Analyzing the impacts on livelihoods of development schemes in Nanga Jela

SLUSE – Field course report 2015, Lubok Antu District, Sarawak, Malaysia

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ABSTRACT

As part of its Vision 2020 agenda, the Malaysian government has aimed to develop areas occupied by indigenous peoples. In the case of Nanga Jela, the Batang Ai resettlement and SALCRA oil palm plantation scheme have altered the livelihood strategies employed by the residents are changing. This study's objective was to identify the livelihood strategies of Nanga Jela who are affected by the land scarcity, largely as a result of such development schemes. An interdisciplinary approach was applied in the study in order to obtain a comprehensive picture of the issue using qualitative and quantitative methods for the data collection. We have interviewed selected respondents including participants from the longhouse and a SALCRA official to gain complete understanding of perspectives on these development schemes. We have also examined soil and water quality to further assess the impacts of land scarcity on livelihood potential. Through methodological triangulation, we have identified issues of land tenure and potential for adaptation to land constraints through the pursuit of off-farm income.

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ABBREVIATIONS

BD	Bulk Density
BOD	Biological Oxygen Demand
C	Carbon
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DOE	Department of Environment
EC	Electric Conductivity
FELDA	Federal Land Development Authority
FCC	Fecal Coliform Count
GTP	Government Transformative Program
GPS	Global Positioning System
LUC	Land Use Change
N	Nitrogen
NCR	Native Customary Right
NPK	Nitrogen, Phosphorus, Potassium
OPP	Oil palm plantation
OP-T	Oil Palm (Top)
PF	Primary Forest
POX-C	Permanganate Oxidizable Carbon
PRA	Participatory Rural Appraisal
RM	Malaysian Ringgit
SALCRA	Sarawak Land Consolidation And Rehabilitation Authority
SOC	Soil Organic Carbon
SSI	Semi Structured Interview
TCC	Total Coliform Count
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
USDA	United States Department of Agriculture
WB	World Bank
WHO	World Health Organisation
WQI	Water Quality Index

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1. INTRODUCTION

Malaysia's efforts to modernize and expand its role in the global market by Vision 2020 (Aiken et. al 2011) have come into conflict with the traditional livelihood strategies of the indigenous Iban people in Sarawak, Malaysia. The Malaysian government's Vision 2020 campaign towards industrial development necessitated the integration of the Iban people into the expanding national economy, often at the expense their traditional livelihood practice of shifting cultivation. The resettled Iban community called Nanga Jela serves as a poignant example of this trend.

In 1984, the Batang Ai resettlement scheme relocated the Nanga Jela community along with 3000 Iban people 6 kilometres south of the site where the Batang Ai Hydroelectric Dam was to be built (Banerjee & Bojsen, 2005). As compensation, the state of Sarawak gave the responsibility of developing the land in the resettled Nanga Jela into a cash crop plantation to the Sarawak Land Consolidation and Rehabilitation Authority (SALCRA). This land use strategy, however, only further disrupted the people of Nanga Jela's ability to practice traditional livelihoods. The size of the flooded area is about 21000 acres and the resettled area is around 8000 acres. In total, the SALCRA plantation scheme in Nanga Jela covers eight out of the nine acres of land that was given to each household-- 3 with oil palm and 5 with rubber (ibid.). They are deprived of the freedom to cultivate the land as they wish, which is causes the people of Nanga Jela to experience land scarcity.

These factors combined population increases from 37 households to 58 households since the resettlement has put constraints on the land. As a consequence, many community members have turned to off-farm livelihood strategies working in private and government sectors.

Before resettlement, this area was occupied by primary forest trees. Since resettlement, however, the area has been occupied by cash crops as part of the SALCRA scheme. From the last few decades of substantial changes in land use and annual cropping system has also led us to question the soil quality in the resettled area.

1.1 Study Site

This study is conducted in the state of Sarawak, Malaysia Borneo. Our fieldwork is confined to the village of Nanga Jela (Latitude:1° 8'41.38"N and Longitude: 111°49'5.72"E) situated within the district of Lubok Antu under Sri Aman division. It is 160 km from Sarawak's regional capital of Kutching.

Figur 1 Study site of Nanga Jela

2. Objective and Research Questions

Objective: Analyzing the impacts on livelihoods of development schemes in Nanga Jela

1. How have livelihoods in Nanga Jela changed in light of the resettlement
    a. What challenges are they presented with?
    b. What opportunities have arisen?
2. What have been the consequences of the SALCRA scheme in Nanga Jela?
    a. Is land scarcity a consequence of the SALCRA scheme in Nanga Jela?
    b. What are the impacts of the SALCRA scheme on the environment?
    c. What are Nanga Jela residents' perspectives on the SALCRA development scheme?
    d. How does SALCRA justify its (development) scheme in Nanga Jela?
3. How have off-farm activities affected the Nanga Jela community?
    a. How do access to wealth vary between those engaged in off-farm activities and those who are not?
    b. How has youth out-migration in pursuit of off-farm activity affected community?

3. STATE OF ART

In recent decades the Sri Aman division of Sarawak, Malaysia has been subject to development schemes commissioned at the national level as part of Malaysia's efforts to modernize and industrialize in pursuit of Vision 2020 (Sanggin & Mersat 2012; The Coalition of Concerned NGOs on Bakun [Gabungan] Malaysia 1999). The two major development projects of interest to our study are the Batang Ai resettlement and the SALCRA plantation scheme.

The resettlement was not the first of its kind, as these projects have been funded by the World Bank and parastatal agencies like FELDA in Thailand and Malaysia since the 1970s (McMichael 2012). For instance, the 1997 construction of the Bakun Hydroelectric dam was largely inspired by the Batang Ai dam project, which necessitated the resettlement of Iban communities including Nanga Jela in 1984 (Banarjee & Bojsen, 2005; The Coalition...Malaysia 1999).

The resettlement and SALCRA schemes have had impacts on Iban communities' ability to practice traditional livelihoods like shifting cultivation, which requires ample land (Banarjee & Bojsen, 2005; Sanggin & Mersat, 2012; Ngidang, D., 1995). Thus, the resettlement of indigenous communities calls development rhetoric to question what it means to own land and the justifications state and parastatal institutions use to execute its agenda for the purpose of natural resource extraction in order to increase export production (Banarjee & Bojsen, 2005; Sanggin & Mersat 2012; The Coalition… Malaysia 1999).

Our study in Nanga Jela, Sarawak Malaysia for 2015 SLUSE field course will attempt to decipher the ways in which development schemes have played out for its residents, and to gain more insight into community members' perceptions of development schemes.

4. METHODOLOGY

4.1 Social science methods

4.1.1 Questionnaire

One of the first methods we conducted in the field was the questionnaire. It covered several topics that were relevant to our research objective examining the impacts of development schemes in Nanga Jela.

We randomly selected households surveying 24 out of 58 households. In our sample, 16 households were located within the longhouse. The other 8 households were located outside of it. We surveyed a proportionate number of each to detect any trends that may exist based on whether households we locate in or outside of the longhouse. It is important to have a clear definition of what is meant by "household" (Casley & Kumar 1988). Households were defined as groups of people living within a *pintu*. A *pintu* is one dwelling chamber distinguished by having its own door, which opens to the *runai* or communal corridor of the longhouse. We administered questionnaires verbally. Since we were dependent on our interpreters, it was critical that they were briefed beforehand on what was meant by each question.

After entering the questionnaire data into a spreadsheet template, we used it to select appropriate participants based on criteria reported in the questionnaire for more in-depth analysis in semi-structured interviews and PRA exercises.

4.1.2 Semi Structured Interview

Multiple SSIs were conducted to obtain and explore issues related to our research questions. Since the SSI permits conversation to flow rather freely, it helped us gather useful information that we had not always considered while preparing our interview questions.

Some of our SSI respondents such as the headman and the SALCRA official were targeted as key informants. Others like individuals working off-farm were selected through criteria derived from the questionnaire survey.

Before each SSI, we prepared a set of questions to ensure that important topics were covered. We showed the questions to the interpreters in advance so that they could discuss and understand the context of the question and translate accurately.

Conducting multiple interviews under conditions of relatively free flowing conversation allowed us to triangulate and confirm accuracy of responses yielded from each interview (Mikkelsen, 2005).

4.1.3 Participatory Observation

Throughout our field study we engaged in participatory observation. This method was used both while in the longhouse and while going to the fields to make direct observations. This method gave us the possibility to gain information about the activities through participating in activities and observing them. It too helped us to triangulate and adapt our research questions based on the observed realities experienced in the community.

4.1.4 Participatory Rural Appraisal

Mikkelsen (2005) asserts that PRAs facilitate discussion on a subject and creates dialogue not only between the interviewer and the participants but also between the participants themselves to gain an in-depth understanding of a topic through investigation of different perspectives in the group. During our time in the field, we conducted a range of PRA methods.

Table 1. List of PRA methods

Methods	What did we do?	Aim
Transect walk	With the aid of local guides and GPS to mark points of we conducted two transect walk. First transect walk was done in two separate groups: one went to see land use and walked through oil palm plantation, rubber field and padi & pepper fields. The other group went and located the gravity fed water source which happened to be	Get an immediate impression on the area of Nanga Jela, land use and tenure.

	very close to primary forest. Second transect walk conducted midway through the field study, to specifically see and triangulate some of the crop data in the questionnaire survey. This transect walk was done specifically with a household where they showed us what crops they grew and how conversed about their livelihood strategy.	
Timeline	This exercise was done with the village elders. 5 - 7 participants above 65 years were selected and were asked to recall the major events, challenges and opportunities they faced with after re- settlement.	To put into perspective the difference in livelihood between generation if re-settlement has benefitted the residents of Nanga Jela.
Focus Group Discussions	Four focus group discussions was conducted in the field and at least 5 participants were selected for each discussions. First focus group was with those who reported dissatisfaction with SALCRA scheme as displeasure with the SALCRA was reported by every household in the questionnaire. The second focus group was with households involved in the government-	In the SALCRA scheme discussion further understand the displeasure with SALCRA and how SALCRA operates. In the fishery project we particularly wanted to know the economic impacts that fish farming has had on the livelihoods of the participants.

	sponsored Batang Ai fishery project. Due to scheduling conflicts, only 2 of the 4 informants were able to participate. Third discussion was conducted with the youths and this discussion was difficult to conduct as our specific participants did not turn up. However we managed to have discussion with five young women who told us of their future aspirations. The last discussion was done for water. Four households were chosen to participate. Three of the households were selected for being sometimes satisfied with the gravity-fed water despite often or always using it for consumption. One household was selected for being the owner of the nearby cultivated hill rice plot. While having this discuss it eventually led to participants doing a seasonal calendar to see the trends of water supply.	The youth discussion gave an insight regarding what the future might hold for the Nanga Jela community. The water discussion we wanted to see if there is a trend or a direct link between the quality and quantity of the drinking sources and the use of fertilizer and herbicides and rain/dry seasons.
Ranking Exercise	Ranking was conducted in order to establish the crops that were important in their livelihood and to see other activities important to the livelihood strategies. Mix group of 5-6 participants were selected and were requested discuss and draw crops	Gain an understanding of what crops are considered of most importance, in terms of income and subsistence.

	and livelihood activities that was important. They were asked to rank the activities from 1 - 5 with 1 being the least important and 5 being the most important to their livelihood. Only one person was given the task to draw and was given instruction only to draw and rank after the group came to a decision regarding what they considered the most important activities to facilitate their livelihoods.	

4.2 Natural Science Methods

4.2.1 Soil Sampling & Analysis

Soil is an important medium for plant growth. It contributes to a range of physical, chemical, and biological properties, and it is linked to environmental degradation. Soil sampling is used examine such properties to determine levels of degradation as a result of perennial oil palm cultivation. Soil samples were taken from two types of land, oil palm plantation and primary forest in order to compare the soil quality. Samples were collected from randomly selected areas. Three replications from each site were taken from two horizon i.e. surface soil (0-5 cm) and sub suface soil (5-30 cm) by using volume specific method for estimating bulk density. Soil texture was estimated by textural classes estimated by FAO (2006). Then the samples were air dried, ground into fine powder, sieved to remove small roots, and measured for under chemical analyses including POX-C, pH and total C and N % conducted by Isotope-Ratio Mass Spectrometry (IR-MS) in Copenhagen University's soil lab.

4.2.2 Water Samples & Analysis

Water samplings were carried out in order to capture water used for drinking purposes including the gravity fed (up- and downstream) and the government supply and secondly the impact from the oil palm plantation (OPP) in the low land running stream (up- and downstream) respectively pointed out in figure x. Three water samples were collected from each sampling station and stored in three different bottles:

two in sterile glass flasks which were covered in aluminum foil to block photosynthesis to occur and to avoid changes in temperatures and one in a 1 Liter plastic container. All samples were measured and assayed as illustrated in table 1. The equipments were calibrated prior to use based on the manufacturer's directions. The oil palm water sample results were evaluated by using the DOE water quality index (DOE-WQI) formula developed by the Malaysian government (INWQS) to assign a general state of the water quality trend in streams all over the country (appendix 14). The formula is executed by combining six water quality parameters which are altered into sub-indexes and calculated into one concise and objective value which can later be plotted into five river quality classes (appendix 14).

Table 2. Water parameters, Place of analysis and Methods

Parameter	Place of Analysis	Method
Temperature (°C)	**In-Situ**	HQ40d Portable Multi-Parameter Meter
pH	**In-Situ**	IntelliCAL™ PHC101 Standard Gel Filled pH Electrode probe
Dissolve Oxygen (mg/L)	**In-Situ**	IntelliCALT™ LDO101 Standard Luminescent/Optical Dissolved Oxygen Probe
Electrical Conductivity (EC)	**In-Situ**	IntelliCAL™ CDC401 Standard Conductivity Probe
Salinity (ppt)	**In-Situ**	HQ40d Portable Multi-Parameter Meter
Ammoniacal Nitrogen (mg/L)	**Mobile Lab**	Salicylate method
Nitrate (mg/L)	**Mobile Lab**	Cadmium reduction method
Nitrite (mg/L)	**Mobile Lab**	Diazotization method
Phosphate (mg/L)	**Mobile Lab**	Phos Ver 3 ascorbic acid method
Biological Oxygen Demand (BOD)	**UNIMAS**	Titration method
Chemical Oxygen Demand (COD)	**Mobile Lab**	Reactor digestion method
Total Dissolved Solid (TDS) (mg/L)	**Mobile Lab**	Gravimetric method
Total Suspended Solid (TSS) (grams)	**UNIMAS**	Centrifuge method
Faecal Coliform Count (FCC)	**Mobile Lab**	Membrane filter technique
Total Coliform Count (TCC)	**Mobile Lab**	Membrane filter technique

5 LIMITATIONS TO THE STUDY

During our field trip there were some limitations to the study. We only had ten days to conduct our fieldwork in Nanga Jela. Constraints on time in the field has certainly affected the quantity and quality of our findings.

The study was dependent on the interpreters to communicate with the community consequently information is likely to be mis- interpreted or even lost. Using our interpreters was crucial for conducting our study, and we had to trust their ability as translators. We had two interpreters, which increased the likelihood that variation in translation styles depending on which translator we working with is likely to have impacted our data.

Furthermore additional limitations was felt in the water analyses. We wanted to take 8 water samples, but was only possible to take 5 due to limitations in the water laboratory. We were able to analyse the gravity-fed water source at the water station, but were not able to take a sample from the gravity water tapped in a household. Therefore, we do not know whether the water is affected in the pipeline from the water source to the households.

