The Impact of Oil Palm Scheme on Livelihood Strategies and Environment

Field Study in Kampung Bokah, Sarawak, Malaysia

BILLEDER

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Abstract

The State Government of Sarawak has during the last decades aimed to transform the rural economy through large-scale oil palm plantations. The present study looks into the relationship between the development of a commercial oil palm plantation in Kampung Bokah, and its effects on livelihood and environment. During a 10 day fieldtrip, a range of methodologies such as questionnaires, interviews and environmental sampling were applied, in order to fulfill the assignment. Although infrastructure and the general income level clearly have improved, the study shows that a change in employment policy in the scheme, have biased the economic benefits. The environmental sampling proved inconclusive to whether or not the changed land use have had an impact on the physical environment, however it is indicated that water quality are a more serious concern than soil erosion.

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1 INTRODUCTION

1.1 Commercial Land Development in Sarawak

The State Government of Sarawak, has during the last decades aimed to transform the rural economy through large-scale agricultural land development. This goal is to be achieved, by developing the NCR land (Native Customary Rights Land) into commercial plantations. NCR land are under the Sarawak Land Classification Ordinance, categorised as land in which native customary rights, whether communal or otherwise, have lawfully been created prior to 1st January 1958 (forever.com/sam/sarawak/articles/landrights.html).

According to the State Government the NCR land are mostly kept idle, under-utilised and unproductive (Ministry of land Development 1997:16). The new NCR land development strategy, is based on the promise, that this idle and fragmented native land, can be consolidated into "land banks", which can be developed to large-scale commercial plantations. This strategy is bringing together native landowners, (with their land), the private sector, (with its capital and expertise) and the government, acting as trustee to manage the interests of the landowners. The native landowners lease their land to the plantation, with options of becoming shareholders of the plantation.

In Sarawak oil palms have been the main plantation crop. The Sarawak Ministry of Land Development acknowledges that around 1.5 million hectares of land are today recognized as NCR land. In 1999 close to 300,000 ha of this land where converted to oil palm plantation. The ambition is that oil palm plantation will cover 1 million ha in 2010 (Cooke 2002:193).

Meeting these goals depends on people's acceptance of the official aims and wishes to invest their land in the development schemes. The Ministry of Land Development has therefore been running a comprehensive campaign, trying to persuade people to give up their subsistence livelihood and instead lease their land to plantations (Cooke 2002:195,200ff).

"Landowners who are not prepared to change will be left behind; those who are left behind will lose, and those who continue to lose will remain poor forever. Large-scale plantation development is the

most logical and perhaps the best option to bring them out of poverty" (Ministry of Land Development 1997:17).

However a number of authors have stressed the economic advantages behind keeping some of the land for traditional farming, despite the relatively low returns for traditional farming. According to Cramb the traditional farming can work as a supplement in times with little demand for labour in general and for social groups according to age and gender, for whom the labour demand is low on the plantations. Finally the traditional subsistence farming has a quality of minimizing the risks of falling market prices (Cramb 1989).

The comprehensive reorganisation of the economy in Sarawak brings along extensive social and environmental changes. In order for a state managed development scheme to succeed, it is therefore essential that the development fits needs and strategies in the communities. For that reason it is necessary for planners to be aware of how people respond to and incorporates the development scheme in their livelihood strategies, how the scheme fits with old practises and which positive and negative impacts the development scheme has on different people's livelihood. Likewise it is important to look at probable environmental side effects that might arise from such developments.

Our research takes place in a kampung, where the land development have had a big importance during the last decade as almost everybody in different ways are engaged in oil palm plantation schemes.

1.2 Kampung Bokah and SALCRA

Kampung Bokah is a village located 29.7 km from Lundu, close to the main Kunching - Lundu highway. Kampung Bokah has 88 households and a population of about 496 people. The village was established in the 1957. All inhabitants belong to the ethnic group Bidayuh.

Most Bidayuh families in the village have plots of NCR lands with sizes ranging from 1 acre to 100 acre for each family. The people in the village are traditional hill rice farmers using shifting cultivation. Beside rice they do commercial farming of pepper, rubber, cocoa and other cash crops and cultivate

fruit and vegetables for own use. Off-farm work and income from large-scale oil palm plantation has a big importance for the village.

In 1989, Kampung Bokah agreed with SALCRA to develop some of their idle land into oil palm plantations. SALCRA (Sarawak Land Consolidation and Rehabilitation Authority) is a State Statutory Agency established in 1976 and a part of the Governments strategy to develop the land, which is held under Native Customary Rights (NCR Lands).
(www.sarawak.gov.my/sarawak_online/state/executive/salcra/salcra1.html).

2 ASSIGNMENT

Apparently SALCRA has been a success in Kampung Bokah. To find out why and for whom this success has occurred, it is important to understand how SALCRA has been incorporated as part of livelihood strategies for different households and social groups, and which impact the development scheme has had on the livelihood in the village. Also it is important to take the environmental impact into consideration. It is usually assumed that development and land use changes causes degradation, or at best simply changes the environment. The consequences are generally negative and can be seen as "the price of development". The question is therefore not if there is an environmental prices of development, but how high a price, and if the price is too high.

Our objective was, when we arrived in Bokah, to compare the livelihood of households using their labour for both SALCRA plantation activities and traditional farming, with those who are only engaged in SALCRA. When we arrived however, we realised that the land use strategies couldn't be organised in two separated groups according to their use of SALCRA and traditional farming. While almost all households at some point have been engaged in SALCRA, hardly any households in the kampung were only using SALCRA as their income source. Almost every household were combining their income from SALCRA, with traditional farming and off-farm-work in the town.
Our objective therefore changed to the following:

- **To determine how commercial oil palm plantations is incorporated as part of land use and income strategies.**
- **To evaluate which impact this engagement has on livelihood and environment.**

For each of these objectives a number of research questions have been determined. These are described in detail under methodologies.

3 LIMITATIONS TO THE STUDY

Since our research is centred on the impact of SALCRA, it would have been natural to take contact to the administration itself. Unfortunately we could only get a research permit that excluded all research regard the organization of SALCRA itself, and didn't allow us to interview any SALCRA officials. Our focus however has never been the administration of SALCRA, but rather how people use the possibilities implied in SALCRA, and which impact that use have for their livelihood. The missing permisions therefore didn't have a major influence on our research. Nevertheless, it meant we lost opportunity to gain access to useful statistical data as well as maps, which could have improved the scope and accuracy of our study. The missing permit also meant we couldn't study SALCRA as a political unit and agent. This could have given us a more complex understanding of the conflicts at presence between SALCRA and the local people.

The fieldwork in Bokah was conducted in cooperation with a group of 5 Malaysian students from UNIMAS University in Kuching. It was therefore necessary to compromise, and to some degree mend, our original intentions and ideas from the synopsis, in order to make our goals similar, so our collected data would be relevant for the objectives of both groups. All the tasks during the fieldwork were in mixed Danish-Malaysian groups, and the general cooperation between our groups worked well.

Also the use of a translator had a big impact on our fieldwork. One of the main problems using a translator, was the tendency that the translator didn't translate the whole answer, but often cut down the answer to one single sentence. Thereby, the translator was holding back information that wasn't specifically directed towards our questions, but still could be of great importance for our research.

Finally, since the fieldwork was limited to a two week period, we didn't have time to go as deep into all aspects of our assignment, as we might have wanted. We were thereby forced to limit our scope and focus, on what we thought to be most interesting and important.

4 METHODOLOGY

As our assignment is covering both social and environmental aspects of a development scheme, a combination of methodologies had to be applied. Even though the socio-economic and the environmental questions of the assignment cannot be truly separated, the methodologies used in natural science are of a somewhat different nature than social scientific methods, and is therefore treated separately in the following.

