

LIVELIHOOD STRATEGIES IN KPG, BIAWAK



ILUNRM Report 2010

Authors:

Tea Sørensen Dissing,
Daniel Mekonnen,
Lone Vestergaard,
Christine Frigaard Weinreich
Lars Westh

Supervisors:

Michael Eilenberg
Myles Oeefse

Livelihood strategies in Kpg. Biawak

This report is based on our participation in the SLUSE course Interdisciplinary Land Use and Natural Resource Management. The report reflects on fieldwork conducted in Kpg. Biawak, a village in the state of Sarawak of Malaysian Borneo from the 6th of March to the 16th of March 2010.

Authors:

Tea Sørensen Dissing, Daniel Mekonnen, Lone Vestergaard,
Christine Frigaard Weinreich and Lars Westh.

Malaysian co-workers

Raine Melissa Rinam, Siti Zubaidah Mat Tahir and Jock Kie Tang

Supervisors:

Michael Eilenberg and Myles Oelefse

Number of words:

10.791

SLUSE
Interdisciplinary Land Use and Natural Resource Management 2010



List of abbreviations

ABI	Above ground Biomass Increment
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
DOA	Department of Agriculture
ICQ(S)	Immigration, Customs, Quarantine (and Security)
NCD	Non Communicable Diseases
PRA	Participatory Rural Appraisal
RM	Malaysian Ringgit
SALCRA	Sarawak Land Consolidation and Rehabilitation Authority
SOM	Soil Organic Matter

Acknowledgements

First of all we would like to express our appreciation and special gratitude to our supervisors Michael Eilenberg, Roskilde University and Myles Oelofse, Copenhagen University for their technical guidance, invaluable advice and critical review of the report.

We extend our thanks to our counterpart UNIMAS students for their cooperation in the field and our fruitful discussion on the research. We would like to thank the kind collaboration of all the respondents of the questionnaire survey and the ranking exercises. We would especially like to thank the government officials who took the time to answer our questions.

Special thanks to our interpreters, Mr. Hong, Mr. Tuah and Mr. Kenneth. Without their support, this work would not have been possible. Furthermore, we would like to thank the UNIMAS supervisors and organizers for their support during our stay in the Kpg Biawak.

Last but not least, we would like to thank the villagers of Kpg. Biawak for letting us stay in the community hall and making us feel welcome and supporting us in our fieldwork.

Abstract

The objective of this study is to investigate the livelihood strategies undertaken in Kampung Biawak.

Kampung Biawak is located at the end of the Biawak-Lundu road next to the border of Indonesia. The road is in very a poor condition, which affects the villagers' access to different assets. The road is being upgraded in connection to the construction of a new official border-crossing (ICQ) and the villagers have great expectations for what the new road will bring in the future.

The border location is an integrated part of the villagers' livelihood strategies both because it provides access to income-generating possibilities, such as motorbike transport and shop-keeping, but also because the villagers are closely connected to their Indonesian neighbours through kinship. The villagers expect the new ICQ to have a huge affect on their future lives - both good and bad.

The majority of the villagers are engaged in subsistence farming and some also have cash crops. The farming practises are traditional based on indigenou knowledge with some modern inputs and knowledge. The soil in Kpg. Biawak is not very fertile, which creates some limitations to the crops grown. However some of the more socio-economically advantaged villagers were able to access knowledge, which could help them to see possibilities in the soil quality instead of constraints.

A general characteristic of the villagers is that they have mixed main occupations (e.g. farmer and shop-keeper) and hence differentiated livelihood strategies, which spreads risks and hence reduces their vulnerability.

Name of the contributors

Main Content	Main Author	Contributing authors
1. Introduction	All	
2. Methodology	All	
3. Presentation of the Kpg Biawak	All	
4. Income generating practices	All	
5.1 Farming	Daniel , Christine	Tea, Lars, Lone
5.3 Social aspects	Tea, Lone	Daniel, Lars, Christine
5.5 Forest	Lars	Tea, Daniel, Lone, Christine
6. Infrastructure	All	
7. Future expectation	All	
8. Reflections	All	
9. Conclusion	All	

Name

Signature

Tea Sørensen Dissing

Daniel Mekonnen

Lars Westh Rasmussen

Lone Vestergaard

Christine Frigaard Weinreich

Contents

1 Introduction.....	8
1.1 Main objective.....	9
1.2 Research questions	9
1.3 Framework for our study	9
2 Methods	11
2.1 Questionnaires.....	11
2.2 Semi-structured interviews	11
2.3 Observation	11
2.4 PRA (Participatory Rural Appraisal)	11
2.4.1 History time line	11
2.4.2 PRA mapping	11
2.4.3 PRA Ranking.....	12
2.5 Soil sampling.....	12
2.6 Water sampling	12
2.7 Forest assessment	13
2.8 Transect walk	13
2.9 GPS logging and mapping	13
3 Welcome to Kampung Biawak	14
3.1 Overview of the village.....	15
3.2 Occupations and activities	15
4 Income generating practices	17
4.1 Border related practices	17
4.2 Farming related practices	18
5 Farming and forest	19
5.1 Farming possibilities	19
5.1.1 The soil of Kpg. Biawak	19
5.1.2 Plant diseases.....	21
5.1.3 Possibilities for large-scale farming	22
5.2 Part conclusion	23
5.3 Social aspects of farming practices	23
5.3.1 Social capital to minimize vulnerability in the farming practices	24
5.3.2 Traditional practice and new knowledge	25
5.3.3 The border location and farming	26
5.4 Part conclusion	27
5.5 Forest in the Area	27
5.5.1 Timber Present	28
5.5.2 Plants Present	29
5.5.3 Vegetation growth of the area	29
5.6 Part Conclusion	30
6 Infrastructure.....	31
6.1 Road conditions.....	31
6.2 Waste management.....	33
6.3 Fire fight accessibility	34
6.4 Water supply	34
6.5 Medical clinic.....	36
6.6 Security	36
6.7 Telecommunication and Internet.....	37
6.8 Education	37

6.9 Part conclusion	37
7 Future expectations	38
7.1.1 Tourism - a livelihood strategy	39
7.1.2 “The blessing of Biawak“	39
7.1.3 Health.....	40
7.1.4 Social relations and security.....	40
7.2 Part conclusion	41
8 Reflections and limitations	43
9 Conclusion	44
10 References	45
Appendix 1	46
Appendix 2	91
Appendix 3	92
Appendix 4	94

1 Introduction

Kampung Biawak is located at the end of the Lundu-Biawak road just next to the Indonesian border. The road has existed since 1972 and was built by the Engineering Corps of the Malaysian Armed Forces to make it easier for the troops to fight communist guerrillas hiding in the border region and easing the access to Lundu for the locals. However the road has not been well maintained hence its condition is very poor.

There is a border crossing located in the village, which has existed since 1963. Before 1963 the border was not patrolled on a regular basis between Kpg. Biawak and the neighbouring village, in practise making the border obsolete, easing the interactions between the two areas. Furthermore because of the road condition it is still easier for the villagers to trade with their next-door Indonesian neighbours than going to Lundu, thus close social as well as economic relations are still well sustained.

The present border crossing is not a recognized international crossing so only Indonesian and Malaysian citizens are allowed to cross. A new official border crossing is under construction (called ICQ(S) (Immigration, Customs, Quarantine and Security)) along with a highway connecting the border area with the main town in the district, Lundu. Officials estimate the road to be finished by September 2011 and it is expected to affect not only the local area around the border crossing but also Lundu and state capital Kuching. The region is expected to gain from the new official border and improved road conditions, as it will decrease the transportation time to the city of Pontianak (economic center across the border in Indonesia) compared to present conditions and increase cross-border trade.

Both the poor road conditions and the border location of Kpg. Biawak seem to be of great importance for the villager's livelihood, as it is an important aspect of their everyday life. Moreover it all seems somewhat interconnected. The poor road conditions promote local cross-border trade, because of the poor accessibility to other markets, and the upgrading of the road is connected to the construction of the new ICQ, as the road is only being build because of the construction of the ICQ. By investigating different aspects of livelihood in the village along with attention to the current infrastructure, income-generating practices, farming practices and the border location this study seeks to clarify and understand the various livelihood strategies undertaken in Kpg. Biawak.

1.1 Main objective

The main objective of this study is to assess the livelihood strategies of Kpg. Biawak.

1.2 Research questions

In order to assess the above we have constructed the following research questions:

1. What are the main income generating practices in Kpg. Biawak?
2. How do the farming practices affect the livelihoods of the villagers?
3. How does the border location affect the livelihoods of the villagers?
4. How does the infrastructure affect the livelihoods of the villagers?
5. What are the future expectations of the villagers?

1.3 Framework for our study

“A livelihood comprises people, their capabilities, and their means of living, including food, income and assets.” (Chambers & Conway, 1991)

We will investigate the livelihood strategies of Kpg. Biawak by applying the sustainable livelihood framework as presented by DFID (1999). DFID describes sustainable livelihoods as containing five different forms of capital namely: human, social, natural, physical and financial capital. According to DFID sustainable livelihoods are dependent on all of the five forms of capital. The capitals are mutually influencing each other and the access to one capital may determine the access to the others. We want to use the sustainable livelihoods framework to investigate the main factors that affect the villagers' livelihoods and the typical relationships between these as shown in figure 1.1 (DFID, 1999).

Scoones (1998) describes the use of the livelihood framework as: ‘Given a particular **context**, what combination of **livelihood resources** result in the ability to follow what types of **livelihood strategies** with what **outcomes**?’

We are in this study investigating what livelihood resources or assets that can provide the villagers with the ability to follow certain types of livelihood strategies and hence achieve certain outcomes, which again can influence the access to other livelihood assets.

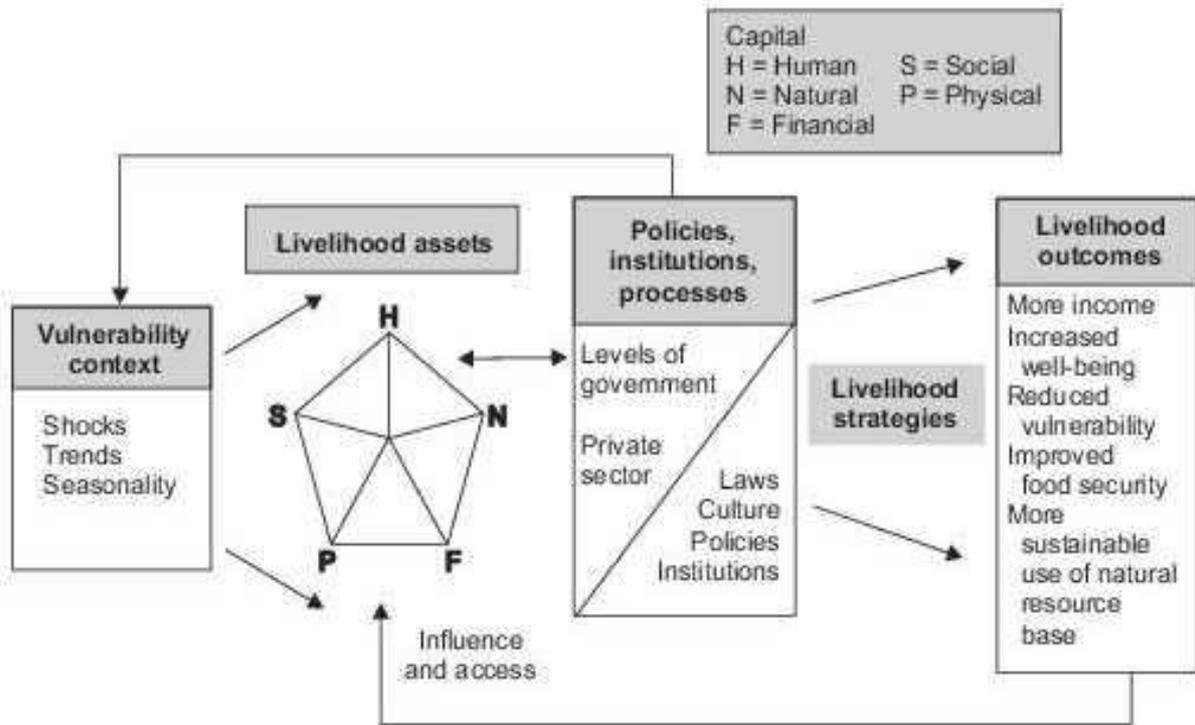


Figure 1.1 Livelihood framework, DFID, 1999: 1

2 Methods

We have investigated the livelihood assets of the villagers by conducting interviews, questionnaires and using PRA methods. Furthermore we have used soil and water samples, forest assessment and, GPS logging and mappings to assess the quality of the natural and physical assets.

2.1 Questionnaires

We conducted 30 questionnaires (36 were conducted, however only 30 useable) to get an overview of the village and to obtain demographic data. The survey was based on random sampling. We wanted to achieve information about the livelihood of the villagers on areas such as occupations, most common grown crops, cross-border marriages, etc.

We also used the questionnaires to make contact with respondents in order to arrange interviews.

2.2 Semi-structured interviews

We chose semi-structured interviews because of the open structure in these interviews, which opens up to new information and knowledge, as the semi-structured interview allows both the interviewer and the respondent to have influence on the conversation while the interview is conducted (Dewalt & Dewalt, 2002; Rubow, 2003). We used the interviews not only to get verbally obtained knowledge; but also as a way to get to know the context in which the interview was taking place (Rubow, 2003).

2.3 Observation

During our entire stay in the village we used observation to get impressions and knowledge about the daily life of the villagers and their surroundings.

2.4 PRA (*Participatory Rural Appraisal*)

2.4.1 History time line

By making a history time line we wanted to achieve an overview of how the village arose and we hoped that it would expose potential historical trends within the livelihood of the village as well as social practices and previous conflicts and their importance for the present situation.

2.4.2 PRA mapping

The aim of using a PRA mapping was to get to know the villagers' perception of the physical appearance of the village as well as to give us an overview of the village.

We also wanted to use the PRA mapping as an event in which we could make contact with the villagers.

2.4.3 PRA Ranking

The aim of using PRA ranking was to get an idea of what values people put in certain crops and to see the relation between the economical benefits from crops and the time spent on growing these crops. Furthermore we wanted to make a ranking of how the villagers saw the condition of different types of infrastructure and their need for improvement in connection to each other.

2.5 Soil sampling

The soil samples were taken to investigate the quality of the natural capital, which the villagers have access to.

Soil samples from the top layer (0-30 cm) were collected randomly from three types of forest (primary, secondary and newly regenerated 4 years old forest) and three types of cultivated fields (oil palm, rice paddy and pepper). A total of six samples were taken back home to Denmark for laboratory analysis. pH values were measured in CaCl_2 (0.01 M) by a Sentron pH-meter and the total nitrogen and total organic carbon were analysed with a continuous flow isotope ratio mass spectrometer (ANCA 20-20, Europe Scientific, Crewe, UK) using 1 mg acetanilide as standard. The organic matter was calculated on basis of the carbon concentration by using the following equation: $\text{SOM} = \text{toc} \times 1.72$, where SOM = soil organic matter, and toc = total organic carbon.

2.6 Water sampling

In order to make a water quality assessment water samples were collected from the river at two different points namely; upstream and downstream. Water quality data such as pH, chemical oxygen demand, salinity, dissolved oxygen, biological oxygen demand and total suspended solid were collected based on in situ measurements and total dissolved solids, ammonical nitrogen, phosphorus, nitrate, total caliform count and total fecal count were analysed in a laboratory in Lundu.



Picture 2.1. Multi parameter water quality instrument

2.7 Forest assessment

We did two forest assessments in order to get a general overview of the state of the forest, an estimate on how the natural regeneration was occurring and how the growth was in the area. The first forest assessment was simultaneously with the second transect walk, estimating the status of the forest. The second assessment was done with a Professor from UNIMAS making 3 10x10 plots at different forest types typical for the area.

2.8 Transect walk

We conducted two transect walks: one within the village centre and one in the surrounding area. This was done to get an overview of and achieve general knowledge about the local area and the resources available. Both walks were done with a guide and points of interest were logged on the GPS.

2.9 GPS logging and mapping

To get a better overview and understanding of how the village were organised we conducted further GPS logging of points of interest to make a more thorough map of the village and combined it with Google Earth.

