Livelihood strategies regarding small-scale farming: a case study from Sejijak Mawang, West Sarawak, Malaysia

Course: Interdisciplinary Land Use and Natural Resource Management (ILUNRM), Faculty of Life Sciences, KU

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Submitted 1st of April 2011

Abstract

This case study aims at assessing livelihood strategies, focusing on small-scale farming, in Sejijak Mawang, a rural village in West Sarawak, Malaysia. Studies in rural SE Asia show a trend towards diversifying income activities, and the same was expected to occur in Sejijak Mawang. To characterize the development of the village regarding trends and vulnerability factors a series of interdisciplinary methods were carried out in the study area. Participatory rural appraisal tools, such as questionnaires, semi structured interviews and focus groups were mainly used for the social study and natural science methods were incorporated to get an overview of the condition of natural resources. Findings show that small-scale agriculture is still very common. Farmers integrate more cash crops such as pepper and rubber into their practices. However, agriculture loses importance as income for villagers tends towards diversification. More households have several non-farming income sources, such as construction work and migration remittances. Furthermore, cash crop farmers are dependent on subsidies in the form of fertilizers to keep yields constant due to acid soils. The natural resource base is widely used by villagers for collecting free goods but degradation makes it vulnerable. Migrating young people has left a generational gap in the village so workforce has decreased as average age has increased. Education levels are low but have increased slightly within the last generation. The impact of all these trends might move Sejijak Mawang away from small-scale farming but further studies need to be conducted to make conclusive remarks.

Table of contents

Preface – Copenhagen April 1st 2011

This report is the written result of two months of intensive studies, including three weeks of a field trip to Sarawak, Malaysia. We would like to emphasize that all authors have contributed equally to the report and that cooperation has been healthy and fruitful. All sections of this report have been discussed continuously and every one has showed engagement from beginning to end. In accordance with the indispensible rules for the report a table of responsible and contributing authors can be found on the subsequent page. As most sections have been drafted by one member and then extensively rewritten several times by two or three other group members, it is difficult to assign one responsible author to each section. It should therefore be kept in mind that the assigned authors (named alphabetically) are not indicating that they are solely involved in the creation of the given section.

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Table of authors

	Responsible author	Contributing authors
1. Introduction	Line	Christopher, Isabelle
1.1 Objectives and research questions	All	
1.2 Hypothesis	All	
1.3 Case study: Rural livelihood strategies in Kampung S.M.	Isabelle	
2. Methods		
2.1 Tool of analysis	Isabelle	
2.2 Natural science methods		
2.2.1 GPS	Christopher	Sanne
2.2.2 Forest assessment	Sanne	Kirstine, Isabelle
2.2.3 Water sampling	Kirstine, Sanne	Line
2.2.4 Soil sampling	Line	Kirstine, Sanne
2.3 Social science methods		
2.3.2. Timeline	Christopher	
2.3.3 Focus group	Isabelle	
2.3.4 Natural Resource Map	Sanne	
2.3.5 Seasonal calendar	Christopher	Line
2.3.6 Questionnaires	Isabelle	Kirstine
2.3.7 Semi structured interview	Christopher	
3. Results and discussion		
3.1.1 Resource maps	Sanne	
3.1.2 Water	Line	Kirstine, Sanne
3.1.3 Soil	Kirstine, Line	Sanne
3.1.4 Forest assessment	Sanne	Kirstine, Isabelle
3.2.1 Diversification of income	Christopher, Kirstine	Isabelle
3.2.2 Increased mobility	Isabelle, Line	Kirstine
3.2.3 Social and cultural change	Isabelle, Line, Sanne	Christopher
4. Conclusion	All	
5. Reflection "What did we learn"	All	

Acknowledgement

Thank you to the SLUSE staff in both Malaysia and Denmark for doing an incredible job guiding us through the field course. Special thanks to Dr. Mohd Effendi Wasli and Dr. Wong Swee Kiong, the two coordinators from UNIMAS for making everything go so smoothly in Malaysia.

Also, a big thanks to the resource people from UNIMAS for answering all our questions and helping us in the field.

A special thank you to the two interpreters, Hong and Geri, for continually translating in the village and for helping us approach cultural differences of which we may not have been aware.

Dr. Thilde Bech Bruun and Dr. Kristine also deserve a special thank you for all their guidance, support and supervision.

In addition, thank you to our Malaysian counterparts, Sharifah and Fizah, for the great collaboration.

Thanks especially to the villagers of Sejijak Mawang for showing hospitality and willingness to participate in this study, and for their patience and acceptance when we kept asking them questions and interrupting their daily lives.

Abbreviations

ANOVA – Analysis of Variance

DBH – Diameter at Breast Height

DFID – Department for International Development

DOA – Department of Agriculture

FCC – Faecal Coliform Count

GPS – Global Positioning System

ILUNRM – Interdisciplinary Land-Use and Natural Resource Management

INWQS – Interim Water Quality Standards

MYR – Malaysian Ringgit

NCR – Native Customary Right

NTFP – Non Timber Forest Products

PRA – Participatory Rural Appraisal

SALCRA – Sarawak Land Consolidation and Rehabilitation Authority

SOM – Soil Organic Matter

SSI – Semi-structured Interview

UNIMAS – University of Malaysia-Sarawak

Key Informants and semi structure interview participants

Position	Name	Age	Gender	Why were they chosen
Headman	Lantey ak. Luhai	74	M	Could contribute to the understanding of organizational structure, history and opportunities and threats of the village
Secretary of the Headman	Amang Lempis	45	M	Able to explain more detailed about farming practices. organizational structure and administration of the village, infrastructure, land tenure
Chief of woman		53	F	Shared information about the role of women in the village, religious and cultural habits and practices, organizational structure of the village
Villager	Ah Yen	23	F	Was able to communicate in English, presented an opposite role to migration trends as she came back to life in the village
Principal Primary School			M	Source of information regarding education in the village and the government policies on education, image of farming in the society
Rubber farmer			M	Shared in depth knowledge on farming practices regarding rubber and the importance as a cash crop
Rice farmer	Liaw		F	To inform about the importance of rice as a staple food and subsistence crop
NTFP - collector	Agnes Ak Pank	47	F	Shared knowledge on different products important to the diet of villagers, availability and use of forest products in past and present, transfer of knowledge between generations

1. Introduction – transition of rural livelihoods

Agriculture is part of the basic livelihood strategy for the rural poor (Windle and Cramb, 1997). Studies have aimed at understanding whether small scale agriculture specifically helps or impedes alleviation of poverty in rural areas (Ellis and Biggs, 2001; Schulz, 1964; WDR, 2008). By changing perspectives and opening towards a more inclusive picture of rural communities and their overall sources of income, a new approach of basic livelihood strategies can be established (Scoones, 1998).

Recent changes in societies encourage a diversification of livelihood strategies and account for much of the occurring ongoing changes in rural areas according to Rigg (2006). While it is impossible to mention all the points that contribute to this view on rural livelihoods, Rigg (2006) identifies general trends.

People are overcoming poverty in different ways by spreading out their income based activities. The livelihood strategy thus consists of a range of concurrent occupations. In addition, the balance of household incomes is shifting from farming to non-farming activities, as remittances for instance, play a growing role in rural household incomes. As infrastructure improvements allow people to more easily lead mobile lives, livelihoods can be sustained from increasingly distant places. This contributes to the rising average age of farmers left back in the villages. Finally, Rigg (2006) mentions that cultural and social changes are also implicated in modifications of livelihood strategies. Farming has essentially become a “low status occupation to be avoided” (Rigg, 2006).

These mentioned trends are linked to certain underlying causes that also affect the livelihood strategies of the rural poor. These trends include decreasing profit to small-holder agricultural production, emergence of new opportunities in the non-farming sector, environmental degradation, increasing land shortages, as well as cultural and social changes (Rigg, 2006).

The vision of the Malaysian government is to transform Malaysia to a developed country by 2020 (Wawasa, 2020). Agricultural growth is a key factor to contribute to economic growth and to lift

communities in rural areas out of poverty (Wawasa, 2020). The strategy for agricultural growth is mainly based on the plan to convert land to large scale plantations; this is mainly facilitated by state agencies. Indeed, the government has specified that their view for sustainable agriculture is to develop large scale oil palm plantations (Wawasa, 2020, pers. comment SAO 2011). Specifically, from 1990 to 2005, the conversion of land to oil palm plantations has been driving a 46% expansion of agricultural land in Malaysia (Hai, 2000; Redmon *et al.* 2005). This shift towards large scale plantations might have negative repercussions on rural livelihoods, through increased degradation of their resource pool (Ashley and Maxwell, 2001).

1.1 Objective and research questions

Rigg (2006) develops general trends that can be seen to change rural livelihood strategies. In Malaysia specifically, the government encourages large scale agricultural growth, which changes current rural livelihood strategies, in order to combat poverty. The current study aims at assessing the livelihood strategies of the villagers of Sejijak Mawang, focusing specifically on small scale agriculture in a small rural village in West Sarawak, Borneo, Malaysia.
With this objective and the above described trends in mind, the following research questions were developed:

1. What is the state and use of the natural resource base?
2. What are the assets of the villagers and how do they affect small scale farming?
3. What are future livelihood strategies of villagers of Sejijak Mawang?

By assets, we refer to social, human, financial and physical assets as defined in the development framework developed by the United Kingdom Department for International Development (DFID, 1999).

1.2 Hypothesis

Based on knowledge received before heading to the field, and on studies by Li (2009) and Rigg (2006) the hypothesis was that small scale agriculture was still practiced in Sejijak Mawang.

However, it was expected that the general trend in the village would be to move away from it in the future.

1.3 Study Area: Kampung Sejijak Mawang

The Bidayuh village of Sejijak Mawang is located about 40 km, South West, from Serian town, in the Serian district of Sarawak. The modern village of Sejijak Mawang, was established in 1963, having moved from an area about 200 meters, because the nearby river posed risks of flooding. Since then, the village has expanded twice: to Sejijak Plaman in 1965 and Sejijak Labaridu in 2007. These migrations occurred when the number of people in the first village was too large. Both of these new villages are within 2km of the original Sejijak Mawang. This study focuses solely on Kampung Sejijak Mawang, which has a total of 60 households and 319 inhabitants.

Kampung Sejijak Mawang is linked to the main road by a one lane road that was constructed in 1964, and has had access to piped water from the mountain Sipadang since 1984. Electricity has been available from Serian town since 1994. Until 1968, the community followed pagan traditions; however, at that time, missionaries came and converted the villagers into Seventh Day Adventists or Roman Catholics. At the same time, the primary school SK-Sejijak was established. Traditionally, villagers from Kampung Sejijak Mawang were subsistence farmers and relied on the surrounding forests for nutritional supplements but also construction materials. The main subsistence crop, rice, has been cultivated for decades, but various cash crops have also been incorporated into the income strategies of villagers. Pepper *(Piper nigrum)* and rubber *(Hevea brasiliensis)* were introduced in 1964 and villagers can apply to the government for fertilizers or pesticides to augment their crop productions. As such, farming is the key livelihood activity in which villagers engage.

2. Methods

In this section, methods to acquire data are presented and discussed for their validity and reliability. These reflections on the methods are a crucial part of this report. The importance are twofold, firstly for the validity of the actual research and secondly for reflecting on the learning process of the ILUNRM course.

In the following paragraph first the tool of analysis will be presented, followed by natural science methods and social science methods. A full list of methods applied can be found in appendix I.

2.1 Tool of analysis

In order to analyze the collected data in a concise manner, the “Sustainable Livelihood Framework” by the Department for International Development (DFID) was chosen. This tool was established to define key elements which are important for a community's livelihoods: the human, natural, financial, social and physical capitals. A detailed description of the concept of the framework can be found in appendix II.

2.2 Natural science methods

2.2.1 Global Positioning System

During the field stay, GPS was used to collect coordinates from points which were relevant for the research in order to identify the location on available maps. This allowed designing maps which indicate distances and location of points. This was especially used for the natural resource methods. The GPS could just be used in limited ways to create detailed maps as no high resolution maps of the area are available.

2.2.2 Forest resource assessment

The forest is used by villagers as a source of collection of timber and non-timber forest products (NTFP), such as edible and medicinal plants. To get an understanding of the value of this resource, an assessment of the forest condition was conducted. A 20x20m plot was measured in old secondary forest surrounding the village (Figure 2.1), with the coordinates (N 01°04`43.2; E 110°19`56.0). The plot was selected on a walk with a NTFP collector from the village, selected through a questionnaire survey. A resource person from the University of Malaysia-Sarawak (UNIMAS) agreed with the collector that it was representative of plots used by villagers.

Figure 2.1This map represents where the forest assessment took place

Using measuring tapes and a compass the plot was laid out and marked with string. Within this plot, diameter at breast height (DBH), height and species composition were collected from trees with a DBH greater than five. The forest resource person from UNIMAS identified these parameters. Data collected were used to calculate basal area for each species and to make a diagram of diameter class distribution.

Only one plot was assessed as the procedure is time consuming. Generalizations are thus difficult. However, this assessment was done during a walk with a forest collector, and therefore it can be seen as a sample from a forest area where collection of products takes place. Using this method also makes one rely on a specialized forest resource person to identify all species. Information provided by the guide was triangulated with an interview with a female NTFP collector for data reliability. Assessments of more forest plots and discussions with other collectors would have strengthened this assessment.

2.2.3 Water sampling

The river water is used for drinking and household purposes. Poor water quality could thus affect villagers' health and therefore be a vulnerability factor. Contamination levels were tested according to Interim Water Quality Standards (INWQS). Water quality of both tap and river water was tested to control water quality. Parameters tested are salinity, dissolved oxygen, pH, turbidity, faecal coliform, total coliform counts, phosphorus and ammonia. Water samples were collected from four different locations: three samples from Kayan Mawang and one from tap water (Figure 2.2).