4.1 Research Questions and Selection of Methodology

In our assignment we have two dimensions regarding the relation between livelihood and the development scheme: 1) How people incorporate the scheme into their livelihood strategies, and 2) which impact this involvement has on livelihood.

For answering these two objectives, we need to appraise the **socio-economic conditions** in the village as background information for our analysis. In order to narrow the different aspects down, we looked at 1) the current natural resource management, with a focus on the distribution between farming and plantation activities, and 2) other income generating activities. This information we choose to gain through our questionnaire having a demographic section. Also we did 5 transect walks, in order to get an overview of the distribution of land used for traditional farming and plantation activities. Finally, we used a number of qualitative methods. These include interviews with key informants about the general conditions in the village; with farmers regarding inputs and outputs associated with different land uses, and with workers from SALCRA about the specific job opportunities in SALCRA. Also we used PRA methods, ranking the importance of different income sources.

For the objective on **livelihood strategies** we focused on following research questions: 1) How was SALCRA implemented in Bokah ? 2) the reasons for participating / not participating in SALCRA? And 3) what are the different income strategies, according to age, gender and education level? In order to answer these questions, we designed a part of the questionnaire around reasons for participating and working for SALCRA. Also we have done a number of qualitative interviews. For research question 1, we have done two qualitative interviews with elders about the village history, and two interviews with key informants about SALCRA's importance for the kampung. For research question 2 and 3 we have done qualitative interviews with 4 people working for SALCRA, as well as two informal interviews about reasons for participating / not participating. Also we interviewed 4 groups of young people about their expectations and dreams for the future, in order to get an idea of how young people, as a social group, are looking upon SALCRA as an income source, and also to get an idea of how SALCRA will be used in the near future. Finally we have used the PRA method, ranking the importance of income sources, as data for answering these questions.

For the question of **impact on livelihood**, we have focused on 1) what have improved and deteriorated ? 2) How is the benefit distributed ? 3) Is there other sources of improvement, and what is people's perception of the change? And 4) how is the expectation and satisfaction regarding the scheme? For the purpose of answering these questions, we have a third part in our questionnaire regarding perception of SALCRAs impact, as well as expectations and satisfaction. Some of the qualitative interviews described shortly above, are used again for this part of our assignment, which is interviews with elders regarding kampung history, interviews with key informants about the overall social economic condition, as well as informal interviews about improvements. Also we have done two matrix rankings regarding importance of improvements.

To address the question of **impacts on environment** we will focus on two issues, namely soil erosion and decreasing water quality. 1) Is there an increase in soil erosion as a result of changed land-use from traditional farming practices to commercial oil palm plantation? 2) Is there a deteriation of the water quality associated with this change? To answer these questions soil and water samples are taken from

each of the two land uses, in an attempt to pinpoint significant variations in the above variables. The details of the sampling on methodologies are discussed later.

4.2 Social Scientific Methodologies

In the social scientific part of our research we combined the questionnaire with qualitative interviews. The strength of qualitative interviews is the open structure of the questions, which make the informant answer spontaneously and thereby gives the interviewer an ability to get the informant's own conceptions of things. An ideal research sequence would therefore start with a number of qualitative interviews before the specific design of the questionnaire as you thereby can put the informant's general perceptions into the questionnaire instead of your own predetermined ideas of how things are (Casley and Kumar 1988:94f). However due to time limitation we wanted to start conducting the interviews as fast as possible. This choice had a number of consequences for our quantitative data, which will be described below.

The combination of the two methods enables us to combine quantitative data about how people use SALCRA with more dept-going qualitative information of why people act as they do. Finally the use of both methods gives us the opportunity to cross check our information.

4.2.1 Questionnaire

To get quantitative data, usable for a statistical overview of the socio-economic conditions as well as attitudes towards development, we designed a general household survey. The questionnaire was prepared before the fieldwork but adjusted after 2 test-interviews. We chose to select a random sample of 40 households for the purpose of getting a representative section of the people in the kampung. We did each interview with the current head of the household. The final version of the questionnaire can be seen in appendix I.

There are big uncertainties with the data we gained from the questionnaires as we were doing the interviews differently. Because our questionnaire wasn't prepared thoroughly enough before we started

to use it, we had almost conducted all interviews before our way of interviewing was standardized. Almost every day new weaknesses were found, which we tried to compensate for by deciding specific ways of doing the interviews. However as we all were involved in the interviewing some of these rules were forgot.

One of the big problems was our design regarding questions on income. For most households the income was unstable and therefore it was difficult for the respondents to define an average monthly income. We tried to compensate for the problems by asking specifically if they had other income apart from their salaries. For the subsistent farming we asked people to estimate how much money they saved from cultivating their own rice, vegetables and fruits. Finally we observed what was in the houses and asked in certain situations how they could afford these things. However since we did these things in different manners, the data on income has become insufficient.

Another problem occurred in the questions regarding reasons for participating / not participating in SALCRA. For these questions the respondent could chose between predefined statements from a scale ranging from strongly agree to strongly disagree. However we started to conduct the interviews before we were familiar with people's own perception and explanation for choosing to participate. Therefore we risked getting answers to our questions that people have never thought about. For example we have the following statement: "I want to co-operate with the government". When people were presented with this statement they tended to answer agree. However this would never come up as a reason for participating when we used an open-ended question.

4.2.2 Transect Walks.

In order to get an overview of different ways to administrate land, we chose to do 5 transect walks using GPS. We chose our sample in order to get a composition of different land uses and different sizes of owned land. Our original plan was to make detailed maps of each household's owned land and specify the particular use and location of each plot. However this appeared to be difficult because of a number of facts. Some had plots of land in the oil palm plantations, but didn't know where it was; the plots used for traditional farming were to small to get the details of the land use on GPS; it was too

time consuming mapping the idle land as it was difficult to pass through. The informants were often unwilling to define their exact borders as there were a number of uncertainties regarding ownership. The maps are therefore incomplete and inexact. However since the idea was to get an overview of the land use it is still useful data.

The primary advantage of the transect walks were as method of triangulation as well as a tool to gain certain qualitative data. Because we brought the GPS receiver the informer had to define his / her borders. Therefore we received information of border disputes and shared ownership, which didn't appear in the questionnaires. Also the use of GPS clarified the big confusion between acres and hectares in the questionnaire and gave us a change to check the size of owned land. Finally some farmers would lead us through their fallow land because of the GPS. In general the transect walks therefore gave us a number of qualitative information and chances for observation that the questionnaire or the qualitative interviews couldn't give us.

Fig: 1 Field walk in a traditional plot.

4.2.3 Field Interviews

In order to get a basic understanding of how people chose to manage their land as well as the inputs and outputs required and gained from different crops, we did a semi-structured interview on each transect walks. For the field interviews we used topic-focused interviews. (See appendix II) .

By using a standardized question guide we wanted to make the data comparable in order to look at relations between different crops and input / output. At the same time the questions should be flexible so we could go into dept with specific topics, if the informant had a special knowledge or interest in these. As the interviews weren't formal and controlled the informants would talk more freely and thereby give us information outside the question frame, which expanded our general understanding of the farming practices. Most of the time however the informality meant that general questions on our list was left out. Therefore it is not possible to compare inputs and outputs on different crops, although it was an important aspect of our overall purpose.

4.2.4 Interviews with People Working for SALCRA

We choose to do three interviews with people working for SALCRA; two general workers, a supervisor and a contractor. For the two general workers and the foreman we made a semi-structured interview with open questions similar to the closed questions in the questionnaires. Thereby we hoped to get a more dept-going understanding of the data from the questionnaires. For the contractor we made a topic-focused interview with a focus on general questions.

Certain question regarding SALCRA created some tensions. People started to whisper when talking about the contractor or the Indonesian workers, and the foreman tried to avoid a number of our questions. Also we were insecure about how and to what extent it would be appropriate to ask questions about SALCRA. In a number of cases the tensions have hindered us from asking certain questions and getting information, which would have been of importance for our project. However by using quantitative methods the unwillingness to answer a specific question can be seen in a broader context and therefore be used as a data in itself.