3 Welcome to Kampung Biawak



Very Old Secondary forest

River

Fruit orchard

Cleared Forest

River

Cleared Forest

Dam

Waterfall

River + small cave

Water Storage

6 Year old forest

Unkept patch

Hill Rice

Farmers House

Mixed Fruit Patch

Fallow Land

Dual Pepper and Rice

Village Center

Tele Atlas

State

a © 20

10 Di



Figure 3.1 Transect walk

According to interviews and the history timeline the village of Kpg. Biawak was founded when a group of people belonging to the Dayak Salako ethnic group migrated from the village Kpg. Sajingan on the Indonesian side of the border. The early village consisted of 3 longhouses build in 1920 of which two are still standing while the third one fell when the army barracks were build in the village. The village is centered around these two old longhouses. Today the village consists of about 136 households with a population of around 767 people.

3.1 Overview of the village

The village is located close to the Indonesian border with a couple of physical landmarks as boundaries. To the North the river Pasir Ulu runs down the mountain and also to the East of the village marking the boundaries. To the South West runs a ridge, which marks these boundaries, as well as the border between Malaysia and Indonesia (see map appendix 3).

3.2 Occupations and activities

Based on 30 questionnaires we found that the majority of the villagers categorise themselves as farmers (58.3 %), 16.7 % as housewives, 12.5 % as shopkeepers and 12.5 % had other occupations (teacher, medical assistant etc.) (Figure 3.1). Even though some of the people considered

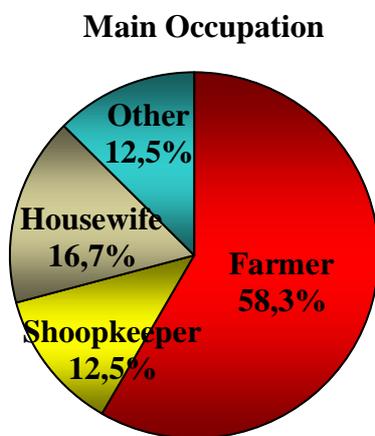


Figure 3.2 Distribution of Main occupation

themselves as farmers further talks with them indicated that they were also doing some side jobs such as looking after a friend's shop, helping at the medical clinic or providing motorbike transport service.

The area is dominated by small-scale subsistence farmers who only produce crops for themselves and often without any interest or opportunities to produce in larger scale. However, there are also

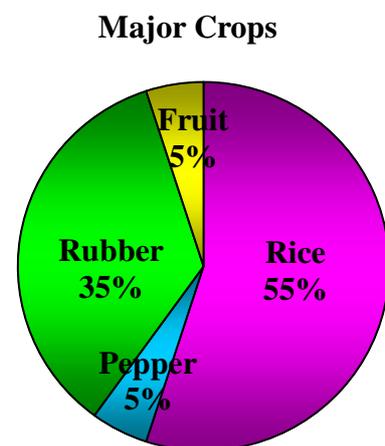


Figure 3.3 Distribution of major Crops

cash crop farmers in the area, and furthermore a few farmers showed willingness to experiment and try out new crops and methods.

The primary crops grown by farmers in Kpg. Biawak are hill rice, paddy and rubber, followed by fruits meanwhile pepper and cocoa are produced in smaller scale. Although rice is the most produced crop, it is solely for own consumption, while those producing rubber, fruits (on a larger

scale), pepper and cocoa primarily sell their products.

As the PRA matrix shows rice is by far the dominating crop but not the best one for selling, as the production of rice in the area is quite extensive.

This indicates that the villagers are mostly practising subsistence farming. Livestock is also produced in the village, but this is mainly in small scale for own consumption since expenses for fodder are quite high.

CROP	PADI	PATAH	JIJAH	LADA	LADA	KUBA	KUBA
AREA HECTAR							
PRODUCED THE MOST	5	5	3	1	1	3	
INCOME (CASH)	3	5	2	1	1	5	
PLANTABILITY	3	5	2	2	2	3	
LAND REQUIREMENT	4	1	1	2	2	3	
FOOD CONSUMPTION	5	3	3	1	1	3	
ALTERNATIVE USE	3	1	4	1	1	2	

Picture 3.1 PRA Matrix (Crops)

The isolated location on the end of the Biawak road might be the answer to why there is no large-scale farming, as logistics in the area are hampered by the poor condition of the road. However even though the village is a bit isolated due to the bad road the location close to the Indonesian border has made the village into a small hub for small-scale Malaysian-Indonesian trading, which the majority of the village is engaged in. The location allows a steady stream of goods, legal as well as illegal, to go to and from the village without much interference from local authorities. The villagers have lots of activities across the border, both business and social matters.

4 Income generating practices

There are three main income-generating occupations in Kpg. Biawak namely farming, shop-keeper and motorcycle transport. The border location of the village opens up to income-generating practices, which would not be a possibility if the village was located elsewhere. Therefore, the location of the village can be perceived as an asset to the villagers, which can give access to other assets, such as financial capital.

4.1 Border related practices

The village has about 10 shops and most of them have small cafés too where you can get a drink or some simple food. The majority of the costumers are Indonesians from the neighbouring villages Kpg. Aruk and Kpg. Sajingan hence their existence is very closely connected to the border location. Besides selling commodities for cash income they also do barter trade. The Indonesians come over to trade their crops, such as rubber, pepper, cocoa and fruits to get rice, sugar, cooking oil, cookies and other processed food stuffs. This gives the impression of Indonesia being less developed than Malaysia, as they trade primary commodities for processed commodities.

The majority of the shop-keepers in Kpg. Biawak buy their shop items from Lundu and Kuching, which are the bigger cities in the area however some shop-keepers buy cigarettes in Indonesia, which they sell in the village or to customers in Lundu. This is not legal, as they do not pay customs for the cigarettes however in local context it is seen as one of the perks of living in a border village. Furthermore when acting in a border area the perception of what is legal and what is illegal is not black and white but more like grey. On government level smuggling is illegal as it is formulated in the laws but on local level, especially in an area like Kpg. Biawak that were once united, it is not perceived as an illegal act as the border is just a physical installation without the same symbolic and political value as the government sees it.

It should also be mentioned that according to an informant 20 tonnes of sugar each day pass through the village on the way to Indonesia because sugar is cheaper in Malaysia than in Indonesia due to government subsidies. This is a good example of the grey zone in these border areas. However according to the immigration officer in Kpg. Biawak there is no illegal trade of importance in the village.

In this way the border location influences both what is sold and what is bought in Kpg. Biawak and it also influences the possibilities for generating income through shops. However there are seasonal fluxes in the selling possibilities and during harvest season the Indonesian customers are not coming as regularly as outside the harvesting seasons.

Motorbike is the most common and popular mode of transportation in Kpg. Biawak hence providing transport is a good source of income in the village. The motorbike transport business seems well organized in the sense that they have made a motorbike club where members can borrow money for health care and educational purposes (see chapter 5.3.1). In this way the motorbike business is also connected to the social structures in the village. According to an interview with the advisor of the motorbike club, there are many Indonesian customers hence we found the motorbike business connected to the border location. Because of the confrontation between Malaysia and Indonesia in the 60ies there is a free zone area up till 200 meters after the border line on both sides where it is legal to roam without passes. This will however change when the ICQ opens as they will have tighter security and proper travel documents will be needed in order to cross the border. The motorbikes are transporting both people and goods, and there are seasonal fluxes in the income from this business where festivals, New Year and other holidays bring more customers.

Location	Price (RM)
ARUK	10.00
PASIR ULU	5.00
ESTATE	10.00
JANTAN	15.00
JANGKAR	15.00
KAMPUNG BARU	20.00
PASIR TENGAH	30.00
TANJAM	20.00
ABADI	35.00
PASIR HILIR	25.00
SEDAING	35.00
RUKAM	30.00
SIMPANG 3	35.00
LUNDU	40.00
SERAYAN PERIGI	40.00
SEBAKO	50.00
PAON TEMBAGA	45.00
SEMATAN	50.00
PUEH	60.00

MOTOSIKAL SAHAJA BEROPERASI
24 JAM
~ KELAB PENAMBANG KAMPUNG BIAWAK ~

Picture 4.1 Pricelist of motorbike transportation.

4.2 Farming related practices

As mentioned in the presentation of the village there are some cash crop farmers in the village. The income made from the fruit is generally very low hence the majority of the villagers who cultivates cash crops are mostly involved in subsistence farming thus it is more a security or 'money in the bank' to them than their most important income.

We were informed by one respondent that the dragon fruit prices are good compared to other crops however expensive to grow, as one frame used for one plant costs about 20 RM as it is made from the Belian tree (ironwood)¹ but will then last for many years. We only encountered one farmer who exclusively cultivated cash crops. He was relatively wealthy and was more the exception than the rule.

¹ Very strong but expensive wood as it is more or less extinct in the wild and grows very slowly.

5 Farming and forest

Both the accessible land and the surrounding forest are important assets to the villagers and are indispensable components of their livelihood strategies.

5.1 Farming possibilities

The farming possibilities, or farming practices, depend upon soil characteristics, weather conditions, pest/disease problems, farming knowledge, capital, market possibilities, workforce, land tenure and governmental support.

Location	pH	Total N (%)	SOM (%)
Paddy field	4.1	0.20	2.86
Oil palm field	4.0	0.14	2.88
Pepper field	4.4	0.17	4.10
4 years fallow	4.6	0.13	3.90
15 years fallow	3.7	0.15	3.70
Primary forest	3.5	0.23	6.91

Table 5.1 pH values, total N and SOM status of different soils in the area of Kpg. Biawak.

5.1.1 The soil of Kpg. Biawak

A soil analysis showed that the soil in Kpg. Biawak is strongly acidic (Table 5.1). The soil from the primary forest and the 15 years fallow were more acidic than the 4 years fallow and the cultivated areas. This is properly because of the higher amount of biomass resulting in higher degree of root respiration and plant decomposition which are two factors, which play major roles in acidifying soil (Bruun 2010, personal reference). Cultivation methods might have a small effect on the pH level, though none of the interviewees used lime in order to increase the pH level. We found it likely that the farmers chose the soil with the highest pH level for their crop cultivation for instance by using indicator plants, as one farmer explained.

Total nitrogen in cultivated and forest areas ranged from 0.14 - 0.20 % and 0.13 - 0.23 %, however it should be mentioned that both the oil palm farmer and the pepper farmer had applied fertilizers.

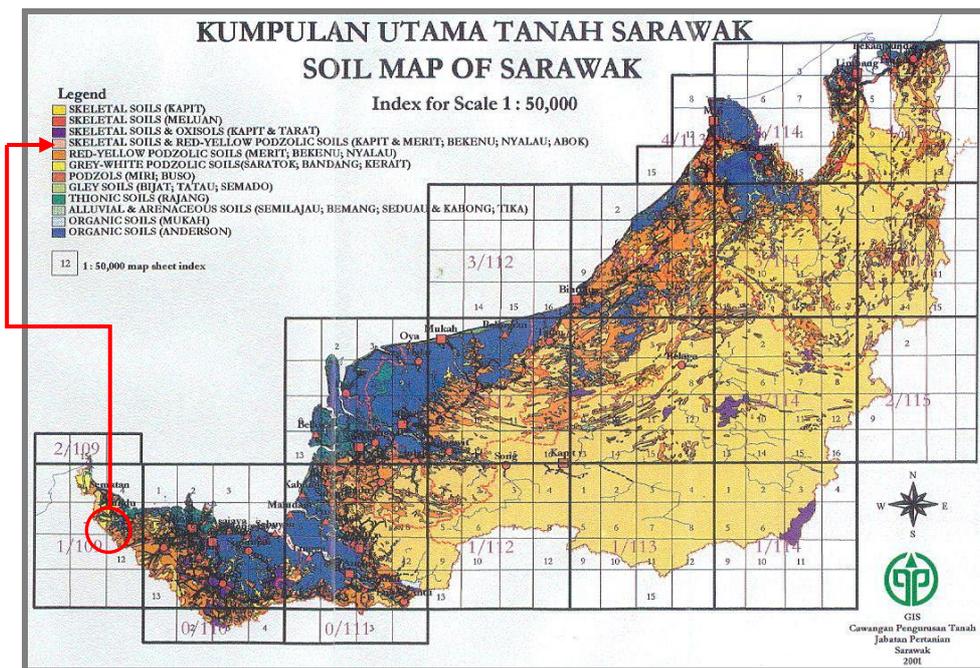
According to soil status limits set by Defoer *et al.* (2000) (Table 5.2), Kpg. Biawak has a good soil type considering total N and SOM in both cultivated and forest areas.

Factor	Status factor in the soil		
	Good	Deficient	Poor
SOM (%)	> 1.7	0.9 – 1.7	< 0.9
Total nitrogen (%)	> 0.1	0.05 – 0.10	< 0.05

Table 5.2. Soil status limits set by Defoer *et al.* (2000)

However, it is important to mention that the total content of nutrients is not the same as what is available for the plants, and normally only <1% N is considered available (Defoer *et al.* 2000).

Based on Sarawak Land Classification Systems, there are 5 classes of soil types, and according to the Department of Agriculture (DOA), Sarawak, the soil in Kpg. Biawak is classified as “soil class III”, also called “red-yellow podzolic soils” (Fig. 5.1) or ultisols (Coulter, 1998). This indicates land with two or three moderate or one serious limitation which restricts the range of crops, the degree of possible mechanization, or requires special conservation practices (interview with DOA, 2010).



(Figure 5.1 DOA, 2010)

The low soil pH values in Kpg. Biawak indicates a potential low amount of available N, P, K and Ca, a low base cation exchange capacity and a potential toxic, high concentration of Al, Fe and Mn (Figure 5.2). These findings are consistent with general characteristics of ultisols (Coulter, 1998; Cramb, 2005). Furthermore not only the pH value, but also a reddish soil colour observed in the area of Kpg. Biawak, indicated a high concentration of iron in the soil. N, P, K and Ca are essential macronutrients while a high concentration of Al, Fe and Mn can be toxic for the plants (Husted *In* Jensen & Husted 2009) hence the soil in Kpg. Biawak has a poor fertility and may also have toxicity problems.

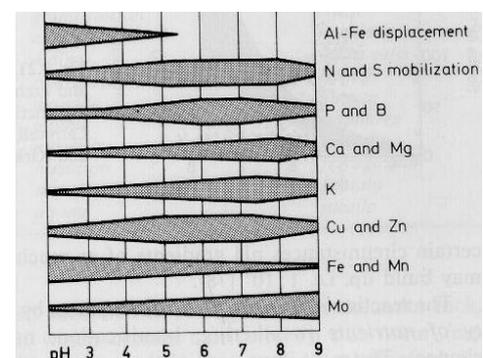


Figure 5.2 pH influence on nutrient mobility (after Trough, from Schroder 1969)

The heavy rain falls in this part of the world might be an explanation for why the soil in Kpg. Biawak is acidic, since heavy rain may result in soil acidification due to an accumulation of Al^{3+} in the soil solution (Husted *In* Jensen & Husted 2009).

The low availability of essential plant nutrients, and high risk of toxicity in the soil, gives farmers of Kpg. Biawak some big plant nutritional challenges, and several villagers applied fertilizer to their crops. Fertilizers were provided as subsidies from the government (mix of N, P_2O_5 , K_2O and MgO (picture 5.1)) but several villagers found the fertilizer of a low quality. However it could be that the quality is fine but that it is the low pH level, which makes the plant nutrients in the fertilizer unavailable for the plants.

It should also be mentioned that one farmer did not believe that the written information on the bag of fertilizer was consistent with the actual content in the bag. Furthermore even though the soil in Kpg. Biawak induces some limitations on the farmers, then one farmer found the soil excellent for dragon fruit production, hence the soil in Kpg. Biawak may have a potential for large-scale production of this crop.



Picture 5.1 Fertilizer provided by the government.

5.1.2 Plant diseases

A problem mentioned by several farmers was a fungal pepper disease (picture 5.2). Since these farmers rely partly on pepper production, it is an important issue to them. When the disease occurred the farmers had to stop the pepper production and grow something else for a period, and some farmers had stopped growing pepper all together (picture 5.3). Some farmers had heard of a cure for the disease, but they did not know if the cure was effective and at the same time they found it too expensive.



Picture 5.2 Diseased pepper



Picture 5.3 Converted pepper field



Picture 5.4 Healthy pepper field

5.1.3 Possibilities for large-scale farming

As mentioned earlier there is no large-scale farming in Kpg. Biawak, which could be due to several different factors. According to DOA the soil type of the area is of a poor quality and the expenses for improving the soil quality are very high. Our analyses of the soil confirmed that the soil has a somewhat poor fertility. Furthermore DOA told us that the area was not even suitable for oil palm, which strength is that it can be grown on fairly marginal soil. The soil fertility can have a negative effect on the productivity of the area hence it could be unsuitable for large-scale farming.