Figure 2.2: The photo (left) shows locations of water sampling: upstream (N 01°03`49.0; E 110°20`39.7), midstream (N 01°03`58.7; E 110°20`45.8), and downstream (N 01°03`57.0; E 110°20`53.7).Photo (right) shows the SONDE and water sampler in action.

In-situ, water temperature, pH, dissolved oxygen (DO) and salinity were analyzed using the multi-parameter water quality SONDE model YSI 6820. In addition, concentration of ammonia (NH_3) and phosphate (PO_3^{-4}), total coliform count (TCC) and faecal colifom count (FCC) were measured in the laboratory. A description of the exact methods used can be found in Appendix III**.**

Gathering samples from different seasons would have accounted for yearly variations in land use and agricultural practices that could affect water contamination. These data are not a comprehensive overview of water quality for the whole year.

2.2.4 Soil Sampling

The hypothesis was that agriculture moves towards increased cash cropping. Soil analyses were conducted to see what differences exist in soil fertility between land uses.
Soil samples were taken from three different field uses: upland rice, rubber and secondary forest (Figure 2.3). To ensure that the parent soil types were similar, an area with all three land uses within close proximity were chosen. Slopes within each plot were calculated with an inclinometer. Slope degrees averaged at 30˚, varying from 19˚ to 46˚. See appendix V for slopes and coordinates for each sample.

Figure 2.3 The photo (left) shows locations of soil sampling: one upland rice, one rubber and one secondary forest plot.Photo (right) shows the rubber plantation from where one of the samples was taken.

Using an auger, samples were taken from the top soil (0-10cm) and the sub soil (20-30cm). Three auger samples were taken within $1m^2$, for three plots in each land use type, and mixed to make one composite sample. This sampling method enabled statistical analyses to be conducted.

Due to time constraints only one profile map was established and discussions with soil scientist Dr. Mohd Effendi Wasli explained that profiles seen would be similar in all plots.

Soil samples were air dried and crushed and were tested for pH, aluminum, organic carbon and nitrogen. In soil labs at the University of Copenhagen, pH and fertility parameters were measured. For pH, soil samples were mixed with distilled water and pH of water was measured using a pH-meter. Aluminum levels were measured with a Colorimetric Aluminium Test kit, Merck. However,

the scale stopped at 60mg/kg and tropical soils often have higher values then this. Results are thus not precise. Organic carbon and nitrogen were tested using a mass spectrometer.

Comparisons between the data were calculated with the statistical program R using variance analysis (ANOVA) with a confidence interval of 95%.

Finding sites with better established crops could have allowed for more substantial conclusions about soil fertility with different land use types. However, this was not the case as the rubber field was only two years old. Pepper is not included in the analysis because fertilizers were applied to the fields and measurement could reflect fertilizer input not soil quality. Finally, the study focused only on soils in one area of the villagers' lands, and is therefore not representative of all soils in the area. This is because different soils present were not identified until late in the field stay.

Figure 2.4 Photos from the individual location. Top: rubber field, bottom left: the secondary forest – note the bamboos, indicating that the forest is relatively young, bottom right: the rice field – note the land slide in the background, indicating erosion

2.3 Social science methods

2.3.1 Participatory Rural Appraisal tools

The PRA methods used were based on the practical guidelines and theories on participatory research explained by Pretty *et al*. (1995).

2.3.2 Timeline

A village timeline was conducted to gain knowledge on the village history regarding location, agricultural practices, infrastructural development and unexpected events that altered village life. The participants were asked to discuss such events on their implication. This was useful to understand stages the village and livelihood strategies had gone through. A group of older villagers (3 women & 5 men) were discussing as they had experienced most of the changes.

The data which were obtained are valid as the participants discussed information that was important for the village and additional questions revealed the importance for them specifically. Due to the discussion and a mixed gender group, the data about the past seem to be reliable. The method worked well as all participants would engage in the discussion and that the student group learned about the village history.

2.3.3 Focus group

Two focus group discussions with women and one with rubber farmers were conducted.
The women focus group provided information about cultural traditions, education, agricultural practices and the future of agriculture regarding the young people. The information helped to understand the women's perception of lifestyle changes on the above mentioned topics.
The focus group with 5 rubber farmers aimed to gain information on land uses and tenure, to understand the importance of rubber for income generation and the exchange with the extension service.

The method worked well to gather many villagers' opinions, even though the number of participants was difficult to facilitate.

The women focus groups were attended by many women and they were encouraged to participate which makes the data more reliable. However, outspoken villagers would take over the discussion, which could influence the opinion of others. The discussion topics also covered topics other than small scale agriculture which provided extra information about the village. This was however not always useful regarding the research objective. To triangulate some points (education, young people) a separate male focus group could have been an alternative to avoid a gender biased view.

Figure 2.5. Participants of the natural resource map activities.

2.3.4 Natural Resource Map

Two natural resource maps were done to get an overview of the participants' perception of the local environment regarding important landmarks, boundaries which define the village land, crops which are important for the livelihood, soil quality and infrastructure such as roads and water supply. The aim was to understand the resources available for the villagers and how they use them.

The natural resource maps were drawn in two separate sessions by a group of younger villagers (mixed gender) and a group of older male villagers. The two groups use natural resources in a different way but still depicted similar information. The group of older men who worked on the

map were mainly members of the village council, but no older women were present to verify or add details to the map which were important for female villagers.

The first resource map was drawn after a short preparation period by the students, which influenced the quality of the details as no structured questions were set up. However, after conducting the second resource map the data from both maps show reliability as they indicate similarities in the above mentioned key points.

2.3.5 Seasonal Calendar

The objective of the seasonal calendar session was to learn from the villagers about their farming practices which support their livelihood. Upland rice, pepper and rubber were identified by the students as the most important crops. Three groups of mixed gender were split up to gain data on all relevant processes in the cropping cycle. The data from the seasonal calendar are used to understand, farming practices, an indication of time and if man or woman are responsible. With this information a relation between availability of labour and its affect on farming practices could be drawn.

The session was challenging as rubber as a perennial crop was not triggering a discussion on practices and instead a focus group discussion was conducted on rubber and land tenure instead. Men actively participated in the making of the rice calendar whereas women had to be encouraged to share their opinions. It was important as men forgot some processing steps. This showed that it was essential to include both men and women in the PRA exercises. In general, many people wanted to participate, which made it harder to facilitate the process and encourage everybody to share their view. Outspoken villagers were taking over the process which could cover some information of other villagers.

The data obtained from the seasonal calendar for rubber were less valid, as the session was not conducted in the same way as rice and pepper, but was conducted as a focus group discussion.

Data obtained were reliable as they were confirmed by group members after the session and participants had the chance to make additional comments.

2.3.6 Questionnaire

Sample Techniques

For the questionnaires, it was initially planned to sample at least 50% of the households in order for the results to statistically represent a significant amount of the village. Time allowed conducting 26 questionnaires out of 60 households, which represents 43% of the village.

Figure 2.6 Snapshot from a questionnaire session. Here one of the shop owners are being interviewed

The secretary of the headman provided a map of the village that had been drawn in 2009, which indicated all houses with numbers. A random and systematic sampling method was used by selecting houses with even numbers from the map. This ensured that every neighbourhood was represented. However, if some households were not available due to absence of the people, accidental sampling was used to survey the neighbour household. The questionnaire was conducted at different day times, to ensure that not only the head of the household was answering questions.

Questionnaire Format

Initially the questionnaire was developed in Denmark. As such, adjustments were made in order to synchronize with the Malaysian counterparts and to adjust to new information about the village. Two pilot tests were carried out before the questionnaire was finalized (see appendix IV).
As not all participants were able to read and write, the questionnaire was carried out as an interview. The interviewer would ask the interpreter to translate the questions and answers and after translation the students would write down the response. If a respondent had additional comments, open-ended questions were asked to supplement the questionnaire.

In the process it took time to build up similar understandings about how the data should be acquired and what data was relevant. This was leading to different ways of filling out the questionnaires and made standardization more difficult.

In general working through the translator made the questionnaire more time consuming than expected as common understanding took time to establish.

The questions posed in the questionnaires were valid to the research, but the way the data were obtained is lowering the validity and reliability as questions were asked differently by students and translators. In general the questionnaire was filled out in a different way, which makes it more difficult to extract the data in a concise manner, without changing the obtained data.

2.3.7 Semi Structured Interview

To gain information about the village structure, farming practices, land tenure and possible future development of the village, semi structured interviews (SSI) were conducted with eight key informants. The interview topics were selected to obtain in depth knowledge from one source, which seemed to be knowledgeable on the subject. During the preparation in Denmark the interview questions were prepared according to available information about the village. Nevertheless during the field time, more in depth questions were added specifically related to farming practices and land tenure.

In addition to the planned interviews, a group discussion with the Sub district officer in Tebedu and an agricultural extension officer was conducted. These group discussions gave room to ask questions regarding agricultural extension, rural development, education and land tenure. These data were useful to compare villager's opinion and government opinion, to identify discrepancies or similarities. During the interview the key informant was often accompanied by other persons, which added information but could also have steered the direction of the answer.

The information acquired during the SSI is valid for the research, as relevant topics could be covered in depth with the interviewee. However the subjectivity of the interviewee makes the data personally biased and triangulation on topics helped to verify the data.

3. Results and discussion

First of all, the results of the water, soil and forest assessment are presented and discussed in relation to environmental degradation. Subsequently the main findings on livelihoods in Sejijak Mawang are presented and discussed. The section is organized into diversification of income strategies, increased mobility and social changes.

3.1 Natural resources

Environmental degradation is one propelling force that contributes to changing agricultural practices in rural areas (Rigg 2006). In this study, the river, soils and forest are more closely studied in order to assess the state of these resources. Degradation of the natural resource can affect the sustainability of small scale farming in Sejijak Mawang.

3.1.1 Resource maps

Two resource maps were made by different groups of villagers of different ages and then compared (figure 3.1). The following is a description of the distribution of soil, forest and water resources along with the different crop fields to get an overview of the available natural resources.

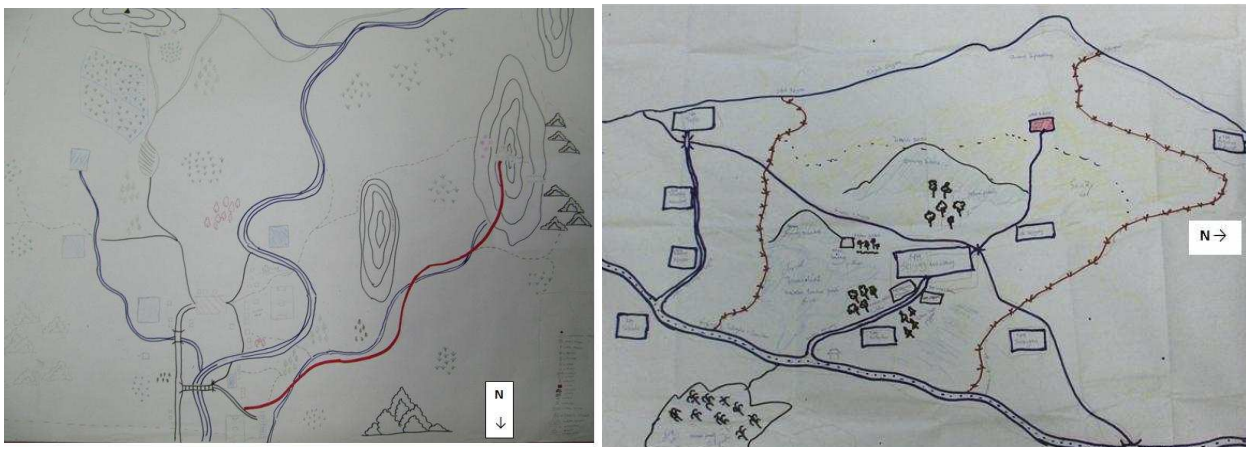

Figure 3.1. Resource maps drawn by (left) a group of young people and (right) a group of older people.

The area west of the village is dominated by sandy soil, while east of the village, the dominant soil is clay. Two mountains close to the village Terenak and Sibaie have fertile soils. The larger

Sipedang Mountain has fertile soil at its foot and less fertile sandy soil at the top. Soil close to the Kayan Mawang river is considered fertile. While, mountain soils are mostly used for cash crops like rubber and pepper, these cash crops are also planted in clay soil areas. When cocoa was grown here, it was planted near the river as it is very nutrient demanding. Upland rice is grown both on sandy and clay soils throughout the area.

Kayan Mawang surrounds the village and fish ponds are located along one of its ramifications. The village has a water pipeline coming from Mt. Sipedang, supplying tap water to villagers 9 months a year. The top of Sipedang is dominated by primary forest while secondary forest is located both close to the village and at Sipedang's foot.

3.1.2 Water

Under the Interim Water Quality Standard (INWQS), Malaysian rivers are categorised into six classes. These classes and their different standards are shown in the following table for each tested parameter, along with results of water samples taken for this study (table 3.1).

Our results						**INWQS classes**					
Tests	**Unit**	**Upstream**	**Midstream**	**Downstream**	**Tap water**	**I**	**IIA**	**IIB**	**III**	**IV**	**V**
Temperature	(°C)	24.39	24.42	24.53	24.34	normal	normal	normal	normal	normal	normal
Salinity	°/₀₀	0.04	0.04	0.04	0.03	< 0.5	< 1	-	-	-	-
Dissolved oxygen (DO)	mg/l	8.74	9.55	8.50	8.66	> 7	5 - 7	5 - 7	3 - 5	< 3	< 1
pH	-	6.72	6.91	7.00	6.99	6.5-8.5	6.5 - 9.5	6 - 9	5 - 9	5 - 9	-
Turbidity	NTU	0.77	0.90	0.77	1.0	< 5	< 50	< 50	< 50	< 50	< 50
Faecal Coliform	counts/100ml	1200	1300	1380	144	< 10	< 100	< 400	< 5000	< 5000	-
Total coliform counts	counts/100ml	4960	4800	5600	472	< 100	< 5000	< 50000	< 50000	< 50000	> 50000
Nutrient P	mg/l	0.11	0.05	0.04	0.08	< 0.1	0.1-0.2	< 0.1	-	-	-
Nutrient NH3	mg/l	0.30	0.038	0.094	0.01	< 0.1	< 0.3	< 0.3	< 0.9	< 2.7	> 2

Table 3.1. Water sampling results compared to the standards of the Interim Water Quality Standard (INWQS). Each water sample result is coloured according its class in the INWQS.