Fig: 2 interviewing in front of the shop.

4.2.5 Historical Interviews

For the historical interviews we did one interview with the headman and one with an elder recommended by the headman. We organised the interviews around tree topics: First, the Kampung history since the establishment, second, a specification of the differences from when the village was just established and now, and finally a ranking of the most important improvements or events in the Bokah history. The purpose of the interviews was to find out which events and improvements the informants thought of as important. However since one of our objectives in these interviews was to find out how big a part SALCRA had in the Kampung history both of the informants were probably too involved with SALCRA to give a representative picture. Both informants had a lot of land in SALCRA and were involved with the local committee for SALCRA. People with less land and a smaller involvement would probably not have given SALCRA such a dominating position in the Kampung history as was the case with these two interviews.

4.2.6 Interviews with Young People

In the interviews with young we did not select a specific sample but chose the respondents by chance on the street corners and outside the church. We did interviews with 4 groups; a group of young men, young women, teenage girls and teenage boys.

The fact that there was a distinctive difference in the answers regarding gender and age incline that the separation into four groups were a good strategy in order to compare differences between the groups. On the other hand if the different groups were interviewed as individuals the differences between the groups would most likely not have been as clear as it appears now. One reasons for this is that in all the groups there were a tendency that one would answer our question, while the other ones should be approached directly. Their answers would therefore tend to follow the structure of the leader in the group.

In both interviews with teenagers the parents were present. It is important to take into consideration whether the young ones are answering what they think, or what they think the parents wants to hear. In questions about future dreams it might be difficult for the kids to talk honestly about their reasons for not wanting to become farmers, when their parents, working as farmers are present.

4.2.7 Informal Interviews

During the fieldwork we had a number of informal talks. In our experience we were much more likely to get information about personal opinions, which is in conflict with the general or public opinion, as well as gossip of specific individuals when the interview is informal. However these aspects are very useful data in order to get peoples perception of problems associated with in this case SALCRA. Therefore the informal interviews have been important data for our results.

However there are a number of problems associated with informal interviews. In a very short research period it is most likely you get these conversations with people who are open and self secure. In our situation it was easier to make the informal chats with people speaking English, which often meant well-educated and relatively rich members of the community.

4.2.8 PRA

To gain information about which income sources and improvements people regarded as the most important we did a small number of ranking exercises using PRA methods. We only did the ranking on test level: One with our two cooks, one at the end of an informal interview and one in the end of a qualitative interview. Since we thought there were too many problems associated with the methods we did not follow up and choose a specific sample.

The main difficulty by using PRA was the relation between the time spent on explaining the concept of ranking and the gained information. Because of our difficulties explaining what we wanted the informants to do, we ended up doing most of the talking and the participatory dimension practically disappeared. Also things they did not think of as compatible was forced into priorities and rankings.

However since our fieldwork has finished we have found the data as useful despite of these problems. The advantage in our data from the PRA method is the systematized information. By persisting asking the importance of each income source in relation to each category you get a very thick description.

4.3 Natural Scientific Methodology.

Due to time constraints, we choose to focus our efforts upon a simple approach to environmental degradation. Through a minimum of representative samples we have tried to scale the two major environmental consequences of agricultural change in Malaysia, as identified at the first Sarawak-Sabah environmental convention in 2000 (Juin et al. 2000): soil erosion and decreasing water quality. Sampling is divided between oil palm plantation and traditional farming in order to compare environmental impact of these two land-uses, in this comparison however one must always keep in mind the simplicity of the sample and the statistical problems encountered when sampling is kept to a minimum. Also the results only compares land-use change from traditional agriculture to oil palm plantation, but a lot of the oil palm planting is on the expense of idle land and secondary forest, and the resulting environmental effect of the COP might therefore very well be larger than indicated through this study.

4.3.1 Soil Erosion - Sampling and Theoretical Considerations

Since soil erosion is an extremely difficult variable to make any direct quantitative assessment of, we have chosen to work with a combination of 3 indicators, which in combination might give us indication of the extent and approximate rate of soil erosion on different land-uses. Each of the indicators is briefly discussed below:

USLE

The USLE has in previous studies been used with some success for estimating the erosion rate of different plots, and is indeed the only truly theoretically founded method for doing this. The USLE calculates the potential erosion rate on basis of 6 factors: Rain erosivity(R), Soil erodibility(K), slope angle and slope length factor(SL), plant cover factor(C) and cultivation practice factor(P). We use the USLE as an indicative tool only, since the limitations on time and scope of this study does not allow us to make any actual conclusions on the scale of erosion rate between different land-uses. This is due to two important limitations: 1. We only conduct the sampling on 4 random plots in the catchments, which is not statistically satisfactory to upscale the results to the remaining area on basis of land-use percentages. 2. Since R, K and SL factor would be the same before and after land use change, the comparisons we can make from this study is basically only a comparison of the C-factor.

Textural differences up and down slope

Through textural analysis of topsoil samples of up and down slope sights in different land-uses one can get a reasonable indication of the extent of soil erosion in that site. In theory erosion processes would release the finer particles upslope and deposit them down slope, thereby making the texture relatively course upslope.

Fig: 3 Soil sampling in oil palm plantation phase 7.

TSS of streams

Erosion will as mentioned above release fine particles, which can either be deposited down slope or be washed out to nearby streams. Therefore the amount of suspended fine particles in the streams would be an indicator of erosion upstream from the sampling spot. In theory indication of the extent of erosion in an area can therefore be gained from TSS sampling downstream in the river. An important problem though, is that unlike the indicators mentioned above TSS is highly time specific in accordance with rainfall events (erosion only occurs during rainfall), and measurements should therefore be timed with heavy rainfall episodes since most of the eroded sediment is lost during high intensity rainfall (Veihe et al Year?) .

Sampling

4 sites where chosen after preliminary investigations of the land-use in the area. 2 sites were located in oil palm plantation, one in phase 1 (the oldest oil palms, planted 12 years ago) and one in phase 7 (the youngest oil palms, planted 2 years ago). The other 2 sites were located in areas of traditional/commercial farming, since pepper and paddy where the most common crops, one site in each where chosen. When choosing the exact location of the sites emphasis where given to getting as

close to “average” conditions as possible, considering factors such as slope, length of slope and crop management, unfortunately in practice this proved quite difficult due to lack of information on the area, transport opportunities etc.
The sites were measured for slope and length of slope using clinometer and measuring tape. Samples were taken on upslope and down slope locations using a soil auger, and were taken for both 0-10 cm and 10-20 cm (only for use in nutrient status analysis), giving a total of 4 samples pr site. Also notes were taken on surface conditions, canopy, and maintenance of cover crops and other features of interest.

Analysis
All samples were analysed for ammonium, nitrate, phosphate, potassium and pH using a simple soil test kit. This was done at the laboratory in Malaysia in order to look for nutrient status of the soils and possible fertilizer/leaching relations between top and subsoil. Topsoil samples (8 in total) were taken to Denmark and texture was determined using the hydrometer method.

4.3.2 Water Quality - Sampling and Theoretical Considerations

In this study the main focus regarding water quality is on factors such as nutrients, organic content (BOD,COD), TSS/Turbidity, pesticides and coli forms(total and faecal), all factors that might be influenced by changed land-use and development of an area. When interpreting the acquired data it is again extremely important to remember the environmental setting in which they were recorded, preferably the data should be acquired shortly after heavy rainfall events where most of the nutrients, soil and sewage is lost.