6. RESULTS AND ANALYSIS

6.1 Overview of Nanga Jela

6.1.1 Sitemap of Nanga Jela

Figure 2 depicts the routes taken on the two transect walks we went during our time in Nanga Jela on the first day in the field. The blue and the orange line are our first transect walk. The blue line is the walk to the gravity fed water source and the orange line is the walk around the different plots of land use. The yellow line indicates the second transect walk to the fields that was conducted to triangulate the data received in the questionnaire regarding various crops grown.

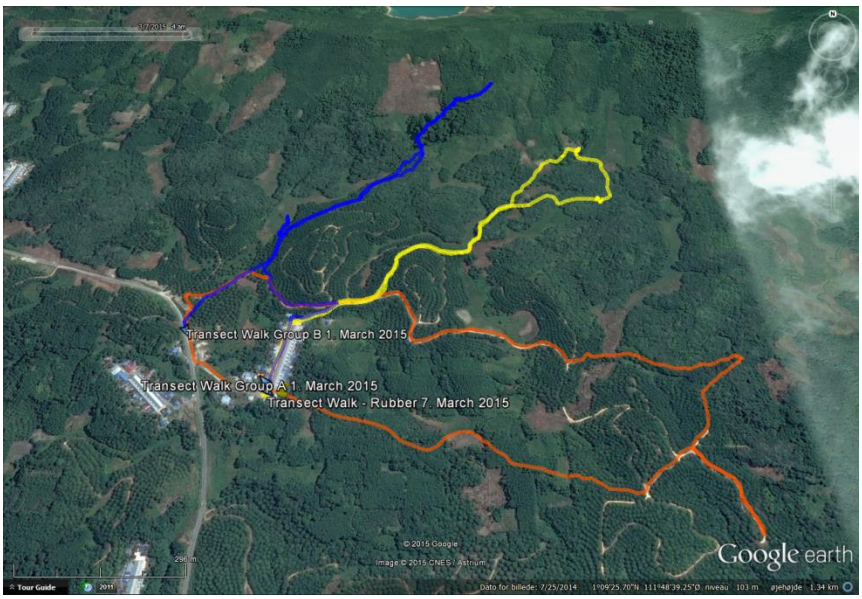


Figure 2 Transect walks to get an overview of Nanga Jela.

6.1.2 Demographics

There are 57 households in Nanga Jela. There are 37 households living within the longhouse and 20 households live in separate houses outside the longhouse. The current total population of Nanga Jela is 290[1].

[1] Appendix 2 SSI Headman

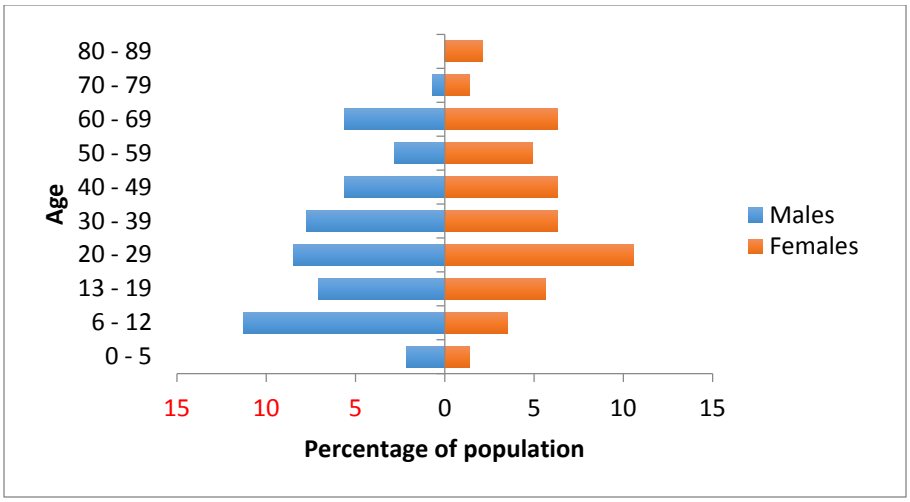


Figure 3 Population in Nanga Jela 2015

Figure 3 is a population pyramid of households in Nanga Jela based on the data collected from the questionnaire. The bulk of the population in Nanga Jela is between 20 to 69 years old. Although the population pyramid indicates there are number of people between 20 - 39 years, we did not see many young adults in the village. We infer that the reason that so few people between 20 - 39 years are living in Nanga Jela is because this age cohort spends the majority of their time working and studying in cities. They were accounted for in the questionnaire because many still return on weekends and holidays. Despite the low birth rate and out-migration, the population has increased due to factors such as new members marrying into Nanga Jela. Compared to the proportion of people in their reproductive years (20 - 39 years), there are relatively few children in Nanga Jela.

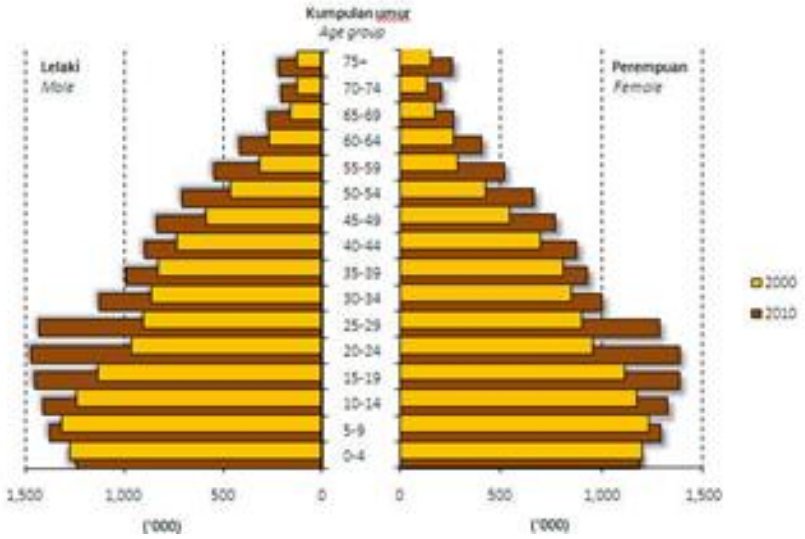


Figure 4 Population of Malaysia from 2000-2010

Figure 4, shows the 2010 population composition in Malaysia. Although it could be inferred that the population is rectangularizing, it is more pyramidal in shape than the population composition in Nanga Jela. From our data, it can be concluded that the population composition in Nanga Jela reflects a trend of low birth rate for the number of adults in their fecund years compared to other parts of Malaysia. This trend is linked with development.

6.1.3 A Brief history of Nanga Jela since Resettlement

Table 1. Result from timeline with elders

Year	Event	Description
Around 1980`s	Before resettlement	Started construction of the Batang Ai Dam
1984	Resettlement of Nanga Jela	New longhouse built by the government
	Construction of road	Had only pitch road, better one after 2000
	First headman	TR Janting, Father of present Headman
	Public Transportation	Public transportation vehicle (bus, van. Bus) available 5 times/day After 2000 no bus service available
1985	Got dusun land	Got from Govt. and divided among the community
	Deforestation of primary forest	For exploration of area /cultivation of crops
	Vegetable and swamp rice cultivation started	On their own dusun land (not titled, based on legislation)
	Govt. treated water connected	Started to drink this water instead of the gravity feed water
1987	Connection of electricity	Connected by SESCO (Sarawak Energy Company)
	Cocoa scheme started	Done by SALCRA
	Connection of electricity	Connected by SESCO (Sarawak Energy Company)
1993	Kinder garden established	For primary education
	Cocoa plantation ended	For the failure or lesser outcome
	Start of large scale rubber plantation	Started after cocoa plantation also by SALCRA
1994	Start of large scale rubber plantation	Started after cocoa plantation also by SALCRA
1995	Oil palm scheme started	By SALCRA
1996	Started pepper plantation	In the common land, because they didn't get dusun lot officially
1998	Conversion of religion	From traditional to Christians
2005	Start of small scale rubber plantation	Because they have already their owned or private land (dusun land)
2010	Telecommunication started	Mobile phone introduced here but before that they have Solophone charged by solar power
	Official title to the dusun lot	Within longhouse all of them has title except community from Batang Ai The total no. of plot is 52
2013	Fishing farm started	From GTP (Government Transformation Programme), Now 4 households are involved
	Official title to the dusun lot	Within longhouse all of them has title except community from Batang Ai The total no. of plot is 52

The main findings from the PRA timeline with the elders are that Nanga Jela got dusun lots (orchard) mainly to grow padi, fruits and vegetables, as a part of the resettlement scheme in 1985, but they did not get the official title to their dusun land until 2013. The oil palm scheme

began in 1995. In 1996 they converted to Christianity when hitherto they practiced traditional Iban beliefs.

At time of resettlement, there were 37 households all of which settled in the new longhouse. After resettlement, the population expanded and people had to live in separate houses because the people who moved to Nanga Jela after the resettlement weren't given any land. Although they were not entitled to dusun lots, through our observations and questionnaires, those living outside the longhouse do not appear to be any worse off economically than those living in the longhouse. Like those living inside the longhouse, many rent land or have inherited land from relatives that were around during the resettlement scheme. According to our questionnaire, 37% of households rent land[2]. Motives for renting lands are varied. In addition to not being entitled to a dusun lot, many report not having large enough dusun lot because of the SALCRA oil palm scheme[3].

[2] Appendix 1 Questionnaire
[3] Appendix 10 FGD Dissatisfation with SALCRA

6.2 Land Scarcity

6.2.1 SALCRA

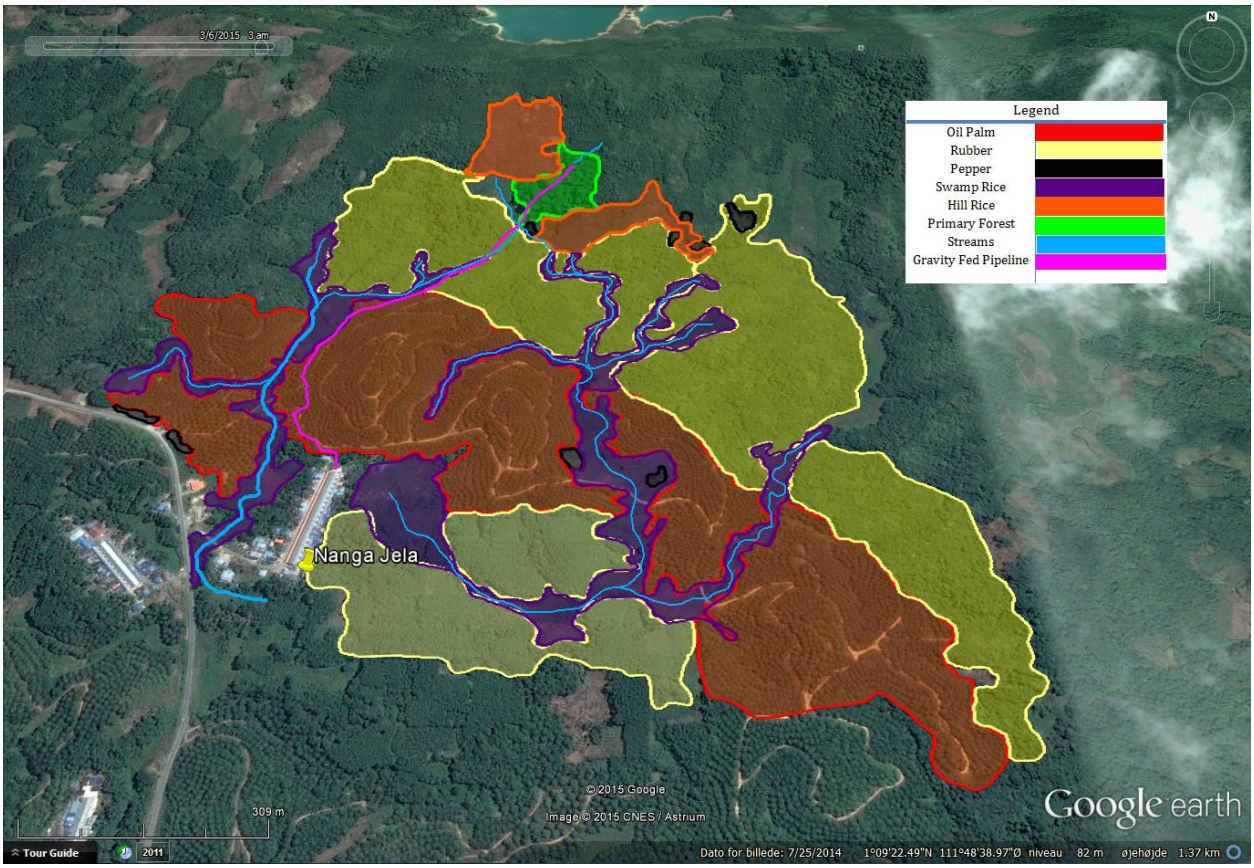


Figure 5 Land Use Map in Nanga Jela

The map in gives an indication of how much land the oil palm plantation (OPP) covers. From our transect walk, we learned that SALCRA oil palm schemes take up at least ⅓ of the resettled lands, which we also experienced on the transect walks. Furthermore, the questionnaire data reveals that the perception of SALCRA schemes among the people of Nanga Jela is unanimously unsatisfactory[4]. Similarly, during the SSI with the headman, he also emphasized dissatisfaction with SALCRA and reports that there is not enough land available to cultivate surplus crops. When asked about the cause of land scarcity, SALCRA was overwhelmingly the response [5].

The SALCRA official informed us that the oil palm scheme did not create land scarcity because farmers could simply plant their crops in between the oil palm trees[6]. Our informants emphasized

[4] Appendix 1 Questionnaire
[5] Appendix 1 Questionnaire
[6] Appendix 10 FGD Dissatisfation with SALCRA

that this is impossible because doing so would impede oil palm yields. In the questionnaire survey, a household reported that they planted pepper alongside the OPP's due to land scarcity. In the FGD with households who reported being dissatisfied with SALCRA similar cropping trends were also mentioned. During the discussion they reported that they must buy food for consumption because there is not enough space to grow it on their own land.

6.2.2 Land Ownership

From our data, it is apparent that there are misunderstandings about the official terms of the contract with SALCRA. In the FGD with those dissatisfied with SALCRA, respondents claimed that the contract is 60 years long[7] but the SALCRA official reported that it is only 25 years long[8]. Meanwhile, the headman informed us that SALCRA claims to have lost the contract altogether, and he has not had access to it in years. Thus, the contract, to his understanding, remains indefinite in duration. These conflicting responses have implications in terms of land tenure because the resettled land occupied by the plantation scheme is under the control of SALCRA, and the length to which this will last is not consistently understood. Currently the only land which the residents have access and formal title to are the dusun lots[9].

6.4 Environmental Impacts of Land Scarcity

6.4.1 OPP Impact on Soil

Our results showed that the conversion of primary forest to OPP's, has detrimental impacts on all land composition. Planting oil palm increases deforestation rate, which affects the land cover and LUC, as we can see results from analyzed soil samples[10]. If soil fertility is depleted in future, it will be difficult to cultivate agricultural crops with low inputs like fertilizers, pesticides etc. The introduction of high inputs into the soil is cost expensive and harmful for soil health. By measuring biologically active soil carbon (Using POX-C method), soil quality can be evaluated (Weil *et al*, 2003). In Malaysia large changes occurred due to increased permanent oil palm cultivation. Land use change in Nanga Jela is

[7] Appendix 10 FGD Dissatisfation with SALCRA
[8] Appendix 3 SSI SALCRA official
[9] Table 1
[10] Table 2

primarily characterized by forest cover loss and reduction of forest land. Wicke *et al* 2011 has been reported that, in the past thirty years there has been reduction of forest land 20 % in Malaysia.