Results show that, in general, nutrient levels are low. However, a slightly higher nutrient content is detected from the upstream river sample, which could be a result of seepage of fertilizers from

agricultural practices. In addition, there is a normal level of dissolved oxygen (>7) which indicates a good balance between aerobic and anaerobic processes. For all samples, the pH level is neutral and placed within class I standards and turbidity measurements show the water is clear.

Figure 3.2 The photo shows the water pipeline over the river flowing through Sejijak Mawang

The faecal coliform count (FCC) is very high for all river samples, compared to acceptable standards. All river samples are thus class III. This means that water must undergo extensive treatment before use. The treatment methods are not elaborated in the guidelines for this class but are supposedly dependent on the type of pollution (table 3.2). For the tap water, FCC levels correspond to class IIB, defined as water that can be used recreationally with body contact. The following table shows the classification of each water sample.

Table 3.2. Classification and guidelines of the water samples according to the INWQS (DID, 2011)

Sample	**Class**
Upstream	III For water supply - extensive treatment required
Midstream	III For water supply - extensive treatment required
Downstream	III For water supply - extensive treatment required
Tap water	IIB Recreational use with body contact

Faecal coliform bacteria are the biggest problem regarding water quality. Direct discharge of waste from animals or human waste could account for these high numbers. It was observed in the village that livestock were often placed above or in proximity to open sewage channels. As such, urea and faeces flowed directly into the river. This could be for convenience sake, as channels provide easy evacuation of waste from near the houses.

According to several villagers the pipeline dries out for three months a year during the dry season. This means that the river is the only source of water during this period and water must therefore be fetched from the river and boiled during this time. Depending on the river water in some months of the year makes the villagers more vulnerable to water pollution. Analyses of samples showed that treatment is required, not just of river water, but also, to a lesser extent, of tap water. As such, the water is a vulnerability factor for the villagers' health.

3.1.3 Soils

Soil quality also affects agriculture.When soil samples were taken it was observed that the soil contained high levels of clay and that the topsoil was darker than the subsoil. This was confirmed by digging a soil profile. Differences in color are due to higher contents of soil organic matter (SOM) in the topsoil (Borggaard, 2007). According to Dr. Mohd Effendi Wasli, soil scientist from UNIMAS, these soils can be characterized as red yellow podzolic, also known as ultisols by the US soil taxonomy classification system. Red yellow podzolic soils are typical of the rolling hills of West Sarawak and these soils show an increase in clay content with depth (Andriesse, 1972; de Neergaard, 2008). As such, sampled soils are typical of the region.

Figure 3.3 Photo illustrates the color difference between top and sub soil, indicating differences in SOM. The top soil is approximately 7 cm.

Soils were tested for different parameters that indicate fertility. The results from the laboratory analysis can be seen in table 3.3. Appendix V shows the soil analysis result by plot. Table 3.3 shows only the average of these results.

Table 3.3: Soil sample results, with standard deviation for pH, Al, OC%, N% and C/N-ratio are shown in the table.

	pH (H_2O)	Al (mg/kg soil)	OC%	N%	C/N-ratio
Rice					
Top soil (0-10 cm)	4.56±0,29	≥60	3.488±0,75	0.248±0,03	13.94±1,49
Sub soil (20-30 cm)	4.78±0,06	≥60	2.042±0,13	0.169±0,02	12.12±0,46
Rubber					
Top soil (0-10 cm)	4.55±0,15	≥60	3.312±0,34	0.242±0,01	13.70±1,26
Sub soil (20-30 cm)	4.78±0,09	≥60	1.835±0,16	0.150±0,02	12.34±1,09
Secondary forest					
Top soil (0-10)	4.62±0,18	≥60	3.351±0,61	0.246±0,03	13.61±1,49
Sub soil (20-30)	4.66±0,48	≥60	2.029±0,49	0.149±0,02	13.43±1,19

For each plot, the two soil depths were compared to see if there were any differences in the measurements of pH, OC%, N%, C/N-ratio and Al. Results indicated that aluminum content was above 60mg/kg but variations would not be measureable with the instrument used. Through the ANOVA analysis, a significant difference in pH, N%, OC% and C/N-ratio between the two soil layers ($p<0.01$) was found.

However, no differences among these parameters were found between uphill rice, rubber and secondary forest plots. It was similarly found that soil organic carbon concentrations were the same in an upland rice plot and a forest plot, in accordance with de Neergaard *et al.* (2008).

The overall findings of the soil analyses indicate that crop type does not affect the soil, but horizon depth does. However, samples were done in fields that were still not very well established and nutrient differences in soils may have been observed if crops had been established for longer. This is especially relevant since it was observed that rubber plantations have high levels of litter which could affect nutrient content of the soil.

Table 3.4 shows the fertility parameter requirements of rubber. Placed within these values, the soils tested are in the "moderate" category. Fertility of this soil is currently relatively good.

Table 3.4. Soil fertility status in relation to requirements for rubber and measured values from the rubber field. Numbers in grey indicate ranges that can relate to a characteristic of the soil fertility, whereas values in color are measured values. As can be seen according to the pH measurements and total N% the soil is moderate fertile, whereas the Organic C% level is corresponds to the "high" fertility status. Compared measurements from source: AARb, 2011.

	pH	pH measured		Organic C %	Organic C % measured		Total N %	Total N % measured	
		Top soil	Subsoil		Top soil	Subsoil		Top soil	Subsoil
Very high	> 6.5	4.55±0,15	4.78±0,09	> 4.0	3.312±0,34	1.835±0,16	> 0.40	0.242±0,01	0.150±0,02
High	5.5 - 6.5			2.5 - 4.0			0.26 - 0.40		
Moderate	4.0 - 5.5			1.5 - 2.5			0.11 - 0.25		
Low	3.6 - 4.9			0.5 - 1.5			0.05 - 0.10		
Very low	3.5			< 0.5			< 0.05		

All measured parameters are indicators of soil fertility and nutrition availability (Paramananthan, 2000). Soil samples showed that pH is less than five in all plots indicating that soils are slightly acidic. When pH decreases below five, exchangeable aluminum (Al^{3+}) levels increase which can be toxic if present in high levels for most plants (White, 2006 and Borggaard, 2007). As such, Al^{3+} levels could affect crops.

Organic matter can improve acidic soils because the organic fraction can bind dissolved Al^{3+} (Wong *et al.*, 1995). As such, adding organic matter to fields could improve soil fertility. Observations and discussions with farmers indicate that traditionally, farmers in Sejijak Mawang practiced shifting cultivation. When fallow areas are burned, plant biomass is transformed into plant available nutrients and ash that raises pH and increases soil fertility. This reduces soil acidity but also increases amounts of available nutrients (Moran, 1995). However, during the making of the rice seasonal calendar, farmers explained that shifting cultivation is practiced less then it used to be. This could lead towards a trend of decreasing natural fertility of soils. Contrary to this is the government's perception of customary agricultural techniques, such as shifting cultivation, is that it contributes to environmental destruction and should be replaced by plantations and permanent cropping schemes (Banerjee and Bojsen, 2005).

In addition, steep slopes are prone to erosion and high rainfall can cause leaching of nutrients (Porter, 1995). Erosion was observed near field sites and may thus also contribute to loss of nutrients in fields.

It is recommended that farmers with poor soils apply fertilizers to replace nutrients removed by crops (Myers *et al.,* 1995). As a result of intensification in the form of increased cash cropping, farmers might be more dependent on fertilizers. This would increase reliance on the government and outside factors, such as market price fluctuations.

3.1.4 Forest assessment

Figure 3.4 shows that there are a few old trees in the sampled plot. However, there are large gaps between their different diameter classes. This can be a sign of logging that occurred in the area from 1980 until 2001. A lot of younger trees, which could be pioneer species, dominate this plot.

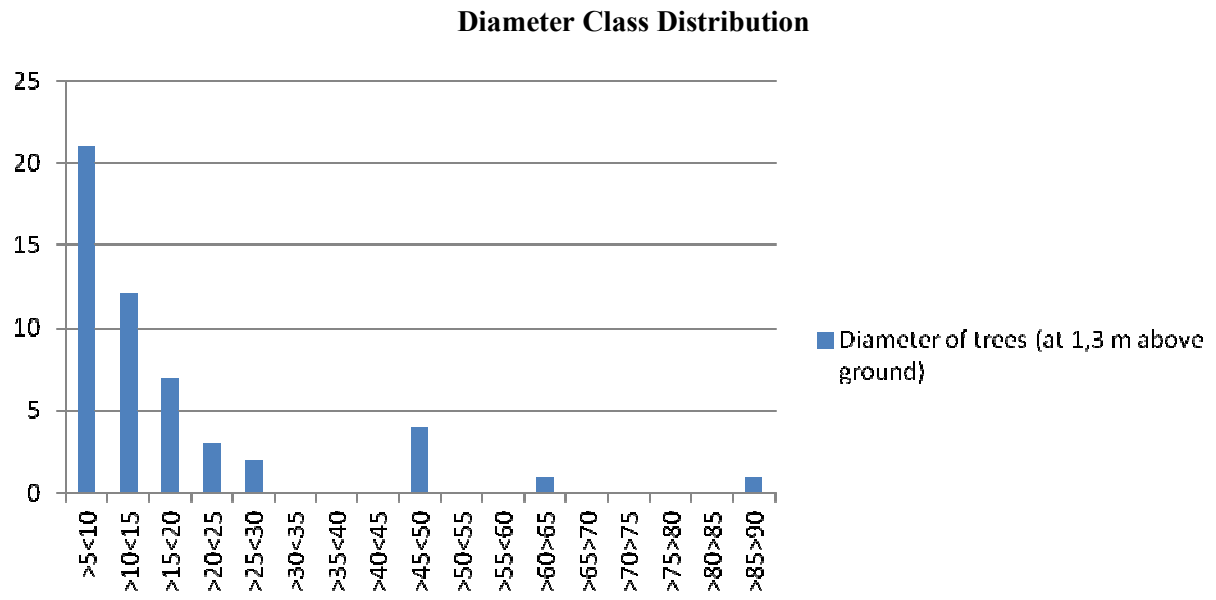

Figure 3.4. Graph representing diameter class distribution in a secondary forest plot

With regard to basal area of trees, *Elateriospermum tapos* clearly dominated with a basal area of 18 (m^2/ha). It was also the most frequent species, totalling 13 trees. After this species, *Artocarpus integer*, *Knema sp.* and *Palaquium* are most dominant regarding basal area. However, the NTFP collector explained that none of these trees are of great economic value as timber trees. This is the case for most trees assessed in the plot. However, there is one species that does have value for timber, *Driddalanops beccarii*. This is a heavy hardwood sold under the name Kapur (Smythies

1965). It only appears twice in the plot with diameters of 13,2 cm and 10,4 cm. These trees are still too small to be valuable as timber (For a full list of trees assessed refer to appendix VI).

The fact that no trees in the plot were of economic value emphasizes the fact that the forest is still recovering from major logging. Indeed, during the making of the timeline, villagers mentioned the year 1980 as an important year in village history because the government-supported logging led to soil erosion, land fragility and pollution of the river. Villagers explained that to this day, some plots of land are unusable as a result of the logging. In addition, they explained that though the economic value of timber trees is still not as high as it was before the logging, it could still increase as the forest recovers from the destruction.

However, some trees are of value for other uses. *Artocarpus integer*, *Elateriospermum tapos* and *Nephelium sp.* are all fruit trees used by the villagers, and one tree in the assessed plot was used for medicinal purposes. This shows that the forest is still valuable to villagers as long as knowledge of different uses of trees is still being transmitted to the village youth. In the interview with the NTFP collector, it was said that these traditions are still being passed on.

According to the questionnaire survey conducted in the village, 84 % of participants use the forest for different purposes. As such, forest collection is an important addition to the livelihood strategy of many Sejijak Mawang households. Collection of NTFP and logging are both activities that can contribute to income. Indeed, studies have shown that collection of forest products contribute to the alleviation of poverty of households (Reddy *et al*. 1999). Degradation of the forest could increase villagers' vulnerability.

3.1.5 Implications of findings

Findings suggest that water is contaminated, which can affect health. Logging has led to loss of timber and degradation of the forest, where villagers collect forest products. Soil quality affects cropping schemes and poor soils may require the application of fertilizers. As such, the

degradation of these natural resources may directly affect the future livelihoods of villagers. In fact, the degradation of the natural resource base may cause population pressure on the land or a diversification of income strategies (Mertz and Wadley 2005; Mertz *et. al.* 2005).

3.2 Trends of changes in Sejijak Mawang

3.2.1 Diversification of income

In Sejijak Mawang a twofold source of income strategy, which contributes to the financial assets, is found in 74% of the households. Some households have up to three or four income activities. The trend to diversify a household's income base is caused by societal trends that encourage acquiring consumer goods (Rigg, 1998; Reardon and Vosti, 1995). Studies have described diversification as a reaction to new opportunities due to improved infrastructure and market access (Windle, 2002; WDR, 2008). Most of the farmers in Sejijak Mawang still diversify their livelihood by subsistence and cash crop interaction but the research also showed that income diversification is based mainly on local opportunities through cash crops and construction work within the village (figure 3.5).