Sampling
5 streams where chosen after preliminary investigations of the area and supported by a topographical map. The size and flow of the chosen streams were quite variable; from the 3 m wide Sg. Jambu to the big 50 m wide Sg. Kayan. The streams were chosen from two criterions: 1. The streams should be of “reasonable size” (no less than aprox. 2 m wide) so as to make the results less affected by climatic conditions and 2. The streams should be assignated to areas of plantation and non-plantation

respectively, meaning that the main part of the upper catchments from the sampling spot should be in that land-use. The second point proved somewhat problematic due to our limited access to information of land-use in the area, and therefore in practice the sampling spots were chosen on basis of a combination of recommendations and information from informants and accessibility by road.

5 streams were sampled, 3 were running through plantation (Sg. Jambu, Sg. Danian and Sg. Janjan), and 2 through non plantation (exact land-use unknown, assumable a combination of traditional farming, secondary forest and fallows) (Sg.Grogo and Sg. Kayan).

General data such as temperature, turbidity, dissolved oxygen etc were obtained quickly using a hydro lab unit lowered into the stream and were generally taken at three points across the cross-section Furthermore multiple samples were taken for subsequent analysis in the laboratory, these samples were taken at 1/3 depth above the bottom in the centre of the stream (recommended from our technicians). In the larger streams a grip-sampler lowered from the bridge had to be used.

Analysis

The samples were analysed according to standard procedures in the laboratory for nitrate, ammonium, phosphate, potassium, COD, BOD, TSS, faecal and total coli forms and pesticides. To tests were run for each sample to improve statistical accuracy of the data.

5 LIVELIHOOD STRATEGIES

To evaluate the impact of a development scheme, it is important to see who is using the scheme and why. In order to do so livelihood strategies can be used as an analytical tool for determining how households and individuals allocates resources such as time, land and labour in order to preserve or improve their productive capacities as well as social status and network (Mertz el al 1999:134f). In the following we will describe how SALCRA has been incorporated as part of livelihood strategies in Kampung Bokah. In order to do so we have focused on the use of land and the use of job opportunities in order to create an income.

When SALCRA was first implemented the main reasons for people to participate was to get a land title, to increase their income by dividends and finally to get new job possibilities in the plantation. In the following we will look at how these 3 aspects is integrated as part of people's livelihood strategies.

5.1 Land Title

When a household lease their land to SALCRA it is for a time period of 25 years. In order to lease out the land, the borders are determined and the status will change from communal NCR land to privatised native land. That means people will receive a land title, proving their ownership of the land. However till now only 13 households in Bokah have received their land titles, apparently to prove for the rest of the kampung, that everybody eventually will get their titles. We got a number of reasons for why SALCRA haven't given them their titles. One reason is that the government fear people will sell their plot once they have received their land titles. According to others, SALCRA keeps the titles because they are afraid people will stop participate in the scheme, once they have received their titles.

People are in general very unsatisfied with not receiving the title. By leasing land to SALCRA people hoped to ensure their rights for their land in the future. To most natives land is seen as a direct and basic source of sustenance and provider of life, and hence the primary indicator of wealth (Cooke 2002: 205). There are big insecurities associated with the rights to the NCR land. People are insecure of which land belongs to whom. Also people are afraid the land eventually will be taken of the government as the government in last instance still are in control of the NCR land. When they receive their land title they feel secure about their rights to use their land as they wish. Also the land can be used in order to gain cash if sold, or used as a guaranty when taking loans in the bank.

5.2 Land Use

Dividends

The idea behind SALCRA is that people submit idle land and land previously used for traditional farming for the scheme. Through professional administration and advantages gained by large-scale farming, the land use will be more efficient and make a bigger profit. The profit will be distributed to the farmers as dividends.

The oil palm plantation is separated into 7 different phases referring to the age of the palms. Phase 1 is the part first planted and gives the best yield. The fruits can be harvested for the first time after two years and will produce fruits for 25 years. The yield is approximately 2 tons per ha every month. SALCRA gets an output around RM 800 for every ton depending on the market price. The owners of the land will receive dividends twice a year according to how many ha they have leased to SALCRA and in which phase their land is. Households with their land in phase 1 have received dividends from 1996. The dividends have varied from RM 250 till RM 1450 per ha per year. The average is RM 1000 per ha every year.

Current participation in SALCRA

Around 80 percent of the households in Kampung Bokah are participating in SALCRA. Traditional farming is however still of big importance. From a questionnaire covering 40 household, 2 persons have no land, 1 has only idle land, 5 have only land used for traditional farming, 8 have all their land in

SALCRA, while 24 have some land in SALCRA and some land used for traditional farming. The area used for traditional farming is covering 131.5 ha; the SALCRA area covers 119.8 ha.

The main reason why people participate with all their land, part of their land or has no land in SALCRA depends more than anything on whether the land is placed in the SALCRA zone or not. As the promises in the upstart period were big most people chose to participate if they had the chance. However few had to surrender their land to SALCRA against their wishes because their land was placed in the SALCRA zone. Still the general pattern is that people lease as much land to SALCRA as they can. The remaining land will be managed according to a number of factors such as the size of land in and outside SALCRA, alternative income sources and labour force in the household.

Land Use Strategies, 2 Cases

For the purpose of illustrating how different households are managing their land we will in the following focus on two households (Household 1 and 2). In both households only the head of household is investing labour in the land use, as the younger members has off-farm jobs or goes to school. The main difference between the two households is the size of land.

Household 1 has 7 ha in SALCRA in phase 1. This is a relatively big plot of land compared to the average size of leased land for SALCRA on 3 ha. For household 1 an estimated income from dividends would be RM 49.000 from the time span 1996 – 2002. Previous the land was used for paddy, but most of it was idle. Compared with the labour required and the output received for paddy the economic advantages gained from changing the land use is big. Since household 1 by the dividends gains a monetary income, they have chosen to cultivate paddy on their remaining farm land, which covers 4 acres. The paddy is harvested once a year and used for own consumption. In a good year the yield will be 1200 kg. This will be enough to provide the household (7 people) with rice for one year.

Fig: 4 Mixed plot of pepper, paddy, vegetables and fruits

For Household 2 the situation is different. This household has only 1 ha leased to SALCRA. This will not provide the household with enough cash in one year. Therefore the household depends on other cash-generating activities. In order to gain this income the head of household previously worked for SALCRA. However she couldn't keep this job and therefore she in 1989 decided to be a farmer. The plot for traditional farming is 2.5 acres and mainly used for pepper and cocoa. Beside the cash crops she also cultivates paddy, vegetables and fruit trees for own consumption. Last year she earned RM 2000 on the pepper.

The two examples indicate a number of things regarding the land use. Firstly households get a better output from the cultivating of cash crops per ha than from leasing land to SALCRA. However since the income possibilities in town are much bigger and therefore attract the younger generation, there is a labour shortage for the traditional farming. Therefore most households only cultivate what one or two persons can overcome. This means the people with a lot of land get big advantages by leasing their land to SALCRA, as they can receives a high yearly income, without investing labour in the land. On the other hand people with little land in SALCRA still depends on traditional farming in order to get an

income if they don't have other income sources. This has to some extent created an economic segregation in the kampung according to sizes of land in SALCRA.

Secondly traditional farming requires hard work and gives low returns. Therefore the traditional farming is mainly used when people don't have other income sources, which is mainly the case with older people. This indicates the importance of the traditional farming for a specific social group and therefore indicates a danger with changing all land use for the purpose of oil palm plantations.

Thirdly it is evident that most household tries to minimize the risks associated with focusing on only one income source by combine their use of land in SALCRA with subsistent farming and alternative income generating activities as the cultivation of cash-crops and off farm work.

5.3 Job Opportunities

Job Opportunities in SALCRA

When SALCRA was first implemented one of the big promises was that people would get jobs in the plantations. Nevertheless due to a demand for increased efficiency, SALCRA has since 2001 gradually changed their employment policy. Instead of employing people directly, SALCRA pays contractors to employ people and carry out the picking of fruits. A contractor will get RM 30 for every ton of harvested fruit and pays his workers RM 12 per ton they pick. The job as a fruit picker is associated with very hard work. When the palms were smaller a lot of people in the village were working as fruit pickers on a daily paid basis. However since the palms have grown tall and the workers are now employed on contract basis no locals are interested in these jobs. Therefore the contractors employ Indonesians and people from poorer kampungs.