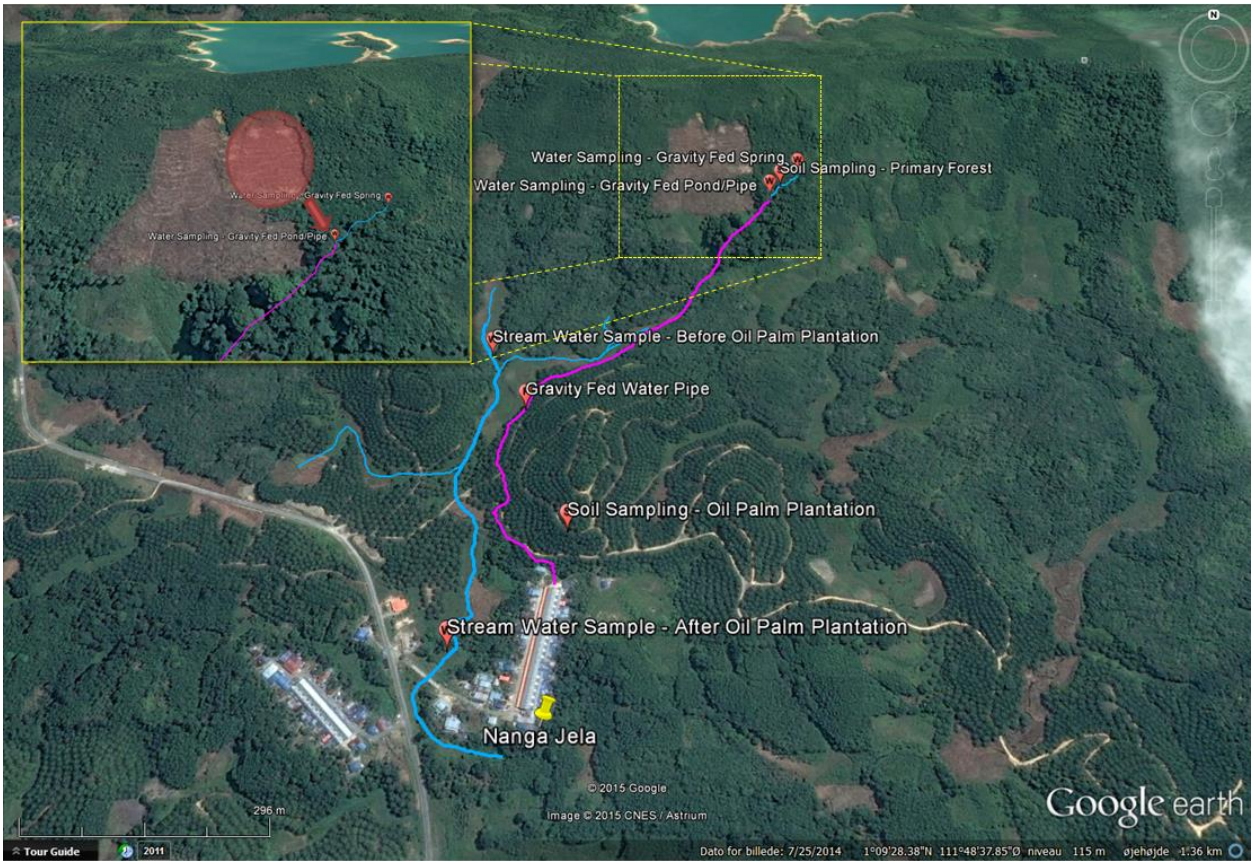


Figure 6 Natural resource (Soil and Water) sampling sites

6.4.2 Chemical Analysis of the Soil

Soil is an important medium for growth of plants. Both chemical and physical soil properties have great significance to LUC and land management. The reason behind choice of different soil parameters for analysis is to get an indication of land use changes. Soil texture is one of the most important properties of the soil because it influences the air and water holding capacity, porosity, drainage, cultivability and nutrient status of the soil.

The texture of soil in the primary forest is mostly silt for 5 cm and loam for 15 cm layer of soil. In the case of OPP, however, the texture is almost silt loam for 5 cm and 15 cm soil layers[11]. Silt loam soil is good for agricultural cultivation (Coulter, 1998). Thus, some OPP areas could have the potential for agricultural and horticultural crop cultivation in terms of textural class.

Tabel 2 Soil bulk density (BD), pH value, POX-C concentrations, total N and C content (%) for the different layers from different sites

Sample ID	BD (g/cm3)	pH	POX-C (mg/kg-1)	C%	N%
PF.T	0.68	6.24	1368	5.22	0.44
PF.15	1.04	5.70	312	1.93	0.19
OP.T	1.23	4.96	720	1.74	0.12
OP.15	1.35	4.82	96	0.61	0.07

This table shows that the soil BD is higher in the OPP field than the primary forest. For both sites BD is higher in 15 cm layer than the 5 cm layer due to the composition of fibrous roots in the 5 cm layer and when soil BD increases then the soil would be more compact, have less organic matter, less air and water penetration into the soil (Coulter, 1998). Bulk density is an indicator of soil compaction and soil health. It also affects rooting depth/restriction, microorganism activity and plant nutrient availability which influence soil fertility.

[11] Appendix 13 Soil

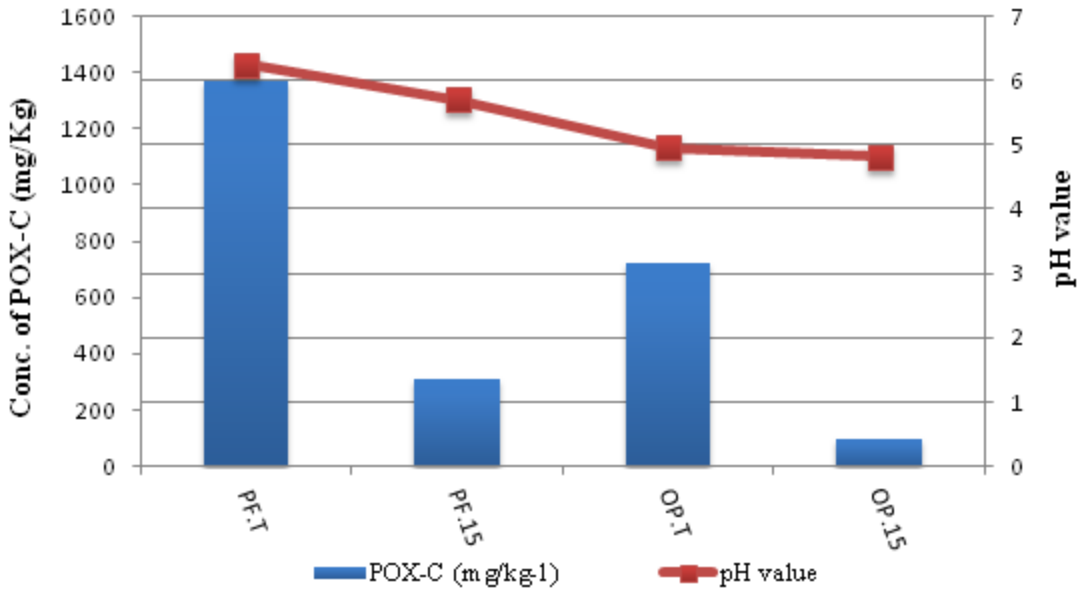


Figure 7 Average POX-C concentration and pH value in 5 cm and 15 cm layer from OPP field and primary forest sites

Soil pH is an important soil criteria because the level of acidity influences chemical, biological and physical processes occurring in the soil. Most plants grow best within a pH range of 6.5 to 7.2. From the Table 2 and the figure the pH level is higher in primary forest soil than oil palm soil. This means that pH is decreasing due to oil palm cultivation for such a long period. In general, the pH range is between 4.5 to 5.5 then the soil becomes acidic, which is not good for crop cultivation.

Carbon is an indicator of soil organic matter. The figure shows that, active carbon stocks are higher for both layers (Top & 15 cm) in primary forest soil than in OPP samples. This indicates great reductions of carbon stock for the oil palm area due to the land use changes. Decomposition of litter fall in the topsoil of primary forest that is also absent in the oil palm land. The difference between different layers of POX-C conc. suggests that land use changes affect topsoil carbon concentrations (Bruun *et al* 2013).

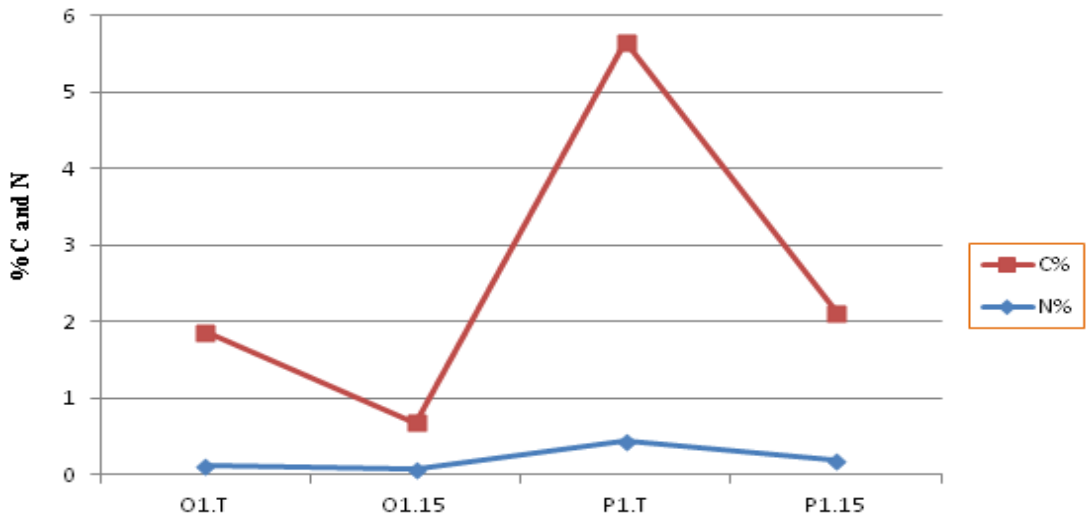


Figure 8 Total N and C content (%) from two soil layers 1. Top (5 cm) and 2. Subsurface (15 cm)

Figure 8 above shows that the total C and N % is higher in both layers of soil (Top & 15 cm) in the primary forest than in the oil palm cultivation land. This is perhaps due to imbalanced decomposition rates and leaching of nutrients from top layer in the OPP. Figure 9 demonstrates that the colour is different for both layers of primary forest and oil palm sites. The primary forest soil is darker than oil palm field soil which indicates the presence of more organic carbon in the primary forest soil. Both active carbon and total carbon are major determinants to assess soil nutrient status for sustainable agricultural systems (Bliar *et al*, 1995).

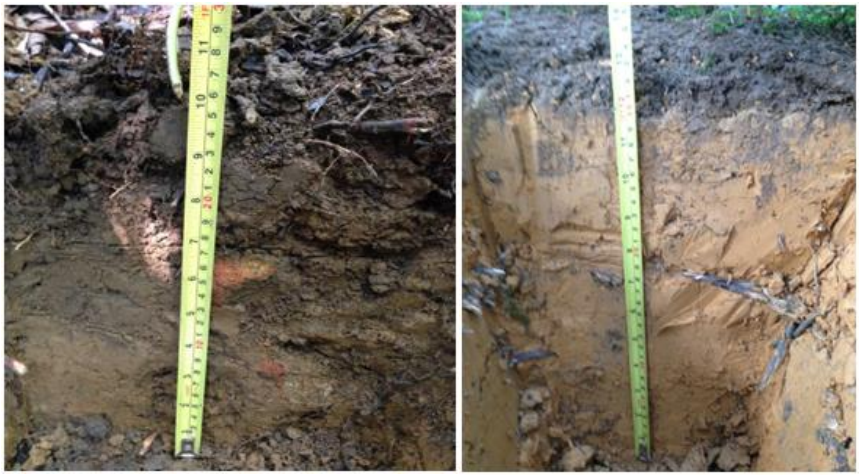


Figure 9 Primary forest and Oil palm soil sampling sites showing soil profile

Environmental Impacts on Soil

Through comparing samples of primary forest and oil palm plantation soil in Nanga Jela, it is evident that the perennial cultivation (20 years) of oil palm has changed the physical and chemical properties of the soil. Bruun *et al.* (2013) found that long term oil palm plantation, increases soil bulk density in subsurface layers and decreases topsoil carbon stocks. This is evident from results of soil analysis in Nanga Jela (Table 2). Due to land use changes the SOC has also been depleted. This affects the soil ecosystem (Bruun *et al* 2013). Our study site is an area prone to rainfall. When heavy rainfall occurs, it leaches out nutrients from top layers causing severely negative effects on soil and standing crops. The organic matter of top soil is also severely depleted following felling, site preparation, and low concentrations of organic carbon (Haron *et al* 1998). Hamdan *et al* (2000) found that severe soil degradation occurs due to the exposure of subsoil because of oil palm cultivation in Malaysia. Because the entire hilly area was initially occupied by primary forest and converted shifting cultivation into cocoa and then oil palm plantation (PRA timeline). Through assessment of all estimated parameters (BD, pH, active C, total C and N) we found that conversion of land from primary forest to OPP led to changing environment by degradation of soil and emissions of CO_2. Transformation of swidden agriculture (shifting cultivation) to oil palm plantation has wide range of environmental consequences in globally and led to changes in pool of soil organic carbon (Brunn, et.al 2009).

6.4.3 OPP Impact on Water

The OPP in Nanga Jela, as discussed earlier, is solely managed by SALCRA who are known to use fertilizers, pesticides and herbicides on oil palms to obtain best possible yields. Residue from these will leach and seek towards lower pressures, eventually ending up in the low land running stream marked on the map in figure 6. From the questionnaire in appendix 14 it is noted that the stream water is not used for consumption. Therefore, WHO drinking water standards are not relevant here; the condition of the stream is, however, still of interest in relation to biological life and other daily activities such as fishing, bathing and irrigation. The current effect from the OPP on the stream can be seen from various parameter results presented in table 5 for upstream (before the OPP – unaffected) and downstream (after the OPP).

Table 3 Subindex and WQI of the the OPP water samples

		Stream	
Water quality in stream	Subindex	Oil Palm Before	Oil Palm After
Dissolved Oxygen	**SIDO**	0	0
Biological Oxygen Demand	**SIBOD**	100,40	100,40
Chemical Oxygen Demand	**SICOD**	98,44	90,46
Total Suspended Solids	**SISS**	97,49	97,49
pH	**SIpH**	98,53	98,81
Ammoniacal Nitrogen	**SIAN**	100,50	96,83
	WQI value	77,32	75,53
	Class	II	III
	Classification	Slightly polluted	Slightly polluted

The results were analyzed according to the WQI formula (appendix 14) and plotted in table 3. Here, they show that water quality before the OPP is within class II and after the OPP it is in class III, which both classify as slightly polluted according to DOE water qualification index appendix 14. Other quality indicators such as bacterial contents, heavy metals etc. are not taken into account in the WQI e.g. are the FCC and TCC results almost a 1000 times higher in the stream after the OPP compared to before the OPP, which has a vastly negative effect on quality.