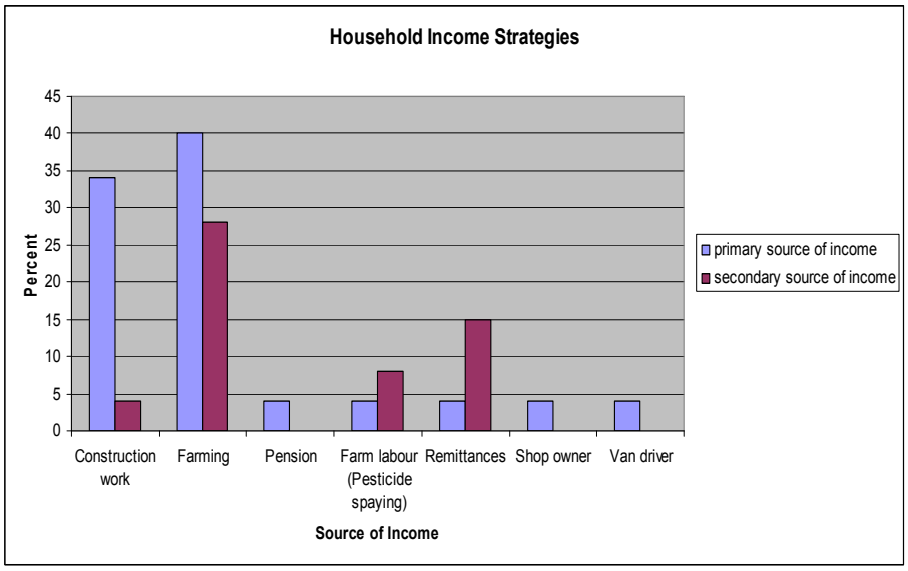

Figure 3.5: Percentage of households primary and secondary source of income within different occupations.

3.2.1.1 Pepper as cash crop

On a global level prices for pepper are relatively high and stable according to the International Pepper Community due to a high demand in western countries, which support a long term market (IPC Pepper Market Review October 2010). In Sejijak Mawang, farming is the primary source of

income and cultivation of pepper is done by 81 % of the households. At present pepper cultivation is a good source of income for the farmers because the government is subsidizing agricultural inputs and is the main customer for the end product. This gives the farmer a reliable large scale partner. The seasonal calendar for pepper showed that harvest is year round, dependent on when the vines are fertilized. Therefore, farmers rely on the subsidized fertilizers (See appendix VII).

3.2.1.2 Rubber as cash crop

A general high demand for natural rubber from the world market and increased prices has developed rubber into a reliable source of income for small scale farmers (Smit 2009).
During a semi structured interview with a rubber farmer it was stated that villagers were engaged in rubber farming in the past but the prices were too low and the farmers abandoned the rubber plantations for other crops. Rubber prices have increased from 2 MYR/Kg to 10-15 MYR/Kg in 2010-2011. This increase in price has encouraged farmers to return to rubber as a source of income. This statement supports Dove (1993) who described rubber as a very suitable "off-and-on" crop in times of low market prices.

Figure 3.6 Rubber processing

In Sejijak Mawang, 57 % of the households have invested in small scale rubber schemes. So far only 23 % can generate income, while 34 % have to wait until the rubber trees are mature. In the 7 years growth stage the labour input is lower. The engagement of a large amount of households in rubber plantations therefore indicates that cash income is wanted by the farmers and that market incentives are influencing the behaviour of farmers. Rubber can be tapped all year round and can also be harvested even after left for a long time with little maintenance (Wadley *et al*. 2005). The

farmer stated that during the renewal in the establishment of rubber plantations, farmers have planted more systematically which has led to a more efficient way of working.

Figure 3.7 The photo illustrates the diversified income strategies some farmers take up in Sejijak Mawang. This farmer was also van driver and shop keeper at the same time. At the picture he is feeding the fish in his fish pond. In the background is his newly established rubber plantation (right) and pineapple plantation seen.

3.2.1.3 Subsistence farming

All households in Sejijak Mawang grow upland rice as a subsistence crop. It is grown traditionally without any mechanized techniques and is therefore labour intensive. Rice cultivation requires high levels of manpower which means that people cannot invest their time in other cash generating activities. However, rice provides a “cash-free” source of food which is central to the diet of local people. The production of rice has been described as a buffer crop which is cultivated to outbalance price changes in cash crop production (Wadley and Mertz, 2005) and thereby creates resilience against shocks.

Farmers intercrop vegetables in the rice, rubber and pepper fields. Furthermore vegetables, fruits and spices are grown in the home gardens, vegetables, fruits, fish are collected from the forest and river, and poultry is domesticated. The labour work is invested in providing the household with additional food, which contains nutritional supplement that is important for the villager’s diet.

Non-timber forest products, which can be generated into small scale income to households, are also found. For example, rattan is collected for basket weaving and bamboo is collected for simple construction work. Both are not assigned any economic cost regarding the purchase of raw materials, beside the time spent on their cultivation or collection (Godoy *et al.,* 1993).
A threat to the widely available free and often common goods could come under stress by outside interventions in the form of logging, mining and infrastructural changes. These scenarios would increase the financial vulnerability of villagers (Rigg, 1998; Hardin, 1968). The NTFP collector stated in an interview that depletion of resources after logging activities have happened and that she had to spend more time to find certain species.

3.2.1.4 Reliance on Subsidies

Farmers stated the importance of government input subsidies such as fertilizers and pesticides, for their cash crop schemes. To the farmers, costs for inputs are not a significant investment; unlike what studies about agriculture conventionally list as a main cost (Ashley and Maxwell 2001). The inputs allow farmers to grow their crops on less fertile soil and still harvest adequate yields. Conversely, the practice of subsidizing inputs against market mechanisms by the government increases the dependency on the government to sustain production levels. Both the agricultural extension officer and farmers in the village mentioned this fact. When asked, farmers said that if there was a reduction of input allocations by the government, they would purchase fertilizers themselves if they had enough savings.

Figure 3.8 Fertilizer for pepper in front of a house in the village.

3.2.1.5 Remittances

Remittances as a source of income are mainly secondary but occur in 16 % of the households. The localization of Sejijak Mawang close to the road could have an influence on the movement of people to other jobs opportunities as described by Windle and Cramb (1997). In Sejijak Mawang, remittances are mainly an addition to the farming income and for some families one of many sources of income. They contribute to strengthening the sustainability of households (Rigg, 2006). In general, jobs taken by migrants are diverse and range from government agencies (e.g. teacher, police, army), to sales assistants and construction work.

3.2.1.6 Examples of income strategies

In rural areas in South East Asia, the households can be split up intro three classes of households in the form of rich, middle income and poor, regarding to income diversification of on farming and off farming activities. In general households with a diverse income strategy are better off and have established security against bad cropping seasons or times with no off farm work (Rigg, 1998; Rigg, 2006).

For this research, no clear definition on identifying rich and poor households were set up, however, based on the questionnaires and observations it was found that households with a diverse income strategy in general were better off. In table 3.5, three examples of households are presented with their strategies to generate income, the natural assets they possess and their family structure.

The first household has a relatively diverse income source. It consists of elderly people living from pension and remittances sent by their six migrated children, who have jobs at government agencies. They have few farming activities, a home garden and a large amount of poultry, compared with the other villagers. The second household has a very diverse income strategy through cash crops and construction. No poultry is domesticated but this household has a home garden, collects NTFP and uses the river for fishing. The household only consists of two adults and two children who are still attending school.

The last household represented only has one income source, construction, but also has a rice field where they hired people to work, a home garden, few poultry and collected NTFPs. It is a couple with just one child, attending primary school. The last household has a relatively high income but through just one income source, meaning they are more vulnerable to external changes. The presented households in general correlate to the trends presented about income diversification (Ashley and Maxwell, 2001; Mertz and Christensen, 1997; Mertz *et al*. 2005).

Table 3.5: Three different household income strategies.

Household	Example 1	Example 2	Example 3
Income sources	1. Pensions 2. Remittance 3. Farming	1. Pepper 2. Rubber 3. Construction	1. Construction
Assets	Home garden Forest products 50 chickens, 5 ducks	Home garden Forest products Fishing	Home garden Forest products 3 ducks, 5 chickens
Family structure	6 children migrated and working for govt. agencies	One child attending secondary school One child attending primary school	One child attending secondary school One child attending primary school

The accumulation of cash income allows farmers to invest in further agricultural expansion or in consumer goods. Villagers who have worked for the state (e.g. army and police) seem to be "well-off" compared to other villagers, who are just engaged in farming. This group was investing in off farm activities such as van driving services, bird nest breeding and little grocery shops. From a sustainable livelihood perspective the diversification into more capital intensive activities, lowers the reliance on agriculture and natural assets and can also offer job opportunities (e.g. wage farm labour, assistance in businesses). However, these future development job opportunities are on a more hypothetical level and were not further assessed. Villagers engaged in agriculture often relied on construction work, but the income diversification was less pronounced and was mainly based on the current profit provided through cash crops.

3.2.1.7 Agricultural innovations?

Through the questionnaire, it was found that no household used any large farm animals that contribute to farming practices which makes agricultural expansion difficult because there are no techniques in place to assist farm work. This would be especially useful as migration leads to less available farm labour. The villagers also do not use any kind of mechanized tools to work in the fields, which further contributes to dependency on labour availability which leads to low work productivity (Løvenbalk *et al.* 2003, Wadley *et al*. 2005).

The secretary of the headman stated that some farmers would be open to new cropping schemes and crops, but they need help from the government to implement these ideas. A village with a high emigration rate, such as Sejijak Mawang, benefits from a crop that can be kept with relatively little maintenance time or by utilizing the full potential of crops such as rubber trees for its rubber seeds and rubber wood for further income generation (Eka *et al*. 2010).

3.2.1.8 Land and financial opportunities

Farmers of Sejijak Mawang explained that land is their most valuable asset because farming is the main income generating activity. However, with regard to financial assets, land owned by villagers under Native Customary Rights (NCR) status, presents several challenges. Idle land and land that is under the status of NCR is of interest to the government who wants to persuade villagers to sell their land to government agencies such as SALCRA to carry out their goals of large scale agriculture and economic productivity of land (Cramb and Willis, 1990). The headman explained that for Sejijak Mawang, the villagers' engagement into oil palm ventures in the 1990s have not been beneficial as the dividend has still not been paid due to unsettled disputes between villagers' over how to distribute the dividend. As a result, villagers are now very reluctant to invest in oil palms.

Within the village, there have been discussions as to whether or not it is beneficial to apply for land titles which certify land for individual households. Today, the status of NCR land represents protection, as land boundaries are agreed upon in the community and between neighbours. On

the basis of land titles, individual households can decide how best to utilize their land (e.g. fallow, cultivation, selling) without consulting outside sources. However, this also means that just one household member could sell the land, which would then be lost as an economic buffer for the whole household if they wanted to return to agriculture (Li, 2009).

3.2.2 Increased mobility

While the extent to which mobility is increasing is a trend difficult to identify, studies have found that livelihoods are increasingly mobile and that people generate their incomes from multiple locations (Rigg, 2006).

3.2.2.1 Outflow of people in Sejijak Mawang

Two population pyramids were established to understand trends in people flows. Figure 3.6a shows all individuals listed by household, while figure 3.6b shows only individuals still residing in Sejijak Mawang. Comparisons between these pyramids shows high emigration rates for the 10 to 35 age range for both genders, meaning that there are only few children and young adults present. From the questionnaire, these rates can be linked to both educational and work-related reasons. Villagers explained that the road linking Sejijak Mawang to the main road was constructed in 1964 and has created easier access to Tebedu or Serian, and thus to outside markets, schools and other services. Indeed, easier access to urban centres allows for relocation of income opportunities but also access to schools (Windle and Cramb, 1997). The principal of local school SK-Sejijak explained that children must move to Serian or Tebedu in order to continue their education at a higher level.

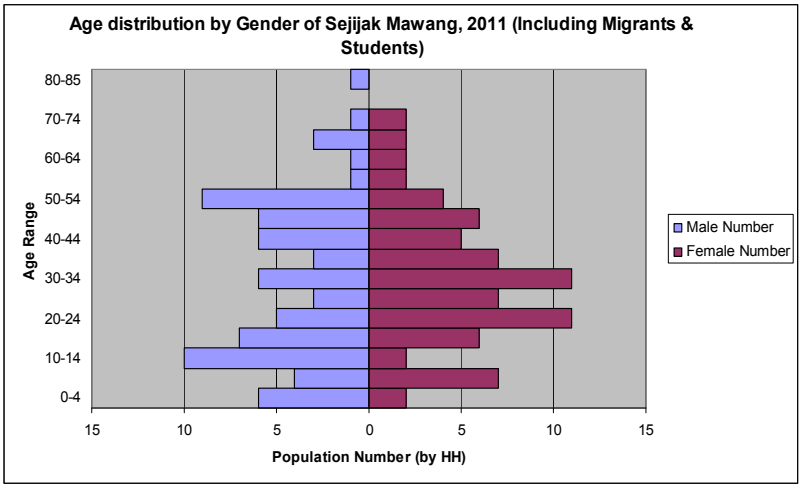

Figure 3.6a Population pyramids of age distribution by gender of all individual of Sejijak Mawang

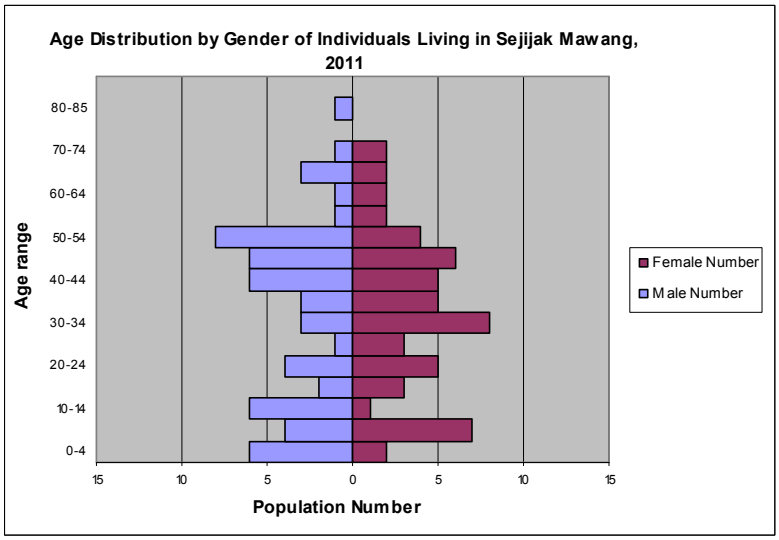

Figure 3.6b Population pyramids of age distribution by gender of individuals living in Sejijak Mawang (excluding migrants and students)

3.2.2.2 Labour availability for farming

Among interviewed households, over 70% have at least one member who has migrated. This is reducing the labour availability for farming. This point was stressed by key informant Ahyen (23 years) who stated that farmers do not cultivate more land than they can harvest. As such, the steady outflow of youth in Sejijak Mawang is a major cause of lack of labour availability and thus reduces the income related to agricultural outputs. In fact, studies have found a significant positive correlation between the available labour force in a household and the number of pepper vines grown by this same household (Wadley *et al*. 2005). As such, lack of labour availability due to

migration can affect the agricultural output of a household as land becomes underutilized or idle (UN Report, 1995). One household specifically explained that they are not able to tap their rubber fields for lack of workforce.