For other jobs in the plantation as repairing the roads, spraying and cutting the grass, the old model for employment is still used. People get employed on a monthly basis and paid RM 10 per day. If the

workers have more than 22 working days in one month, they will receive a bonus on RM 30. Even if the salary for daily paid labour is lower than the contract jobs they are more attractive because the work is not so hard. The reason for this could be that it is mainly older people who want to work for SALCRA. However during the last year, people with a bad performance did not get their contract renewed and half the staffs lost their jobs. This indicates the tendency towards a continuous change from daily paid work to contract work where the employees are paid according to their work performance. According to a number of rumours every general worker directly employed of SALCRA will be fired during 2003.

The changed employment policy is evident in the statistics from our household survey. Currently 7 people out of the 40 head of households are employed on a full time basis for SALCRA. 6 people have worked for SALCRA in a limited period during the last year. For the remaining 27 people 10 never worked for SALCRA and 17 has worked for SALCRA, but stopped. None is working for SALCRA as contract workers.

Compared to other job possibilities, it is obvious that the income gained being a daily paid worker in SALCRA is very low. This means that it is mainly people with no education and therefore few alternative job possibilities that choose to work for SALCRA. Also it is people in need of a stable income. One of our informants is a woman in her forties. She is married and has 6 children, 3 in primary school, 2 in private college and 1 who has left home. During the last 7 months she has worked for SALCRA as a daily paid worker repairing the roads in the plantation. The household were before she started to work for SALCRA dependent on the husband's income as a driver for SALCRA, dividends from 8 hectares of land in SALCRA and subsistent farming. However since two of their children are now in private college, they both have to contribute to the monetary income. As a daily paid worker she earns a bit above RM 200 per month. The woman has no complaint regarding working conditions or salary; it is as it is. She has not considered finding a job elsewhere because she never attended school. She wouldn't like to work in town or in other plantation schemes since they still have small kids and also time and money would be spent on transportation.

Off Farm Work

Besides the traditional farming and the job opportunities provided by SALCRA jobs outside the kampung is having an increasing importance, especially for the young people. The main reason for the choice of not working for SALCRA, is the possibilities of getting higher salaries elsewhere. This possibility is closely related to age, level of education and the willingness to move to town. Most young people choose to do so. Farming and work in plantations is associated with very hard labour and a low status. Besides the young people prefer to get their own income from work in town instead of being part of the family economy, which would be the case if they worked with their parents on the farms.

Many young people aim at jobs as government servants. That is manly teachers, clerks and soldiers. The jobs are very attractive for a number of reasons. The work is considered to be less physical demanding and at the same time more interesting and less tedious than the work on the farms and in the plantations. Also the salary is relatively high and stable. Most important however is the security associated with government service jobs. Once you have got a job for the government the chance of getting fired is very low. Also you get money if you are sick and a pension.

Also without a long education, job opportunities in town are preferred. One of our informants is in his early twenties. He has gone to school up to and including form 3. He would have liked to continue to study but wasn't able to as his family couldn't afford it. As many other young men in his age he is doing construction work as a contract labourer. As a contract worker he earns around RM 25 a day. How long he is contracted varies very much, since he is contracted for only one job to complete at the time. Sometimes a contract job can last 6 months, sometimes only a week. He doesn't considerer it to be attractive either working for SACRA or on the farms: *If you work for SALCRA you will only get RM 10 a day and the oil palms are very tall by now. If you work on the farms you will have to wait a long time to get your returns*. For now he drives back and forth between the town and the kampung. However as most other young people he will move to town if a stable job should occur.

5.4 Stable Income as a Goal for Livelihood Strategies

In order to understand people's livelihood strategies it is important to look at which goals people are trying to gain. It became evident from a number of interviews that a stable income is valuated very high

in the kampung. This has to be seen in the light of the current income possibilities. For the traditional farming of cash crops, the farmers have to wait 3 years for the outputs for pepper and cocoa. During the waiting time the marked prices can drop. Also there is a risk the crops can be attacked by pest and diseases. The paddy is harvested once a year but is manly used for own consumption. Subsistent farming has an important function in order to save money, but it doesn't provide the household with an income for expenses as the education of the children. Also the dividends vary a lot every year. Finally people working in SALCRA or in town are often employed only for short periods, with the chance of not being reemployed the following month if there isn't work to be done.

People try to compensate for the uncertainty in different ways according to their resources. It can be claimed that the older generation mainly combine their labour with the land use in order to receive an income while the younger generation use their labour and educational skills on off farm work as an income strategy. The generation in between are combining the income sources.

For the old people the strategy is to combine different types of subsistent farming with cash crops and land leased for SALCRA, and by the diversity counter-balance the risks. For this group SALCRA gave a good opportunity for stable income through daily paid jobs however with the change in employment policies, they have gone back to the traditional farming. The big dependence of the land also indicates why the land title is of such a big importance. Furthermore since stable income is so central in people's livelihood strategies, it seems unreasonable that the government or SALCRA not will let people administrate their own land by giving them their land titles.

For the younger people off farm work is more attractive. When asking the young people about their dreams for the future the most common reply referred to hopes of getting a stable job, especially as a government servant. This indicates that a stable income also is of big value for the young people. Therefore the investment in education is an important strategy for them and their parents (See Appendix IX).

6 IMPACT OF OIL PALM SCHEME

The following will focus on the social and environmental impacts caused by the implementation of commercial oil palm plantations in Kampung Bokah. It is an extremely complex process to evaluate the impact of a specific project and determine specific causal relations. As a starting point you need to compare the conditions before and after the implementation of the scheme. However in 10 days we were not able to make a proper baseline study of the current situation, and even with more time to do so, we would still be lacking a baseline study conducted before the implementation of SALCRA. Furthermore it requires a dept going insight in political and economic movements on local and global level as well as an exact knowledge of the land use over a long time period to determine what exactly have caused the changes. With no possibilities of comparing the situation before and after, or follow the changes over a long time period we can therefore only focus on people's perception of the changes

and tentative conclusions from the acquired data. In the following we will first look into the impact on livelihood and after the impact on environment.

6.1 Impact on Livelihood

6.1.1 Kampung Bokah before the Implementation of SALCRA

When Bokah was first established in 1958 people depended on products from the jungle, cultivation of paddy and maize for own consumption as well as cash crops subsidised by the government. Off farm work has also in specific periods been a part of people's income strategies. Because of the confrontation with Indonesia a military camp was placed near by from 1963-1968. In this period most household had members working in the camp for a daily pay. Yet people went back to their traditional farming when the confrontation was over. The episode shows how the villagers have adapted to different possibilities of getting income, but always with the farming to revert to. The infrastructures were very bad. There was no water supply, roads or electricity. People had to bring their water from the river and travel by foot through the jungle or by boat.

6.1.2 SALCRA as a Step Stone for Development in Bokah

While the significant changes in Bokah during the last decade have to be seen in relation to the national development, it is evident that SALCRA has played an important role in order to raise the general standard of living. When we asked the villagers of changes during the last ten years they stressed the importance of the improved infrastructure. Most important is the water supply and the paved road leading to the Lundu highway. The infrastructure have improved the general health and possibilities to get medical treatment fast; made it easier for people to transport seeds, yield and other products to and from town and finally it has given people the possibility of taking off-farm jobs.

There are some differences in people's perceptions on what have caused the improvements in the infrastructure. According to some the government has provided the improvements and SALCRA has nothing to with it. Others stress how the road might were paid by the government but only because the villagers said yes to participate in SALCRA.

