can generalize this to a conclusion that in the overall amount of species is higher in the disturbed area. When considering a species, we must therefore investigate what conditions favors it and to what extent it is able to adapt to disturbed areas compared with other species and thus to what extent e species is likely to be abundant on disturbed sites.⁴

⁴ E.g. Hassal et al. explains: *"Terrestrial isopods can be categorised into two groups, steneodynamic and eurydynamic, accordingly to their suites of life history characteristics and their intrinsic rates of natural increase [61]. Steneodynamic species are mostly small soil dwellers with a relatively narrow range of rf values whereas eurydynamic species are larger, more surface active and with a much wider range of rf values so able to increase in density much more rapidly in response to an increase in favourability of their habitat."*

Another aspect to bear in mind is that while there might not be significant differences in diversity of the isopod fauna between disturbed and corresponding undisturbed habitats, the forest fragment size may also have a significant effect determining biodiversity in terms of richness of certain species (e.g. isopods or arthropods).

Reference

M. Hassal et al., 2006, " Biodiversity and abundance of terrestrial isopods along a gradient of disturbance in Sabah, East Malaysia", *European Journal of Soil Biology* 42 (2006) S197–S207, Published by Elsevier Masson SAS.