Furthermore the road condition of the area is not good (further elaborated in chapter 6.1), which could also be a reason for large-scale farming not to have gained a foothold in the area, as large companies may not have an interest in investing in an area where it is difficult and expensive to transport the goods. We observed during our drives to and from the village that there were some areas with large-scale farming up until about midway on the road towards Kpg. Biawak. This could support the argument about road conditions being a reason for the absence of large-scale farming, as Kpg. Biawak is at the very end of the road.

We also found it likely that the bad road conditions affect the competitive power for the cash crop farmers, since the road makes it more difficult and time consuming to access the markets in larger cities, such as Lundu and Kuching. However in general farmers did not have problems selling their products and they did drive to the bigger cities or gross buyers from the bigger cities came to the village. One farmer mentioned problems with selling rambutan, jackfruit and durian, but only in years with good harvest where the competition is high.

Another reason for why there is no large-scale

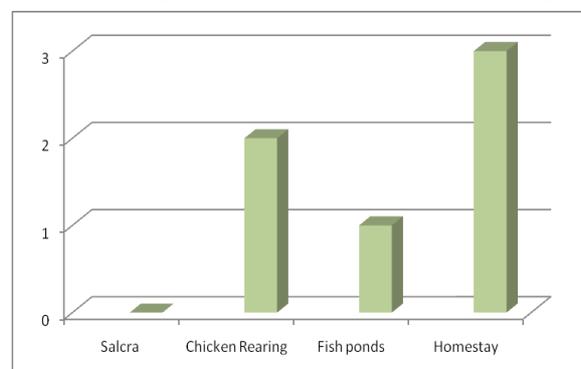


Figure 5.3 Division of interest in development schemes.

farming could be that the area is extremely hilly, which makes the accessibility very poor and more suitable for small-scale farming.

The villagers were not impressed by some of the larger scale schemes that were offered in the area, like SALCRA, which according to the villagers gave a very little return compared to what they gave up. It should also be mentioned that it seems like no one has ever showed initiative or interest to engage in large-scale farming in Kpg. Biawak and maybe it is just a lack of initiative that is the reason why there is no large-scale farming.

5.2 Part conclusion

From our results it can be concluded that the soil has a good nutrient status considering N and SOM however the very low pH value may affect the availability of several nutrients and in this way restrict what is suitable to grow in the soil if no soil management is done. Even though the hot and humid climate is good for crop production the soil may in this way be a limitation to the farmers.

This could also be one of the reasons why large-scale farming is absent in the village as well as poor road conditions and lack of initiative.

5.3 Social aspects of farming practices

The farming practices do not only include natural capital but also social capital is included in these. When we examine the villagers' farming practices, we have to focus on the social capitals seen in relation to the villagers' livelihood strategies and their accessibility to other resources, which may be of importance for a sustainable farming practise. Both social, human, natural, physical and financial capitals are of importance to create and maintain a good farming practice.

5.3.1 Social capital to minimize vulnerability in the farming practices

As the soil analysis shows, the soil needs soil management in order to improve the farming practices. Knowledge about the soil is therefore important in order to improve the cultivation of the areas we have examined. It indicates that access to knowledge on cultivation of the soil is important to have a successful farm. Indigenous knowledge is one aspect, however access to agricultural education proved also to be a factor of some importance (see box 5.1). The importance of education indicates that the farming practices not only require practical skills and traditional knowledge but also access to more modern knowledge/technologies. Investment in education thus seems to be a good investment in the farming practices. Therefore the farming practices are influenced by the access to social capital. In this way the social capitals are important for the access to a sustainable livelihood.

Case Mr. David

Box 5.1

David is a farmer. He has 30 chickens and 3 pigs – these are for his own family. He has 30 Acres. The 10 Acres is for cultivation and the 20 is for forest. He works together with his wife and also gets help from his sons.

He does not think that the children will follow his work on the farm as they are employed in Kuching – in the agriculture department. The son provides David with a lot of knowledge about the latest scientific news of agriculture. Mr. David sees a lot of opportunities in connection to the border. He sees opportunities for higher income because of the increase in population and more people wanting to cross the border.

David and his wife have invested in the only rice machine in the village. They rent out the rice machine for 20 cent per kilo rice. There is a motorbike club in the village and everybody in the motorbike business is a member. They pay 3 RM a month and a commission of 1 RM for each customer. They keep the money in the bank and then lend them out to the members for education or medical purposes. There are 39 members in the club but not all drive motorbikes. 10 of the members are not in the motorbike business but only pay the 3 RM a month.

Mr. David is the adviser of the club. He sees a lot of opportunities in connection to the border because of opportunities for higher income for the reason that there will be more people.

According to DFID (1999) sustainable livelihood depends on strategies, which can minimize vulnerability. It seems like vulnerability is considerably smaller for those who have access to



Picture 5.5 Rice machine

broader aspects of opportunities as diversified livelihoods spreads risks.

The case about Mr. David illustrates how social aspects influence the farming practices. Mr. David had invested in good education for his sons, which turned out to be beneficial for him as his sons, who are now working in the Agricultural Department, is providing him with the latest knowledge on farming practices. That is one way to deal with vulnerability. His social capital, i.e his networks to the Agricultural Department, are providing him with resilience to vulnerability in his farming practices as he can rely on different sources of crops, due to his own farming skills and the help from

his sons. He and his wife are also the owners of the only rice machine in the village. We are not

sure of which opportunities this provides for Mr. David's farming practices besides cost free access to the machine. As they rent out the machine to other villagers it may provide them with a second source of income as well as an opportunity for networking. The case indicates how the social capital

Case Steven's mother

Box 5.2

Steven drove us up to his mother's farm, which seemed quite big. Steven showed us the fields where some of them were right next to the border. The family was also one of those who were forced to give up and sell land to the government in connection to the construction of the new border. Steven's mother told us that she was paid less than half of the money the land was worth.

Steven's mother seemed like a strong woman. She also has a reason to be strong since her husband is a Malaysian Indian and have no rights to the land. Steven's mother is therefore the sovereign owner on the paper of her their farm.

The farm is a part of a big area, which used to belong to Steven's grandfather. When the grandfather died he gave the farm in heritage to the 13 siblings. The farm was equally divided between the 13 siblings, both daughters and sons.

Steven's mother is, besides a farmer, also a shop-owner and she owns a shop in the centre of the village.

Most of the customers are Indonesians and the trade is a mix between cash and barter trade. The Indonesians wants secondary goods – the Malaysians wants primary goods. The family has relatives on the Indonesians side of the border. When the new official border open Steven's mother fears that the new road will lead the customers straight to Kuching instead of by her shop. She therefore fears that the official border will lead to the closure of her shop.

If the shop closes Steven's mother will try to intensify her oil palm cultivation.

and access to other forms of capital is important to the household for optimizing the output of the farming practices.

Besides being a farmer Mr. David is also involved in motorbike transportation. He is the advisor of the motorbike club, which is a formalised group membership. This function might provide him with a beneficial social position in the village, which possibly gives him access to a broad social network. We are not sure how this influences Mr. David's farming practices but the case indicates that the access to different fields of capitals could be beneficial and provide opportunities for different sources of income. This livelihood strategy reduces vulnerability.

It is very common in the village to have mixed occupations, which shows an ability to be flexible, which is important to reduce vulnerability.

Box 5.2 shows that vulnerability is reduced if there are possibilities and willingness to make changes in livelihood practices. Furthermore it shows how the farming strategies can be changed when other circumstances change, which is a very good example of

flexibility and adaptation that will reduce vulnerability to future changes. Steven's mother may change her farming practises due to a changing market which could lead to the closure of her shop. The case is also an example of a common combination of income generating practices in the village namely being a farmer and a shop-keeper.

5.3.2 Traditional practice and new knowledge

As the case with Mr. David indicates education is important for the farming practices. Other interviews did also show how farming and education are connected. This is illustrated in box 5.3.

It is interesting how the farmer explained how he participated in an agricultural course provided by the government, while the agricultural officer in Lundu explained to us in an interview that the villagers do not have any interest in education in the agricultural field. The agricultural officer notes that the mindset of the village is to maintain the traditional farming culture and hence stalls development in this area. This however is not our impression. We experienced farmers who benefit from mixing the use of traditional farming practices with new technologies and knowledge. Some of the farmers are also showing flexibility in their farming practices as they are trying to achieve access to different kinds of resources, which creates new possibilities for a sustainable farming practice.

5.3.3 The border location and farming

There are social practices connected to both the border location of the village and the farming practices. The border location provides Kpg. Biawak with special opportunities. In our interview with the farmers we became aware of the widespread use of cheap labour from Indonesia. The majority of the farmers we interviewed were using Indonesian labour to assist them in their farming especially during harvest seasons. The general attitude was positive as everybody we interviewed saw the advantages of hiring cheap Indonesian labour. No one seemed to feel slighted or felt that the Indonesians took their job opportunities. One informant answered that he would not like to take over the Indonesian workers jobs, as they were paid very little hence he thought it was completely okay for them to come and work in the village. Furthermore a reason for the positive attitude towards the Indonesian labour could be that many of them is relatives or friends and that most of the villagers either use or have used Indonesian labour themselves.

The new border could have a negative effect on the flow of Indonesian labour and thus the future farming practices, as box 5.4 exemplifies.

Farmer, John age of 48

Box 5.3

Description of farm:

His primary crops are pepper (different varieties, among those Indian pepper), dragon fruits and citrus fruits (pomelo and oranges) and several other small-scale mixed fruits.

A typical day for him is going to the field where he removes weed, sometimes he uses fertilizer and herbicides. He gets some of the fertilizer from government however he does not find this very effective. He also buys some fertilizer himself, which he finds more effective even though there is written the same on the list of ingredients on the bags. He has three sorts of fertilizer: one which is universal hence it can be used for all his crops, another one specific for the use of pepper and a third one that is used for dragon fruits. He only uses traditional tools, except for an electronically driven bush cutter.

30 villagers (including himself) had been on the peninsula of Malaysia to attend a course where they learned how to improve the pepper crop production methods, which was paid by government. The government also plan a trip to Vietnam in order to learn different growth methods, but this has not been realized yet.

Box 5.4 shows how the new border probably will have an effect on the farming practices and that it forces farmers to think along new lines in accordance to farming and income-generating practices.

Case Indonesian labour

Box 5.4

All the members living in the household are participating in the farming. He has 7 children where only one of them participates in the farming as the other 6 are living in Kuching working with government. During harvest he also has 7 employees where half of them are Indonesians. When the official border opens it will be more expensive to get Indonesian labour because it will get more difficult and time consuming for the Indonesians to get into Malaysia. He will then try to get Malaysian employees but they are more expensive than the Indonesians. He might also consider growing something less labour demanding such as fruit trees to avoid the extra expenses to labour. Furthermore he considers making a homestay for tourists.

He has not by himself had any bad experiences due to land tenure but he thinks there are some political problems related to land tenure. He thinks the compensation rate is too low when the government takes land, for instance for the development of the border. People do not want to buy land because they are afraid to lose it to the government.

He has no problems by living close to the border. He thinks the official border might attract more tourists and he thinks that he could benefit by from this by selling fruits directly to the tourists. A negative effect would be if the state came and took his land because of the new road.

5.4 Part conclusion

It is very obvious that the villagers in Kpg. Biawak have diversified livelihood strategies in connection to farming, which make them a lot less vulnerable to fluxes and shocks. Some farmers have access to important knowledge through social relations, which therefore also determines their farming practices.

In general the villagers seemed to have many ideas in reserve to solve possible future problems, which shows a great deal of flexibility, and then again can reduce their vulnerability.

5.5 Forest in the Area

The forest in Kpg. Biawak was, compared to many other places, quite intact. The areas in close proximity to the village were mostly cultivated fields or plantations. There was a community forest of about 70 hectares very close to the village centre, which was maintained with permanent forest cover to supply the village with different non timber forest products such as fruits and medical plants, which will only grow under continuous forest cover. Due to its location close to the village centre all trees with timber value had been felled and used. The village got its supply of timber from areas up a hill to the north. This area was more difficult to access, which made it more unattractive for farmers, as the transport time and physical strength needed to get there is higher than cultivating the areas in the lower part. Though we went 2.5 kilometres up the hill, and in our estimation it had been a difficult climb, there were hill rice fields and fruit orchards up to about 2 kilometres from the village centre. This indicates that once the shortage of land is getting worse the villagers are forced to cultivate the more rugged lands. It was around here the village got its supply of timber, and there was evidence of felled trees as well as sawn timber which had been left up there as it had been too

hard a job carrying it down the hill. (See appendix 3 for physical identification). We did not encounter much wildlife in the surrounding forest areas due to hunting. However there was wildlife in the area, and we saw bats and birds, a captured slow lorry as well as heard stories from the villagers about the presence of sun bears, snakes, monkeys and wild boar.

5.5.1 Timber Present

On the first forest assessment we had a quick look at how many different trees were present in the area in order to estimate the value of the forest area as a natural capital. Of the timber trees in the area we noted the red, yellow and white Meranti² (*Shorea* sp.) as present in fairly large sizes and numbers, there were also the presence of Kruin² (*Diptocarpus sarawakensis*), Madang² (*Alseodaphne* sp.), Belian² (very scarce) (*Euderoxylon zwagerii*), Benuang² (*Octomeles sumatrana*) and a tree called Kenau² which was quite rare but not endangered. These species were those our guide knew as he had been working with a logging company. There were several other species classified as Juntas (see box 5.5) they had no timber value but an esthetical value as a lot of these had the big supporting roots you often associate with rainforest trees.



Picture 5.4 Rainforest tree roots

Juntas

Box 5.5

The classification of trees called Juntas in the forest of Borneo is a classification used by the indigenous people. These trees are not necessarily related or have any common features. The only thing they have in common is that whoever points out a Junta has no idea what kind of tree it is or what it is called. Junta is translated into English as the very top of the tree, and is used by the indigenous people so they seem to know everything about their forest.

One author was exposed to this kind of local classification when he in the late 1970ies tried to name the thousands of tree species on Borneo with both local name and scientific name. At some point he had annoyed his guide, so the guide gave a name of a tree which in fact was referring to the author calling him something very unflattering which occurred in the first edition of the book. In the following editions it has been corrected.

² Local name

5.5.2 Plants Present

The undergrowth of the forest had many different plant species; some could not be classified and some were well known like the Giant armofelia (*Amorphophyllus* sp.) and several species of wild ginger (*Scaphochlamys* sp.). A lot of Ratan (*Kothalsia* sp.) were also present as well as Pandan (*Pandanus* sp.), Bomban (*Donax* sp.), Jatan (*Melanorrhoea* sp.) (poisonous), Rattan (*Calamus* sp.) and many *Areca* sp. like Pinang. A lot of these different plants and herbs the villagers collect and use in their daily life. When interviewing the villagers they told us that they were not using any non-timber forest products to generate income. However, observations indicated that they did sell a number of different non-timber forest products.

Picture 5.5
Costus preciosus.
The young shoots are eaten as salad; however the plant can also be used for medicine.



Picture 5.6
Willughbeia sp. (local name: Kubal). This species provides forest fruits to the villagers.



Picture 5.7
Elateriospermum tapos (local name: Perah). After boiling these seeds are eaten. Further on cooking oil can be produced from the seeds.



Picture 5.8
Nepenthes sp. is used for serving rice.

5.5.3 Vegetation growth of the area

Due to shifting cultivation the age of the forest was not consistent, and observations of different indicator plants indicated different lengths of fallow periods. The presence of *Macaranga*³ and *Adinandra*³ indicated a young secondary forest and the presence of *Dillenia suffruticosa* indicated that the forest was developing into a bigger stand (it was also present in the beginning but grows best in shade). These species, as well as some other species, which were lost in translation, told us that the forest in the area had good conditions and were developing well.

On the second forest assessment we measured the trees and noted the different species in the undergrowth at three different locations (see appendix 4 for list of species and tree size). The three locations were 1) a four year old regeneration, 2) a 12-15 year old regeneration, and 3) the community forest which have never been completely cleared (Box x for biomass). According to the

³ Local name

calculations the area has an aboveground live biomass increment (ABI) of 8.14 $\text{Mg}\cdot\text{ha}^{-1}\cdot\text{yr}^{-1}$. In another research done on Borneo by Deborah Lawrence, who measured the ABI in different paddy fields after it had been fallow for some

Site	Biomass	
4 year old forest (Jeramai)	15.39	$\text{Mg}\cdot\text{ha}^{-1}$
12-15 year old forest (Damun)	96.84	$\text{Mg}\cdot\text{ha}^{-1}$
Primary forest (Pulau Galau)	170.62	$\text{Mg}\cdot\text{ha}^{-1}$
Forest growth	8.14	$\text{Mg}\cdot\text{ha}^{-1}\cdot\text{yr}^{-1}$

Table 5.3 Forest Biomass

years, the ABI was between 4-7 $\text{Mg}\cdot\text{ha}^{-1}\cdot\text{yr}^{-1}$ (Lawrence, 2005). This indicates that the growth rate in Kpg. Biawak is in the high end, however it should be mentioned that our calculation for ABI is based on very weak data.