For the improvement of the general socio-economic condition people agree that SALCRA have had a big role to play. Even though it doesn't have the same importance now as it had during the first years, it has been a step stone for the village. Therefore alternative income source, which is now of bigger importance than the income from SALCRA, might have been started because SALCRA gave people money they could invest. A typical example is the investment in children's education. The money from labour work and dividends has made it possible for parents to pay for their children's education. The children will not use SALCRA as an income source, but SALCRA still have had an impact on their chances for getting higher paid jobs. Also the roads been build because of SALCRA have made it easier for people to take off farm work.

	Roads	Water supply	Living standard	Income	Level of education	Quality of health
Nr of respondents	40	40	40	40	40	40
Means	4,38	3,55	4,22	3,88	4,03	4,03

Fig: 5 The table shows weather or not different parameters have developed during the last ten years. Numbers of "Mean" means average chosen from "strongly disagree (1)" to "strongly agree (5)".

6.1.3 Changes in SALCRA (Perception and Satisfaction)

When SALCRA was implemented the big aim for the government, according to their campaigns were to improve the livelihood for the rural poor. Nonetheless SALCRA has with its new policy changed from being a social project helping the poorest people getting jobs and develop their land to a more profit orientated scheme. There is a big difference in people's opinion on this change, which is closely related to different perception of the purpose of SALCRA.

In general the kampung is divided in two groups. On the one side are the ones who mainly use SALCRA as an income source regarding the dividends, this are typically people with a lot of land. The main role of SALCRAs is for them to be an efficient company producing a surplus; therefore they are satisfied with the changes. On the other side are people with little land, who mainly used SALCRA as a

job possibility. For them the main purpose of SALCRA was to create job opportunities. Many of these people have lost this use of SALCRA because of the changes. For that reason they are very dissatisfied.

The conflict is especially clear around the issue with foreign workers. The people with a lot of land think there are plenty of jobs, the local people are lacy and the foreign workers help the kampung. The efficiency means SALCRA can pay less for the labour and hence increase the surplus and the dividends.

On the other hand people with little land look upon SALCRA's role as different. One older woman told us: *When SALCRA first came things went all right. They helped people in the village, but now it is not so good anymore. They employ foreigners instead of local people.* From her position the local people are not lacy, but simply not willing to work hard for 10 MR a day. With the employment of Indonesian workers the efficiency is increased with out the salary being raised. Since the main purpose of SALCRA is to provide the local people with jobs, the employment of foreign workers is to let the local people down.

One can argue that if the government's intention with SALCRA was to help the poor farmers, the change is a problem. SALCRA will not obtain this goal only by giving dividends to people with a lot of land, but rather by giving people with few alternatives income sources, a chance for a stable income. Furthermore since SALCRA doesn't provide alternative jobs for this group of people the traditional farming on the NCR land is crucial for survival. Therefore the future plans of developing 2/3 of all NCR land for oil palm plantation seem irresponsible.

6.1.4 Future Impact

It is doubtful that SALCRA will have the same importance in the future as now. Rather alternative income sources will overshadow the importance of dividends. The main change in the Kampung in the future would most likely be the urban migration among the younger generation. When the young people were asked why they went to town, some stressed they preferred to stay in Bokah if the job possibilities were there, while others were attracted to the city life. It could be claimed that SALCRA

by focusing on providing job opportunities could hinder that young people left the rural areas, however, whether that will improve the young peoples livelihood is difficult to predict.

6.2 Impacts on Environment

This section will present and discuss the obtained information regarding the environmental change in the Bokah area. Results from questionnaires and analysis will both be taken into account, in order to appreciate both local perceptions as well as general analytical results.

6.2.1 People's Perception of Environmental Degradation.

Probably the best and most reliable indicator of environmental degradation is eye witness reports from the people who have been living in the area for decades observing and living through environmental changes. Although biases, limitations and variation in peoples knowledge and interests, and the importance of small, long term trends that people might not immediately recognise, all limit the credibility of the results from interviews, scientists would be very bold not to appreciate the experience of local knowledge and opinions. Numbers and samples can be deceiving, especially when time and resources are limited as is the case of our study. Also one might ask the question whether or not, people's perception of the condition of their environment is not equally important to the "actual" state, as indicated by numbers and analysis. Even if numbers indicate for example soil erosion as a major problem, if the farmers don't regard it as so, then maybe it is in fact no more than an "academic problem" that has no relevance for the local people who actually lives there. Further more mitigation measures will be hard to implement locally if the locals do not agree on the purpose of them.

Only a few questions regarding the environmental impacts of the oil palm scheme where asked. These questions though showed some very interesting results. As seen in figure 6, most people agreed that water quality had decreased, while only few recognised soil erosion as a problem. Regardless of the results from the scientific analysis these opinions should therefore be given some weight in the final conclusions.

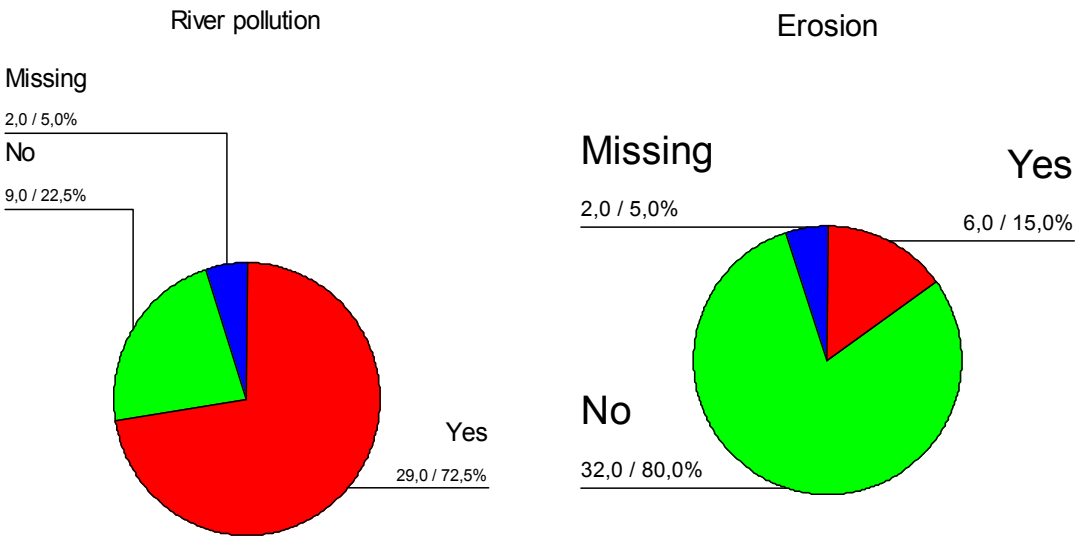

Fig: 6 Peoples attitude towards two environmental impacts “River pollution” and “Erosion”

6.2.2 Soil Erosion as a Result of Changed Land Use?

The collected soil samples were analysed for texture to indicate possible displacement of soil through erosion and for use in the USLE estimation of potential soil loss. Soil organic carbon, soil structure and permeability were not determined although it would be preferred for proper estimation of the K-factor in USLE. Estimation of the K-factor using the nomograph and only soil texture is still to be preferred though to the mean K-factor of the overall soil class in the area (Anita Veihe, Personal information).

The results from the analysis and USLE calculation can be seen in appendix V, while the results from the TSS analysis of the 5 streams can be seen in appendix VI.

Results from the USLE calculations should of course not be over interpreted due to its general limitations and the specific limitations in the scope of this project mentioned earlier. They do however give us an indication of the magnitude of potential erosion. The values are quite high seen in a world perspective, mainly due to the extremely high precipitation, but not drastically high compared to other USLE calculations in Borneo. (Veihe et al.year?) for example calculates soil loss rates from 68,6

t/ha/yr to 669,5 t/ha/yr on plots of ginger and hill paddy in Sabah on slopes of 20-40 degrees which is much steeper than the slopes in Bokah. The results also show the importance of the C-factor which is the main reason for variation between the 4 land uses, bare land (pepper) obviously having the highest potential soil loss rates.