6.4.4 Additional Impacts of Land Scarcity on Water

Another result of land scarcity is that marginal lands must be cultivated. Therefore, no land is left fallow. Additional land must also be rented from surrounding communities. These trends indicate that land is used for cultivation closer to the gravity-fed water source, which has can affect community health if it is contaminated with fertilizer run-off etc.

The results from water samples are displayed in figure 6 for the governmental supply, gravity-fed.

6.4.4.1 Chemical Analysis of Water

The results from the PRA focus group, can be seen in figure 10 below drawn by the interviewees. The seasonal ratings of quantity and quality of the gravity fed water source show intermediate quantity levels of water during January and February, decreasing trends throughout spring, and lowest yearly yields in the summer time. In September, the water flow elevates again and peaks throughout October, November and December. The overall water supply in the gravity-fed source is naturally and directly linked to the annual rainfall seasons illustrated in the figure. The ranked quality of the gravity-fed source is lowest in January and increases steeply in

quality from February and March. From there it stabilizes at the highest quality rankings until it drops sharply to 1 from October through December. The governmental water supply shows highest ranking in quantity throughout the entire year, and its annual trends in quality are marked unknown. Additional notes obtained from the PRA session are presented in appendix 14.

Seasonal Calendar of water quantity and quality in relation to cultivation of hill rice and rainfall

Months / Categories	Jan	Feb	March	April	May	June	July	August	Sep	Oct	Nov	Dec
Gravity Feed Quantity	3	3	2	2	2	1	1	1	2	5	5	5
Quality	1	4	5	5	5	5	5	5	5	1	1	1
Govern. Supply Quantity	5	5	5	5	5	5	5	5	5	5	5	5
Quality	-	-	-	-	-	-	-	-	-	-	-	-
Hill Rice Fertilizers								Left Fallow and Burning Field	(Sowing Seeds)	+	+	
Herbicides	Rubber Tapping			Rubber Tapping	Rubber Tapping	Gawai (Harvest Festival)	Land Clearing (Slashing)		+	+	+	Rubber Tapping
Harvesting		+	+									
Rainfall												

TR. Alexis Aloh Anak Biang, Juliana Anak Ugang, James Ucha and Tuking Anak Nyegang

Figure 10. Seasonal calendar with all months throughout the year are presented on the top x-axis together with several categories in relation to drinking water sources presented on the y-axis. Numbers 1 - 5 indicates rankings (worse to best) of the quantity and quality of the two main drinking water supplies. The "+" sign indicates usage, or activity, the "-" means unknown or none recognized annual patterns, while the blue fluxuating solid line shows the annual rainfall (low to high in the column).

The consequences of land scarcity is also reflected in the quality of the gravity-fed water source. Such is evidenced in the nearby rented plot where cultivation of hill rice has been ongoing for ~30 years (figure 6**)**. Trends from the PRA results (figure 10) indicate clear patterns between the use of fertilizers and herbicides in September, October and December and increasing rainfall from October to January. The results show lower quality of drinking water in the same period.

Any stream will receive water through three main pathways:

Tabel 4 Pathways from point of recharge to stream

Pathways	Travel time

Rainfall	Direct access
Stream-groundwater interactions	Short to long travel times
Surface water runoffs	Short travel times

The three parameters are all interconnected through complex flow patterns and parameters given by the properties and composition of the surrounding geology (Modica et al. 1997; 1998). Our study did not involve detailed investigation of groundwater flow patterns. Therefore, the following interpretation of the data collected through the PRA and water analysis should be considered as guidelines to future studies rather than evidential remarks. In general, raise in rainfall will increase the flow velocity of groundwater within a geological body and thereby also enhance the stream-groundwater interaction, this will consequently enforce flush outs of nutrients, minerals and other substances adsorbed onto the soil. The intensive rainfall can in some cases – depending on the properties within the soil – cause over saturated water conditions and subsequently trigger major surface water runoff, which can capture and carry soil sediments and other debris including recently applied fertilizers and herbicides into the stream. Based on the PRA results (figure 10), this scenario seems to be the case of the gravity-fed water source in Nanga Jela during the rainy season. Increased input in nutrients and other chemicals can seriously affect the quality of a water source.

Tabel 5 Chemical analysis of water

	Drinking Water			Stream		
Sampling point	**Govrn. Water supply**	**Gravity Fed Upstream**	**Gravity Fed Pond/Pipe**	**Oil Palm Before**	**Oil Palm After**	**WHO Standards**
Parameters	**Average**	**Average**	**Average**	**Average**	**Average**	
Temperature (°C)	29,20	25,40	25,10	26,40	28,10	-
pH	7,53	7,11	7,73	7,23	7,17	7 - 8.5
Dissolve Oxygen (mg/L)	3,92	3,41	4,03	3,56	3,86	6.0
Electrical Conductivity (EC)	0,07	0,08	0,07	0,05	0,05	2500
Salinity (ppt)	0,03	0,04	0,03	0,02	0,02	-
Ammoniacal Nitrogen (mg/L)	0,00	0,02	0,00	0,00	0,04	-
Nitrate (mg/L)	0,24	0,04	0,00	0,05	0,06	50
Nitrite (mg/L)	0,06	0,03	0,06	0,06	0,05	3.0
Phosphate (mg/L)	0,23	0,72	0,27	2,56	2,48	0.10
Biological Oxygen Demand (BOD)	0.16	0,00	0,00	0,00	0,00	-
Chemical Oxygen Demand (COD)	0,00	0,50	1,50	0,50	6,50	10
Total Dissolved Solid (TDS) mg/L	47,45	52,33	46,80	33,80	29,90	500
Total Suspended Solid (TSS) (grams)	0,00	0,00	0,00	0,00	0,00	-
Faecal Coliform Count (FCC)	0,00	425	750	700	7950	-
Total Coliform Count (TCC)	0,00	850	1500	1400	15900	-

The world's health organization (WHO) has implemented guidelines and recommendations for maximum concentrations of several compounds in drinking water in order to lower the health risks – for short- and long term exposures – and to acquire a sustainable drinking water source (table 5).

PARAQUAT AND GLYPHOSATE

Paraquat was introduced to Malaysia in 1962. (paraquat.com)
Paraquat dichloride is an organic salt used for killing green plant tissues on contact; the salt has in several epidemical studies been linked to the development of Parkinson's disease over long time exposure (Tanner et al. 2011; Kamel 2013) and proved to being able to cause heart, kidney and liver failure as well as lung scarring under short to moderate exposure (Centers for Disease Control and Prevention 2003). The European Union (EU) approved the use of paraquat in 2004, but was shortly after appealed by Sweden, supported by Denmark, Austria and Finland to successfully ban the authorization to use the herbicide from the EU in 2007 due to the recognition and concerns associated to its toxic effect on human and animal health (COURT OF FIRST INSTANCE OF THE EUROPEAN COMMUNITIES - PRESS RELEASE No° 45/07). Paraquat was later banned in China in 2012, but remains legal in, among others; U.S.A and Malaysia despite the well documented toxic effect on human health. The other commonly used herbicide in Malaysia is glyphosate, which has on the other hand proved to be very effective and with little to non-toxic effects on humans and animals (Mink et al. 2011; 2012; Williams et al. 2012). Glyphosate is easily degraded by bacteria and has – depending on the climate – an average half-life of 47 days in soils and varies in water from a few to 91 days (Vencil 2002; Tomlin 2006).

Information about which fertilizers and herbicides used on the studied hill rice plot was not attained. Merz et al. 1997; Borneo Post 2014 does assert that the most used herbicides in Malaysia are paraquat dichloride and glyphosate.

A newspaper article from (paraquat.com 2011) confirms that some weeds – such as goosegrass – started to develop resistance to glyphosate. The article suggests spraying varying rounds of glyphosate and paraquat in order to avoid competition from aggressive noxious growing weed types. Hence, do various types of herbicides may be used on the hill rice, as well as in other crops in Nanga Jela.

Nitrogen exists in several compounds as part of the broader and much complex nitrogen cycle. For the purpose of this study some are mentioned here: Ammonical nitrogen (NH_3-N), Nitrate (NO_3^-) and Nitrate (NO_2^-) with their respective concentration results and WHO recommendations for drinking water in table 5.

Fertilizers

The use of fertilizers on crops was introduced to Malaysia in 1979 (Wong et al. 1990; Yaacob et al. 1992). Fertilizers mainly consists of a well-balanced ratio of Nitrogen (N), Phosphorus (P) and Potassium (K) which are referred to as (NPK's) with added trace elements – often depended on the specific grown crops – such as Zink (Zn), Magnesium (Mg) etc. in order to obtain the best possible growth rate and yields.

The results in table 5 show that the nitrate concentrations drops from 0.04 mg/L upstream down to 0 mg/L at the gravity-fed pond with a proportional increase in nitrite. This implies that higher degrees of denitrification occur further downstream from the spring. Denitrification within the water column is however highly unlikely happening due to the presence of dissolved oxygen (DO). Denitrification are therefore more feasible to occur through complex groundwater pathways where anoxic conditions and redox potentials are much higher (Postma et al. 1991; Modica et. al. 1998; Kronvang et al. 2008).

The concentrations of phosphate in the results (table 5) exceeds WHO recommendations. These are counterbalanced through clean water indicators observed in and surrounding the gravity-feed which include biological fauna and observed low growth of plankton and algae. Freshwater shrimps and frogs were also observed in the gravity-fed stream. Freshwater shrimps are very vulnerable to pollutants and therefore serve as strong indicator of clean water (Frew 1993).

Health Concerns Related to Fertilizers

Exceeding concentrations of nitrate and nitrite in drinking water can cause methaemoglobinaemia (blue baby disease) in bottle-fed infants under short-term exposure, whilst ammonical nitrogen is only toxic in very high concentrations and are only a concern to taste when exceeding 35 mg/L as it can reduce free chlorine and form chloramines which is a compound often used as disinfector of drinking water (WHO 2011). Nitrite is often associated as an intermediate product of ongoing denitrification processes (reduction of NO_3^- to the harmless N_2 gas) which mainly occurs under highly anoxic conditions and by the presence of electron donors; the thermodynamically favored iron (II) (Fe^{2+}), hydrogen sulfides (H_2S) and methane (CH_4) (Postma et al. 1991). Phosphorus has no direct toxic effect on humans, nevertheless does phosphorus along with nitrate in streams and lakes function as immense nourishments for planktons and other toxicalgal blooms, which cause toxins to be liberated in the water and thus, indirectly becomes a threat to a clean drinking water supply. Moreover can the redundant growth of plankton and algae later cause anaerobic conditions and in worse cases trigger eutrophication which will have a negative effect on the life in lakes.

According to EPA US 2009 and WHO 2011, the total coliforms (TCC) (including fecal coliform/E.coli (FCC)) are not a direct sign of polluted waters but should be kept to a minimum due to its indication that other pathogenic organisms with fecal origin may be present. According to the DOE-INWQS in appendix x, the FCC results in table x from the gravity- fed pond classified as class IIB, which designate conventional treatment. While the TCC are low enough to qualify as class I meaning that no treatment is required. FCC and TCC can easily be reduced through boiling of the water before consumption or by episodic chlorine treatment near its source. Other gravity-fed results in table 5, such as pH, electrical conductivity (EC), salinity, biological oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS) and total suspended solids (TSS) have concentrations well below the limits indicated in WHO and the INWQS standards, indicating water quality of class I – and therefore do not require any further attention.

The results from the treated governmental water supply (table 5) are well beneath WHO standards with the only exception of phosphate which is slightly above INWQS standards and classifies as class IIA. This elevated concentration of phosphate is not a concern to the drinking water quality because there is a zero count of TCC and very low BOD results.

6.5 Livelihoods

Livelihood strategies are an amalgamation of activities that people choose to undertake in order to achieve their livelihood goals (Ellis, 2000). While the SALCRA oil palm scheme has an impact on livelihoods by creating land scarcity, there are myriad other endeavors pursued in the community. In Nange Jela, 58% of households still rely solely on farming. Questionnaire data indicates that, 42% of sampled households are involved in various other combinations of off farm activities such as fishing, off shore work, civil service, and private sector jobs[12]

6.5.1 SALCRA as a Source of Employment

When the SALCRA oil palm scheme started in 1995, it was with the intention of providing work for the residents of Nanga Jela (Banerjee & Bojsen, 2005). Initially, there were households who worked in the fields tending to the oil palm. This did not last long because the RM 8 wage for four hours of hard labor was too low. In the FGD with the people who were dissatisfied with SALCRA respondents indicated that working for SALCRA was not appealing because current the wage of RM 22 for a full day's work is still inadequate. The lack of labor from Nanga Jela has led SALCRA to hire Indonesian migrants for harvesting oil palm[13].The FDG revealed that the residents of Nanga Jela do not have a problem with the Indonesians taking the work because they would rather pursue more appealing and lucrative work. Therefore, the only income the residents gain from the oil palm scheme is the dividend[14].

6.5.1.1 The dividend

[12] Appendix 1 Questionnaire
[13] Appendix 10 FGD Dis-satisfaction with SALCRA
[14] Appendix 10 FGD Dis-satisfaction with SALCRA

To ensure that Nanga Jela is economically able to sustain itself, SALCRA gives a portion of the oil palm profit to the households who relinquished their land for the oil palm scheme[15]

During our time in Nanga Jela, we did not come across a household who felt that the dividend received from the scheme was sufficient enough to sustain their livelihoods. In the FGD with those dissatisfied with SALCRA they reported that the in 2014, the total dividend was RM 2400 but the first dividend received this year was only RM 300[16]. According to the SSI with the SALCRA official, the dividend varies yearly based on several factors including fluctuating market prices, crop yields and transportation fees, all of which is subtracted from the dividend.

The fluctuations in dividend cause community members to report dissatisfaction with this arrangement. From our questionnaire, SSI with the headman and FGD with those dissatisfied with SALCRA, it appears that community members are not aware of the reasons behind yearly fluctuating dividends. This indicates a lack of communication from SALCRA leading to a lot of confusion and uncertainty. Since the OPP takes up most of the land, residents of have very limited space to plant padi and traditional cash crops. Thus, residents are unable to glow surplus of crops which prohibits many from earning sufficient income from farming.

6.5.2 Farming

Undoubtedly, the resettlement and the SALCRA plantation schemes have impacted the livelihood strategies of the Nanga Jela community. SALCRA in particular has put a constraint on the land available to practice traditional ways of life. Iban livelihoods traditionally consisted of subsistence level, shifting cultivation of padi rice. Shifting cultivation made their livelihood relatively limited in its environmental impacts. The perennial cultivation of OPP, however, has had impacts on the soil, decreasing annual crop production.

Due to land pressure faced by the people in Nanga Jela, they must be strategic about the crops they grow, as well as how and where they grow them. The transect walk and the SSI with the headman reveal that many households still have land in Batang Ai. This was further triangulated in the questionnaire survey where many of the households reported to have land back in Batang Ai, but is not considered as a practical source of crop cultivation because it is too far or partially

[15] Appendix 10 FGD Dis-satisfaction with SALCRA

[16] Appendix 10 FGD Dis-satisfaction with SALCRA

flooded by the dam project[17]. Moreover, to overcome land scarcity the questionnaire survey indicates that almost 37% of households rent land.