5.6 Part Conclusion

Overall it can be said that the state of the forest is in a fairly good condition and there is a large seedbank of valuable species not far from the village. Forest products are used both for home consumption and as a source of income. The condition for the growth of the forest seems very good once the cultivated areas are left for fallow and the regeneration occurs spontaneously.

6 Infrastructure

The infrastructure represents the physical capital of Kpg. Biawak and is a very important part of the villagers' livelihoods. However not all parts of the infrastructure are equally important to the villagers thus not all aspects will be treated in depth.

PRA-RANKING		Bekalan air	Kemudahan kesihatan	SEKUTING Keselamatan	Bomba	ROADJ Jalan	WASTE WASTE MANEG-MENT	INTERNET ACCEJ Kemudahan Internet	TELE-COMMUN-ICATION Telekomunikasi
PREJENT CONDITION Keadaan Masa Kini	3	3	5	1	1	1	1	4	
NEED FOR IMPROVE-MENT Perlu diperbaiki	5	5	3	5	5	5	3	3	

Picture 6.1 PRA Ranking of infrastructure

PRA Ranking

Box 6.1

The PRA ranking of the infrastructure of the village showed that the participating villagers regard the present condition of the roads, fire fight accessibility, waste management and Internet access as bad. This mark was giving in comparison to water supply, medical accessibility, and telecommunication. However the villagers expressed that they rely less on Internet access hence, it would be positive if they had access to the Internet but can easily accept the current situation of the Internet accessibility.

6.1 Road conditions

As mentioned earlier the Lundu – Biawak road is in a very poor condition since it has not been maintained properly after it was built in 1972. The villagers brought this up spontaneously in most interviews hence it was very obvious that this was an important issue to them.



Picture 6.2 Road condition

The PRA ranking of the infrastructure of the village supported this as the villagers found the present condition of the road extremely poor and at the same time they were dependent on it, as they need a decent road to have better access to Lundu. They need to have easier access to Lundu not only for trade and other income generating matters but also in case of emergencies, such as medical transport to Lundu or fire fight assistance from Lundu.

The condition of the road has been a major concern of the villagers for the last 40 years and they said that it is difficult for them to go in and out of the village without a suitable transportation system since busses no longer come into the village because of the road condition.

The road issue is very dominating in the villagers' livelihood as it is their direct connection to the surrounding world. It almost seems as if the road has been given the role of the 'saviour' in the village. Many blame the poor road conditions for other problems in the village and seem to think that if the road was fixed, everything else would follow. It is probably true that a great many problems will be solved when the road is completed but not everything. Some of the infrastructural challenges the villagers face, such as waste management and water supply, do not, even though interconnected, get solved by finishing the road, as they also require government initiative.

However some shop-keepers have concerns about the road in connection to the flow of Indonesian costumers but this opinion was not shared by all the shop-keepers. If the new road as a physical capital stands in the way of access to financial capital for the villagers it will loose value as a capital. However it will still be an important physical capital, which establishes access to other capitals.



Picture 6.3 New road under construction

The location of the village is very important in this discussion as the road is being upgraded because of the new ICQ and might not have been upgraded if there were no plans to develop a new official border close to the village. This is seen in the light of the past 40 years where nothing has been done to maintain the road until the plans of the ICQ were realised. Furthermore the district officer explained that not only Lundu but also Kuching would benefit from the road and ICQ, as Kuching airport would suddenly be the closest gateway to many tourist attractions in Kalimantan - the Indonesian province on the other side of the border. This emphasises the suspicion that the road has been built because of the future official border crossing and not only to accommodate the needs of the village.

On the basis of this the location of the village is in itself attracting physical capital as the border location is central for the construction of a new road.

6.2 Waste management

The road also plays a central part in the waste management of Kpg. Biawak. There is no proper waste management system in the village including solid waste disposal. Presently they dig a hole, collect their solid waste and burn or bury it, as they have no other choice. Moreover the villagers collect iron and steel once a week and sell it just as aluminium cans are collected and sold/recycled.



Picture 6.4 Waste management



Picture 6.5 Scrap metal

The ‘collect and burn’ method has been taught to the villagers by the government but still the villagers express that they need help from the government to solve the waste management problem. Before the waste management courses they threw garbage everywhere. The improvement of the waste management in the village shows that the villagers have a sincere wish for improving the waste management system and they are willing to make an effort to change the settings in which they live. It furthermore shows that they care about their local environment and that they have access to a certain level of human capital.

By observation it was very obvious that this method of waste management both worked in a structured way and in a rather random way. Next to our house a big hole had been dug where we could dispose our garbage. However if a pile of garbage was randomly collected at a roadside it was just set on fire on the spot. Although the waste management at times is rather random the villagers still make an effort to accomplish their objective by investing human capital and receiving training.

Both in the PRA ranking and in interviews the villagers indicated that there is a huge need for improvement in this area since it could give the villagers better health conditions, a better environment and fewer discomforts connected to waste such as flies and obnoxious smells. There is a hope among some of the villagers that once the road is



Picture 6.6 Garbage disposal

finished there will be a waste management system provided by the government, but as mentioned earlier this is not included in the future plans for the village from official side.

6.3 Fire fight accessibility

As the PRA ranking showed the fire fight accessibility is very poor and really needs improvement. There are no fire hydrants or any other fire-fighting equipment or services in the village and the only assistance they can get is from Lundu where there is a fire department, though due to the road conditions the accessibility is extremely poor.

This was very tragically proved to us, as there was a fire at the local school the day before we left, which burnt down to the ground. Fortunately it happened during night time and no people were injured however a lot of materials were destroyed. It was stated that the military was trained for putting out fires and that the villagers could help if a fire broke out but unfortunately this proved not to be enough.

Furthermore when considering the waste management in the village where solid waste is collected and burnt, sometimes rather random, fire fight accessibility does seem like an important issue.

However the problem about fire fight accessibility is not only having access to fire fighting equipment and training in the village but also to have access to water (natural capital), which during the drier months of April and May can be a problem, as the water supply can be scarce.

6.4 Water supply

It was expressed in several interviews that the village does not have an abundance of water supply but just enough to cover the current households without anyone suffering. This was underlined in the PRA ranking where the current condition of water supply was ranked tolerable but ranked in the top in need for improvement. According to the respondents' opinion there will not be a change in the water supply of the village because the government has no plans to improve the water supply. The agriculture officer told us that the village has a good water supply and the government has no future plans for improving the water supply. The village is currently relying on water from the mountain through a gravity feed system and a dam, which has been provided by the government and is free of charge. Another dam has been made in connection to the new ICQ but this will not affect the water supply of the village in any way as it is located further down the mountain stream and is solely for use of the ICQ.

When the ICQ opens the villagers expect an increase in the population and might be in need of a treated water source to endow with the increase in water demands. However the district officer denied that they were planning such projects.

Parameters	Unit	Concentration of parameters at Upstream	Classes	Concentration of parameters at Downstream	Classes
pH	-	7.07	I	6.71	I
COD	mg/L	0	I	0	I
Salinity	%	0.01	I	0.01	I
Dissolved Oxygen	mg/L	8.10	I	7.59	I
Biological Oxygen Demand (BOD)	mg/L	2.45	IIA	2.45	IIA
Total Suspended Solids	mg/L	2.00	I	0.00	I
Total Dissolved Solids	mg/L	0.016	I	0.018	I
Ammoniacal Nitrogen	mg/L	0.01	I	0.01	I
Phosphorus	mg/L	0.826	Normal	0.05	Normal
Nitrite	mg/L	0.00	Normal	0.00	Normal
Total Coliform Count	Cfu/100 mL	600	IIA	2000	IIA
Total Fecal Count	Cfu/100 mL	50	IIA	90	IIA

Table 6.1 Results from water analysis

On the basis of our water samples the water was classified as Class I and Class IIA (Table 6.1), which indicates that the water quality is good and suitable for consumption without any contaminants or pollutants. The water supply does not only cover the physical capital but also the natural capital. The above shows that the village possesses not only good access to water in the form of physical capital but also that the quality of the water is good thus the village has good access to natural capital in this sense. However if the water



Picture 6.7 Water dam (Source)

supply is going to be scarce in the future it will decrease the village's access to both natural and physical capital hence their livelihoods will be affected by this in a negative way, as a decrease in access to one asset can have influence on how they access other assets.

6.5 Medical clinic

There is a medical clinic in the village where Mr. John, an assistant medical officer, is in charge along with a nurse. The clinic has two examination rooms and a delivery room plus a community kitchen, which can be used by all the villagers. Furthermore it has a small guest room for guests in the village. There is no ambulance available in the



Picture 6.8 Medical clinic

clinic and critical cases that need to be transferred to

Lundu are transported by Mr. John's private vehicle. There are several programmes in the clinic including a mother-child programme where pregnant women are being followed through their pregnancy, yearly check for NCD's (Non Communicable Diseases) as well as a special senior (60+) medical check programme.

Both the PRA ranking, interviews with villagers and Mr. John showed average satisfaction with the present condition of the medical clinic, however all felt that there was a great need for improvement. The satisfaction could be due to the fact that they feel lucky to have a clinic at all, since this is not common for villages in the area. Mr. John has already sent an application to the government for improvement of the clinic (doctor, transport and extra staff) in connection to the new ICQ, as he predicts that the work burden will rise substantially when it opens, as it is cheaper for the Indonesians to go to a medical clinic in Malaysia than in Indonesia.

6.6 Security

Both interview data and the PRA ranking showed that the villagers are satisfied with the current state of security in the village. However, they think that stationing police in the village to achieve a better security system in the future could improve this, especially concerning the opening of the new ICQ. Some villagers did express concerns about the security in the future, as they have been told stories about crime and murder in the border village Serikin, but most expected the village to be safer in the future as more police and military would be stationed in the village.

6.7 Telecommunication and Internet

According to the villagers' discussion in the PRA ranking, the telecommunication system of the village is good but could be improved by providing landlines in the village, as they presently are depending on a mobile phone system only. However interviews showed great satisfaction with the current telecommunication system since there has recently been built a new telephone mast, which covers the village very well. Furthermore they seemed to feel that hand phones are more handy thus they did not feel that improvement was necessary.

Internet access is only available at the school or by a USB modem.

6.8 Education

Currently Kpg. Biawak has one primary school, which is located near the village and can be reached by an approximately ten minutes walk. The school is providing primary education service for the village and the villagers are satisfied with the school and its facilities. The government is currently expanding the school by building a new and bigger school, including a kindergarten, which is supposed to be free of charge for the village children who have not yet reached the age of schooling. It seems that the government is observant to the village's need for education.

6.9 Part conclusion

All of the above are assets for the villagers' livelihoods and they are all somewhat interconnected as one asset can influence the access to the others. However it seems that the most important asset is the road, as it has been longed for quite some time and between the lines has been conceptualised as the future 'saviour' possessing the ability to solve other developmental challenges in the village. The current state of the road limits the villagers in accessing other assets (such as infrastructure, social networks and financial assets) and hence obstructs them to obtain some of their objectives and furthermore makes them more vulnerable to shocks, such as the fire in the school.

7 Future expectations

In analysing a sustainable livelihood it is important to be aware of the current structures in an area and the structure among a group of people. It is also important to be aware of the underlying processes in these areas (DFID, 1999). The processes can be on an individual level as well as between groups of people. The processes can also be institutional e.g. started by a governmental organisation. The new road under construction in Kpg. Biawak is such a process, which the villagers expect will have a very positive influence on their livelihood.

New processes are usually providing opportunities, but not for all. The opportunities for the improvement of the livelihood of a household offered by new processes are determined by the livelihood strategy of the household and how this strategy fits the new structure provided by the new processes. Likewise the new road will provide opportunities as well as affect the current order of the village. The villagers who could benefit from having access to a bigger market expressed great expectations for the new road. This group of villagers told us in interviews that the new road could give them access to markets in Lundu and Kuching. This could provide them with better opportunities for trade. Interviews with other villagers showed a different side, as they were afraid the new road could ruin their possibilities for maintaining their income from trade.

The interviews with different shop-keepers showed that the majority of them are concerned with the opening of the ICQ. Most of their costumers are Indonesians and they fear that they will lose them, as they will go directly to Kuching and Lundu instead. This is connected to the new road, which is under construction in connection to the ICQ. However it will be more problematic for the villagers on both sides to cross the border, as they will have to possess proper travel documents, as the Pas Lintas Batas (Cross Border Pass) agreement no longer will be valid. When we spoke to the district official he explained that the crossing will be under the same strict control as in the airports however people living in the local area will still have the opportunity to get a special passport resembling the current 'International Border Crossing Agreement'⁴. How this is going to be realised was however not clear.

⁴ People who live in the area on the Indonesian side of the border have an agreement called the 'International Border Crossing Agreement' where they can go in and out of the country as they wish but not to Lundu and further - they can only stay in the border area.

7.1.1 Tourism - a livelihood strategy

According to DFID new processes provides new livelihood strategies. We have identified future tourism as a strategy for income generating practices as interviews with farmers and shop-keepers indicates there is some anticipation among the villagers for future tourism as a new possible source of income.

One respondent told us his shop would not be affected by the new ICQ in a negative way even though the majority of his customers are Indonesians, as he believes the new official border will attract more tourists. One informant mentioned that someone had bought the area around the waterfall and planned to open a coffee shop in the waterfall area in Kpg. Biawak following the opening of the new official border. This could seem like a good idea if the ICQ would bring more tourists to the area, however this seems somewhat difficult to realise, as the area surrounding the waterfall is quite sloping and hard-to-reach. We did on the other hand not take the easiest trail to the waterfall when assessing this and were told that there is an easier way to get there.

Furthermore some of the farmers expressed hope about future tourism. One of the respondents told us that the opening of the ICQ would be a good opportunity to sell his fruit directly to the tourists instead of selling it to buyers from Lundu or Kuching. In this sense the new road could provide access to a new and bigger market by providing the opportunity for selling commodities to tourist.

7.1.2 “The blessing of Biawak“

It seems like the border location provides some of the villagers with special possibilities for sustainable livelihoods as it is providing opportunities for different sorts of income and therefore a reduced vulnerability for those fit to benefit from the special opportunities of the border location and the new ICQ.

The advisor of the motorbike club, Mr. David, mentioned that he sees the new ICQ as an opportunity to earn a higher income with the motorbike business, as it will mean possibilities for more costumers because of the expected growth in population and the increase in people crossing the border.

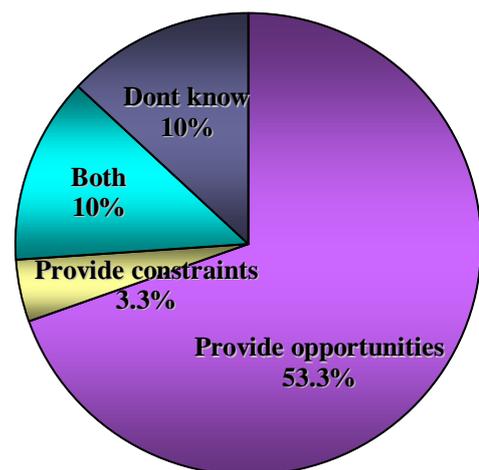


Figure 7.1 How the villagers perceive the border location (missing data 23.3%)

The district official agrees with Mr. David on this and he refers to the ICQ and border location as a blessing to the villagers as it gives them the opportunity to grow bigger.

The immigration officer in the village, who does not originate from Kpg. Biawak, further explained that the location of the village is unique because it is a 'village within the border' and added that the local people must know how to grab the opportunities and the advantages of this to develop or to improve their living standards.



Picture 7.2 Immigration office

7.1.3 Health

The ICQ will also help prevent health shocks in the village. Medical assistant in Kpg. Biawak, Mr. John, and the district officer both explained that all people entering Malaysia from Indonesia in the future will be tested for NCDs (e.g. malaria and dengue fever) when breakouts occur. This is to avoid the spread of these diseases as malaria has been spread to the area from Indonesia before, however there had not been any breakouts in the last 2 years. In 2008 the rubber prices increased and many Indonesians came over to work in the rubber plantations. 12 Indonesian workers were tested positive for malaria in this period (no Malaysians) hence it was very obvious that the disease came from Indonesia.