Figure 3.7: Rice and rubber farmer at work.

3.2.2.3 Returning to the village?

Even though there is emigration of youth from the village, the population pyramid shows an increase in population in the village after age 35. This return is especially noticeable in men, so it seems possible that initially, more men then women had migrated away from the village and were then returning. Typically, women return to the village when they are having children because they want help and support from families (Sim, 2001). Men, however, can immigrate back later in their lives. This return of workforce means that farms are kept active because people are returning and can work land. Indeed, women interviewed during the focus group explained that while youth may be uninterested in agriculture for now, they would undoubtedly work in farms later in life. While this was stated by both older women and the youth themselves, it is very likely that they have different perceptions of a return to the village. While the elders are hoping that their children return to overtake the land, the option of a return was echoed more reluctantly by the youth. It might also be that the elder and youth have a different timeframe for the return, saying the elder want their children to return after a couple of years, whereas the youth plan to return by the time they will retire.

While the returning workforce implies that farms will be kept active, it seems also that the labour will be unqualified as they will have to learn all the farming skills with which they would usually be

brought up. The older women in Sejijak Mawang explained that some agricultural techniques are not handed over to the younger generation, such as certain shifting cultivation practices or tree pruning techniques. Besides less transfer of knowledge, migration means that livelihoods are less linked to the land because people are increasingly mobile. To some extent, this is also linked to people generating their income from non-farming activities. Youth going into non-farm activities but possibly returning to farming later in life are both processes that increase the age of people engaged in farming. This trend of people flows in Sejijak Mawang is supported by Rigg (2006).

Increased mobility of youth and the rising age of farmers have created a generational gap that is inducing social changes in Sejijak Mawang. Social changes in relation to rural livelihoods are discussed further in next section.

3.2.3 Social and cultural change

Social and cultural changes, specifically generational gaps and changing education levels, affect livelihood strategies (Rigg, 2006; Li, 2009).

3.2.3.1 Generational gap

In a rural village like Sejijak Mawang, knowledge is gained in two ways: through formal education and with older villagers members passing on local knowledge to younger members (Seymour 1974). Passing on this knowledge enables younger generations to continue using some customary techniques, such as natural resources collection. The NTFP forest collector explained that youth was still being taught about the use of NTFPs. Indeed, during the forest walk, the young people were aware of traditional uses of many plants.

However, formal education is low in Sejijak Mawang, even if it is the law in Malaysia that children attend school. Official numbers distributed by the sub district officer state that in 2010, 27 students graduated form 5 (SPM) but only 6 graduate form 6 (STPM). There were no graduates

with higher level degrees. Other villages in the district have similar records of SPM and STPM graduates but the level of higher education degrees is low (official records, 2010).

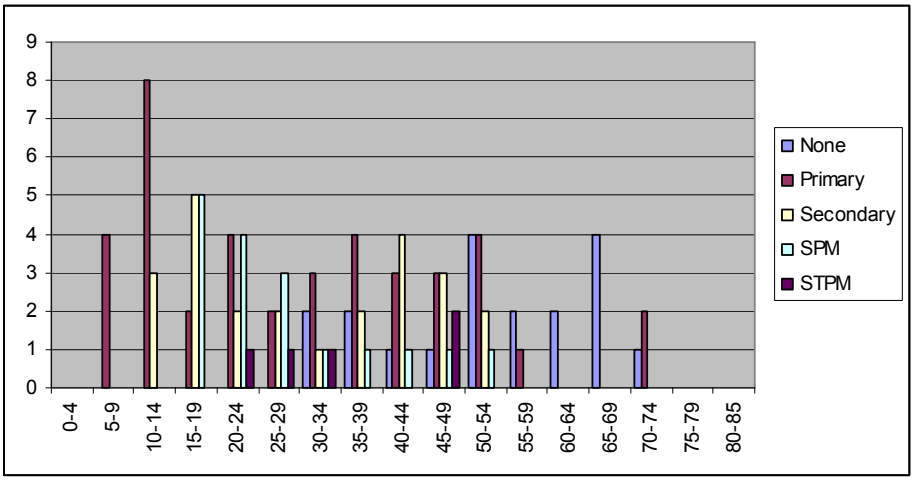

Figure 3.7. Level of education by age classes among villagers of Sejijak Mawang. The different shadings refer to different levels of education as indicated by the legend.

As previously discussed, migration plays a significant role in the village. Parents migrate or mothers that stay in the village take over men's workloads, which changes household social dynamics (Lipton, 1980, UN Report, 1995). This results in children being raised by grandparents who have hardly any education. As proposed by the principal this might be a reason for the low umber of students because the grandparents will not encourage school attendance because they do not see it as important. Figure 3.7 shows that the overall education level of villagers over 50 is classified as "none". However, until age 30, respondents have at least a primary school level of education. This is consistent with other studies in Sarawak that have found that younger populations tend to be more educated then older, resident populations (Hansen *et al.* 2006).

3.2.3.2 The role of agriculture in the future

With regard to agriculture, problems of low education levels are twofold. On the one hand, different interviewees did confirm that farming knowledge is passed from the older to the younger generation. If children are away, this whole learning process is put on hold which can threaten the sustainability of small scale agriculture. On the other hand, as the principal pointed out, better education levels could lead to students enrolling in agricultural schools and bringing new

innovations back to the village. Indeed, the secretary of the headman stated that in some farmers would be open for new cropping schemes and crops, but they would support from the outside.

There is an agricultural extension office in Tebedu that could stimulate agricultural knowledge transfers. While the agricultural officer said that Sejijak Mawang receives regular agricultural support when needed, villagers did not confirm this statement when asked about it in a focus group. It seems that there is a lack of communication and trust between both parties on this topic. In fact, key informant Ahyen said that the village saw agricultural department officers less then once a year. Inconsistencies between what the government says and what was stated by villagers has been noted in other Malay villages as well and it is not clear if it is the Department of Agriculture (DoA) which is not able to reach the villagers, or the villagers who are not interested in the information the DoA is offering them (Løvenbalk *et al.* 2003). Indeed, given the ageing of the agricultural work force, it is possible that farmers in the village are not interested in working with the DoA to develop new cultivation techniques (Løvenbalk *et al.* 2003).

If children are going to school, but dropping out or not going to agricultural institutions, and in addition, agricultural support is not being provided by the government, small scale agriculture is threatened from all sides: children are not learning about farming at home or at universities and older villagers are not learning about new farming techniques from youth that studied agriculture or from supporting outside agencies.

3.2.3.3 Changes in the perception of agriculture as an occupation

Observations showed that many villagers have access to information about different lifestyles and outside networks through television and mobile phones. Exposure to the outside world alters the way rural people think about farming, work and their futures (Rigg, 2006). In an informal interview, one girl confirmed this statement saying that youth is unwilling to work in agriculture because influences of mass media had made them dream about moving to cities. When asked, youngsters said they dreamed of being pop singers and football players. This is echoed by Rigg (2006) who found that farming has become a low status occupation.

During the field stay, it was observed that many of the young people were not participating in farming, even though it was the rice harvest time. They preferred staying up late and sleeping until noon. Expectedly other villagers were expressing dissatisfaction with this fact. When asking different villagers why the youth were not participating in the farming the general answer was that they are lazy and afraid of the sun. This statement was repeated by the young key informant Ahyen. As such, even the available work force left in the village is unmotivated to work.

4. Conclusion

The study attempted to assess the livelihood strategies of the villagers of Sejijak Mawang, focusing specifically on small scale agriculture. As stated in the introduction, the hypothesis is that villagers in Sejijak Mawang mainly rely on agriculture, although it is expected that the livelihoods are moving towards other income generating activities. Overall the findings confirm this hypothesis.

The assessment of the natural resource base led to the conclusion that the forest is degrading which lessens available free goods for the villagers. Soils around the village are acidic but fertilizer applications can maintain land fertility and are recommended to grow crops such as pepper. In the past, farming was mainly a subsistence occupation, in recent history, cash cropping has become increasingly common. Sources of income have diversified to include off-farm activities, such as construction, shop keeping and van driving. Remittances from migrated family members also contribute to income.

Results show that 70% of households count individuals, typically younger than 30 years, who migrated. This is for both work-related and educational reasons and decreasing available work force in farming activities, leads to an increasing average age of farmers. This might lead to lack of agricultural innovation, as older villagers may be reluctant to try out new farming techniques. In addition, farming does not seem to interest the younger generation. Indeed, several of the young people in Sejijak Mawang say they are dreaming of moving away from the village. This decreasing of labour availability is a vulnerability factor for small scale agriculture in the future.

The future livelihood strategies of Sejijak Mawang are difficult to assess. Villagers tend towards a diversification of income strategies, which makes it possible, among other factors, for them to gain financial independence from land as a fixed asset. This is especially important as the government exercises outside pressure on the villagers to sell their land to state agencies interested in large scale agriculture. In addition, while agricultural inputs are provided by the government, they do make villagers dependent on policy changes regarding subsidy allocations. Cultivation of cash crops makes villagers rely on global market fluctuations for cash crops. On the other hand, if the

observed trend that villagers are diversifying their income activities continues, they might be less vulnerable to these exterior forces.

As difficult as it is to assess future development in the village, patterns are visible and do support global trends in rural development (Rigg, 2006 and Ashley and Maxwell, 2001). Though livelihood strategies extend away from the village, there might still be future income opportunities in Sejijak Mawang.

5. Reflection "What did we learn"

5. 1 The time in the village

We had different expectations about the fieldwork and some were more focused on certain methods than others. Compromises and coordination were needed to meet each other's academic ambitions and personal working habits. Cooperation with the Malay counterparts was established only upon arrival, so time was needed to merge ideas. During the stay, cooperation strengthened and understanding increased, as we learned about group members - personally and professionally.

An important part of the study was social engagements through dinners, church visits and other activities through which trust and networks were build between villagers and students. However, social interactions detracted attention from the work, for instance transcribing or planning. Nevertheless, fieldwork would not be possible without social engagements.

It was also very easy to get personally engaged in villagers' lives, and to stay objective and professional was challenging. Staying open minded and not letting expectations colour our questions was difficult.

Being structured versus open-minded would have made space for more spontaneity during the fieldwork. This was important because unexpected information could change the direction of our project. Nevertheless, planning activities is crucial in order to steer activities in the desired direction.

5.2 Method reflections

Using translators influenced the way the group interacted with villagers, as language was a natural barrier. One of the translators could not speak Bidayuh, so villagers had to speak Malay which could influence how they expressed themselves.

The fact that both translators were male and one was from the local area could have influenced interactions. A few times we felt reservations from villagers if topics seemed sensitive. Situational and circumstantial factors could influence answers. Often, people gave different answers to the same question making us doubtful about the validity of the data. Triangulation of data through different sources made responses more verifiable. Specifically, the contradictory answers about SALCRA made us eager to find out more. We tried to investigate this issue further but it was beyond our scope and ended up not being a main part of our report. This showed the challenge of choosing relevant data among all available information.

Different views on how to translate and lack of communication with one of the translators, influenced the way data collection was carried out. We should have set up a clearer vision about how to carry out the field work. Sometimes there was no time to go through questions as thoroughly as we may have wanted. Also, before carrying out each social science method we should have taken the time to explain our underlying thoughts to the interpreters.

Using the DFID framework to structure our data was useful to arrange the information which we used in the report. However, for a period of time, we were very focused on structuring our data in accordance to the framework, which was actually a barrier for interpreting our data in an interesting way.

In general the social methods used were working well in the field and the willingness of the villagers to participate allowed us to collect useful data. However, sometimes we had not clarified what exactly data should be collected – this would sometimes result in less useful data.

Due to time constraints and because of our interests in issues related to livelihood strategies, very little time was left for natural science methods. This restricted the number of samples and replicates we took. Therefore, the validity of soil, water and the forest assessment results are weak but we saw it as a chance to learn about different methods.

Natural science methods were not that relevant from a validity point of view in this study, but were seen in the overall objective as a chance to learn about different methods and how they are organized and implemented.