Ellis (2000) indicates that to safeguard livelihood against shocks such as fluctuating market prices, flood, droughts etc., many rural communities keep various livestock and strategically grow different crops, which often plays a critical role as a store of wealth and as a buffer against bad times. Likewise, households in Nanga Jela use their *dusun lot* to grow padi along with cash crops such as rubber and pepper to earn income. Furthermore, in the FGD with households dissatisfied with SALCRA respondents explained that they strategically plant their crops on land where they are able to catch fertilizer runoff from the oil palm.

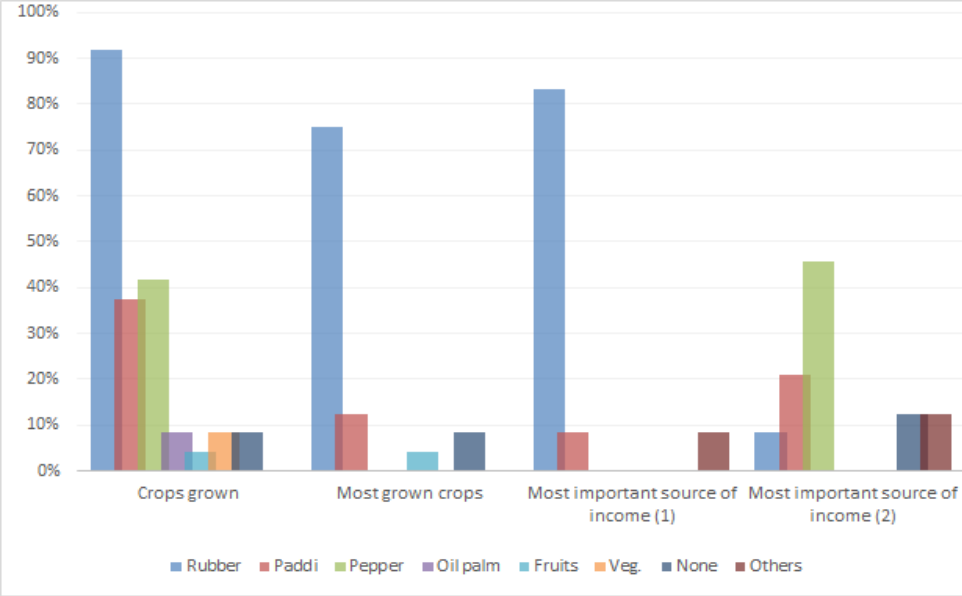


Figure 10 Livelihood Strategies: crops grown by households

The figure depicts the crops that households cultivate in Nanga Jela. Rubber is grown the most. It is reported to be the most important source of income from farming. To triangulate the data from the questionnaire regarding the crops grown in the community, the transect walk to the fields indicates that many households grew padi, rubber, and pepper on their dusun lots. The PRA livelihood ranking session reveals that current market prices for rubber are low. They can only sell rubber for RM 2.70 per kilo and when the prices are high, however, they can earn around

[17] Appendix 10 FGD Dis-satisfaction with SALCRA

RM 10 per kilo[18]. As a consequence, households are not tapping rubber right now. Instead they are focusing on pepper production because they earn around RM 31 per kilo. Therefore, figure 10 also shows pepper as the second most important source of income from farming. The figure also shows that residents seldom grow fruits, vegetables or even oil palm because cash crops are more lucrative and they can buy food for consumption from local markets. It should be considered that the data presented in figure 10 comes as the result of the fact that questionnaire respondents may have interpreted importance of crops over time rather than according to this particular growing season.
The income received from selling of cash crops is used for activities like buying food from the market, paying for children's school supplies along with long term projects like renovating homes, and building their savings[19].

Figure 10 also demonstrates that households do not earn much from padi or vegetables. The SSI with household 51 indicated that most padi is grown for consumption. In the SSI with household 46, who explained that subsistence farming on the limited land does not provide sufficient income. Growing cash crops was far more valuable in terms of income, thus households rely on the local market for buying food for daily consumption. This was further evidenced during our visit to Sunday market in Lubok Antu, where we saw many people from Nanga Jela buying food for the week. Some households have the ability to plant vegetables for their own consumption behind their house but it is not clear exactly how many are able to do this.

Nonetheless, the data from the questionnaire survey indicates that farming as the sole livelihood strategy, is generally negatively correlated with wealth indicators whereas households with other/additional sources of income have more wealth[20]. Farming is mostly associated with elders and people with minimal education, who have limited skills to work off-farm. For all the 25 households sampled the questionnaire survey results do indicate that farming is only done with elderly with minimal education.

6.5.3 Off-farm work

[18] Appendix 5 SSI with Aunty
[19] Appendix 5 SSI with Aunty
[20] Table 6 Wealth Indicators

Figure 11 shows the questionnaire data regarding the various forms of off-farm activities that the residents in Nanga Jela practice.

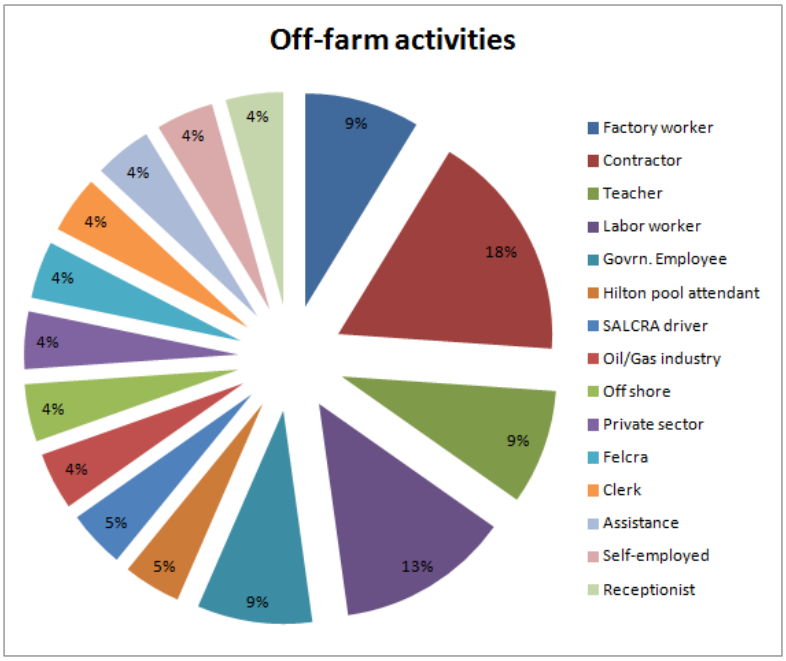


Figure 11 Off farm activities in Nanga Jela

It is becoming a common trend for residents in Nanga Jela to work off-farm in order to supplement the fluctuating income yielded from farming activities.

Table 6 Wealth indicators

Wealth indicators	HH nr. 12 Son works off-shore drilling and sends remittances	HH nr. 28 Father works as a pool-attendant at Hilton	HH nr. 45 Labour worker and teacher	HH nr. 51 Farmers, have no other source of income
Times going to the city	Once a week	Once a week	4/5 times a week	Once a month, public trans.
Satellite TV	Yes	Yes	Yes	No
Separate freezer	Yes	No	No	No
Washing machine	Yes	Yes	Yes	No
Gas line	Yes	Yes	Yes	Yes
Last big expenditure	Car in 2014	Washing machine	Computer	None
Haircut at salon	3 times a year	No	15-20 times a year	No
Computer	3, one from the gov. and 2 self bought	Yes, one from the gov.	Yes, bought herself	Yes, one from gov.
Cell-phone – monthly expenditure	2, 200RM/month	Yes, 50RM/month	Yes, 200RM/month	No
Place buying clothes	Sri Aman	Sri Aman	Kuching	Lubok Antu
Car - year bought	2, one bought in 1997 the other 2014	Yes, 2010	2, bought in 2007	No
Times consuming meat	Everyday	Kids almost everyday, adults sometimes	Almost everyday	Once a month
Food on a normal day	Rice, vegetables, meat, fish	Rice, vegetables, meat, fish	Fish, pork, rice and fruit	Rice, green vegetables, fruits
Observations/ notions	House looks fancy, big TV and speakers, well decorated. Son has another house in Sri Aman	House looks unfinished, needs renovation. Floor made of linoleum sheet and many walls are not painted	House looks clean and smells nice. Well decorated.	House looks unfinished, lack of furniture, plastic on floors.

In order to further assess whether there were any patterns of household having off-farm income being slightly better off than household who only have farming income, a list of wealth indicators was derived to test this theory. Table 6 demonstrates the wealth results derived from the SSI conducted with four households. Three household have members involved in off-farm activities while one household solely relied in farming. Those involved in off-farm activities included one family that received remittances from a son working in offshore drilling, a teacher and a pool boy at a local resort.

The data in table 6 indicates that household with members with some sort of off farm work are able to derive more benefit from their income. For instance, all households that have off-farm income have a cars and go to city once or several times a week, their diet consists of meat

consumption everyday whereas the households that only has farming as income source does not have any car and goes to the city once a month using public transportation and diet mainly consists of vegetables.

Although table 6 provides limited insight into the impacts of off-farm income in the community as a whole, from these interviews it can be concluded that certain off-farm jobs, like offshore, being a government worker are more lucrative than others. Working as a pool attendant at the local resort, however, does not appear to generate as many wealth indicators. Thus, it is likely the type of off-farm income that matters most in determining the level of benefit gained from off-farm livelihoods.

Still, it is apparent that households regard off-farm income as important because it is more stable than income generated from farming. In the FGD with those dissatisfied with SALCRA, the consensus among respondents was that they feared for households relying solely on farming to sustain themselves.

6.5.3.1 Fish Farming

Box 2 - Fishing Farming: A Case Study

Fish farming in Batang Ai Lake was initiated by the Department of Agriculture – Sarawak in the Government Transformative Program (GTP). The agricultural department had advertised in Lubok Antu for fish farming opportunity and everyone in the region could apply.

In Nanga Jela fish farming has been undertaken by four families, the headman was the first person to become involved in the farming activity.

The farm is still owned by the Department of Agriculture and they do random checks and the government requires the farmers to keep the nets full, expand and develop it and send a status report once a month.

Though the government still owns the farms the profit earned from selling the fish is farmers to keep.

Fish farming is a lucrative livelihood activity based on arrangements with the Ministry of Agriculture and the profits it yields. The government gives the fish farmers' initial capital along with tilapia to begin fish farming[21]. The fish farmers also have access to a private middleman that is consistently looking to meet demands for fish. In the FGD with households involved in the fishery scheme, it was indicated that the middleman pays them for the fish on the spot[22]. Furthermore, this indicates that consistent demand makes for a steady form of income which serves as a major advantage to livelihoods. On average, households involved in the fishery scheme earn RM 1500 per month and during holidays seasons like Chinese New Year they can earn around RM 3000 in three days[23]. This amount is high compared to the dividends households receive from the SALCRA oil palm scheme.

From the FGD with households involved in fishing, we learned that the income from gained through fish farming allows households to build savings and renovate their homes. When asked if they were suddenly not to be involved in the fish business, one responded that her husband would have to work far away from the community, and another said that he would have to plant more crops to earn sufficient income. Still, it was agreed, that these alternatives would not compensate for what they are earning from fish farming. According to the SSI with the SALCRA official, the Ministry of Agriculture plans to expand fisheries to include more farming opportunities in the future based on the success experienced in these four households**.**

6.6 Quality of life

The pursuit of off-farm work that arose from the introduction of development schemes have affected the quality of life of those residing in Nanga Jela in ways that are mostly positive. Drawing on the testimony of our respondents, it is apparent that development schemes like the resettlement and SALCRA have also introduced the community to many new amenities, which are generally linked to a better quality of life.

From our questionnaire survey, SSI with the headman, FGD's, and PRA timeline, it was reported that the resettlement scheme is generally perceived positively because access to to surrounding

[21] Appendix 11 FGD Fish farming
[22] Appendix 11 FGD Fish farming
[23] Appendix 11 FGD Fish farming

areas has become easier since the old longhouse was located between two rivers, which made transportation difficult. The hydroelectric dam project gave Nanga Jela access to electricity and piped water in the resettled area. Moreover, the dam has given four households the opportunity to participate in the lucrative fishery scheme in the Batang Ai Lake.

The construction of the road was motivated by the establishment of SALCRA plantations, which require transportation of oil palm to mills for processing. The road gives the community access to such amenities as health clinics that are open for 24 hours a day and to markets and towns where children can attend school and commodities can be purchased[24]. Although dissatisfaction with SALCRA management was reported unanimously in the questionnaire survey, informants in the FGD with those dissatisfied with SALCRA did admit that SALCRA offers some beneficial services. For example, SALCRA has been known to help community members transport harvested padi, it built the government-run school, and it offers transportation in the event that a community member passes away.

6.6.1 Wealth

From our participatory observation, it was apparent that the Nanga Jela community in general is relatively wealthy. For example. the majority of households have multiple cars parked in their driveways. Furthermore, during the administration of our questionnaires, it revealed that many households have satellite televisions, speaker systems, multiple computers, tiled floors, and painted walls. The wealth indicators in figure #, illustrate that those engaged in off-farm activities tend to be wealthier than those who are not.

6.6.2 Education

Ellis (2000) notes that human capital is the chief capital available to any household and human capital is enhanced by investment in education, training and skills acquired by pursuing one or more occupation. The trend towards the pursuit of off-farm jobs is also reflected in varying educational levels and livelihood strategies exhibited among different generations in the community.