Improving the health conditions in the village, especially concerning NCDs, is a very important step to reduce vulnerability concerning health shocks. This means that the new ICQ will be a huge asset to the village in this sense.

7.1.4 Social relations and security

As explained earlier the villagers of Kpg. Biawak have many social relations and interactions with their Indonesian neighbours. In this context some villagers think that it will be more difficult to sustain these close relationships in the future because of the extended control and need for proper travel documents when crossing the border. On the other hand others have explained that they used to visit their relatives often in the past but because of security issues they do not any more. The security issue mainly concerns the Indonesian army, which demands money from them on the Indonesian side. If they would not give them money they would threaten to take their personal belongings or commodities. Others have explained that they are scared when they cross the border to visit the neighbouring village at nighttimes, as it is not secure because of the Indonesian army.

There is a general anticipation that this will change when the new border opens, as there will be more Malaysian military present and the supervision will be stricter.

However other informants have explained that they fear that the security of the village will be worse as the opening of the ICQ could cause higher crime rates in the area. This assumption is based on stories from another border village called Serikin, that used

to have a low crime rate but now they have some incidents with ‘missing car cases’, which are also connected to the infrastructure as the better road conditions makes it easier to drive the car into Indonesia and disappear. Furthermore there was recently a murder case in Serikin where a taxi driver was killed on the 3rd day of the Chinese New Year. These are all stories that make some villagers worry about the security situation when the new border opens.

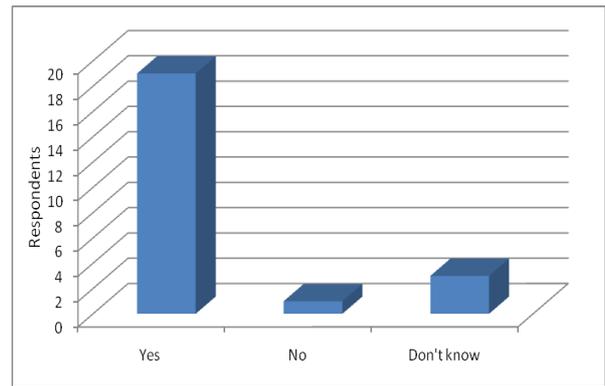


Figure 7.2 Can you benefit from the new official border

7.2 Part conclusion

It is difficult to give a homogeneous answer to whether the ICQ will bring possibilities or constraints for the villagers in the future, as the villagers are not one homogeneous group. Furthermore it is not possible to say that there is a clear division of the villagers as several villagers expressed both concerns and expectations for the ICQ. Therefore the answer is probably that it will bring both and thus generate new structures and processes in the village and, as a consequence, new livelihood strategies. Our study indicates that the villagers who would benefit the most from the new border and the new infrastructure in connection with the new border is the ones with the broadest access to different resources to create and maintain a livelihood. It is the villagers who presently rely on different sorts of income generating practices who will benefit the most from the new road and border. This is because the access to different sorts of income generating practices is reducing the vulnerability of the livelihood of the household. Nevertheless there is no doubt that the villagers themselves have many thoughts about what the opening of the ICQ will bring. The border location is unique and especially because of the history of the village the border is an integrated part of their daily lives and their livelihood strategies. The structure of Kpg. Biawak is highly influenced by the border location and the process of development as well as the future for the villagers in Kpg. Biawak is based on this special location. It is understandable that the villagers have worries and hopes for the future, as it is a very large part of their everyday life that will change without them having any influence. However they are not to be regarded as passive in this process. As our

research indicates a lot of the villagers find new ways and possibilities for livelihood strategies based on the opportunities and constraints that their daily life provided to them by living on the border location of Kpg. Biawak.

8 Reflections and limitations

Our research is influenced by a number of factors. First and foremost our time limitation influenced the information we could get. The limited time made it impossible for us to use some of our methods in a proper way and in general all of our research was very superficial.

Furthermore our personal bias, both determined by our personality, personal appearance and by the circumstances under which we conducted our fieldwork, caused constraints for what data we could access.

The work with interpreters and the use of interpreters furthermore created a certain bias. Both because they had a certain influence of who we got into contact with but also because of their own position in the village. Our relations with the interpreters may have placed us in a social position, which may have constrained our access to data and research among the villagers (Hasse, 2003). This meant that our access to the villagers was strongly influenced by the interpreters. Furthermore there is an implicit bias when using an interpreter, as important things can get lost in translation because of the interpreters personal bias.

The natural science methods were also restricted because of the working conditions. The limitation of time and the weather conditions meant that we were only able to collect soil samples from three different plots instead of 5 - 10 samples needed to get representative data of an area. As well as not having samples from different fields of the same crop. All soil data were not thoroughly analyzed and the procedure made it impossible to make any statistics on them.

The forest assessment was done superficially and the ABI is calculated from the assumption that two different areas can be expected to have the same growth rate which due to the time limitation could not have been done any differently.

9 Conclusion

The livelihood strategies undertaken in Kpg. Biawak are very much affected by the accessible resources. The income-generating practices are diversified and include farming, shop-keeping and motorbike transportation. Some villagers are engaged in several income generating activities and may find it easier to adapt to the changes that are occurring in relation to the new official border. Other villagers only rely on one source of income or subsistence farming, which may cause them to be more vulnerable to future changes. The border location is very important in the villagers' everyday life and creates possibilities for diversified income-generating practices.

To have access to education, knowledge and networks proves to be important for the development of farming practices. Furthermore there is no large-scale farming in the area which seems to be a combination of lack of initiative from the villagers, soil conditions and infrastructure.

The most important infrastructure to the villagers is the road, which is in a very poor condition. It affects the livelihood of the villagers quite a lot, as it limits the villagers' access to physical, financial and social assets. Furthermore the new road is seen as a symbol for a bright future as the villagers expect to get access to many other assets and thus create new livelihood strategies that will reduce their vulnerability.

The villagers have many expectations for the future, both negative and positive. Many expectations are connected to the new road and the ICQ. The villagers see possibilities and constraints in both. However most constraints open up to new livelihood strategies for the villagers and they show willingness and flexibility to be active agents in their future livelihood strategies even though they have concerns.

10 References

- Bruun, T.B. (2010). Personal reference: Postdoc, Department of Agriculture and Ecology, Faculty of Life Sciences, Copenhagen University, Thorvaldsensvej 40, 3 floor, 1871 Frederiksberg C, Denmark, Tlf: 35333412, email thbb@life.ku.dk
- Chambers, R. and Conway, G. (1991). Sustainable rural livelihoods: practical concepts for the 21st century. In IDS discussion paper 296
- Coulter, J.K. (1998). *Tropical soils*. Blackwell Science Ltd. Oxford OX2, London
- Cramb, R.A. (2005). Farmers' strategies for managing acid upland soils in Southeast Asia: an evolutionary perspective. Elsevier. *Journal of Agriculture, ecosystems and environment*. 106 (2005) 69-87
- Defoer, T., Budelman, A., Toulmin, C. and Carter, S.E. (2000). Building common knowledge. Participatory learning and action research (part 1) In: Defoer, T. and Budelman, A. (eds). *Managing soil fertility in the tropics. A Resource Guide for Participatory Learning and Action Research*. Royal Tropical Institute. Amsterdam
- Dewalt, K. and Dewalt, B. (2002). *Participant observation. A guide for Fieldworkers*. Altamira Press. Lanham
- DFID (Department for International Development) (1999). Sustainable Livelihoods Guidance sheets. Livelihood outcomes Framework
- Hasse, C. (2003). Mødet. Den antropologiske læreproces. In: Hastrup, K. (ed). *Ind i verden. En grundbog i antropologisk metode*. Hans Reitzels Forlag. København
- Husted, S. (2008). Implications of soil acidity, alkalinity and conductivity on plant growth pp 45-90. In: Jensen, L.S. & Husted, S. (ed). *Applied Plant Nutrition*, Faculty of LIFE Sciences, University of Copenhagen
- Lawrence, D. (2005). Biomass accumulation after 10 - 200 years of shifting cultivation in Bornean rain forest. Environmental Sciences Department, University of Virginia
- Rubow, C. (2003). Samtalen. Interviewet som deltagerobservation. In: Hastrup, K. (ed). *Ind i verden. En grundbog i antropologisk metode*. Hans Reitzels Forlag. København
- Truoug from Schroeder (1969). Slide no. 16 from lecture on SLUSE course Interdisciplinary Land use and Natural Resource Management the 5th of February 2010. Lecture by Myles Oelofse
- Scoones, I. (1998). *Sustainable rural livelihoods: A framework for analysis*. IDS Working Paper 72.
- Righton: IDS. In: DFID (Department for International Development) (1999). Sustainable Livelihoods Guidance sheets. Livelihood outcomes Framework
- Spradley, J. (1979). *The ethnographic interview*. Rinehart and Winston. New York

Appendix 1

Livelihood Strategies in the Border Village of Kampung Biawak

**Field Study in Sarawak, Malaysia
Thematic course: Interdisciplinary Land Use and Natural Resource
Management 2010**

Supervisors:

Michael Eilenberg

Myles Oelofse

Composed by:

Lars Westh

Lone Vestergaard

Daniel Mekonnen

Tea Dissing

Christine Frigaard Weinreich

Tables of content

1. Introduction	49
1.1. Definitions of frontier and border	50
1.2. Problem area and Assumptions	50
1.3. Objectives	51
2. Main research question	51
2.1. Sub questions	51
2.2. Elaboration of sub-questions	52
3. Methods	0
3.1. Participant observation	53
3.2. Questionnaires	11
3.3. Interviews	54
3.4. GPS Logging	54
3.5. PRA (Participatory Rural Appraisal)	11
3.5.1 Transect walk	55
3.5.2. History time line	11
3.5.3 Mapping of village	55
3.5.4. Seasonal calendar	56
3.5.5. PRA Matrix	56
3.6. Soil sampling and analysis	56
3.7. Water analysis	56
References	58
Books and anthologies	58
Articles	59
Websites	59
Appendix 1	60
Data and issue sheet	60
Appendix 2	Fejl! Bogmærke er ikke defineret.
Time schedule	Fejl! Bogmærke er ikke defineret.
Appendix 3	Fejl! Bogmærke er ikke defineret.
PRA Matrix for crops	Fejl! Bogmærke er ikke defineret.
Appendix 4	Fejl! Bogmærke er ikke defineret.
Seasonal calendar	Fejl! Bogmærke er ikke defineret.
Appendix 5	73
Questionnaire	73
Introduction	73
Appendix 6	76
History timeline (and storytelling)	76
The History of Kampung Biawak	76
Appendix 7	77
Structured interview	77
Appendix 8	79
Interview guide for semi-structured interview	79
Appendix 9	81
Interview guide for semi structured interview	81
Introduction	81
Appendix 10	84
Interview guide for semi structured interview	84
Appendix 11	87

Data sheet for water analysis	87
Appendix 12	89
Data sheet for soil sampling	89
Appendix 13	90
Map preparations / overview of the area	90

1. Introduction

Sarawak is the largest state in Malaysia and is located immediately north of the Equator between latitude $0^{\circ} 50'$ and $5^{\circ}N$ and longitude $109^{\circ} 36'$ and $115^{\circ} 40'$ E. It is 124,449.51 km² large and has a population of 2.07 million (2005). Sarawak's economy is export orientated and dominated by primary commodities. Its primary sectors makes up about 40% of the GDP with the secondary sector responsible for 30% of the GDP (Sarawak Government Official Portal, 2010).

Kampung Biawak is located $1^{\circ} 37'$ N and $109^{\circ} 40'$ E in Sarawak and it consists of 136 households with 767 people. The people of the village belong to the Dayak Salako ethnic group who are grouped under the Bidayuh ethnic category and the land is under the Native Customary Rights status (NCR). The village originated from a village in Kalimantan and they moved to the current location in the 1920s (SLUSE, 2010).

There is old secondary forest in the area, which is not used for generating capital. The forest resources are used for building new houses, repairing the rundown ones, and for small game hunting. Due to its location on the border there are several trading shops and some of the inhabitants provide transport services for a fee (SLUSE, 2010).

There is no large-scale farming in Kp. Biawak and most households practice subsistence rice farming and cash crops such as pepper, cocoa, rubber and fruits are grown (ibid.). Although the government attempts to reduce the execution of slash and burn practice in Malaysia, this farming strategy is still very common in Sarawak (Padoch *et al.*, 2007), and could therefore very likely be a farming strategy commonly used in Kp. Biawak.

The state in Sarawak views its agricultural frontiers as poorly exploited areas with old fashion agriculture and low productivity, and are therefore considered as potential development areas. They see opportunities in cheap cross border labour and the ecological suitability to oil palm production. Of political and economical reasons they see plantations as development, and therefore favour the establishment of these (McCarthy & Cramb, 2009). It is our assumption that there is a potential threat that the government suddenly will support an oil palm company to seize the farmers land for the use of oil palm production. This happened to some extent in 2006 where an oil palm company encroached into the land of the village leading to conflict. The conflict got further complicated when the neighbouring village of Kp. Pasir Tengah claimed that the concerned land belonged to them and thus authorized the company to operate in the area. Following Kp. Biawak received compensation for this (SLUSE, 2010).

Besides agriculture, the villagers in Kp. Biawak earn money by border trade. Due to the location close to the Indonesian border, the main customers in the 10 shops and the 20 small sundry shops in

the village are Indonesian's crossing the border in order to buy food rations or clothes. Further on several villagers earn money by providing cross border transporting service to people or light goods on their motorbikes (SLUSE, 2010).

The future of Kp. Biawak may be headed towards very opposite directions. Some villagers find Kp. Biawak as a potential tourist area due to the natural environment with mountains, a waterfall and a cave (SLUSE, 2010). However, apparently no one has up to now tried to realise this idea (ibid.), and the old secondary forest and the surrounding natural areas may potentially be a resource that could work as a greater benefit for the villagers in the future than in present time. Also the border trade may change in the future. It could either decrease or increase, and maybe the villagers could do something specific in order to improve the trade, such as focusing on the cultivation of certain cash crops.

1.1. Definitions of frontier and border

Border: "a line separating two political or geographical areas esp. countries"

Frontier: "a line or border separating two countries [...] the extreme limit of settled land beyond which lies wilderness [...]"

(New Oxford American Dictionary)

In the present report we will use two different terms when we refer to the location of the village near the Indonesian border. It is important to our report and analysis to distinguish between the political *border* location and the *frontier* location. The first definition is connected to the political and geographical separation of the two countries, and latter connected to its remoteness from the central government as well as its natural resource endowment, which creates a 'natural border' between the two countries. This distinction is important to our report because the affect on the villager's livelihood will differentiate whether we refer to the political border, e.g. cross-border marriages and trade, or if we refer to the frontier location as a resource frontier with e.g. governmental development agendas or local resource utilisation.

1.2. Problem area and Assumptions

The livelihood strategies employed in Kp. Biawak are different among the villagers, but all the villagers have in common that they live close to the Indonesian border. The livelihood strategies for some villagers are strongly connected to the frontier location. For instance the shop owners, the transport service workers and the farmers who grow cash crops or hire cheap labour across the border. For other villagers, the frontier location may only have a less or insignificant influence on

how they earn their wages. However the frontier location may also have a social impact on the village, e.g. in form of cross-border marriages or local border related conflicts, for instance related to old times, when Kp. Biawak moved from Kalimantan (SLUSE, 2010).

Based on our collected information described above some basic assumptions can be made. As mentioned the village has several income generating activities connected to the border (motorbike transportation, trade), which makes us believe that the location of the village plays an important role in relation to the economy of the village. Furthermore we presume that the farming practices and strategies in the area are connected to the frontier location because the location creates possibilities, according to accessibility for sale of commodities, as well as restraints e.g. because of external competition e.g. from Indonesian communities.

Not only the economy is assumed to be affected by the border location of the village, also social aspects are expected to do so. The villagers could very likely enter into cross-border marriages, have relatives on the Indonesian side of the border, e.g. due to the former location in Kalimantan, or there could be Indonesian migrants living in the village. All issues which could affect the social aspects of the livelihood in the village in one way or the other. Furthermore the villager's social cross-border relations could also have an impact on the income generating practices connected to the border such as trade relations and farming practices, e.g. cheap labour or important trade networks.

Furthermore we assume that there is a wish for tourism in the village, as some villagers have mentioned that the area has potential for this. Because tourism can be perceived as a source of money (tourists spend money), we presume that this is desirable but the area does not necessarily have the structural potential for it.

1.3. Objectives

Our objectives of this study are to assess the livelihood strategies of the village of Kp. Biawak in connection to its border location.

2. Main research question

In what ways are the livelihood strategies in Kp. Biawak affected by its frontier/border location?