From the beginning of our field stay, we decided to focus only on Sejijak Mawang and not the two sub-villages. This was due to the guidelines from UNIMAS. On the other hand possible differences and similarities would have been very interesting to investigate. This became even more true as time passed, as there apparently was a flow of people migrating from Sejijak Mawang to Sejijak Plaman and Sejijak Labaridu.

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Appendix I – List of methods applied

Participatory rural appraisal tool		
Method	Number of samples	Data obtained
Questionnaire	26	Information on household level about family structure, farming activities, land use, land tenure, use of NTFP and homegarden, ranking of time used and income gained for each activity.
Semi structured interview	11	Village structure, farming practices, land tenure and possible future development.
Focus group	3	From 2; general knowledge about traditions, education and agricultural practice. From 1; rubber as an income, land use, land tenure.
Timeline	1	Sejijak Mawangs history
Natural resource map	2	Overview of local environment; important landmarks, boundaries, important crops, forest, rivers, infrastructure and soil types.
Seasonal calendar	3	Rice, rubber and peppers cropping cycles. Information of soil preparation, planting, weeding, fertilizer application and harvest.
Other social science		
Method	Number of samples	Data obtained
Informal transect walk	2	1. Overview of Sejijak Mawang, 2. Overview of two neighbouring villages.
Informal interviews	>2	1. Duties of women, 2. Migrated persons story and view of Sejijak Mawangs future.
Observations		General understanding
Natural science		
Method	Number of samples	Data obtained
Soil sampling	9	Soil fertility test of three land uses. pH, Al^{3+}, OC%, N% and C/N-ratio were found in laboratory.
Water sampling	8 (+ 8 non-usable)	Water quality test of four different plots in the river. Chemical properties and bacterial pollution were found, partly in laboratory.
Forest assessment	1	20x20m plot in secondary forest assessed to find biodiversity, species, height and diameter of trees.
GPS		Collection of coordinates of relevant points, making maps to indicate points in relation to the village
Data analyses		
Method	Number of samples	Data obtained
DFID		Tool for analysing obtained data within the categories: human, natural, financial, social and physical capitals.
Statistics		Statistical significant and standard deviations were calculated in the two programmes R and excel.

Appendix II - Description of DFID framework

As defined in the DFID framework, "human capital represents the skills, knowledge, ability to labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives".

Social capital includes networks, formalised groups and trust relationships within the village context.

Natural capital includes natural resources used by villagers. This includes such elements as water, soils and the surrounding forest.

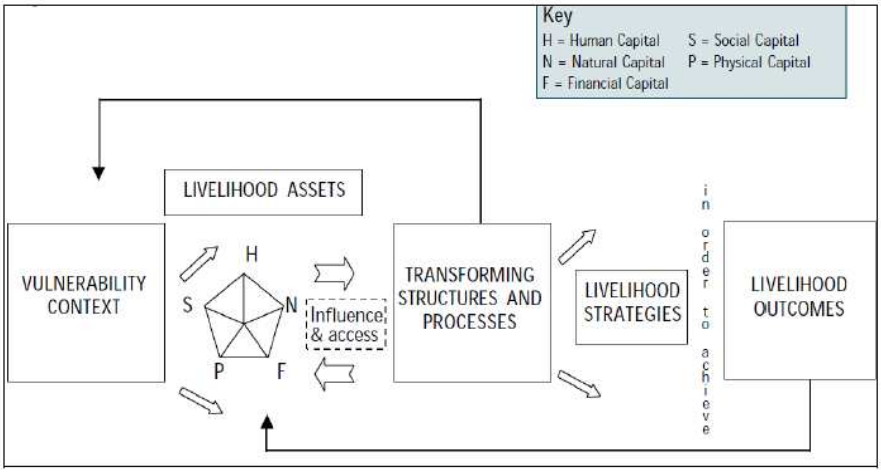
Physical capital "comprises the basic infrastructure and producer goods needed to support livelihoods". Specifically, infrastructure, sanitation, and communication capabilities are discussed.

Finally, financial capital "denotes the financial resources that people use to achieve their livelihood objectives".

In addition, it is relevant to discuss external forces that influence livelihoods in the village, such as the Malaysian government's view of the sustainability of agriculture.

The objective of this report is to assess the sustainability of small-scale agriculture in Kampung Sejijak Mawang. The diversification away from agricultural roots has allowed some aspects of rural agricultural life to continue existing (Rigg, 1998). As such, the sustainability of small-scale agriculture relates to other livelihood possibilities that could exist for the villagers. Understanding the changes in livelihood strategies the village has seen over time will help understand what trends can be expected for the rural agricultural life to persist in Sejijak Mawang. Using the DFID framework as a tool of analysis will help understand what different assets the village has, and how these assets could affect the sustainability of agriculture in the village.

A depiction of this framework follows:



Source: DFID, 1999

Appendix III - Water quality measurement

In-Situ Measurement

Water quality data were collected based on in-situ measurements and laboratory analyses. The in-situ measurements were recorded using the multi-parameter water quality SONDE model YSI 6820. This instrument was used to record the water temperature (^{0}C), dissolved oxygen (mg/L), pH, turbidity (NTU) and salinity. The in-situ measurements procedures are described as follow:

a. At each station, turn the multi-parameter "ON" and placed the probe into the water body which must face against the water flow.

b. Sufficient time was required for the probe to stabilize before sampling.

c. All the readings were recorded of relate parameter that display on the screen and the reading taken was replicate.

d. A duplicate (replicate) sample should be taken in the field.

e. The probe was rinsed with distilled water.

f. Turn off the instrument and the probe was handled carefully so as not to damage it while in the field.

The following methods for water quality measurement were done according to the *Standard Methods for the Examination of Water and Wastewater* http://www.standardmethods.org/

Phosphorus (P)

This was determined by using APHA (1999) method by using Powder Pillows and Phosphorus Reactive (Method 8048) (0 to 2.50 mg/L PO_4^{3-}). The instrument is installed with the correct module that displays 810 nm, decimal position and the zero prompt. The 10mL cell is filled to the 10mL line with sample. The content of one Phosphate Powder Pillow is added to the sample cell (the prepared sample). It is capped and inverted several times to mix and a blue color will form if phosphorus is present.

A 8-10 minutes reaction period should be used if determining total phosphate following the acid-per sulfate digestion. 10mL of cell is filled to 10mL line with sample (the blank). The blank is placed in the cell holder with close cell compartment cover and ensure the zero reading measurements.
The prepared sample is placed in the cell holder and *start measurement* is pressed. Then the display shows the result in mg/L phosphate as PO_4^-). The equation for amount of phosphorus is as followed:

Amount of phosphorus in the sample (mg/L P) = sample (mg/L PO_4) x 0.336

Ammonia (0-3.00 mg/L NH_3-N)

This is determined by using APHA (1999) method with Nesslar Method EPA accepted for reporting and in this method, distillation is required. The correct module is installed to display the <120 nm, program number, the concentration units, decimal position and zero prompt. 25mL sample cell is filled to the 25mL. Another 25mL sample cell is filled with deionized water.

3 drops of mineral stabilize is added to each sample cell. It is capped and inverted several times to mix. 3 drops of polyvinyl alcohol dispersing agent is added to each sample by holding the dropping bottle straight. It is inverted several times to mix. 1.0mL of Nesslar Reagent is pipettet to each sample cell. It will then capped and inverted times to mix. After 1 minute the blank is placed in the cell holder and ensure zero reading measurement. The prepared sample is placed in the cell holder and measurement is started. The readings are recorded.

Total Coliform Count (TCC) and Fecal Coliform Count (FCC)

This is determined by using APHA (1999) method. First, the forceps are sanitized by dipping the forceps in alcohol and burning alcohol off with a Bunsen burner. By using the sanitized forceps, an absorbent pad is placed in the sterile petri dish.
The neck of the broth plastic tube (ampoule) is unscrewed and then drained the media broth onto the pad and the top is put on the petri dish. The ampoules are inverted two or three times to mix the media broth. The Hach's new m-Coliblue^{24} broth is used for the media where it allows for the simultaneous detection of total coliform count and fecal coliform count. An enzymatic indicator in the medium causes total coliform colonies grown on the m-Coliblue^{24} to be red and fecal coliform colonies to be blue. The media content is poured evenly over the absorbent pad.
The forceps are sanitized again with alcohol and flame. The top half of the filtration system is unscrewed to the bottom half and before taking a sample, a pipette is used to rinse the filtration system with a small amount of distilled water. A membrane filter is placed with the grid side up.
The sample is shaken and poured into the funnel. 5ml of water sample for each point is pipetted for TCC analysis and 20ml for FCC analysis. For tap water analysis, 50ml is pipetted for TCC and 100ml for FCC analysis. The vacuum is applied and the sample is then filtered.
The filtered sample is transferred into the prepared petri dish using the sterile forceps. With a slight rolling motion, the filter is placed with grid side up on the absorbent pad and then, checked for trapped air under the filter. The petri dish is inverted two or three times and then incubated at 35± 0.50C for 24 hours. After 24 hours, the petri dish is removed from the incubator and the colonies on the membrane filter are counted.. Red and blue colonies indicate total coliform and fecal coliform respectively.

The equation below is used to determine the amount of colony count;

Amount of colony (cfu/100ml) = (Colony count x 100)/ml of sample

Appendix IV – Revised questionnaire

GPS point :		**Interpreter:**	
Householdnumber:		**Note taker:**	

Thank you for taking the time to talk to us. We are a group of students from Denmark and the University of Malaysia doing a study on various aspects of agriculture and which opportunities you have in your village. We would like to ask you some questions about these aspects related to your household. If you feel uncomfortable answering any questions, please let us know and feel free not to answer them. If you have any questions for us about what we are doing, please feel free to ask us.

AGE: _____

GENDER: Male_____ Female _____

RELIGION: Roman catholics _____ 7.th Day Adventists_____ Muslims_____ Other _____

EDUCATION OF INFORMANT: Primary school____ Secondary school____ Pre-University____
University _____

Activities

What do you do for living?	If married, what does your partner do?

Family Structure

Please mention all members of your household, also members not living in the house.

RELATIONSHIP TO RESPONDANT	M/F	AGE	OCCUPATION	EDUCATION	PEOPLE NOT LIVING IN THE HOUSE	HOW OFTEN DO THEY COME BACK TO YOUR HOUSE			WHERE DID THEY GO?	WHEN DID THEY LEAVE?	REASON	ARE THEY INVOLVED IN HH AGRICULTURE ACTIVITIES
						DURING WEEK	HOME 1-2 PR YEAR	PERMANENTLY AWAY				

Land use

What are you growing?

PLOT (ALSO UNUSED)	(CURRENT) MAINCROPS ON PLOT	AREA/ TREES	YIELD	IS IT SOLD? IF YES, PRICE AND TO WHOM:	HOW LONG DOES IT TAKE TO GO TO FIELD	DO YOU OWN THIS LAND?	WHAT IS THE STATUS OF THIS LAND

Why is some land unused? _____

Do you do shifting cultivation?_____

Livestock type					
Livestock number (current)					

Do you lease out land? Yes _____ No _____

(If yes)To whom, and what is the size of the land?_____

Do you lease land from others, if yes from who?_____

Do you have a **homegarden**? Yes _____ No _____

What plants?

Medicinal _____

Edible fruits + vegetables_____

Timber/Fuelwood _____

Do you sell any of it? _____

Does anybody in your household collect **forest products**: Yes _____ No _____

Medicinal _____

Eatable _____

Timber/Fuelwood _____

Hunting _____

Does anybody in your household do **fishing**? (river or pond) _____

Please rank the overall time used on each of the above mentioned activity (1 is most time used). Including forest, fishing and homegarden activities.	Please rank your sources of income (1 is the highest income).
1)	**1)**
2)	**2)**
3)	**3)**
4)	**4)**
5)	**5)**

Appendix V – Soil sampling results

Table showing results from soil analysis

Land use	Horizon	Depth, cm	pH	Al (mg/kg soil)	OC%	N%	C/N ratio
Paddy/ Rice							
Ri 1	A	0-10	4.66		2.757	0.2214	12.45
Ri1	B	20-30	4.72		2.137	0.1786	11.97
Ri2	A	0-10	4.72	60	3.455	0.2476	13.95
Ri2	B	20-30	4.79	60	1.893	0.1498	12.64
Ri3	A	0-10	4.31		4.252	0.2757	15.42
Ri3	B	20-30	4.84		2.095	0.1782	11.76
Rubber							
Ru1	A	0-10	4.39		3.697	0.2441	15.15
Ru1	B	20-30	4.89		1.677	0.1235	13.58
Ru2	A	0-10	4.58	60	3.055	0.2356	12.97
Ru2	B	20-30	4.73	60	1.826	0.1582	11.54
Ru3	A	0-10	4.69		3.184	0.2455	12.97
Ru3	B	20-30	4.72		2.003	0.1682	11.91
Secondary Forest							
SF1	A	0-10	4.51		3.25	0.2251	14.44
SF1	B	20-30	4.71		1.498	0.1238	12.10
SF2	A	0-10	4.53	60	4.002	0.276	14.5
SF2	B	20-30	4.63	60	2.135	0.152	13.995
SF3	A	0-10	4.83		2.8	0.2355	11.89
SF3	B	20-30	4.63		2.453	0.1716	14.29

The table below provides an overview of the samples, with slope and geographical coordinates for each plot. The intention was to get samples from plots with the same slope, since the degree of the slope affects nutrient level. However on table xx it is obvious that for rice and secondary forest there are some variations in the slope.