[24] Appendix 2 SSI Headman , Appendix 3 SSI SALCRA official

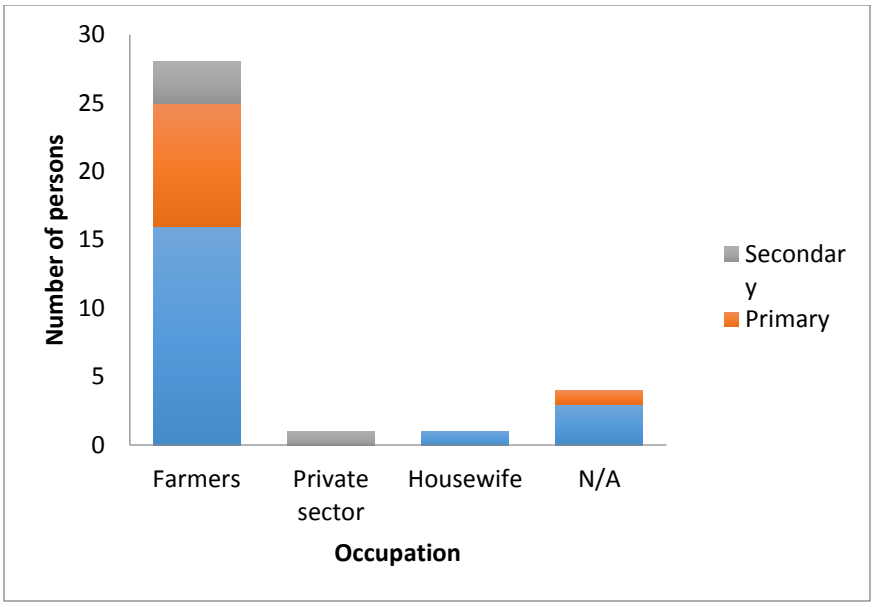
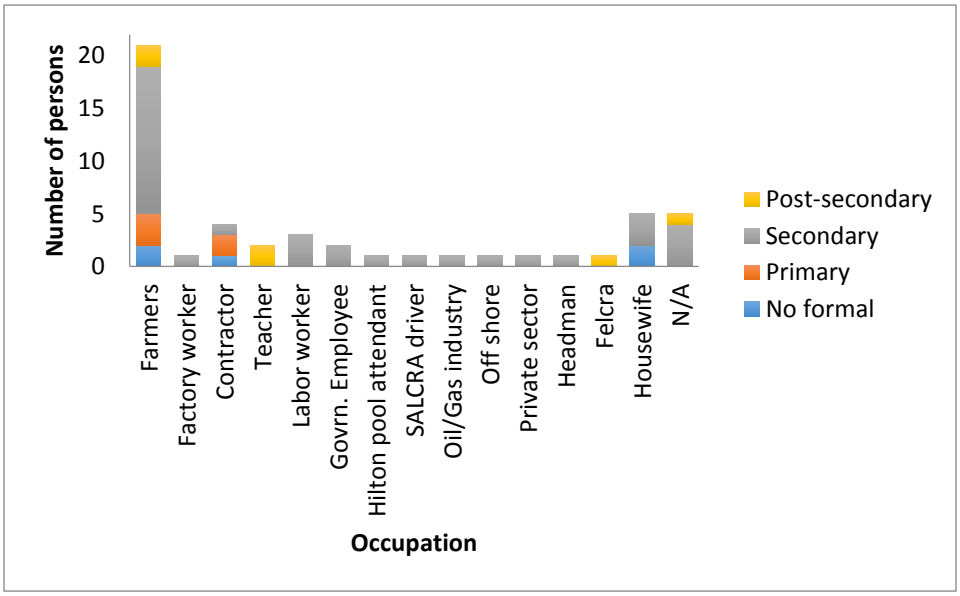


Figure 12 Occupation vs level of education 50+ years.

The majority of livelihood is farming. The most common educational level is no formal education. There are very few people involved in off-farm livelihoods.



Figur 13 Occupation vs level of education 26 - 49 years

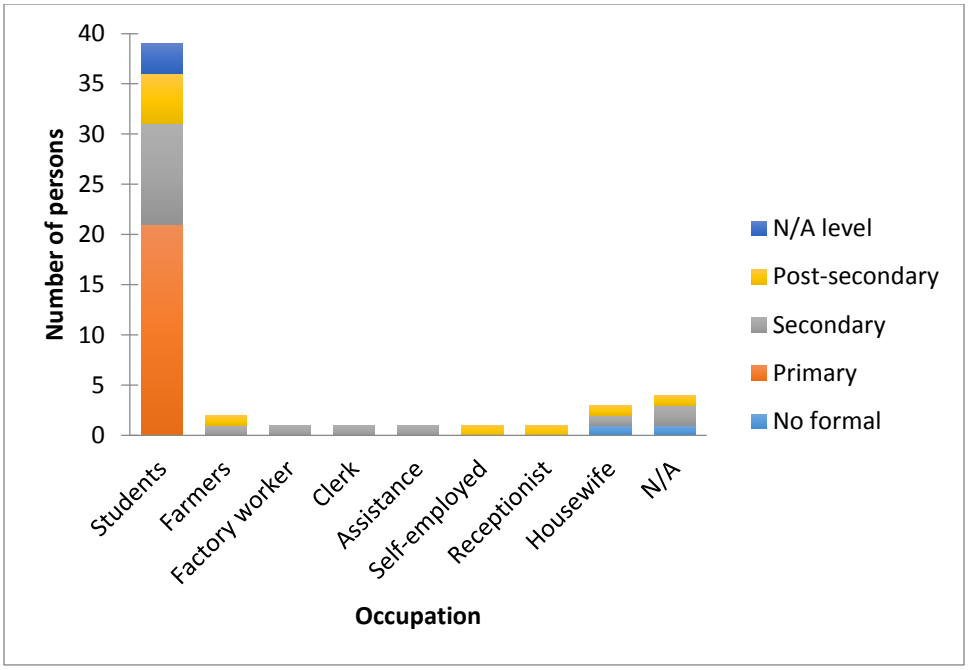


Figure 14 Occupation vs Level of education 6 - 25 years

Most people within this sample are students. Many are still earning primary education because, according to our questionnaire data, they are below the age of twelve. More than in any of the older generations are earning postsecondary educational levels, and variation in livelihood strategies has persisted. Relatively few in this sample are farmers. It may seem speculative for us to infer about the future livelihoods of the youth, but based on trianagulation of data it is likely that youth are working to pursue careers outside of the community[25].

These three figures are based on data extracted from our questionnaires. Overall, there is a clear trend in increased levels of educational attainment over the generations, as well as a wider variety of off-farm livelihoods being pursued. Those between the ages of 26-49 exhibit a higher proportion of people who have completed secondary education than those over 50 years. When we consider that the adults between the ages of 26-49 grew up in the new resettled area, indicates that there is easier access to schools in the resettled area.

It is apparent that these trends will continue into the future based on our FGD with those dissatisfied with SALCRA. In their closing comments about what they expected for the future of Nanga Jela the informants emphasized that depending on the land for income was becoming increasingly difficult. They felt it was important for their children to become educated and

[25] Appendix 12 FGD Youth

prepared to work in off-farm careers. Moreover, FGD with community youth, revealed that families are supportive of their children's education and career aspirations. The youth respondents reiterated the trend of aspiring to work in careers that required higher education rather than to work as farmers. The interviewees, all of which were females, between the ages of 16 and 24, report that they want to be geologists, engineers, or police officers.

6.6.2.1 Youth

The Youth

In the focus group discussion with the youth have ambition to live and work in the city and support their family, many of them difficulties imagining themselves as full time farmers. On the other hand nearly all our respondents mentioned that they would eventually come back to support their family or take them back to the city. However they understood when the time comes, it would be a difficult decision.

Through the focus group discussion with the youth we met Gloria and eventually conducted an interview with her. She has just completed her Diploma and is waiting for her results to embark on further education to become a geologist. She takes inspiration from an uncle who is in an engineer in Kuching and has full family support for further education. However she mentions although she has independence, it is difficult for her to fit in the city with no family but hopes that she inspires and motivates the younger children, to reach for their ambition.

7. DISCUSSION

7.1 The Development Project/Paradigm through a Critical Lens

The impacts of development initiatives exhibited in Nanga Jela serve as a cross section of global development trends. On the local level, we have seen the ways that development schemes impact indigenous peoples. Looking more broadly, we can begin to infer some of the national government's motives behind the push towards the modernization and industrialization of Malaysia as a whole. To more fully understand the impacts of these efforts in Nanga Jela, we must zoom out and examine the phenomenon of development itself with a critical eye. Using two widely accepted templates for assessing development: economist Amartya Sen's Human Development Index and Ellis's Framework for Livelihood Analysis, as examples, it is apparent that there is a disproportionate emphasis put on economic development and integration into formal, wage earning sectors (Stanton 2007; Ellis 2000). With this point in mind, let's revisit the development schemes that have had consequence in Nanga Jela, and how they have changed the community forever.

7.2 Resettlement & SALCRA as Development Schemes

The construction of the Batang Ai hydroelectric dam was funded by the Asian Development Bank. The power is largely harnessed to provide electricity to Peninsular Malaysia **(**"The Coalition of Concerned NGOs on Bakun [Gabungan] Malaysia**)**. Due to land constraints, these longhouse communities are not entitled to cultivate the resettled land as they please. Under the authority of SALCRA, we witness the government's attempt to integrate the Iban people into mainstream economic development by having them work on cocoa, rubber, and oil palm plantations that were established on their resettlement area. This state of affairs represents the production-oriented value judgments passed on Nanga Jela's traditional practice of shifting cultivation, *"...as inefficient and construed as an obsolete practice that causes irreversible destruction and damage to the environment"* (Banarjee, 2005). Such claims serve to legitimize state intervention in the name of development at the expense of indigenous cultures.

As we have established, participation in SALCRA schemes in the Sri Aman and Lubok Antu region is minimal. Reported satisfaction with the scheme is null. Reasons for this include the fact that the scheme offers low-wage work under harsh conditions and insufficient dividend pay as tradeoffs for their title to land. In terms of the former, the rhetoric that integration into wage

labor force will empower people and reduce poverty masks the reality that the mobilization of a cheap labor force would be far more convenient than having to import Indonesian migrant workers or pay indigenous people fair wages for their labor. In terms of the dividends, we see the ways in which integration into global markets creates vulnerability at the local level, especially when income is dependent on export-oriented monocultures like oil palm. The apparent and unanimous disdain for SALCRA indicates that perhaps this scheme is not so much a source of compensation to the indigenous peoples, but an opportunity for the government to further maximize the industrial development potential of the area. This seems especially likely considering that today, Malaysia produces 44% of the world's oil palm exports (Malaysian Palm Oil Council 2012).

7.3 Livelihoods

Today, the constraints that plantation schemes have put on the resettled land, farmers in Nanga Jela have gradually moved from subsistence-based shifting cultivation of rice padi towards increased perennial cultivation of cash crops like rubber and pepper on their dusun lots. In addition to not having enough land to subsist in traditional ways, the shift towards cash crop production has helped the community to generate income. Another way that it has adapted to land scarcity is through the pursuit of off-farm livelihoods. Such has been made possible through certain perceived benefits brought about as a result the development schemes. For example, the road which was built in order to transport oil palm harvests has also made nearby markets and towns more accessible to the community.

Off-farm jobs are generally linked to increased wealth and more stable income. In fact, the general attitude of those included in our study was that depending solely on cash crop income is increasingly precarious due to fluctuating market prices and limited land to plant surplus. Although one might expect that population increase since resettlement might exacerbate land pressure, access to education and trends toward the pursuit of off-farm activities allows for an alternative livelihood strategies that are less dependent on the particulars of land tenure.

7.4 Future Perspectives

On the local level, despite the community's negative opinions of SALCRA, the promise of modernization and development within the community is enticing. Changes in livelihood and

lifestyle experienced as a result of the resettlement and SALCRA schemes have been embraced. For example, off-farm work is perceived as a more dignified livelihood than farming. Such demonstrates a shift away from traditional ways towards Malaysian mainstreams where modernization serves as the wind in their sails. At this point, this is likely a necessary step because under the terms of the resettlement and SALCRA old ways of life are rendered obsolete.

People proudly told us that the income they generate in off-farm endeavors has helped them to develop their households through the acquisition of modern amenities like televisions, computers, refrigerators, tiled floors, home decor, cars, etc. and send their children to school. The adoption and enjoyment of modern comforts serves, from a neoliberal perspective, as a benefit to development because with the introduction to wage-labor, people can spend their earnings on increased consumption, further stimulating economic growth and expansion.

Another indicator of development is integration into formalized education and achievement at higher levels. Ellis states, "Public education and macro policies are generally designed to raise the level of human capital and they play a significant role in economic development and growth" (Ellis, 2000). Both trends are exhibited in Nanga Jela where the number of people are pursuing formal education has increased significantly since the resettlement, and a gradually increasing education levels have been attained across generations. Even though they lament that doing so will probably wear down cultural beliefs and ways of life, community members want their children to become educated and to work outside the community because they feel that it will lead to a better life.

The resettlement has also brought electricity, clean water, and access via road to 24-hour health care facilities. These schemes have also given the community a school, which SALCRA built and the government regulates.

It would appear that the development of Nanga Jela has had irreversible effects on traditional Iban livelihoods. It also demonstrates the remarkable propensity of this community to adapt their livelihood strategies to conditions of land scarcity. Under these circumstances, the introduction and increased access to modern amenities has improved quality of life. Under these understandings, the community has increased its development index. This does not mean, however, that the total impact of the development schemes is positive or that certain initiatives on the national and international level are excusable. Land tenure and indigenous cultures have been lost. Although predominating views towards development and modernization are positive,

the destruction of cultural diversity and the subjugation of certain perspectives on ownership over others is apparent in our time spent in Nanga Jela where economic potential overrides social, cultural, and historical entitlement to land. In turn, expansion-oriented economic development leads to the destruction of rainforest, degradation of natural resources while enabling global dependence on biofuels only further pose a threat to the earth. Therefore, plantation schemes such as SALCRA's oil palm scheme in Nanga Jela signify national reliance on export monocultures, despite indigenous communities.

8. CONCLUSION

It is time that we revisit our research objective and research questions. Our objective was to analyze the impacts development schemes have on livelihoods in Nanga Jela. Through a myriad of qualitative and quantitative methods, we examined the aftermath of the Batang Ai resettlement scheme and the SALCRA oil palm plantation in Nanga Jela. We determined the community perspectives on these schemes and how life has changed because of them.

In terms of how livelihoods in Nanga Jela changed in light of the resettlement, it is clear that traditional livelihoods of shifting cultivation of padi have largely been left to the community elders, and that farmers have adopted the production of cash crops like rubber and pepper, though the prices fluctuate each season based on market value. Furthermore, generational trends dictate that many are pursuing off-farm as teachers, fish farmers, civil servants, construction workers, laborers and working offshore. From our analysis, it does not appear that any major challenges have resulted from the resettlement. In general, the community seems to be content living in the resettled area because of the opportunities it has afforded them. The community is more able to access nearby communities, allowing them to utilize 24-hour health clinics, schools, and markets. After resettlement, the community has electricity and treated water from the government as well as a seasonal clean gravity feed source.

There are distinct consequences of the SALCRA scheme in Nanga Jela, the greatest one being the land scarcity. The SALCRA scheme controls 8/9 acres of the land allocated to each family where 3 are planted with oil palm and 5 with rubber, making it difficult to plant surplus cash crops for consistently sufficient profit. If oil palm continues to occupy vast forest area, the ecosystem and environment will be destroyed through soil erosion, nutrient status depletion and reduction of agricultural crop cultivation. Compared to the primary forest, the perennial

cultivation of oil palm has been detrimental to soil quality. The water quality due to SALCRA fertilizer runoff in the rivers was not relevant to the people because they do not use this water for consumption. Residents unanimously reported being dissatisfied with scheme management because the dividends were insufficient and inconsistent in amount, and it was clear that there is not enough communication between SALCRA officials and community members. Community members do admit that SALCRA contributed some positive changes. For one, they now have access to a road, to a kindergarten and transportation services. SALCRA's perception of the scheme is overwhelmingly positive and uncritical. For instance, it justifies the scheme by emphasizing that the oil palm plantation should not cause land scarcity because community members can simply plant in between trees.

The pursuit of off farm livelihoods has increased significantly since the resettlement and the establishment of the SALCRA scheme. The community is generally quite wealthy. The presence of cars, electronics and other conveniences was apparent during our time in the longhouse. Still, there seems to be a correlation between wealth and type of livelihood. Farmers with no off-farm income appear to be particularly economically vulnerable and lacking in wealth, while families receiving off-farm income in typically were well-off. In terms of the youth out-migration and its effects on the community, is clear that the favored trend is to pursue education and off-farm livelihoods even if that means vacating the community for long term periods of time. This trend generates wealth in the community overall through remittances and higher levels of educational attainment among youth.

Parents and children alike hope for something more than farming for their children's future. This is undoubtedly linked to the resettlement and to the SALCRA scheme which has created both push (land scarcity) and pull factors (access to modern amenities and larger towns) that have resulted in irrevocable changes in the livelihoods of people living in the resettled Nanga Jela.