2.1. Sub questions

1. How does the farming practice affect the livelihood of the village?
2. What are the income generating practices in connection to the border?

3. What are the social practices in connection to the border?
4. What are the potential for tourism development?
5. What are the future aspirations of the village in connection to land use?

2.2. Elaboration of sub-questions

Our five sub-questions are going to frame the investigation of our main research question and provide us with knowledge hence we are able to make a satisfying analysis.

In sub-question number one we will investigate how the farming practices affect the livelihood of the village both considering cropping, utilisation of available resources (natural as well as technology), social structures of the farming practices, and agricultural management practices.

Sub-question number two will investigate the income generating practices in connection to the border such as transport and trade. The aim is to find out how much of the income in the village is connected to the border location, hence making an overview of the importance of this.

Through the third sub-question our aim is to investigate the social practices in connection to the border location. We will look at issues such as cross-border marriages, migration, and relatives as well as social status connected to these, as their cross-border relationships may have important affects on the villager's livelihoods.

The fourth sub-question aims to find out what potential the village and its surrounding natural areas have for tourism and if the expressed desires for tourism are realisable concerning among others its border location, accessibility, aesthetic value, and the condition of the forest.

Our last sub-question aims to find out what the future aspirations of the village are in connection to land-use, both concerning farming (large-scale/small-scale), tourism and other desires. This will provide us with knowledge about the villager's desires for the future and if they have any hopes or wishes for changes. Furthermore, it will give us knowledge about possible planned government development schemes in the frontier area and the villager's thoughts about this.

3. Methods

Our study area is special due to its location on the Malaysian-Indonesian border, which we assume provides a diverse interaction between the trading, agriculture and natural resources in the area. This interaction makes it essential to assess both the social and natural aspects in order to get a better understanding of the complexity on how and to what extent these different fields intertwine. This requires both social and natural scientific methods, which are used and combined to answer our research questions.

We will use the following methods in order to answer our research questions.

3.1. Participant observation

We use participant observation to obtain data, which would be hard to get using other methods. Participant observation can reveal why land use practice is done in a certain way.

In examining land use, participant observation can give us a understanding of why the farmer use the natural resources like he or she does. "The word 'resource' does not refer to a substance, but a function that a thing or a substance may perform or to an operation in which it might take place" (Zimmerman quoted in Bradshaw, 2005: 114), hence resources are only regarded as a resource by the ones using it thus participant observation is a good method to understand why something is regarded as resource.

When we examine the trade in the village participant observation can help us to find out the value giving to the things, which are traded in the barter trade. In barter trade where the value of the traded items are highly subjective participant observations can serve to give us an understanding of how value are given to certain items.

We are also using participant observation to examine social relations in the village. By using this method we try to share the same life of the villagers and hopefully this will help us to get an understanding of the way social relations are being perceived by the villagers.

Even though we do not carry out participant observation during our entire stay in Kp. Biawk, we will be aware of our behaviour and pay attention to our surroundings and to our understanding of how we are being perceived by the villagers throughout our whole stay. We are aware that our behaviour is determining the social roles we are given in the village and the importance of these social roles, as it is through these we are given the position, which allows us to obtain certain information (Hasse, 2003:84).

The ethical aspects of participant observation are part of this method (Hastrup, 2009). We will therefore try to think of the ethical aspects of our behaviour during our whole stay in Kp. Biawak. A part of the ethical aspect is the balance of nearness and distance, principles, which also are important for conducting valid data (Gammeltoft, 2003:285). While we need the nearness to share experience with our informants, we need the distance for our analytical, methodological and theoretical reflections. We will write these reflections as well as our observations down in a neatly written diary.

3.2. Questionnaires

We use a survey to obtain data and get an overview about the grouping of options and opinions to specific issues concerning livelihood within a particular group. We have chosen a representative sample and are mainly asking farmers.

3.3. Interviews

3.3.1. Semi-structured Interviews

By using semi-structured interviews we want to explore the villagers personal opinions and knowledge, general as well as expert, concerning all of our research questions. Because it is allowed for the interviewee to move away from the original question, semi-structured interviews will be able to open up to knowledge and possible problems within our area of study, which we haven't thought of ourselves (Brymann, 2004:321-322).

The semi-structured interview provides both the interviewer and the respondent to have influence on the conversation while the interview is going on. The open structure can provide new perspectives on the problems we are investigating, and we will be careful to notice the possibilities that may occur while we do this sort of interview (Rubow 2003:240).

3.3.2. Structured interviews

The structured interview is controlled by the interviewer and in this interview we use an already written interview guide (Dewalt, 2002:122). We use structured interview in order to acquire answers on specific questions.

3.4. GPS Logging

We are going to use GPS logging for several purposes. First of all it will be used for village mapping, in order to get an overview of the village. Secondly it will be used to locate different

households and their land and fields as well as different points of interest, e.g. landmarks, which could be of interest for tourists.

3.5. PRA (Participatory Rural Appraisal)

We will use several methods of PRA not only to get an overview of the village when we arrive, but also for later use to get some quantitative/general knowledge about the livelihood of the villagers.

We are aware that these methods cannot stand alone as standardised methods. They will contribute to our data by giving us an overview and general knowledge of the local livelihood strategies and practices, which we can look, further into by using the methods mentioned in this report.

We will use the following PRA methods:

3.5.1 Transect walk

When we get to the village we will start by doing a transect walk to get an overview and to achieve general knowledge about the local area. We will find a local who can take us around the area and do a 'walk and talk' and at the same time use the GPS so we can plot important or interesting places for later use in our research. We will also use the transect walk as a way of doing participant observation, as we regard it as an opportunity to have a "grand tour" (Spradley, 1979), which we use to get to know the area (Mikkelsen, 2006: ch. 3).

3.5.2. History time line

By making a history time line we will achieve an overview of how the village has formed into what it is today and it will also expose potential historical trends within the livelihood of the village as well as previous conflicts and their importance of the present situation. Besides giving us an overview this method will enable us to analyse our data in a greater context and to answer our research questions more profoundly. This method could moreover tell us something about why the relation to its cross-border neighbours is the way it is in a later analysis of this (ibid.).

As a supplement to the historic time line we will use narrative interviews to find out the relation between the individual villager and the development in the area (Jackson, 2002). We think this will help us to understand the way the village has developed and changed over time.

3.5.3 Mapping of village

Another method to achieve an overview of the village is to make a map in cooperation with some of the villagers. The map is supposed to provide us with knowledge about the location of different

resources as well as important objects to the villagers, such as the community hall, medical centre, school, other common social areas (e.g. football fields), local shops, the political border etc. Through this method we also want to achieve knowledge about the village's perception of its territory/land compared to the next-door village (with an eye to the disagreements in 2006) as well as its use of land and natural resources (Mikkelsen, 2006: ch. 3).

3.5.4. Seasonal calendar

This method will be applied to get an overview of the activity levels, concerning farming and trade, in the village. Moreover this method will provide us with knowledge about the rainy season (the wettest season), it will give us an overview of the crops and it will give us a picture of the present situation (concerning farming and crops) in the village, hence the matrix ranking will partly be based on the data we collect here (ibid.).

3.5.5. PRA Matrix

By using matrix ranking we will get a good view of the villager's criteria for certain topics. This method will especially be used to find out what types of crops are of greatest value or importance for the village and to some extent why (ibid.).

The division of groups (whether the groups should be women/men/children or mixed) is important but hard to know beforehand, as we do not yet know how the social structures and practices are in the village, hence a division into groups at this point would be meaningless.

3.6. Soil sampling and analysis

Soil samples will be collected from different fields (paddy fields and forest area) to evaluate the fertility status of the soil in the study area, which helps to determine the nutrient content, composition and other characteristics. It is important to understand the components, which make up the soil in which the crops are grown, in order to assess if the farming practices are adjusted with soil composition. Since the soil from a single place cannot adequately represent the soil in the study area, we will take soil samples from 5 to 10 different places in the field. The soil will then be analysed for C: N ratio, soil pH, available Phosphorus, available Potassium, Nitrogen and organic matter content.

3.7. Water analysis

Water sample will be taken primarily from drinking and irrigation water to get a water quality assessment, to see if the water quality of the area is polluted and if this can have any influence on

the farming practices. The most common parameters that will be measured are those related to water pollution due to land clearing, sewage and effluents discharge parameters that are measured at the site. These include: pH, dissolved oxygen, conductivity, salinity and temperature (Sumok, 2001).

References

Books and anthologies

Bernard, R. (1995) *Research Method in Anthropology. Qualitative and Quantitative Approaches* AltaMira Press, New York.

Bradshaw, M. (2005) Resources and Development. In: Daniels et al.: *An Introduction to Human Geography, Issues for the 21st Century*, Second edition, Pearson Education, Essex.

Bryman, A. (2004) *Social Research Methods*, Oxford University Press Inc., New York.

Dewalt, K & B. Dewalt (2002) *Participant Observation. A guide for Fieldworkers*, AltaMira Press, New York.

Gammeltoft, T (2003) Intimiteten: forholdet til den anden. In: Hastrup, K (ed) *Ind i Verden. En grundbog i antropologisk metode*. Hans Reitzel. København.

Hasse, C (2003) Mødet: den antropologiske læreproces. In: Hastrup, K (ed) *Ind i Verden. En grundbog i antropologisk metode*. Hans Reitzel. København.

Hastrup, K (2003) Introduktion: den antropologiske videnskab. In: Hastrup, K (ed) *Ind i Verden. En grundbog i antropologisk metode*. Hans Reitzel. København.

Hastrup, K (2009) *Mellem mennesker. En grundbog i antropologisk forskningsetik*. Hans Reitzels Forlag, København.

Jackson, M. (2002) *The Politics of Storytelling. Violence, Transgression and Intersubjectivity*. Museum Tusulanum, Copenhagen.

Mikkelsen, B. (2006) 'Participatory Methods in Use' (ch. 3). In: *Methods for Development Work and Research: A New Guide for Practitioners* pp. 87-123, Sage Publications.

Newman, D. (2003) 'Boundaries'. In Agnew et al. *A Companion to Political Geography*, Blackwell.

New Oxford American Dictionary (2007) Version 2.0.3 (51.5), Apple Inc.

Rubow, C. (2003) Samtalen: interviewet som deltagerobservation. In: Hastrup, K (ed) *Ind i Verden. En grundbog i antropologisk metode*. Hans Reitzel. København.

Spradley, James (1979) *The ethnographic interview*. Wadsworth Pub Co.

Articles

McCarthy, J.F. & Cramb, R.A. (2009) Policy narratives, landholder engagement, and oil palm expansion on the Malaysian and Indonesian frontiers. *The Geographical Journal*, **175** (2), pp. 112–123.

Padoch, C., Coffey, K., Mertz, O., Leisz, S.J, Fox, J. & Wadley, R.L. (2007) The Demise of Swidden in Southeast Asia? Local Realities and Regional Ambiguities. *Danish Journal of Geography* **107** (1): 29-41.

Sumok, P. (2001) River water quality monitoring: Sharing Sarawak Experience. 6th SITE Research Seminar, 13-14 September 2001, Malaysia.

SLUSE 2010 = Written information from the teachers about the village.

Websites

Sarawak Government Official Portal (2010), www.sarawak.gov.my

- <http://www.sarawak.gov.my/seg.php?recordID=M0001&&mainmenuID=M0001> (18.02.10)

Appendix 1

Issue	Research Question	Objectives	Proposed methods	Expected outcomes
Farming practice and livelihood	How does the farming practice affect the livelihood of the villagers?	<ul style="list-style-type: none"> -Soil fertility -Water quality -Who does the farming - Farming income/outcome - Technicalities - Types of Crops / Crop value - Access and infrastructure - Land tenure - Livestock - Social aspects and status 	<ul style="list-style-type: none"> Soil analysis Water analysis Interview, Participant observation -Questionnaire, interview Questionnaire, Interview Participant observation PRA Matrix, Seasonal calendar, Mapping, Interview PRA Mapping, GPS logging, Questionnaires Mapping, Semi-structured interviews (Key informant and lower level informants), history time line Interview, Mapping Interview, Participant 	<ul style="list-style-type: none"> - Find out if the soil is suitable for the crops they are growing - Find out if the water is suitable for human consumption and irrigation - Working division and responsibility, foreign labour? - Profitability of the farming practice - Suitability of the farming practices - Suitability, consumption access, location and crop priorities - Trade possibilities - Who owns what and why? Social structures in relation to land tenure - Production of livestock, Socio-economic aspects of livestock production

			observation	- Get to know other social aspects that we were not aware of
--	--	--	-------------	--

Issue	Research Question	Objectives	Proposed methods	Expected outcomes
Frontier location Income generating practices	What are the income generating practices in connection to the border?	<ul style="list-style-type: none"> - Income from motorbike transport, and what are the social structures of this business? - Border Trading (including: How much and what is traded in the village and who is participating. What are the income and how is it organized) - Labour migration trans national (- Labour migration rural-urban (villagers going to the city)) 	<ul style="list-style-type: none"> Structured interview, participatory observation (e.g. take a ride in the area and ask people you meet) Structured interview, Participant observation, Questionnaire Semi-str. interview, questionnaire, PRA (semi-str. interview, questionnaire, PRA) 	<ul style="list-style-type: none"> - Who does this and why, profitability - Value of the trade for the villagers - To find out if it have any influence on the villagers livelihood (- To find out if it have any influence on the villagers livelihood)

Issue	Research Question	Objectives	Proposed methods	Expected outcomes
Frontier location Social practices	What are the social practices in connection to the border?	<ul style="list-style-type: none"> - Trans border marriages - Social conflicts due to the frontier location - Social structures 	<p>Questionnaire, semi-str. Interview</p> <p>Semi-str. interview, questionnaire, history timeline</p> <p>Questionnaire, Semi-str. interview, Participant observation</p>	<ul style="list-style-type: none"> - Impact on social structures and practices - Are there any and if, what are the impact of it - Get to know other social aspects that we were not aware of

Issue	Research Question	Objectives	Proposed methods	Expected outcomes
Natural resources Tourism	How are the natural resources in relation to potential tourist development in the area?	<ul style="list-style-type: none"> - Forrest assessment - Natural points of interest - Accessibility - Landscape values - Villagers point of view 	<p>Transect walk, biodiversity estimation</p> <p>GPS logging, transect walk, aesthetic evaluation, Mapping</p> <p>GPS logging, transect walk, Mapping</p> <p>Transect walk, aesthetic</p>	<ul style="list-style-type: none"> - Find out species enrichment, condition and uniqueness of the forest - Condition and uniqueness of the area, accessibility for tourists - The location of natural points of interest in relation to each other and the village. Walking grade.

			evaluation Semi-str. interview, transect walk	- Aesthetic value - Villagers point of view on potential tourism
--	--	--	---	--

Issue	Research Question	Objectives	Proposed methods	Expected outcomes
-------	-------------------	------------	------------------	-------------------

The future	What are the future aspirations of the village?	<ul style="list-style-type: none"> - Oil palm plantation - Tourism - Choice of crops, large-scale production - Government intervention/schemes in relation to development - Education - Other ideas 	<p>Questionnaire, semi-str. interview</p> <p>Questionnaire, semi-str. interview</p> <p>Semi-str. interview, questionnaire</p> <p>Government officials semi-str. interviews, key informant interview</p> <p>Semi-str. interview, Questionnaire</p> <p>Semi-str. interviews</p>	<ul style="list-style-type: none"> - What are the prospects and is oil palm production desirable? - Is tourism desirable and by who, and how can they see it realised - Do the villagers want to change something and who - What does the government have planned for the area - What are the desires and possibilities - Get to know future aspirations that we are not aware of.
------------	---	---	---	--

Appendix 2

Date	Time	Daniel	Christine	Lars	Lone	Tea	Preparations, practicalities and tools
Friday 5/3	Morning* Afternoon Evening**	Arrival, coordination and last preparations with counterparts	Arrange interview with government officials (9/3), printing of questionnaires and interviews				
Saturday 6/3	Morning Afternoon Evening	Depart from Kuching at 9.00 Arrive at village 12.30 Welcome ceremony	Depart from Kuching at 9.00 Arrive at village 12.30 Welcome ceremony	Depart from Kuching at 9.00 Arrive at village 12.30 Welcome ceremony	Depart from Kuching at 9.00 Arrive at village 12.30 Welcome ceremony	Depart from Kuching at 9.00 Arrive at village 12.30 Welcome ceremony	Networking → finding informants, making appointments for questionnaires and PRA Matrix (1 st priority) Making appointments for structured interviews (2 nd priority)
Saturday 7/3	Morning Afternoon Evening	History timeline Questionnaire PRA Mapping	Transect walk II Forest assessment and mapping PRA Mapping	Transect walk II Forest assessment and mapping ↓	History timeline Questionnaire PRA Mapping	Transect walk II Forest assessment and mapping ↓	GPS, camera, paper (large and small), coloured pencils, tape Make appointments for questionnaires and interviews
Sunday 8/3	Morning	Structured	Questionnaire	Questionnaire	SPSS typing	Structured	Make