Unfortunately no clear pattern can be seen in the soil texture on up and down slope sections. Coarseness of the soil is about the same up and down slope or even slightly courser down slope than upslope (oil palm phase 7), and are not of a magnitude that gives any clear indication of soil erosion. This could indicate that either the data are flawed or the number of samples to small for a truly representative picture of what is going on, or simply that no significant soil erosion are taking place at present. TSS results that could have been a very important and reliable indicator of soil erosion, gives an equally blurry picture, with both high and lows in the streams related to traditional farming. This is most likely due to two important factors that greatly limit the reliability and comparability of the results. 1) It had not rained for a period of 3 days prior to sampling (further discussed in the water quality section) and 2) the 5 streams were highly different in size and consequently also in discharge and catchment area, both which are factors that must be expected to have high influence on the magnitude of the TSS, and makes conclusions on present data difficult. More reliable results would necessitate comparable rivers of same size in oil palms and non plantation, and sampling in a longer period, getting samples during both high low rainfall periods.

All in all it would be unwise of us to make conclusions about differences in soil loss of the respective land uses based solely on the collected material, the lack of observation of erosional features (appendix V) on the sites and the results from the textural analysis however suggests that erosion does not seem to be a major problem in the area in general.

Land Use	**Oil palm phase 1**	**Oil palm phase 7**	**Pepper**	**Paddy**

Potential soil loss in T/ha/year	**19,27**	**39,464**	**59,125**	**21,43**

Fig: 7 Results from USLE calculation

Land Use	Oil palm phase 1		Oil palm phase 7		Pepper		Paddy	
Up or down slope	Up	Down	Up	Down	Up	Down	Up	Down
Clay (<2μm)	**6,2**	**12,6**	**20,4**	**21,2**	**20,4**	**13**	**14,4**	**18,4**
Silt (2-20μm)	**11,8**	**7,4**	**17,6**	**21,4**	**13,6**	**23,4**	**17,6**	**17**
Fine sand (20-200 μm)	**53,4**	**57,6**	**49**	**67,6**	**58,8**	**54,6**	**62**	**58**
Course sand(>200μm)	**35,4**	**37,6**	**13**	**9,8**	**7,2**	**9**	**6**	**6,6**

Fig: 8 Results of analysis in vol. percent

6.2.3 Decreasing water quality?

The new gravity-water supply system of Kpg. Bokah has decreased the importance of water in the streams for drinking purposes. Nevertheless pollution of the aquatic systems can still have adverse effects for its biological life, and the water might still be considered a resource for the locals living by it; using it for fishing, swimming and as a possible backup source of drinking water. The results from the conducted sampling and analysis can be seen in appendix VI.

Again, like TSS, no clear pattern of variation can be observed when comparing the streams running through oil palm plantation and non plantation (only one stream comply with this requisite, since it was only discovered after sampling that the catchment area of Sg.Grogu, was in fact also partly covered with oil palm). As indicated earlier the lack of conclusiveness of the samples, was to be expected taking into account the less than optimal conditions for the sampling. First of all it didn't rain for a

period of 3 days before the sampling was conducted (and relatively low rainfall in general the weeks before), this must be expected to highly influence the results as most surface runoff and sewer spills etc. will occur during high intensity rainfalls. Further more since most of the streams are quite small this effect will be even more likely since discharge levels of smaller streams are much more fluctuating than larger streams. Again a longer time sequence making samples before and after high intensity rainfall events would be to be preferred for better results. Also the great variation in the size and discharge of the selected streams should be avoided since comparison is generally difficult especially on basis of just one sample. The reality of time, logistics and information did however force us to compromise with these limitations. We only had access to equipment for sampling on one predetermined day, and we didn't have a lot of streams above minimum size to choose from, forcing us to sample what was "available" in the accessible area.

The acquired results can also be compared to national standards (appendix VII and FIG 9) to give an indication of the general level of pollution of all the streams. All values of the analysed variables are in the lower categories of class I and IIA indicating water that are close to drinking standard and therefore not significantly polluted. Even though some values can immediately seem comparatively high (like when coli forms are compared between small and large rivers), all values are low compared to national standards. It should be strongly emphasised though that these results are far from conclusive enough to make concrete statements, considering the above limitations of the study.

Finally when comparing figures such as nutrient status of soils with aquatic concentrations, a high degree of yearly variation must also be expected in compliance with application times of f.ex. fertilizer, but also with rainy, and dry seasons. This applies off course both for strictly quantitative purposes and for comparisons between different land-uses.

	Sg. Jambu (Oil palm)	Sg. Danian (Oil palm)	Sg. Janjan (Oil palm)	Sg Grogu (Oilpalm/Other)	Btg Kayan (Non-plantation)	INWQS Class I	INWQS Class IIA
DO, mg/L	**62,1**	**77,13**	**77,5**	**58,4**	**77,7**	**7**	**5-7**
Temperature., °C	**25,29**	**25,39**	**25,17**	**25,02**	**25,82**	**-**	**-**
Conductivity, mg/L	**0,0310**	**0,0135**	**0,0133**	**0,0123**	**0,0134**	**1000**	**1000**
pH	**5,88**	**5,71**	**5,58**	**4,93**	**4,85**	**6,5-8,5**	**6,5-9,5**
Depth, m	**0,5**	**--**	**0,26**	**2,9**	**1,8**	**-**	**-**
Salinity, ppt	**0**	**0**	**0**	**0**	**0**	**0,5**	**1**
Turbidity, NTU	**15,94**	**11,19**	**12,77**	**60,5**	**40,81**	**5**	**50**
Nitrate, mg/L	**0**	**0**	**0,044**	**0,088**	**0,022**	**Nat.Level**	**7**
Ammonia, mg/L	**0,142**	**0,129**	**0,0835**	**0,194**	**0,155**	**NA**	**NA**
Phosphate, mg/L	**0,077**	**0,097**	**0,067**	**0,013**	**0,036**	**Nat.Level**	**0,2**
COD, mg/L	**7,5**	**4,5**	**6**	**13**	**7,5**	**10**	**25**
BOD, mg/L	**0,99**	**3,15**	**1,91**	**1,34**	**2,05**	**1**	**3**
TSS, mg/L	**20**	**10**	**39**	**5**	**40,5**	**25**	**50**
Total Coliform	**164**	**207**	**494**	**960**	**897**	**100**	**5000**
Fecal Coliform	**7**	**30**	**63**	**57**	**24**	**10**	**100**
TDS, mg/L	**0,0199**	**0,0086**	**0,0086**	**0,008**	**0,0087**	**500**	**1000**

Fig: 9 Averaged results from water analysis compared to interim national water quality standard of Malaysia

7 CONCLUSION

The study has shown that a stable income is of central importance for all social groups. However individuals and households are using different strategies in order to obtain this. We have argued that older people mainly used their labour and NCR land in order to gain an income, where the young people used labour and education. Therefore it is primarily older people who use SALCRA as a part of their livelihood strategy. This is done by obtaining a land title, receiving dividends and getting a stable income through jobs in the plantation.

The participation in SALCRA has improved the socio-economic condition in Bokah, as it increases the income opportunities for people in the kampung. However a change in employment policy has caused a bias where it is mainly people with a lot of land that benefits from the scheme, while people with little land still depends on their traditional farming. We have argued that if the main goal of SALCRA is to develop rural poor, this might be problematic.

Due to sub optimal sampling conditions, and limited comparability of the collected samples, it wasn't possible to make any final conclusions regarding the environmental impact of the changed land use. However the results indicated that soil erosion does not seem to be a major problem in the village, a conclusion which was supported by statements from the local population. Results from the water samples shows no serious problems in any of the sampled streams, however the limitations of those results due to poor sampling conditions combined with pessimistic statements from the local population, makes it questionable whether or not this is actually the case.