9. REFLECTION

In our report we have tried to analyse development schemes' impacts on livelihoods in Nanga Jela. We realise, in retrospect, that many improvements could have been made. Especially when writing the report, improvements to our methodology have come to mind that would have been valuable in regards to our achieving the best possible understanding of background, livelihood, and culture in the community. Still, experiencing firsthand both the potential and constraints of each method have been a great source of reflection.

9.1 Questionnaire

While conducting the questionnaire, our initial mistake was not conducting a pilot any of the households (Casley and Kumar 1988). In doing so, we could have edited the questionnaire to minimize misinterpretations and to optimize our focus of research. Furthermore, with the trial experience of the pilot questionnaire, we might have thought to wealth indicators and water criteria sooner and would have ended up with more robust data for all households surveyed rather than just a few.

Furthermore, after we conducted the questionnaire, while compiling our data we realised that many households listed their entire family as living in the household, which completely skewed our data. For instance, in one case we found out that the household's son had his own house in Lubok Antu where he lived with family and only visited Nanga Jela during the weekends. Other households could have responded similarly. Thus, data regarding composition livelihoods for people actually living in the community as well as information on out-migration are likely to be somewhat inaccurate.

Another source of error was the way questions were asked. Although we made certain that our interpreters did not ask leading questions, there were instances where questions were not left open enough. For instance the question should have been written on the questionnaire *" how much land do you have?"* rather than *"how many hectares of land do you have?"* Consequently, we had few respondents who answered in acres, which would have been the more accurate measurement.

Since we had to gather data from relatively large number of households in such a short time and with household members only being available after 19:00 hours, we had to make use of both interpreters and the Iban speaking Malaysian counterparts to conduct the questionnaire survey.

When we logged the questionnaire data, there were responses that were unclear or even written in Malay. In an ideal situation, the questionnaire survey would have been conducted by the same individuals and questions asked in exact same manner to avoid any biases (Casley & Kumar 1988).

After we finished conducting the questionnaires we realised that it would be valuable for our report to have some sort of wealth indicators in order to compare differences in wealth between those who had off-farm income and those who had not. Had we included this in our questionnaire survey, we would have had robust data from 24 households rather than just 4 households used in only 4 SSIs.

9.2 Semi structured interview

Although SSIs may yield a lot of data, there were instances where we were not sure about the reliability of this information. Though we triangulated our data with various SSI and other methodologies, it became frustrating not to get clear answers.

Towards the end of our time in the field, we realized how useful it was to make **interview guides** organized based on themes from our research objectives we would like to touch on with the respondent. This helped to make sure the interview had a logical flow, and we were more able to generate relevant questions during the interview when the themes were in mind. Particularly in cases like the SSI with the SALCRA manager, it would have been easier to have questions organized by topics/themes because he is a busy man, and back tracking from topic to topic was an inefficient use of everyone's time. It can be nerve wracking to conduct an interview over potentially controversial topics, so having the a guide organized by topics also would have helped us keep our focus and to generate questions more naturally within the flow of conversation.

9.3 Focus Group Discussions

In retrospect, there are some things that we should have done differently when conducting FGDs. One struggle was in our delivery. Remembering to make eye contact with the respondent when everything had to first be communicated to interpreters was something we forgot to do a lot. The respondents would often give answers to the interpreter instead of the interviewer. Consequentially, in many instances the interpreter did nearly all the informal small talk to get the

respondents “warmed up” before any discussions, meaning we could have missed important information in these less formal conversation. During these times, we often had no idea what was being said. To solve this, we often made sure to ask the interpreter to translate everything.

Another challenge we faced in our FGDs was that respondents had difficulty freely talking to us without feeling intimidated, especially when there was a large number of us present at the interview. For example, when we held a FGD with five teenaged girls, they were quite shy and reluctant to speak their minds. In these situations, we had to rely on the questions we prepared beforehand creating a dynamic that was more akin to a questionnaire. It might have been a better idea to have a discussion with a physical exercise, like drawing etc. Eventually we brought snacks to make the interview more informal.

Furthermore, we conducted the youth FGD in the long corridor of the longhouse where it was background noise and people walking by, causing a distraction. The FGDs conducted in enclosed spaces were successful in terms of data collection because respondents were more relaxed and able to focus.

Reflecting on our time in the field, we could have planned the FGD with young adults working or studying outside the longhouse better because most of the desired respondents were gone by the time we got around to this FGD, and it was a crucial part of answering one of our research questions. Instead, we did not get the respondents that we originally wanted to talk to. It took us by surprise that all of the respondents were school girls. As a result, we had to discard a lot of relevant questions because we decided to complete the interview (Casley & Kumar 1988).

In another FGD with fishermen we found out how important it was to have a clear view of the research objectives and questions we would like answered through the methods we employ. Doing so would have enabled us to better stay on track and to recognize when discussion is not going in a relevant direction. After this interview, we made sure to have a more clear structure in the interview guide and to keep the interview on track.

9.4 Soil sampling

When we went for the transect walk on the first day, we selected some sample sites located in the primary forest, oil palm, rubber, pepper and padi field because we wanted to compare the physical and chemical properties of the soil between the sites to assess suitability of crop cultivation. In reality, we were only able to complete sampling in two areas due to time

constraints. In retrospect, we should have paid more mind to the fact that we only had one day to take soil samples, something that we learned is time consuming.

9. 5 Water sampling and analysis

To fully understand the effect of hill rice cultivation on the gravity-fed drinking reservoir, continued chemical testing should be conducted throughout the year with inclusion of other important parameters like heavy metals etc. Most importantly, establishing equipotential lines showing surface and groundwater flow patterns to identify where the actual source of water in the gravity feed would have been beneficial to our study.

Lack of resources limited the amount of water samples we were able to take. A sample from the tap in the longhouse, for example, would highlight possible contaminants within the pipeline from the gravity feed. Contamination within a completely water-filled pipe rarely occurs if the water is continuously in motion and high pressures are maintained. We did noticed, however, that the pipe was leaking at several points on its path down to the longhouse. During dry seasons where the water flow within the pipe is of lower pressures, contaminants can gain direct access to the pipeline and enhance bacterial growth.

Insufficient resources in the lab also limited conditions for analyzing the water samples and have affected the quality of the water results presented in this report.

9.5 General thoughts

Generally speaking, this experience taught us the importance of keeping our research objectives in mind as we conduct our methodology in order to maximize our limited time in the field. This struggle originated in the drafting of our synopsis when we cast our net too wide in terms of the methods we wanted to employ. Often we found ourselves, in earnest, striving to absorb as much knowledge as we could about the community. Although it may seem useful and harmless to engage in participatory observation on a rubber tapping session, for instance, we must scrutinize our aims in order to remain on target. In this case, learning how to tap rubber was not relevant to our objectives. By the same token, when we have a clear focus on our objectives and an impromptu opportunity arises to conduct a PRA activity at the Batang Ai Lake fisheries or we are invited into a household one evening to drink tea or rice wine, we can get the most out of

these experiences when we are conscientious of our objectives and the purposiveness of our methods in reaching them.

10. REFERENCES

Banerjee, N. & Bojsen, K.P. 2005, "Negotiability and limits to negotiability—land use strategies in the SALCRA Batang Ai Resettlement Scheme, Sarawak, East Malaysia", *Geografisk Tidsskrift-Danish Journal of Geography,* vol. 105, no. 1, pp. 17-28.

Blair, G.J., Lefroy, R.D. & Lisle, L. 1995, "Soil carbon fractions based on their degree of oxidation, and the development of a carbon management index for agricultural systems", *Crop and Pasture Science,* vol. 46, no. 7, pp. 1459-1466.

Bruun, T.B., de Neergaard, A., Lawrence, D. & Ziegler, A.D. 2009, "Environmental consequences of the demise in swidden cultivation in Southeast Asia: carbon storage and soil quality", *Human Ecology,* vol. 37, no. 3, pp. 375-388.

Bruun, T.B., Egay, K., Mertz, O. & Magid, J. 2013, "Improved sampling methods document decline in soil organic carbon stocks and concentrations of permanganate oxidizable carbon after transition from swidden to oil palm cultivation", *Agriculture, Ecosystems & Environment,* vol. 178, pp. 127-134.

Casley & Kumar. 1988. Chapter 2: Qualitative Interviewing and Individual informant; and chapter 5: Structured surveys. In: The collection, analysis, and use of monitoring and evaluation data. Baltimore London: Published for the World Bank by the Johns Hopkins University Press

CDC | Facts about Paraquat. Accessed March 26, 2015 http://www.bt.cdc.gov/agent/paraquat/basics/facts.asp

The Coalition of Concerned NGOs on Bakun [Gabungan] Malaysia. 1999. "The Resettlement of Indigenous People affected by the Bakun Hydroelectric Project, Sarawak, Malaysia. *Thematic Review 1.2 Dams, Indigenous People and vulnerable ethnic minorities.* World Coalition on Dams.

Coulter, J., Webster, C. & Wilson, P. 1998, "Tropical soils.", *Agriculture in the tropics.,* , no. Ed. 3, pp. 48-81.

Effective Fertilizer Management Practices for High Yield Rice Production of Grananary Areas in Malaysia. Accessed March 25, 2015. http://www.fftc.agnet.org/library.php?func=view&style=type&id=20140718104151

Ellis, F., 2000. Chapter 2: A Framework for Livelihoods Analysis. In: Rural livelihoods and diversity in udbygning Norden. Oxford: Oxford University Press, pp. 28-51.

Frew, J., 1993, *Advanced Geography Fieldwork.* Nelson Thornes, p.5. Herbicide Handbook, 8th ed.; Vencill, W.K. Ed.; Weed Science Society of America: Lawrence, KS, 2002; p 231-234

Hamdan, J., Burnham, C. & Ruhana, B. 2000, "Degradation effect of slope terracing on soil quality for Elaeis guineensis Jacq.(oil palm) cultivation", *Land Degradation & Development,* vol. 11, no. 2, pp. 181-193.

Haron, K., Brookes, P., Anderson, J. & Zakaria, Z. 1998, "Microbial biomass and soil organic matter dynamics in oil palm (Elaeis guineensis Jacq.) plantations, West Malaysia", *Soil Biology and Biochemistry,* vol. 30, no. 5, pp. 547-552.

Kamel, F., 2013, "Paths from Pesticides to Parkinson's." *Science* 341, no. 6147 (August 16, 2013): 722–23. doi:10.1126/science.1243619.

King, V. T., 1984, "Review." *Bulletin of the School of Oriental and African Studies, University of London* 47, no. 2 (January 1, 1984): 401–2.

Kiyu, A., & Hardin. S., 1992., "Functioning and Utilization of Rural Water Supplies in Sarawak, Malaysia." *Bulletin of the World Health Organization* 70, no. 1 (1992): 125–28.

Liew, K. B., and M. Lepesteur. 2006., "Performance of the Rural Health Improvement Scheme in Reducing the Incidence of Waterborne Diseases in Rural Sarawak, Malaysia." *Transactions of the Royal Society of Tropical Medicine and Hygiene* 100, no. 10.

Malaysia. 2014. YouthPolicy.org. *World Bank.* Accessed on 30 March, 2015 http://www.youthpolicy.org/factsheets/country/malaysia

Malaysian Palm Oil Industry. 2012. Malaysian Palm Oil Council (MPOC). Accessed on 30 March, 2015 (http://www.mpoc.org.my/Malaysian_Palm_Oil_Industry.aspx)

Malaysian Weeds Need Mixed Modes of Action | Paraquat Herbicide for Non-Selective Weed Control in No-till and Other Sustainable Agriculture Systems." Accessed March 27, 2015. http://paraquat.com/news-and-features/archives/malaysian-weeds-need-mixed-modes-of-action

McMichael, P. 2011, *Development and social change: A global perspective*, Sage Publications.

Mertz, Ole, and Hanne Christensen. "Land Use and Crop Diversity in Two Iban Communities, Sarawak, Malaysia." *Geografisk Tidsskrift* 97 (January 1, 1997). https://tidsskrift.dk/index.php/geografisktidsskrift/article/view/2153

Mertz, Ole, Reed L. Wadley, and Andreas Egelund Christensen. "Local Land Use Strategies in a Globalizing World: Subsistence Farming, Cash Crops and Income Diversification." *Agricultural Systems*, Local Land Use Strategies in a Globalizing World: Subsistence Farming, Cash Crops and Income Diversification, 85, no. 3 (September 2005): 209–15.

Mikkelsen, B., 2005., Chapter 3: Participatory Methods in Use. In: Methods for Development Work and Research. A new guide for practitioners, pp. 87-124

Mink, Pamela J., Jack S. Mandel, Jessica I. Lundin, and Bonnielin K. Sceurman. "Epidemiologic Studies of Glyphosate and Non-Cancer Health Outcomes: A Review." *Regulatory Toxicology and Pharmacology* 61, no. 2 (November 2011): 172–84. doi:10.1016/j.yrtph.2011.07.006.

Mink, Pamela J., Jack S. Mandel, Bonnielin K. Sceurman, and Jessica I. Lundin. 2012., "Epidemiologic Studies of Glyphosate and Cancer: A Review." *Regulatory Toxicology and Pharmacology* 63, no. 3

Modica, Edward, Thomas E. Reilly, and David W. Pollock. "Patterns and Age Distribution of Ground-Water Flow to Streams." *Ground Water* 35, no. 3 (Maj 1997): 523–37.

Modica, E., H. T. Buxton, and L. N. Plummer. "Evaluating the Source and Residence Times of Groundwater Seepage to Streams, New Jersey Coastal Plain." *Water Resources Research* 34, no. 11 (November 1, 1998): 2797–2810. doi:10.1029/98WR02472

Morel, A.C., Saatchi, S.S., Malhi, Y., Berry, N.J., Banin, L., Burslem, D., Nilus, R. & Ong, R.C. 2011, "Estimating aboveground biomass in forest and oil palm plantation in Sabah,

Malaysian Borneo using ALOS PALSAR data", *Forest Ecology and Management*, vol. 262, no. 9, pp. 1786-1798.

Ngidang, D. 1995, "The politics of development in longhouse communities in Sarawak, East Malaysia", *Development in Practice*, vol. 5, no. 4, pp. 305-312.

Official Website of Natural Resources and Environment Board Sarawak." Accessed March 31, 2015. http://www.nreb.gov.my/pages.php?mod=webpage&sub=page&id=173

Pesticides — a Double-Edged Sword – BorneoPost Online | Borneo , Malaysia, Sarawak Daily News | Largest English Daily In Borneo." *BorneoPost Online*. Accessed March 25, 2015. http://www.theborneopost.com/2014/03/16/pesticides-a-double-edged-sword/

Postma, Dieke, Carsten Boesen, Henning Kristiansen, and Flemming Larsen. 1991 "Nitrate Reduction in an Unconfined Sandy Aquifer: Water Chemistry, Reduction Processes, and Geochemical Modeling." *Water Resources Research* 27, no. 8 2027–45.

Sanggin, S.E. & Mersat,N.I. 2012 "Indigenous People's Participation in Land Development Project in Selected Areas of Sarawak", *OIDA International Journal of Sustainable Development*, Vol. 03, No. 11, pp. 67-80.

Stanton, Elizabeth A. 2007. "The Human Development Index: A History". *Global Development and Environment Institute*: Tufts University.