	Afternoon	interview (shop owner)	Questionnaire	Questionnaire	session	interview (shop owner)	appointments for interviews
	Evening	Questionnaire	Questionnaire	Questionnaire	Questionnaire		
Monday 9/3	Morning	9.00 - 12.00 Proposal Presentation	9.00 - 12.00 Proposal Presentation	9.00 - 12.00 Proposal Presentation	9.00 - 12.00 Proposal Presentation	9.00 - 12.00 Proposal Presentation	
	Afternoon	13.00 - ? Interview government officials	13.00 - ? Interview government officials	13.00 - ? Interview government officials	13.00 - ? Interview government officials	13.00 - ? Interview government officials	
	Evening	Questionnaire	Questionnaire	Questionnaire	SPSS typing session	Questionnaire	
Tuesday 10/3	Morning	Participant observation	Vegetation sampling	Vegetation sampling	Participant observation	Participant observation	Camera
	Afternoon						
	Evening	Seasonal calendar	Seasonal calendar	PRA Matrix	PRA Matrix	PRA Matrix	
Wednesday 11/3	Morning	Water Sampling	Water Sampling	Mapping of village	Mapping of village	Mapping of village	Equipment for water samples, GPS, paper, pencils
	Afternoon						
	Evening	Processing of data	Villager interview I	Villager interview II	Villager interview I	Villager interview II	
Thursday 12/3	Morning	Soil Sampling	Soil Sampling	GPS logging of landmarks/'tourist attractions'	GPS logging of landmarks/'tourist attractions'	GPS logging of landmarks/'tourist attractions'	Equipment for soil samples, GPS, camera,
	Afternoon	Participant observation	Participant observation	↓	↓	↓	
	Evening	Processing of	Processing of	Processing of	Processing of	Processing of	

		data	data	data	data	data	
Friday 13/3	Morning	Animal Survey	Structured interview (shop owner)	Animal Survey	Structured interview (shop owner)	Animal Survey	Camera
	Afternoon						
	Evening	Farmer interview I	Farmer interview II	Mapping (finishing up on earlier mapping: GPS, landmarks, tourist attractions etc.)	Farmer interview I	Farmer interview II	
Saturday 14/3	Morning	Participant observation/ extra interview if needed	Participant observation/ extra interview if needed	Participant observation/ extra interview if needed	Participant observation/ extra interview if needed	Participant observation/ extra interview if needed	
	Afternoon						
	Evening	Preparation of Research Findings Presentations	Preparation of Research Findings Presentations	Preparation of Research Findings Presentations	Preparation of Research Findings Presentations	Preparation of Research Findings Presentations	
Sunday 15/3	Morning	Research Findings Presentation	Research Findings Presentation	Research Findings Presentation	Research Findings Presentation	Research Findings Presentation	
	Afternoon	'Buffer time' for unexpected opportunities to collect data and flexibility	'Buffer time' for unexpected opportunities to collect data and flexibility	'Buffer time' for unexpected opportunities to collect data and flexibility	'Buffer time' for unexpected opportunities to collect data and flexibility	'Buffer time' for unexpected opportunities to collect data and flexibility	
	Evening						
Monday 16/3	Morning	Farewell ceremony with the villagers	Farewell ceremony with the villagers	Farewell ceremony with the villagers	Farewell ceremony with the villagers	Farewell ceremony with the villagers	
	Afternoon	Departure from village	Departure from village	Departure from village	Departure from village	Departure from village	

	Evening	Processing of data					
Tuesday 17/3	Morning	Wrapping up with counterparts in Kuching and processing of data	Wrapping up with counterparts in Kuching and processing of data	Wrapping up with counterparts in Kuching and processing of data	Wrapping up with counterparts in Kuching and processing of data	Wrapping up with counterparts in Kuching and processing of data	
	Afternoon						
	Evening						
Wednesday 18/3	Morning	Wrapping up with counterparts in Kuching					
	Afternoon						
	Evening						
Thursday 19/3	Morning	Departure	Departure	Departure	Departure	Departure	
	Afternoon						
	Evening						

*Every morning we will have a morning meeting where we will prepare the day

**Every evening we will have a diary hour and a recapitulation of the day

We will aim to eat all meals together (when its possible) both for social reasons but also to catch up on each other's work and discuss our experiences.

Appendix 3

Crop Para- meter	Rice	Pepper	Cocoa	Rubber	Fruits	Forest Products			
Produced the most									
Income (Cash)									
Plantability									
Low labour requirement									
Food									
Alternative Uses									

Appendix 4

Calendar	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Agriculture activity												
Cash Income												

Appendix 5

Questionnaire

Introduction

We come from the University of Copenhagen and the University of Kuching where we study sustainable land use and natural resource management. We would like to ask you some questions that will help us a great deal in our studies.

You will be secured anonymity and your name will not occur in connection with your answers given.

Do you have any questions before we proceed to the questionnaire?

Date: March 2010	Interviewer:	Informant no.*:
Gender: F M	Age:	Number of individuals in the household**:
Education***:		

* Informant will be given a number to secure anonymity but we will know his/her real name to avoid two-time answers.

** No. of individuals in household include people who lives and eat in the household.

*** Indicate last year of completed education (e.g. none, primary education, secondary education, post-secondary, other, please specify).

1. What is your main occupation?

Farmer:	Working in a shop:	Working in the motorbike transport business:
Wage labour - if yes, please specify:		
If other, please specify:		

2. How much land do you own? (For used measures we will ask translator or counterparts)

--

3. How much of your land is cultivated? (For used measures we will ask translator or counterparts)

--

4. Which major crops do you grow? (Please rank, where 1 is the most dominant, 2 is second most and so on)

Rice:	Pepper:	Rubber:	Fruit:	Cocoa:
If others, please specify:				

5. Do you receive any government subsidies?

Yes:	No:
If yes, please specify:	

6. Are there any other members of the household who participate* in farming?

Yes:	No:
------	-----

* Contribute with labour

7. If yes, whom? (Mark the relation to respondent)

Husband:	Wife:	Son:	Daughter:	Mother:	Father:
Sister:	Brother:	Niece:	Nephew:	Grandmother:	Grandfather:
If others, please specify:					

8. How do you use your farming products? (Please rank where 1 is most dominant, 2 is the second most and so on)

Home consumption:	For sale:
If others, please specify:	

9. Are you engaged in any cross-border activities?

Yes:	No:	Don't know:
------	-----	-------------

10. Has anyone in your household engaged in cross-border marriage?

Yes, male:	Yes, female:	No:	Don't know:
------------	--------------	-----	-------------

11. Do you find the border location of your village:

Providing opportunities:	Providing constraints:	Both:	Don't know:
--------------------------	------------------------	-------	-------------

12. Do you think an international border crossing is desirable?

Yes:	No:	Don't know:
------	-----	-------------

13. Would you like to have tourism in this area?

Yes:	No:	Don't know:
------	-----	-------------

14. Do you think you could benefit from tourism in this area?

Yes:	No:	Don't know:
------	-----	-------------

15. Have you or anybody in your household ever considered to migrate?

Yes:	No:	Don't know:
------	-----	-------------

16. If yes, why?

Education:	Job opportunities:	Marriage:	Internal conflicts in the village:
If others, please specify:			

17. Would you like to be involved in a governmental development scheme*?

Yes:	No:	Don't know:
------	-----	-------------

* i.e. plantation scheme

18. If yes, which one?

SALCRA oil palm scheme:	Chicken rearing:	Fish ponds:	Timber production:	Tourist home stay programme:
Others, please specify:				

Thank you very much for participating you have been a huge help to us ☺

Appendix 6

History timeline (and storytelling)

Village history (starting point from when they migrated from Indonesia)

Major important events in the village history

The History of Kampung Biawak

(What we already know and need to get confirmed and elaborated)

- 1920s: migrated from the village of Kp. Sajingan in Kalimantan, Indonesia (Questions for elaboration: Why did they migrate from Indonesia?)
- 2006: loss of land to neighbouring village (Questions for elaboration: How much land did they lose and what/how much did they receive as compensation? Do they feel tricked or in any way overlooked? Is there still a conflict going on?)

Appendix 7

Structured interview

Interview with motorbike transport worker or shop owner

Introduction

We come from the University of Copenhagen and the University of Kuching where we study sustainable land use and natural resource management. We would like to ask you some questions that will help us a great deal in our studies.

You will be secured anonymity and your name will not occur in connection with your answers given.

Do you have any questions before we proceed with the interview?

Concerning only motorbike and shop owners

Date: March 2010	Interviewer:
Name:	Gender: F M Age:
Motorbike:	Shop owner:

1. How much do you earn a month from this job (on average)?

2. How big a percentage is your wage of your household's income?

3. Why did you start this occupation?

4. Is this your only occupation? If no, please specify

5. How many of your customers are from the Indonesian side of the border?

6. Is your business dependant on the border location?

7. (Only if shop owner) What are the main trading items?

Thank you very much for your participation, it has been a great help to our studies 😊

Appendix 8

Interview guide for semi-structured interview

Interview with government official

Introduction

We come from the University of Copenhagen and the University of Kuching where we study interdisciplinary land use and natural resource management. We would like to ask you some questions that will help us a great deal in our studies. The questions will be about the future governmental plans for Kampung Biawak. Do you have any questions before we proceed?

Location	
Name and title of the interviewee	
Date	March 2010
Name of interviewer	
Name of supporting interviewer	

Farming practises

1. We have heard that in many villages in Sarawak the government provides development schemes. Can you tell me about the development schemes being undertaken in Kampung Biawak?

- Who participates, why, which type of scheme
- Does the state government provide input subsidies for the farmers?
- Development schemes in the past.

Village situation

2. What do you see as the main challenges in present time for Kampung Biawak?

- Infrastructural, economical, migration...?

3. What have in the past been the main challenges for Kampung Biawak?

- When did this occur?
- What strategies have been tried to overcome these problems

Border location

4. Can you describe the possibilities and constraints that the location near the border provide for village

- Past and present
- Migration, cheap labour
- Have there been any disagreements between people in the village and Indonesian people?
- Can you tell me what the disagreement was about? How did it end/how was it solved?

5. What are the future plans for the border?

- Official border?
- How do you think these plans would affect the village?

Future plans

6. We would like to know about the future plans for development in the village. Can you tell us about these? How will they be realised?

- Oil palm plantations/schemes
- Other schemes
- Any plans for the forest?
- Infrastructure
- Border changed into official border?
- Tourism development

Thank you very much for your participation, it has been a great help to our studies 😊

Appendix 9

Interview guide for semi structured interview

Interview with villager

Introduction

We come from the University of Copenhagen and the University of Kuching where we study sustainable land use and natural resource management. We would like to ask you some questions that will help us a great deal in our studies.

You will be secured anonymity and your name will not occur in connection with your answers given.

Do you have any questions before we proceed with the interview?

Location	
Informant no.*	
Date	March 2010
Name of interviewer	
Name of supporting interviewer	

*The informant will be given a number on this sheet to secure anonymity, but we will be aware of the name of the informant.

Concerning research question 3: What are the social practices in connection to the border?

1. My impression is that the livelihood of the village is very much affected by the border location. What is your opinion of this?

- In what ways does the location of the village near the Indonesian border affect your everyday life?
- Can you describe the possibilities and constraints that the location near the border provides?

2. What are your experiences with trans border marriage?

- Do you know anybody from the village who has married an Indonesian person? How many do you know of?
- Was the person(s) from the village a man or a woman?
- On which side of the border do they live now?
- Do you have a positive, negative or neutral view on these marriages, and why?

3. What problems have you or anyone you know experienced due to the frontier location?

- Have you experienced/heard of any disagreements between people in the village and Indonesian people?
- Can you tell me what the disagreement was about? How did it end/how was it solved?

4. How do you think your everyday life would change if you had an official border crossing near the village?

- Other job opportunities/change of occupation, change of use of the border, more/less interaction with Indonesians, new tensions, possibilities/constraints?

Concerning research question 5: What are the future aspirations of the village in connection to land use?

5. How do you think the village will change in the future (10-20 years from now)?

6. If you could choose, how would you like the village to be in the future?

- Stay how it is now? Or in which direction would you like it to change?
- How do you think this could be realised?

7. Would oil palm production in this area be a positive change? Why/why not?

8. How do you feel about future tourism in the village?

- If positive: What do you think would be the best way to realise this?
- Do you think this area/village would be interesting for tourists to visit? Why?

9. Considering education, how do you think the school and education possibilities are in the village?

- Good/Bad
- How you think these possibilities should be different in the future?

10. Do you have anything you want to add?

Thank you very much for your participation, it has been a great help to our studies ☺

Appendix 10

Interview guide for semi structured interview

Interview with farmer

Introduction

We come from the University of Copenhagen and the University of Kuching where we study sustainable land use and natural resource management. We would like to ask you some questions about your land use and farming that will help us a great deal in our studies.

You will be secured anonymity and your name will not occur in connection with your answers given.

Do you have any questions before we proceed with the interview?

Location	
Informant no.*	
Date	March 2010
Name of interviewer	
Name of supporting interviewer	

*The informant will be given a number on this sheet to secure anonymity, but we will be aware of the name of the informant.

- = Guiding keywords to our own use

Concerning research question no. 1: How does the farming practices affect the livelihood of the villagers?

1. Could you describe your farm to me?

- Do you grow crops, have animals or both? Do you have other jobs than farming? Do you sell any of your farm products, or is it solely for home consumption?

2. How is your family involved in the farming?

- Who in your household are involved in the farming? (husband, wife, children, grandparents, other family, Indonesian people, other employed labour)
- Who of these people does what? (is everyone working together, how is the work divided between you?) (soil preparation, sowing, daily management (pesticide spraying etc.), harvesting, selling, buying of seeds/equipment, taking care of animals)

- Is everyone participating to the same degree? (how much time do you spend in your field? Do the others spend the same amount of time in the field as you? (remember animal care as well!)).

3. Can you tell me about the relation between you farming income and outcome?

- Do you sell/trade any of your farm products? Which and how much?
- How much money are you using in total per year for running your farm? (buying of seeds, fertilizer, pesticides, herbicides, machines, labour payment, animal fodder, etc.)

4. I would like to know something about your cultivation methods and input. Can you describe these for me?

- Slash and burn? Or growing on the same field every year?
- *If he answers that he grows on the same field every year:* Do you grow the same crop in the same field every year or do you move the crops around on your fields (crop rotation)?
- Different crops mixed in the same field? (= intercropping)
- Which machines? Driven by humans, animals or motor driven?
- Use of fertilizers? Pesticides? Herbicides? Irrigation? Grow legumes for soil improvement?

5. I would like to know which crops you grow on your field, and the value of these. Can you describe this for me?

- Types of crop, what are the main crops?
- Which of your crops can be sold for the highest price?
- Most labour demanding crop and least labour demanding crop?

6. Can you tell me about the problems you have experienced in your crop production?

- Insect attacks, diseases, water logging, accessibility etc.

7. Have you experienced any disagreements due to land tenure? Could you describe this experience for me?

- 2006 conflict with neighbour village
- Official title of land (NCR?)

8. My impression is that the livelihood of the village is very much affected by the border location. What is your opinion of this?

- Does it have an influence on his farming practices and activities?
- Labour migration trans national
- *If he has Indonesian labour*: do they sleep and eat in your house?

9. What problems have you or anyone you know experienced due to the frontier location?

- Have you experienced/heard of any disagreements between people in the village and Indonesian people?
- Can you tell me what the disagreement was about? How did it end/how was it solved?

10. How do you think your land use would change if you had an official border crossing near the village?

- Land use change?
- Would this affect the types of crops being cultivated?
- More difficult to sell crops and more competition from outsiders?

11. How do you think your land use will change in the future?

- Changes in crop cultivation, large-scale farming, something completely different?

12. If you could choose, how would you want it to change?

- Get more land, participate in large-scale farming (oil palm, rubber, etc.), change in use of technologies, hire labour, etc.

13. How do you think tourism in your village would affect your farm?

- In a positive way, negative way?