Overview of soil samples with slope and geographic coordinates related to each sample

Field	**Plot**	**Slope**	**Coordinates**	**elevation**
Paddy field	Ri 1	30°	N 01°03´53.1 E 110°21´41.5	93m
	Ri 2	25°	N 01°03´53.6 E 110°21´41.9	94 m
	Ri 3	46°	N 01°03´52.4 E 110°21´41.0	98 m
Rubber field	Ru 1	29°	N 01°03´53.6 E 110°21´40.1	62 m
	Ru 2	28°	N 01°03´53.3 E 110°21´40.5	67 m
	Ru 3	31°	N 01°03´53.1 E 110°21´40.5	65 m
Secondary forest	SF 1	37°	N 01°03´48.9 E 110°21´41.0	108m
	SF 2	19°	N 01°03´48.8 E 110°21´40.8	110m
	SF 3	29°	N 01°03´48.6 E 110°21´40.1	n/a

Appendix VI - Forest assessment data

Genus/Species	Family	Frequency	Basal area (m^2/ha)	Comment	Uses
artocarpus anisophyllus	Moraceae	1	0.091	Of secondary importance as timber	
Artocarpus borneensis	Moraceae	1	0.238	Of secondary importance as timber	
Artocarpus dadah	Moraceae	1	1.257	Of secondary importance as timber	
Attocarpus nitidius	Moracea	1	0.091	Of secondary importance as timber	
Artocarpus integer	Moraceae	1	4.047	Of secondary importance as timber	Edible fruits
Antidesma sp.	Euphorbiaceae	1	0.091		
Alangium sp.	Alangiaceae	1	0.110		
Buchanania sp.	Anacardiaceae	1	0.363		
Batica sp.	Dipterocapaceae	1	0.064		
Dialium sp.	Fabaceae	1	0.594		
Dacryodes sp.	Burseraceae	1	0.967		
Dialium sp	Fabaceae	2	0.205		
Dryobalanops beccarii	Diprocapaceae	2	0.554	Heavy hardwood sold under the trade name: **Kapur**.	House construction
Diospyros sp.	Evenaceae	2	0.863		
Elateriospermum tapos	Euphorbiaceae	13	18.078	Not major importance as timber	Edible fruits
Eugenia sp.	Myrtaceae	2	0.479	Not of much value as timber tree.	House construction
Garcinia sp.	Clusiaceae	1	0.390		
Gonystylus sp	Thymealiaceae	1	0.055	May be of value as timber tree depending on species	
Hopea sp.	Dipterocapaceae	1	0.189		
Knema sp.	Myristiceae	3	1.681	Normally don't grow to timber size and therefore of no economic importance.	
Kompassia excelsa	Fabaceae	1	0.724	protected in Sarawak under the Wildlife Protection Bill of 1990.	
Litsea	Lauraceae	1	0.672	Good light hardwood, often used localy	
Monocarpia sp.	Anonaceae	1	0.071	Of secondary importance as timber	
Neoscortechinia sp.	Euphorbiaceae	1	1.012	Not major importance as timber	
Nephelium sp.	Sapindaceae	1	0.297		Edible fruits
Palaquium sp.	Sapotaceae	2	1.422	May be valuable as timber depending on species, which is not specified.	To cure boil
Ptychopyxis sp.	Euphorbiaceae	1	0.208	Not major importance as timber	

Appendix VII – Seasonal calendar

	Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	Weather		rainy			season			dry season				
	- Crop -												
1	Pepper												
	Preparation	can be done all year around											
	Planting												
	Harvest										*		
	Fertilizer appl.												
	Pesticide appl.												
	Herbicide appl.	X			X					X			X
2	Rice												
	Preparation					Open land	clearing undergrowth	cutting trees	burning				
	Planting												
	Weeding												
	Harvest												
	Processing												
	Fertilizer appl.											X	
	Herbicide appl.											X	

Appendix IIX – Synopsis

In this appendix the synopsis can be found as it was handed in before the field trip. See next pages.

21-02-2011

Synopsis

Assessment future livelihood opportunities in Kampung Sejijak Mawang with focus on the role of small scale agriculture.

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TABLE OF CONTENTS

The world development report of 2008: Agriculture for Development “recommends that rural smallholders unable to compete in higher value production should exit agriculture” (Li, 2009). It suggests that an upgrade in education levels and improved job availability could be an escape from poverty for the rural poor. It fails to mention however, that finding any job is difficult. Nor does it mention that reports on “Indonesian plantation workers “across the border in […] Sabah described their conditions as 'bonded labor … a kind of modern slavery”. At the same time though, it has been pointed out that “subsistence agriculture pursued in isolated villages is a form of life many rural people are eager to escape” (Li, 2009). In addition, giving up one's land in the hopes of finding better or more profitable employment elsewhere is a bold move, as this may do little more then to entrench a person's poverty, rather than offer a way out of it (& Li, 2009).

The World development report 2008 suggested overall that there is no easy escape from rural poverty and that leaving one's rural livelihood behind in favor of seeking off-farm jobs that can pay a living wage may do little more then to increase vulnerability and lessen one's available assets. These available assets can be loosely categorized into five different categories upon which livelihoods are built (human, natural, financial, social and physical) and all should be taken into account when trying to interpret and understand the livelihood strategies of any community (DFID, 1999). Understanding these different aspects of the livelihood framework can help envision future possibilities with regard to livelihood development options and can help assess in what direction a community wants to, or should, move.

For this study, the community in which we seek to establish these future livelihood development trends is a village in the province of Sarawak, Malaysia, known as Kampung Sejijak Mawang. In the past years, there has been strong economic growth in Sarawak. This has in general resulted in increased government spending. Nonetheless, economic development has not been broadly dispersed to the different rural communities. It has been mostly directed to urban centers and specific highly productive agricultural regions (Windle & Cramb, 1997). This is problematic since the majority of the overall population, and indeed, most of the poor communities, are living in rural areas. In addition, the government has encouraged large-scale commercial land development to a greater extent than subsistence farming (Cramb & Wills, 1990).

In Sarawak, both agriculture and rural development are important, in terms of the overall economic income from agricultural practices, but also because agriculture in general is the basic means of livelihood for the poor (Windle & Cramb, 1997). Small-scale agriculture is widely practiced in the rural areas of Sarawak. Traditionally, shifting cultivation was widely practiced as a part of the culture of the indigenous people (Cramb & Wills, 1990). Since then, the use of this agricultural system has decreased, even though subsistence and cash crop farming are still practiced in the rural areas (Hansen & Mertz, 2003). As suggested in the WDR of 2008, it would indeed seem that people are seeking a way out of agriculture (Li, 2009).

Kampung Sejijak Mawang is located approximately 50 km south of Kuching, Borneo. It is a Bidayuh village comprised of 60 households for a total of 182 inhabitants. While the majority of the village is Christian, there are still some Muslim households. The village has electricity supply and a gravity-feed water supply system. It also has a primary and pre-school, a community hall and a few mini sundry shops. In the past, the economic activities among the villagers in Kampung Sejijak Mawang have centered on shifting cultivation, pepper farming, logging and the collecting of forest products. At present, shifting cultivation is not practiced anymore because of lack of labour. However, small-scale agriculture consisting mainly of rubber and pepper cultivation on quality soils is still practiced. The cultivation of upland rice on the other hand, now occurs on soils considered less fertile. In fact, in Kampung Sejijak Mawang, small-scale agriculture as a livelihood strategy is now competing against the possibilities for migration and off-farm work in and outside the village. In addition, employment in large-scale agriculture practices has become a possibility. This option has especially been relevant since a large area, formerly used by the villagers, was rented to Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) 20 years ago for establishment of an oil palm plantation.

Based on our knowledge of Kampung Sejijak Mawang, it would seem that the general tendency of the villagers is to migrate out of their village to work in other locations. Literature reviews suggest this is a relatively common tendency in Sarawak. In addition, the future of small-scale agriculture in Sejijak Mawang seems unsure due to land rights issues and the presence of SALCRA. Small-scale subsistence agriculture is an important aspect of livelihood strategies which could either encourage or dissuade people from staying in their village. While previous reports suggest that people are less interested in small-scale, subsistence agriculture then seeking employment elsewhere, we intend to see what trends are present in the village of Sejijak Mawang.

RESEARCH QUESTIONS AND DEFINITIONS

Having this objective in mind, our research aims to assess the current and future livelihood opportunities in Kampung Sejijak Mawang, focusing more specifically on the role of small-scale agriculture in this community.

In order to address this objective, we have developed the following research questions:

1. What are the past, present and future strategies for the management of natural resources?
2. What effect does the migration have on the labour availability for farming in the village?
3. What are the constraints and opportunities perceived by villagers in relation to land tenure?
4. Which livelihood strategies do people in S.M. perceive as suitable for present and future?

For each of these, we have developed sub-questions that will enable us to answer the research question. A full table of these questions can be found in Appendix 3.

In order to better address these questions, we have tried to come up with the following definitions for certain words.

A farmer we defined as any person in the village who themselves would say that farming is their primary source of income.

A migrant is a person who does not provide any working force with regard to agricultural labour.

Off-farm work is done by someone who comes back to work on the farm, even though this may only occur once a month.

We expect to redefine these terms with the villagers and/or headman once in Kampung Sejijak Mawang.

METHODS

Our research aims to obtain information regarding current livelihood strategies in Kampung Sejijak Mawang, Sarawak, Malaysia. Specifically, we want to investigate the potential future of small-scale agriculture and the interest the villagers see in this venture for themselves. Our group is comprised of students whose backgrounds include geography, natural resources, social science and resource chemistry. As such, we have chosen to integrate all of these different areas of expertise in our study and want to take advantage of the diversity of our backgrounds to as great an extent as possible.

There are some methods which we will use for general knowledge. We will begin by walking around the village in an effort to get to know the village structure and to introduce ourselves to the community. We will constantly be observing as one of these general methods. We plan on establishing a timeline of the village history, probably with the headman, in order to gain background knowledge about the village in which we work. Most of our methods require participation from villagers and a willingness on their part to share their knowledge, time and expertise with us. In addition, we have to ensure that our questions are considered appropriate and are not issue sensitive.

However, we have chosen to utilize the following methods for different specific parts of our research. Many of the methods will be used to answer different questions at the same time, so we will explain each method here in detail. However, a table indicating which methods are being used to acquire data for which research question specifically, can be found in Appendix 3.

QUESTIONNAIRES (APPENDIX 2)

Questionnaires will be distributed to at least 30 households in the village of Sejijak Mawang in order to get a sampling of at least half of the households in our village, which will hopefully allow us to establish an overview of the village as a whole. Seeing as none of the students from the University of Copenhagen speak Bidayuh, Malay or Iban and we are not sure how high the literacy rate of the villagers will be, we plan to administer the questionnaires orally with the help of the translators. The questionnaire includes questions regarding age and gender in order to gain general knowledge about the profiles of the villagers of Sejijak Mawang. However, it also includes questions about migration patterns and sources of income in order to have a better understanding of the livelihood strategies of the villagers.

SEMI-STRUCTURED INTERVIEWS (APPENDIX 1)

We will conduct semi-structured interviews, with the help of our translators, with the headman of the village, primary school teachers, farmers, an agricultural extension officer and a SALCRA officer. An overview of the general points we hope to bring up in each of these interviews is available in Appendix 1. By interviewing these different people, we hope to gain information about the history of the village, the systems in place that either encourage or dissuade villagers from staying in Sejijak Mawang and the farmers' perceptions of their own land rights among other key aspects. These interviews will also allow us to organize the participatory rural appraisal methods (PRA).

We will conduct different focus group discussions with informants that will vary in terms of age, gender and occupation. We hope to determine the exact groups based on the semi-structured interviews and once we better understand the social patterns and dynamics in the village. We will conduct some focus groups discussions simply by talking with small groups of villagers and asking them some questions in order to steer the conversation in a direction which allows us to gain knowledge that will allow us to answer our research questions. We will use the translators as intermediaries and will keep the groups small in order to allow us to better follow the procedures. We plan to use the following PRA methods specifically (Nathan, 2010).

VENN DIAGRAM

The institutional relationships between different members of the community as well as a mapping of the systems in place that encourage villagers to stay in Sejijak Mawang will be mapped out by the villagers with the use of Venn diagrams.

SEASONAL CALENDAR

Using a seasonal calendar enables us to identify and characterize the annual agricultural, animal husbandry, forestry and/or fishing activities that take place in the village. We will establish cropping cycles, periods of communal labour and this will allow us to verify if some times of year require more labour force then other periods, which could help explain migration patterns.

LIVELIHOOD AND INCOME MATRIX

This matrix shows the principal productive activities in the community and which activities generate the most income. It allows us to identify relative amounts of income generated and the time spent on each of these livelihoods. This method allows us to establish current livelihood strategies and based on this, we hope to establish future possible trends.

We are also interested in the use of different scientific methods which will allow us to understand current natural resource management strategies.

GLOBAL POSITIONING SYSTEM (GPS)

During the community walk, households will be identified and spatially stored using a GPS receiver. This will help us choosing the households for participating in the questionnaire survey. After the community map has been drawn, the most important areas regarding land use are being mapped using GPS. This is done to compare the community maps with “real life” scale in order to understand the importance of different land uses or resources compared with the actual size of these. Also GPS will be used for mapping the practices of farmers visited in order to visualize and understand their assets and constraints regarding small-scale farming.

WATER AND SOIL SAMPLES

We will take water samples in order to assess the erosion processes. We are not intending to conduct extensive analysis on the water quality. Instead we will focus on soil analysis in order to assess the soil fertility, which is an important measure for the present and future of the small scale farming in the village. We are intending to identify two important land uses and/or two very different soil types and compare the quality of the soils. One of the land use types should be oil palm plantation since it should be a dominate land use type in the area and then the other land use type could be rubber field or pepper field. We intend to do core samples with an auger – five cores pr site mixed to a composite sample and then extract one sample for further analysis from each site. From these samples we intend to analyze for nutrient content, pH, conductivity and soil organic matter (SOM). Additionally we hope to dig holes to reveal the soil horizons from each site. We are now hoping to do three holes pr site to estimate the bulk density in a statistical sound way, but depending on the time available we might decrease the number of holes to only one pr site.