While the environment is fragile towards changing political strategies for using the land, our study indicates how people still depend on the land for survival. Therefore it is of crucial importance that development of the land, with the aim of helping people, does not at the same time destroy the prospects for future generations by causing pollution or undermine risk minimizing practises of the people that depend only on the land.

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10 LIST OF APPENDIXES

I. Questionnaire (English version)

II. Interview Guide Used During Field Interviews

III. Interview Guides for Qualitative Interviews (a & b)

IV. GPS Map Including Sampling Spots for Water analysis

V. Description of Sampling Sites and Results from Soil Analysis

VI. Description of Sampling Sites and Results from Water Analysis

VII. Interim National Water Quality Standards of Malaysia

VIII. Individual Time Schedules during Fieldwork

IX. Correlation of Income

Time schedules for individual group members.

Time schedule (Lars)

date	Time	Tasks	In cooperation with
20/1	Morning	Introductory "sightseeing"	All of us
	Afternoon	Field walk/interview	
	Evening	1 Questionnaire	Ling, Loh
21/1	Morning	2 Questionnaires + making appointments	Loh
	Afternoon	2 Questionnaires Mapping	Sune, Adrian
	Evening	2 Questionnaires	Adrian, Ling, Loh
22/1	Morning	Mapping	Sune, Adrian
	Afternoon	Mapping Planning of water sampling	Sune, Adrian Liew, Adrian
	Evening	2 Questionnaires	Ng
23/1	Morning	Water sampling	Adrian, Liew, Pu, Ng, Sune
	Afternoon	Water analysis, Lundu	Adrian, Liew, Pu
	Evening	Analyse till 24.00	Adrian, Liew, Pu
24/1	Morning	Go to Lundu and Selampit to get tools	Liew, Adrian, Pu
	Afternoon	Soil sampling(SALCRA phase 1 and 7)	Liew, Adrian, Pu, Stine, Sune
	Evening	Dinner in Bau	All of us
25/1	Morning	Soil sampling Paddy and Pepper	Liew, Pu, Adrian
	Afternoon	Go to Lundu for analysis of soil samples	Pu, Adrian
	Evening	Analyse till 22:00	Pu, Adrian
26/1	Morning	Field walk/interview	Stine, Sune
	Afternoon	Field walk	Sune
	Evening	Calculation of USLE results	
27/1	Morning	Discussion of results	
	Afternoon	Preparing presentation	
	Evening	Presentation in Bokah	All of us
28/1	Morning	Leave Bokah	All of us

Notice: Every evening a group meeting was held with participation of all group members to discuss and distribute the days results.

Time schedule (Pu Wei)

date	Time	Tasks	In cooperation with
20/1	Morning	Introductory sightseeing"	All of us
	Afternoon	2 questionnaires	Ng
	Evening	1 questionnaire	Ng
21/1	Morning	2 questionnaires	Ng
	Afternoon	2 questionnaires	
	Evening	2 questionnaires	
22/1	Morning	Typing data to SPSS program	Liew
	Afternoon	Field walk	Lucy and Liew
		Plan of sampling choosing	Ng
	Evening	Questionnaire	Ling and Loh
23/1	Morning	Water sampling	Adrian, Liew, Ng, Lars Sune
	Afternoon	Go to Lundu for analysis	Liew, Adrian, Lars
	Evening	Analyse till 24:00	Liew, Adrian, Lars
24/1	Morning	Go to Lundu and Selampit to get tools	Liew, Lars, Adrian
	Afternoon	Soil sampling(SALCRA phase 1 and 7)	Liew, Lars, Adrian, Sune, Stine
	Evening	Dinner in Bau	All of us
25/1	Morning	Soil sampling Paddy and Pepper	Liew, Lars, Adrian
	Afternoon	Go to Lundu for analysis of soil samples	Lars, Adrian
	Evening	Analyse till 22:00	Lars, Adrian
26/1	Morning	Typing data to SPSS program	Liew
	Afternoon	Typing data to SPSS program	Liew
	Evening	Typing data to SPSS program	Liew
27/1	Morning	Go to Lundu to analyse BOD and TSS in water	Ling, Loh, Liew
	Afternoon	Analyse SPSS for presentation	Liew, Loh
	Evening	Presentation in Bokah	All of us
28/1	Morning	Leave Bokah	All of us

Notice: Every evening a groupmeeting was held with participation of all group members to discuss and distribute the days results.

Time schedule (Stine)

date	Time	Tasks	In cooperation with
20/1	Morning	Introductory "sightseeing"	All of us
	Afternoon	Field walk	Everyone
	Evening	Questionnaires	Liew
21/1	Morning	Questionnaires	Ling and Adrian
	Afternoon	Interview med Mr Katakis	Ling and Adrian
	Evening	Questionnaire	Lucy and Loh
22/1	Morning	Questionnaire	Ling and Lucy
	Afternoon	Questionnaires	Lucy
		Informal interview med dame	
	Evening	Interview SALCRA guy	Lucy
		Interview with headman	
23/1	Morning	Questionnaires	Mr Ng and Loh
	Afternoon	Interview: Lian and husband	Ling, Lucy, Sune
		PRA	
	Evening	Questionnaire	Ling and Lucy
		Qualitative int. with Mr. Kenneth	Sune
24/1	Morning	Qualitative interview: agricultural department	Mr Ng
	Afternoon	Soil sampling	Pu, Liew, Loh, Adrian,
		Questionnaire	Lars and Sune
	Evening	Dinner in Bau	All of us
25/1	Morning	Field trip Megeh	Lars, Sune and Lucy
	Afternoon	Interviews with young men	Ling and Lucy
	Evening	Interviews with teenage girls	Ling and Lucy
26/1	Morning	Church	Ling
		Interviews with young mothers	
	Afternoon	Field trip with older man	Sune, Lars, Calvin
		Interview with young boy	Ling and Lucy
	Evening	Qualitative interview with elder about village history	Ling and Lucy

27/1	Morning	Discussion of results	
	Afternoon	Prepare presentation	
	Evening	Presentation in Bokah	All of us
28/1	Morning	Leave Bokah	All of us

Notice: Every evening a groupmeeting was held with participation of all group members to discuss and distribute the days results.

Time schedule (Sune)

date	Time	Tasks	In cooperation with
20/1	Morning	Introductory "sightseeing"	All of us
	Afternoon	Field walk/interview	Everyone
	Evening	Questionnaires + making appointments	Ling and Loh
21/1	Morning	Preparing on mapping	
	Afternoon	2 Questionnaires Mapping	Lars and Adrian
	Evening	2 Questionnaires	Adrian
22/1	Morning	Mapping	Lars and Adrian
	Afternoon	Mapping	Lars and Adrian
	Evening	Questionnaires	Ling
23/1	Morning	Water sampling	Adrian, Liew, Pu, Ng, Lars
	Afternoon	Interview: Lian and husband PRA	Ling, Lucy, Stine
	Evening	Questionnaire Qualitative int. with Mr. Kenneth	Ling and Lucy Stine
24/1	Morning	Village mapping	
	Afternoon	Soil sampling(SALCRA phase 1 and 7)	Liew, Lars, Adrian, Pu, Stine
	Evening	Dinner in Bau	All of us
25/1	Morning	Field trip Megeh	Lucy and Stine
	Afternoon	Went to Selampit	
	Evening	Preparing map	
26/1	Morning	Field walk/interview	Stine, Lars
	Afternoon	Field walk	Lars Calvin Ling and Lucy, Stine
	Evening	Preparing map	
27/1	Morning	Preparing map	
	Afternoon	Preparing map and presentation	

	Evening	Presentation in Bokah	All of us
28/1	Morning	Leave Bokah	All of us

Notice: Every evening a groupmeeting was held with participation of all group members to discuss and distribute the days results.