14. Do you have anything you want to add?

Thank you very much for your participation, it has been a great help to our studies ☺

Appendix 11

Data sheet for water analysis

Name of the village: _____

Specific local name: _____

GPS location _____

Source of water _____

Parameter	Unit	Data obtained
Ammonical Nitrogen	mg/l	
BOD (biological oxygen dissolved)	mg/l	
COD (chemical oxygen dissolved)	mg/l	
DO	mg/l	
pH	-	
Colour	TCU	
Electrical Conductivity	mmhos/cm	
Floatables	-	
Odour	-	
Salinity	‰	
Taste	-	
Total Dissolved Solids	mg/l	
Total Suspended Solids	mg/l	
Temperature	°C	
Turbidity	NTU	
Faecal Caliform*	counts/100ml	
Total Coliform	counts/100ml	

INTERIM NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA (INWQS)

Parameters	(Units)	Classes					
		I	IIA	IIB	III	IV	V
Ammonical Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2
BOD	mg/l	1	3	3	6	12	> 12
COD	mg/l	10	25	25	50	100	> 100
DO	mg/l	7	5 - 7	5 - 7	3 - 5	< 3	< 1
pH	-	6.5-8.5	6.5 - 9.5	6 - 9	5 - 9	5 - 9	
Colour	TCU	15	150	150			
Electrical Conductivity	mmhos/cm	1000	1000		-	6000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	‰	0.5	1	-	-	-	-
Taste	-	N	N	N	-	-	-

Total Dissolved Solids	mg/l	500	1000	-	-	-	-
Total Suspended Solids	mg/l	25	50	50	150	300	> 300
Temperature	°C	-	Normal +2	-	Normal +2	-	-
Turbidity	NTU	5	50	50	-	-	-
Faecal Caliform*	counts/100ml	10	100	400	5000 (2000)@	5000 (2000)	-
Total Coliform	counts/100ml	100	5000	50000	50000	50000	>50000

Source: <http://www.did.sarawak.gov.my/wqis/sgsarawak/pagetwo.htm>

Appendix 13

Map preparations / overview of the area

QuickTime™ and a decompressor are needed to see this picture.

QuickTime™ and a decompressor are needed to see this picture.

Appendix 2

List of methods used in field work in Kpg. Biawak.

Method	Times conducted
Questionnaire	36 (of these 30 was useable)
Semi-structured interview	23
Observation	All the time during the field work
PRA (Participatory Rural Appraisal)	
- History time line	1
- Mapping of village	1
- Crop ranking	1
- Infrastructure	1
Transect walk	2
GPS logging and mapping	Several times when relevant
Forest assessment	2
Soil sampling	1
Water sampling	1

Appendix 3

See attached CD

Needs Application Google Earth

Available at: <http://earth.google.com/download-earth.html>

Appendix 4

Location Kampung Biawak, Lundu
 District
Type of forest Primary forest (Pulau Galau)
Date of Survey March 10th, 2010
Weather Raining
Age of forest N/A

Subplot	Local Name	Taxonomic Name	Dbh (cm)	Ht (m)	BA (sq. cm)	Ws (kg)	Wb (kg)	Wl (kg)	AGB (kg)
SP1	Nyatoh	<i>Palaquium</i> sp	45,40	35,00	1619,45	526,22	110,97	15,69	652,88
	2 Cempedak	<i>Artocarpus</i> sp	5,40	20,00	22,91	8,34	1,32	0,66	10,32
	3 Empilik	<i>Lithocarpus</i> sp	7,80	22,00	47,80	17,06	2,83	1,17	21,06
	4 Nyatoh	<i>Palaquium</i> sp	13,50	25,00	143,19	49,64	8,87	2,69	61,21
	5 Ara	<i>Ficus</i> sp	9,00	30,00	63,64	22,55	3,81	1,45	27,81
	6 Merdang	<i>Lasia</i> sp	24,10	30,00	456,34	153,38	29,67	6,40	189,45
	7 Keruing	<i>Dipterocarpus</i> sp	14,00	30,00	154,00	53,28	9,57	2,85	65,70
	8 Nyatoh	<i>Palaquium</i> sp	22,00	30,00	380,28	128,44	24,54	5,60	158,58
SP2	Nyatoh	<i>Palaquium</i> sp	23,00	29,00	415,64	140,05	26,92	5,97	172,94
	10 Nyatoh	<i>Palaquium</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	11 Nyatoh	<i>Palaquium</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	12 Rattan	<i>Keramus</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	13 Wild palm	<i>Arenga</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	14 Nibung	<i>Onchorasperma tegilarium</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	15 Semambu	<i>Calamus</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	16 Pulang balik	<i>Anisophyllia disticha</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	17 Selukai	<i>Polyalthia</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	18 Selangan batu	<i>Shorea</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	19 Kayu hujan panas	<i>Goniothalamus velotimus</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	20 Anak kelampai	<i>Elateriospermum tapus</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	21 Rengas	<i>Semecarpus</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	22 Cempedak	<i>Artocarpus</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
23 Melaban	<i>Tritaria</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
SP3	Nyatoh	<i>Palaquium</i> sp	13,50	25,00	143,19	49,64	8,87	2,69	61,21
	25 Merdang	<i>Lasia</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	26 Wild palm	<i>Arenga</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	27 Nibung	<i>Onchorasperma tegilarium</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	28 Unidentified Sp	<i>Unidentified Sp</i>	7,50	27,00	44,20	15,81	2,61	1,10	19,52
	29 Semambu	<i>Calamus</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
SP4	30 Kembayau	<i>Dacryodes</i> Sp	27,00	30,00	572,78	191,35	37,59	7,55	236,50
	Rattan	<i>Korthalsia</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	31 Wild palm	<i>Arenga</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	32 Wild fern	<i>Arenga</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	33 Poisonous plant	<i>Anacardiacea</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	34 Nibung	<i>Onchorasperma tegilarium</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	35 Semambu	<i>Calamus</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	36 Pulang balik	<i>Unidentified Sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	37 Temukau	<i>Polyalthia</i> sp	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	38 Uhaq	<i>Polyalthia</i> sp	9,10	30,00	66,50	23,53	3,99	1,50	29,03
Total Biomass									1706,23 mg/ha

Location	Kampung Blawak, Lundu District	Weather	Raining
Type of forest	Secondary Forest (Damun)	Age of forest	12-15 years
Date of Survey	March 10th, 2010		

	Local Name	Taxonomic Name	Dbh (cm)	Ht (m)	BA (sq. cm)	Ws (kg)	Wb (kg)	WI (kg)	AGB (kg)
SP1	Pelal'	<i>Alstonia becaria</i>	6,60	20,00	34,23	12,33	2,00	0,90	15,23
2	Pelal'	<i>Alstonia becaria</i>	7,60	19,00	45,38	16,22	2,68	1,12	20,03
3	Tamau	<i>Malotus sp</i>	6,50	18,00	33,20	11,97	1,94	0,88	14,79
4	Pelal'	<i>Alstonia becaria</i>	7,90	19,00	49,04	17,49	2,91	1,19	21,59
5	Popan	<i>Ficus sp</i>	13,50	35,00	143,19	49,64	8,87	2,69	61,21
SP2	Kumpang	<i>Myristica sp</i>	5,00	19,00	19,64	7,18	1,12	0,59	8,89
7	Kumpang	<i>Myristica sp</i>	5,40	19,00	22,91	8,34	1,32	0,66	10,32
8	Kumpang	<i>Myristica sp</i>	5,50	19,00	23,77	8,64	1,37	0,68	10,70
9	Mampak	<i>Commersonia sp</i>	7,20	19,00	40,73	14,60	2,40	1,03	18,03
10	Menyam	<i>Golichidion sp</i>	6,80	20,00	36,33	13,06	2,13	0,95	16,14
11	Jadindong	<i>Euonmyus</i>	8,60	21,00	58,11	20,64	3,47	1,36	25,46
12	Pelal'	<i>Alstonia becaria</i>	5,90	20,00	27,35	9,91	1,58	0,76	12,25
13	Menyam	<i>Golichidion sp</i>	5,00	21,00	19,64	7,18	1,12	0,59	8,89
14	Mampak	<i>Commersonia sp</i>	10,00	22,00	78,57	27,68	4,75	1,71	34,14
15	Pelal'	<i>Alstonia becaria</i>	11,50	24,00	103,91	36,33	6,35	2,11	44,80
16	Pelal'	<i>Alstonia becaria</i>	6,60	18,00	34,23	12,33	2,00	0,90	15,23
SP3	Mampak	<i>Commersonia sp</i>	5,80	21,00	26,43	9,59	1,53	0,74	11,85
17	Mampak	<i>Commersonia sp</i>	5,40	21,00	22,91	8,34	1,32	0,66	10,32
18	Pelal'	<i>Alstonia becaria</i>	9,50	22,00	70,91	25,05	4,27	1,58	30,90
19	Mampak	<i>Commersonia sp</i>	9,10	25,00	65,06	23,04	3,90	1,48	28,42
20	Pelal'	<i>Alstonia becaria</i>	11,00	19,00	95,07	33,32	5,79	1,97	41,09
21	Pelal'	<i>Alstonia becaria</i>	9,50	13,00	70,91	25,05	4,27	1,58	30,90
22	Merdang	<i>Latsia</i>	6,70	18,00	35,27	12,69	2,06	0,93	15,68
23	Pelal'	<i>Alstonia becaria</i>	7,00	16,00	38,50	13,82	2,26	0,99	17,07
24	Tupur laki	<i>Unidentified species</i>	5,20	17,00	21,25	7,75	1,22	0,63	9,59
25	Semerpa	<i>Adinandra</i>	5,50	17,00	23,77	8,64	1,37	0,68	10,70
26	Pelal'	<i>Alstonia becaria</i>	10,10	18,00	80,15	28,22	4,85	1,73	34,80
27	Mampak	<i>Commersonia sp</i>	5,00	20,00	19,64	7,18	1,12	0,59	8,89
28	Mampak	<i>Commersonia sp</i>	5,40	22,00	22,91	8,34	1,32	0,66	10,32
29	Mampak	<i>Commersonia sp</i>	5,50	20,00	23,77	8,64	1,37	0,68	10,70
SP4	Marup	<i>Ficus sp</i>	10,60	18,00	88,28	31,00	5,36	1,87	38,23
31	Marup	<i>Ficus sp</i>	12,00	19,00	113,14	39,47	6,94	2,25	48,67
32	Marup	<i>Ficus sp</i>	12,20	17,00	116,94	40,76	7,19	2,31	50,26
33	Benuak	<i>Macaranga</i>	5,90	16,00	27,35	9,91	1,58	0,76	12,25
34	Tepan	<i>Ficus sp</i>	6,70	17,00	35,27	12,69	2,06	0,93	15,68
35	Benuak	<i>Macaranga</i>	6,10	16,00	29,24	10,57	1,70	0,80	13,07

36	Jering	<i>Pithecolobium jeringa</i>	15,40	20,00	186,34	64,15	11,67	3,29	79,11
37	Jering	<i>Pithecolobium jeringa</i>	15,70	20,00	193,67	66,60	12,15	3,38	82,14
38	Jering	<i>Pithecolobium jeringa</i>	7,60	18,00	45,38	16,22	2,68	1,12	20,03
39	Sarat	<i>Lygodium sp</i>							
40	Calamus	<i>Calamus</i>							
41	Unknown	<i>Homstadia</i>							
42	Resam	<i>Dicranopteris sp</i>							
43	Sendayan	<i>Scleria sumatransis</i>							
44	Dabal	<i>Dacryodes sp</i>							
45	Kembayau	<i>Dacryodes sp</i>							
46	Unknown	<i>Ixora sp</i>							
47	Buan	<i>Dillenia suffruticosa</i>							
48	Jambu nakal	<i>Plethiandra sp</i>							
49	Anak Jering	<i>Pithecolobium jeringa</i>							
50	Anak Cempedak	<i>Artocarpus Indicus</i>							
51	Asam	<i>Aporosa sp</i>							
52	Amak	<i>Cucurlijo sp</i>							
53	Ubah	<i>Eugenia sp</i>							
54	Anak pelaik	<i>Aistonia spatulata</i>							
55	Anak meredang	<i>Latsia</i>							
56	Anak ara	<i>Ficus sp</i>							
57	Wild pandan	<i>Pandanus sp</i>							
58	Akar randau	<i>Climber</i>							
59	Wild Ginger	<i>Homstadia</i>							
60	Wild fern	<i>Nephrolepis acutifolia</i>							
			8,01	19,56					968,37
								Total Biomass	96,84

Location Kampung Bawak, Lundu District
 Type of forest Newly Generated Forest (Jernai)
 Date of Survey March 10th, 2010

Weather Raining
 Age of forest 4 years old

jar

Subplot	Local Name	Taxonomic Name	Dbh (cm)	HT (m)	BA (sq. cm)	Ws (kg)	Wb (kg)	WT (kg)	AGE (kg)
SP1	Rubber	<i>Hevea brasiliensis</i>	5,00	8,00	19,64	7,18	1,12	0,59	8,89
	2 Unknown	<i>Parashorea sp</i>	4,30	7,50	14,53	5,35	0,82	0,47	6,64
	3 Unknown	<i>Mallotus sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	4 Unknown	<i>Leuca sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	5 Mempak	<i>Commersonia sp</i>	4,50	9,30	15,91	5,85	0,90	0,50	7,25
	6 Jambu	<i>Pithecellobium sp</i>	4,10	8,00	13,21	4,88	0,74	0,43	6,06
	7 Jackfruit	<i>Artocarpus sp</i>	4,50	7,00	15,91	5,85	0,90	0,50	7,25
	8 Wild ginger	<i>Houttuynia sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	9 Wild Fern	<i>Arenaria sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	10 Sendayan	<i>Scleria sumatrana</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
SP2	Rubber	<i>Hevea brasiliensis</i>	5,10	6,70	20,44	7,46	1,17	0,61	9,24
	12 Unknown	<i>Parashorea sp</i>	4,20	7,30	13,86	5,11	0,78	0,45	6,35
	13 Unknown	<i>Mallotus sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	14 Unknown	<i>Leuca sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	15 Menyam	<i>Golichium sp</i>	4,20	6,90	13,86	5,11	0,78	0,45	6,35
	16 Jambu	<i>Pithecellobium sp</i>	3,90	7,10	11,95	4,43	0,67	0,40	5,50
	17 Jackfruit	<i>Artocarpus sp</i>	4,20	8,00	13,86	5,11	0,78	0,45	6,35
	18 Wild ginger	<i>Houttuynia sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	19 Paku uban	<i>Arenaria sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	20 Sendayan	<i>Scleria sumatrana</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	21 Unknown	<i>Melastoma Malabathricum</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	22 Unknown	<i>Cucurbita sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
23 Malinjangin	<i>Croton sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
SP3	Unknown	<i>Ficus Grossularioides</i>	4,80	7,60	18,30	6,63	1,09	0,55	8,22
	25 Kumpang	<i>Myrtilla sp</i>	4,60	6,50	16,63	6,10	0,94	0,52	7,57
	26 Unknown	<i>Cucurbita sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	27 Unknown	<i>Leuca sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	28 Unknown	<i>Mimbalabathrum sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	29 Unknown	<i>Ficus Geocarpa</i>	4,20	7,10	13,86	5,11	0,78	0,45	6,35
	30 Unknown	<i>Croton sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	31 Rubber	<i>Hevea brasiliensis</i>	4,60	8,00	16,63	6,10	0,94	0,52	7,57
	32 Unknown	<i>Parashorea sp</i>	4,60	7,10	16,63	6,10	0,94	0,52	7,57
	33 Unknown	<i>Mallotus sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	34 Menyam	<i>Golichium sp</i>	4,30	6,00	14,53	5,35	0,82	0,47	6,64
	35 Jambu	<i>Pithecellobium sp</i>	4,90	7,00	18,89	6,90	1,07	0,57	8,55
	36 Jackfruit	<i>Artocarpus sp</i>	4,80	7,00	18,30	6,63	1,09	0,55	8,22
	37 Wild ginger	<i>Houttuynia sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	38 Wild Fern	<i>Arenaria sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	39 Sendayan	<i>Scleria sumatrana</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	40 Unknown	<i>Leuca sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00
41 Unknown	<i>Mimbalabathrum sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
42 Unknown	<i>Cucurbita sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
43 Unknown	<i>Croton sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
44 Unknown	<i>Ficus Grossularioides</i>	4,80	6,30	18,30	6,63	1,09	0,55	8,22	
45 Unknown	<i>Ficus Geocarpa</i>	4,50	6,00	15,91	5,85	0,90	0,50	7,25	
46 Unknown	<i>Myrtilla sp</i>	4,70	6,80	17,36	6,37	0,99	0,54	7,89	
47 Unknown	<i>Musa sp</i>	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
			2,02	3,22					153,89
Total Biomass									15,39