TEPOI

Our preliminary knowledge of Sejijak Mawang suggests that many villagers have migrated and work outside the village. It would seem that many people work in nearby Tepoi, another student group’s field site, which is considered a wealthier village and is characterized by high fertility soils. In addition, it is known for its production of high quality durian fruits. We would be interested in comparing data with them, especially about the soil quality, in hopes of understanding more about the potential of future agriculture in our village. In addition, if we had time, we would like to try to have a focus group discussion or a semi-structured interview with migrant works from Sejijak Mawang who are in Tepoi.

We have divided the tasks based on number of people necessary to complete the assignment and the time we estimate it will take us to perform certain activities.

Time Table & Schedule of Activities

Date	**Activities**	
		Evening
Saturday 26/02	Walk around the village, find a elevated lookout, introduce ourselves to the villagers and the headman	Summary of data, discussion
Sunday 27/02	Walk around the village and identify households and points of interest (with GPS), do interview with headman, prepare presentation for government officials, find out possibilities of interviewing agricultural extension officer & SALCRA officer, choose participants of focus group discussions	Summary of data, discussion
Monday 28/02	Carry out 15 questionnaires (2 groups of 2 students) , identify key informants for Venn diagram and focus groups	Summary of data, discussion
Tuesday 1/03	Government presentation in Tebedu (?), Agree on final research questions & methods, invite participants for focus group activities (different groups on select days)	Summary of data, discussion
Wednesday 2/03	Carry out 15 questionnaires (2 groups of 2 students), water sample gathering, prepare focus group interview (farmers), prepare SSI with school teacher	Summary of data, discussion
Thursday 3/03	Soil sample gathering, focus group interview, community map, cropping calendar, mapping of resources (farmers), interviewing school teacher	Summary of data, discussion
Friday 4/03	SSI (SALCRA, AE, migrant workers, youth, farmers), Field visit, mapping natural resources with GPS (info obtained from community map), soil sampling	Summary of data, discussion
Saturday 5/03	SSI (SALCRA, AE, migrant workers, youth, farmers), Field visit, mapping natural resources with GPS, soil sampling	Summary of data, discussion
Sunday 6/03	SSI (SALCRA, AE, migrant workers, youth, farmers), Field visit, mapping natural resources with GPS, soil sampling, Pre - Summary of data, prepare presentation for government officials	Summary of data, discussion
Monday 7/03	Morning presentation to government officials in Tebedu,	Social gathering in the evening
Tuesday 8/03	Fairwell gathering with villagers, Leaving to Kuching	

<u>Groups/people we would like to do interviews with:</u>

Villagers I (income, future expectations to future livelihood), villagers II (land tenure), headman (network), school teachers, agricultural extension officer, SALCRA officer, villagers III (Migrant workers), youth, women.

APPENDIX 1 – SEMI-STRUCTURED INTERVIEW GUIDELINES

The interview guidelines have been constructed around the main and sub research questions. The have been pre formulated to real questions besides the more loose structure of a Semi Structured Interview, to discuss with the Interpreter about how to best ask the question and to get a mutual understanding on what data should be obtained.

SEMI STRUCTURED INTERVIEW GUIDELINE – HEADMAN KAMPUNG SEJIJAK MAWANG

What are the past, present and future strategies for the management of natural resources?

What are the common farming practices and management of natural resources?

Which natural resources have been important in the past compared to the present for the village?

Are agricultural extension services available?

Which subsidies are available from the state?

What effect does the migration have on the labour availability for farming in the village?

What was the size of the village 5 / 10 / 20 / 30 years ago?

How are the groups who migrate first out of the village?

Which groups are sustaining village life?

Are there stimulants by the government to stay or leave?

What are the constraints and opportunities perceived by villagers in relation to land tenure?

What is the size of village and the agricultural land in S.M.?

How much land is leased to SALCRA?

Are written contracts or land titles available?

How many families participate in the palm oil schemes?

What are the offered Benefits from SALCRA?

How much is the proposed dividend by SALCRA?

What is the influence of missing dividend to villager's livelihood?

Is the external help available to facilitate between villagers and SALCRA?

Which livelihood strategies do people in S.M. perceive as suitable for present and future?

What current investments are done in the village?

What are future job opportunities?

SEMI STRUCTURED INTERVIEW GUIDELINE – AGRICULTURAL EXTENSION AGENT

Is extension service available to farmer in S.M.?

How have cropping patterns in the area changed?

What is the impact of providing of agricultural inputs?

What is the future outlook of agricultural activities in the area?

SEMI STRUCTURED INTERVIEW GUIDELINE – SALCRA OFFICER

Who is your contact person /-s in S.M.?

What is the area of land, hold under plantation?

Which benefits are offered by the plantation scheme to the villagers?

What is the area of land leased from villagers in S.M.?

What are the future plans of oil palm plantation in the area?

SEMI STRUCTURED INTERVIEW GUIDELINE – PRIMARY SCHOOL TEACHER

What effect does the migration have on the labour availability for farming in the village?

What is the amount of pupils in primary school?

Is there a decrease or increase of pupils?

Until what student amount will stay the school open?

What are the possibilities to find work in S.M.?

Which livelihood strategies do people in S.M. perceive as suitable for present and future?

How important is school education for parents

Is there a difference between children of farmers and mostly relying on off farm activities for their future wishes?

SEMI STRUCTURED INTERVIEW GUIDELINE – FARMER

What are the past, present and future strategies for the management of natural resources?

(Crops grown and area – maybe known from questionnaire)

Have you intensified /specialised your cropping schemes?

Have you changed your cropping patterns?

Which inputs do you use? (Fertilizer, Pesticides)

Do you have access to credits?

Is the soil still as productive compared to 5 / 10 years ago?

Who are the middle men buying your crops?

What are the constraints and opportunities perceived by villagers in relation to land tenure?

Are you leasing land to SALCRA?

If you leased land, have you received your payments from SALCRA?

Do you still own land how do you use it?

Do you hold official papers for the land?

What effect does the migration have on the labour availability for farming in the village?

What is the labour input from family members?

What have been current or planned investments in machinery or crops?

Importance Cash crop vs. Subsistence activities (why are you still growing upland rice)

VILLAGE QUESTIONNAIRE – KAMPUNG SEJIJAK MAWANG

This questionnaire is designed to get an overall overview of the population structure in Sejijak Mawang

Introduction to questionnaire: Thank you for taking the time to talk to us. We are a group of students from Denmark and the University of Malaysia doing a study on various aspects of agriculture and which opportunities you have in your village. We would like to ask you some questions about these aspects related to your household. If you feel uncomfortable answering any questions, please let us know and feel free not to answer them. If you have any questions for us about what we are doing, please feel free to ask us. And if you have any additional information you want to share with us, we will be happy to take it into account! We will keep these answers confidential unless you are comfortable sharing your information.

Name

Name of Longhouse

Age

Gender	Female	Male		
Religion	6th day Adventist	Roman Catholic	Moslem	
Education	Primary School	Secondary School	Pre-University	University

Primary Source of Income	Farming, please name farming activity
	Migrate Labour, please list which jobs
	Shop owner
	Driver
	Remittances
	Others

Secondary Source of Income	Farming, please name farming activity
	Migrate Labour, please name which job
	Shop Owner
	Driver
	Remittannces
	Others

Land use

What are you growing?

ID NO					
AREA					
CROP					
LIVESTOCK TYPE					
LIVESTOCK NO (CURRENT)					

Do you lease out land?.....

To whom?.....

What size is the area?.....

Migration

Are there people migrating in this household? YES If No, skip the rest

How many are migrating?

NO	M/F	AGE	EDUCATION	OCCUPATION	HOW OFTEN ARE THEY COMING HOME?			WHERE ARE THEY MIGRATING TO?	WHEN DID THEY START MIGRATING	CONTRIBUTING TO THE INCOME?
					MIGRATING DURING WEEK	COMING HOME 1-2 PR YEAR	PERMANENTLY MIGRATED AWAY			
1										
2										
3										

APPENDIX 3 – SUMMARY TABLE

Overall objective: To assess the future livelihood opportunities in Kampung Sejijak Mawang with focus on the role of small scale agriculture

Research question	Sub-questions	Data acquired	Methods	Inputs	Verifiable Indicators	Important & Critical Assumptions
1. What are the past, present and future strategies for the management of natural resources	1.1 What are the effects of land use management on the ecology of the areas?	Natural resource utilization	Observations	n/a	Data table with water quality and soil measurements & map of village & description of natural resources in the area	n/a
			Community walk	Tape measure, GPS, notebooks, pens, 1 local guide, interpreter, all students		Available local guide
		Water quality assessment	Water samples & analysis	Litmus paper, water collection container, notebook, pens, 2 students, GPS		
			Interview with villagers	Notebook, pens, translator, students		Available & willing participants
		Soil assessment	Soil samples	Plastic bags, notebook, pens, trowel, soil assessment kit		
			Interviews with villagers	Notebook, pens, translator, students		Available & willing participants
		Forest assessment	Forest resource assessment (diameter)	Measuring tapes (2), string, excel, chalk		That there is patches of forest in connection to the village
	1.2 What are opportunities and constraints concerning natural resources to farming activities?	Farming practices (cropping and livestock)	Observations	Local guide, notebook, pens, students, translator	Description of cropping & farming practices Description of current regulations	
			Interview with headman	Notebook, pens, translator, students, big paper cards, markers, hardcopy methods guides		Available & willing participant,
			Walking with farmer in the field and talking	Local farmer, notebook, pens, students, translator		Available & willing participant
		Regulations influencing the farming	Interview with AE/ headman/ villagers	Notebook, pens, translator, students, big paper cards, markers		Available & willing participants (including agricultural extension officer)
		Availability of subsidies	Interview with AE/ headman	Notebook, pens, translator, students, big paper cards, markers		Available & willing participants (including A.E. officer)
		Villagers perception of farming as a future work	SSI & focus group discussion	Notebook, pens, translator, students, big paper cards, markers, operational facilities		Available & willing participants
		Assessment of the state of ecology (see 1.1)	(see 1.1)	n/a		

Research question	Sub-question	Data acquired	Methods	Inputs	Verifiable Indicators	Important & Critical Assumptions
2. What effect does the migration have on the labour availability for farming in the village?	2.1 How is the demography of S.M.?	Survey of distribution of age, gender, education among villagers	Census on either all villagers or samples, questionnaire	Notebook, pens, students, printed questionnaires	List & Table	People at home when we come or willingness to go into field with us
	2.2 Why are people migrating from S.M.?	List of migrates (age, employment, gender)	As in 3.1	Notebook, pens, students, printed questionnaires	Venn diagram, List & map & Description of migration patterns	See 3.1
		Destination for migration	As in 3.1	Notebook, pens, students, printed questionnaires, Google Earth		See 3.1
		Changes in infrastructure	Observations, SSI with headman	Notebook, pens, students, big paper cards, markers		Available & willing participant
		Migration patterns	Questionnaire			
		Institutions supporting agriculture	Venn Diagram	Notebook, pens, students, big paper cards, markers		
	2.3 How are farming practices effected by migration?	Lack of labour	SSI Questionnaire	Notebook, pens, students, big paper cards, markers, available participants	description of systems, networks & educational level	Available & willing participants
		Impact of remittances	SSI Questionnaire	Notebook, pens, students, printed questionnaires		See 3.1
		Farming practices	Timeline SSI Questionnaire	Notebook, pens, students, big paper cards, markers, translator		Available & willing participant

Research question	Sub-questions	Data acquired	Methods	Inputs	Verifiable Indicators	Important & Critical Assumptions
3 What are opportunities and constraints as perceived by villagers in relation to land tenure?	3.1 Who has access rights to land?	Distribution of land in S.M.	observation, transect walk with headman, GPS, community map	See 1.1	Map (?), Description of who has access rights	Available & willing participant
		Decision making process when land is inherited (household/ village level)	interview with headman	Notebook, pens, students, big paper cards, markers, translator		Available & willing participant
	3.2 What is the awareness of people regarding their rights on land tenure?	Survey of peoples opinion towards their land rights	SSI & focus group interview	Notebook, pens, students, big paper cards, markers, translator	Description & Understanding of land tenure issues	Available & willing participants
	3.3 Which role does SALCRA play in relation to land tenure issues in S.M?	Understanding of dynamics and disagreements of villagers regarding NCR land and contracts with SALCRA	SSI	Notebook, pens, students, big paper cards, markers, translator	Description & Understanding of land tenure issues	Available & willing participants, Available of SALCRA officer

Research question	Sub-question	Data acquired	Methods	Inputs	Verifiable Indicators	Important & Critical Assumptions
4. Which livelihood strategies do people in S.M. perceive as suitable for present and future?	4.1 What are the main sources of income of villagers in S.M.?	List of income generation activities (farming, remittance, off farming)	SSI	Notebook, pens, translator, students, big paper cards, markers	Diagrams & Tables & Seasonal calendar	Available & willing participants
			Questionnaire	Printed questionnaires, translator, students, pens, notebooks		Available & willing participants
			Seasonal calendar from villagers samples	Notebook, pens, translator, students, big paper, markers, operational facilities		Available & willing participants
			Ranking of different income activities	Notebook, pens, translator, students, big paper, markers, results from precedent activities		Available & willing participants
	4.2 What could be future sources of income for villagers in S.M.?	Future income opportunities and constraints	SSI school teacher	Notebook, pens, translator, students, big paper cards, markers	Ranking & Description of future sources of income	Available school teacher
			activity (shuffle shoe) with youth of S.M.	Notebook, pens, translator, students, big paper, markers		Available youth & willingness to participate in activity
		Future importance of small holder farming	Preference ranking of time spent on different activities	Notebook, pens, translator, students, big paper, markers, results from precedent activities		Available & willing participants

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