Tanner, Caroline M., Freya Kamel, G. Webster Ross, Jane A. Hoppin, Samuel M. Goldman, Monica Korell, Connie Marras, et al. "Rotenone, Paraquat, and Parkinson's Disease." *Environmental Health Perspectives* 119, no. 6 (June 2011): 866–72.

The Management of Soils and Fertilizers for Sustainable Crop Production in Malaysia." Accessed March 25, 2015. http://www.fftc.agnet.org/library.php?func=view&style=type&id=20110722065556

Tomlin, C. D. S., 2006 and British Crop Protection Council. *The Pesticide Manual, a World Compendium*. 14. ed., editor: C.D.S. Tomlin. BCPC, pp 545-548

Weil, R.R., Islam, K.R., Stine, M.A., Gruver, J.B. & Samson-Liebig, S.E. 2003, "Estimating active carbon for soil quality assessment: A simplified method for laboratory and field use", *American Journal of Alternative Agriculture,*vol. 18, no. 01, pp. 3-17.

Wicke, B., Sikkema, R., Dornburg, V. & Faaij, A. 2011, "Exploring land use changes and the role of palm oil production in Indonesia and Malaysia", *Land Use Policy,* vol. 28, no. 1, pp. 193-206.

Williams A.L., Lanvin, A., Watson, R.E., & DeSesso J.M., 2012 "Developmental and Reproductive Outcomes in Humans and Animals After Glyphosate Exposure: A Critical Analysis." *Journal of Toxicology and Environmental Health, Part B* 15, no. 1 pp. 39–96.

APPENDICIES

Appendix 1: Questionnaire Survey

Section A: Demographic of Respondent

Household Name: **Date: __ March, 2015**

Room Number:

1. Total members of household _____
2. Ethnicity _____
3. Number of years living in Nanga Jela _____

Members of family

Name	Gender	Age	Relation	Occupation	Level of education	Religion

1. What do you do to make a living? _____
2. What is the most important source of income (ranked)?
    1.
    2.
    3.

Section B: Land Use

1. Do you own any Land? **Yes** **No**

2. How much land do you have in total (in hectares)? _____
   _____
   _____

3. Do you rent land from others? **Yes** **No**

	Crops	**Size**	**Fertilizer (yes/no)**	**SALCRA**	**PVT**	**Types of ownership**	**Location (Ng.J/B.A)**
Field 1							
Field 2							
Field 3							
Field 4							
Field 5							
Field 6							
Field 7							

4. Do you feel like you have enough land to plant crops? **Yes** **No**
5. How did you get the land?

   Bought

   Inherited

   Other Specify: _____

6. Which crop do you grow the most?_____

   _____

   _____

7. Do you get help /hire workers from the other households for harvesting? **Yes** **No**

8. Who is responsible for:
   a. Harvesting
   b. Planting crops
   c. Tending the crops

9. Do you have any livestock? **Yes** **No**
   a. If yes, what kinds?_____

      _____

Section C. SALCRA

1. Do you cooperate with SALCRA? **Yes** **No**
   (If yes, proceed to the next questions)

2. When did you get involved with the SALCRA scheme? _____

   _____

3. When you cooperate with SALCRA, what kind of benefits do you get?_____

   _____

4. Are you happy with the SALCRA management? **Yes** **No**

5. Do you loan your Dusun (Private 3 hectare) land to SALCRA? **Yes** **No**

Section D: Off-farm

1. Do you gain income from other activities besides farming?
2. How has the income benefited the household? _____

   _____
3. How important is this off farm income? Rank from 1 to 5 with 5 being the most important.

   1 2 3 4 5

Section E: Water Utilization

1. What types of water supply do you have access to?

Access to water supply	Gravity Feed	Government (treated water)	River water	Other Sources (if any)
Still have water				
Had water				
Never had water				

2. Are you satisfied with the quantity and quality of the water, by type?
   - Quantity = Amount of water/continuous flow/enough water for all in HH
   - Quality = Taste, smell, color, diseases?

Usage and satisfaction	Gravity Feed	Government (treated water)	River Water	Other Source (if any)
Satisfaction with quantity				
Always				
Sometimes				

Never				
Satisfaction with quality				
Always				
Sometimes				
Never				

3. How often do you use the different sources for drinking?

Utilization & Frequency	Gravity Feed	Government (treated water)	River Water	Other Source (if any)
Drinking:				
Always				
Often				
Never				
Dishes:				
Always				
Often				
Never				
Laundry:				
Always				
Often				
Never				
Bathing:				
Always				
Often				
Never				
Cooking:				
Always				
Often				
Never				
Farming:				

Always				
Often				
Never				
Flushing latrines:				
Always				
Often				
Never				

Appendix 2: SSI - Headman

Guide for interview with SALCRA Assistance Regional Manager

Key informant's name: **Date:** __ March, 2015

> **Note:** Make a brief introduction on the field study. Notify the informant regarding the interview and why we want to understand the SALCRA scheme.
>
> Inform them that they can decline to answer any question at any time.
>
> Ask permission to record the conversation.

1. **General questions for the chief**
   a. How old are you?
   b. How long have you been the headman of Nanga Jela?
   c. How did you become the head man (by selection or?)

2. **Description of Nanga Jela**
   a. How many households in Nanga Jela?
   b. Do the children go to school? (If yes, where?)

c. Do you have a health center?

3. Description of land use

a. Does Nanga Jela have any approaches for using the land?
b. How do the residents manage their land?
c. What have been the major land changes in the past few decades?
d. Is there land scarcity? What are the main causes for land scarcity?
e. What is your general thoughts on land scarcity and access to resources?
f. Who is does the farming? (Only residents or perhaps the immigrants from Indonesia?)
g. How important is farming for the people?
h. How has farming evolved over the years?
i. Do the village/farmers receive subsidies/help from the government?
j. How do you cope with an increasing population and limited access to land?
k. How is the land distributed between the households? (Is it equal?)
l. What are the off farm activities?
m. What is your opinion on income diversification? Has it benefited the community or not?
n. Have people migrated from Naga Jela? Why are they migrating? Has it benefitted the community? Is land scarcity leading to diversification of income?

4. Oil palm farming

a. Who is involved in the oil palm plantation?
b. Can people choose not to be a part of the oil palm plantation and engage in other kinds of land use?
c. In which ways are Nanga Jela affected by SALCRA?
d. Who negotiates with SALCRA for the oil palm scheme?
e. How does Nanga Jela benefit from cooperating with SALCRA?
f. When is the completion/end of contract of the oil palm scheme?
g. Has the oil palm scheme had an influence on socio-economic status?

Notes from SSI with the headman

Informant's name: Endawie Ak Janting **Date:** 01 March, 2015

Conducted by: Praerana, Amalie & Lily

Dusun lots - planted rubber on their own land. Can so what they wish with the dusun lots
In these Dusun lots, the residents can so what they wish to do. It is a title ownership (formal recognition has been received).
Mainly grow rice padi, rubber.
Income slight increase because of SALCRA dividends (2 times a year), but not too much.
No issue of land scarcity, many people are working outside (educated), planting pepper more now and land scarcity.
Government programs -> Receive social support / security from federal government. Examples include -> Fishiries, facilities and equipment.

Land

Land is distributed by government. It is equal among households (37), unless they inherit or buy.
Land in in good quality.
Land is limited -> don't have land to cultivate surplus, have to rent from nearby communities.
Future plan: If population increase, they will go back to lands in Batang Ai.

Off farm Activities.

(Most farm; more oil palm) Oil palm only SALCRA in charge.
Off farm activities include – Teachers, lecturer, government/ private sector/ Off shore.
All the off farm activities contribute to long house development

SALCRA

Regional Management -> Not satisfied so far because he believes that dividends not consistent with what they agreed.
If he had a choice he would not sign the re- settlement with SALCRA.

The SALCRA cannot find the signed lease. Every time they try to schedule a meeting with SALCRA, it has never been fruitful.

Indonesian migrants have far higher wages. For the 'local' workers it is not high enough Salary, but if the wages was better then they would work with SALCRA. It is hard work to work with oil palm.

Resettlement

Benefits include -> more development. They have access to market/ road/ hospital. For instance, when they were in Batang Ai, they had to wait until the morning (if someone got sick) to get to the hospital.

Padi Plantation

Traditional Value for padi.

Elders mostly involved.

Commercial padi planting (Modern tech. 2* a year)

Youth

Interested in government sponsored activities (Fishing / Chicken). These are all government transformation programs (GTP)

Water Sources

Only government treated water and gravity feed.

The gravity source built on 1985 / 1986.

The water pipe was once metal but now PVR plastic.

Any issue with water supply?

Before dam → Chlorine for water. So far the water seems to be good. Health department checks two times a year.

Season affect water quality. If it rains then use treated water. Government treated water.

Use stream for farming/ water and fishing.

Appendix 3: SSI - SALCRA Assistant Regional Manager

Guide for interview with SALCRA Assistance Regional Manager

Key informant Name: **Date:** __ March, 2015

Note: Make a brief introduction on the field study. Notify the informant regarding the interview and why we want to understand the SALCRA scheme.

Inform them that they can decline to answer any question at any time.

Ask permission to record the conversation.

Section A: Personal

a. What is your role in the scheme?
b. Do you live in the village?
c. Are you from the village? If not, since when are you here? Where are you from?
d. Who are you working for? (Government, which department)
e. How long have you been working for SALCRA?

Section B: Implementation of the scheme

a. When did the scheme start? Who decided to do it?
b. Type of land of their preferences?
c. What were the major changes on the environment of the village?
    - land use changes,
    - land tenure changes,
    - new infrastructures
d. Did you have any constraints due to the implantation of the scheme?
e. Soil constraints (ex: soil erosion, quality of the soil, is it bad)
f. Water (drainage) –if so, how do you handle it (soil and water degradation)?
g. Can you explain some of the terms of the contract that is set up with Nanga Jela? (Duration, official ownership of the land, rights of Nanga Jela Members and rights of SALCRA etc.)
h. Has the contract been renegotiated since the resettlement, when did it start, how many year until it's renegotiated?

Section C: Decision making

a. Who decides who can join the scheme?
b. What is required of a person to join?
c. What is the cost of joining the scheme? (If there any fee)
d. How are the benefits of the scheme divided?
e. Is there any aid programme / assist with the land owner? (Educational activities)

f. Who makes the management decision and how are they made?
g. Does people in Nanga Jela who are not involved in the scheme receive any benefits?

Section D: Work

a. What kind of job did your scheme created? (Ex: working for SALCRA as harvesters, working in SALCRA management positions)?
b. When do the members of Nanga Jela receive their dividends, how much are they?
c. How is the dividend amount decided? How is it administered?

Section E: Conflict

a. When the scheme starts, what was the reaction of locals? Did you have meetings with the villagers before the creation of the scheme?
b. Do you feel that the locals agree with the scheme? (Compare before / now)
c. If not, do you think there is a way to cooperate with the farmers who ask for more land?
d. Do you often meet the villagers to speak about what is going on in the scheme?

Section F: Livelihood

a. How does the SALCRA oil palm scheme promote development in the area?
b. What are the impacts of the scheme on people's monetary income?
c. How has the crop prices evolve since the creation?
d. What are the main consequences of the scheme on people activities?

Section G: Future

a. How do you see the future? (Increase of land? social activities in the village? job opportunities?)
b. What has been the impact or benefit of this SALCRA scheme or others on the rest of Malaysia/Sarawak?
c. When do the members of Nanga Jela receive their dividends, how much are they?

Notes from SSI with SALCRA Assistance Regional Manager

Conducted by: Lily

Personal Information

a. Assistant manager
b. Estate quarters
c. 9 months living in estate quarters, since he took this job with SALCRA; from Serian originally.
d. SALCRA is a "government linking company" -- agency under the Ministry of Agriculture
e. Been working for SALCRA (at least as regional manager)

Implementation of the scheme

a. (unsure… went to check the Nanga Jela file) 1999
b. Resettlement area – develop/ help people there (assisting with income, activities for the longhouse people to engage in); decision with SALCRA in an agreement with the headman to develop the land where rubber and oil palm can be planted (benefits are that this area and the SALCRA activity on the land has helped to bring the community closer to facilities [road], electricity, and sponsored the construction of a school on the premises); found out about Nanga Jela as a site for SALCRA scheme because it is near the regional headquarters, some members of Nanga Jela work(ed) for SALCRA
c. Given land titles, some of the longhouse people employed dividends (increased income for the community)
d. Negotiate with the headman; padi season the villagers get distracted from SALCRA scheme crops)
e. Mixed together crops for SALCRA and oil palm (?)—soil capacity because of palms over the last 16 years has depleted the soil leading to a slowed production
f. 3 rounds of fertilizer per year—the drainage (agronomic well (?)—to trap fertilizer stacking oil palm fronds at the river bank to collect fertilizer runoff)

g. Duration of contract is 25 years; people own land but can "surrender" land to SALCRA after the contract SALCRA will continue; no contract has ever ended prematurely; individual lot size etc. (division of) is responsibility of members of the community, SALCRA looks at the land as a whole
h. Dividend based on output; 5 years rights of villagers (?); villagers have the right to plant whatever they want in between; given money from a reserve fund for the first few years after planting (before harvestable)

Decision making

a. SALCRA schemes are open to any community; no criteria for eligibility
b. Rules: don't steal fertilizer/tools or sell the fruit (oil palm) on the side
c. It's free (SALCRA community service: road, sponsor education, workers receive benefits (like sponsoring their children's education also airplane pilot training…), transportation (buses, funerals)
d. ---
e. *see question c above* (for the first letter e); there is a representative for every longhouse that meets with the headman; goes to the land every day; to the longhouse twice a year for formal visits and informal visits more than once per month; official meetings are also often held at the regional headquarters; there are 33 villages involved in the SALCRA scheme in Luba Antu

Workers

a. Supervisor driver, not harvesters (because very difficult work so they use Indonesians… but community members could work on the oil palm plantation if they wanted to); 3,000+ RM per person to secure work permits and visas for workers from Indonesia; paid in wages per ton (piecemeal)—24 RM/ton—generally 2 tons per day (48 RM x 25 days/month)
b. ----

Management are largely ("all" ?) from longhouse communities—there is a Nanga Jela community member who works in the regional facility

Dividends depend on market price, production (yield)/size of land, processing fees (manufacture/mill, transportation etc.)

Feedback

Overall, good feedback; other longhouse communities wanting to join SALCRA scheme

SALCRA brings in electricity, roads, water pipe, transportation (buses), schools, clinics (all funded/sponsored/built? by SALCRA)

Future plans

Fisheries (markets for foreign export—Japan): Batang Ai

General Information

SALCRA depends on oil palm ("subsidiary co." SALCRA Jaya); helps to develop/stimulate growth in fertilizers, pesticide, and wholesaler businesses.

Livelihood changes: have improved a lot with SALCRA involvement; development (infrastructure), stimulating growth of other businesses, education, providing jobs)

Been recently subsidizing rubber

SALCRA funded by… income it generates (adding also to state revenue); business capital; new areas of social/development programs (provides funding for government); SALCRA profits fund operation and management of SALCRA as well but sometimes get loans from government for start-up projects (always able to pay back)

Appendix 4: SSI with Youth

SSI guide with key youth informant.

Respondents' Name/s: **Date:** __ March, 2015

Note: Make a brief introduction on the field study. Enlighten the informant regarding the interview and we want to understand what is it to be a youth in Nanga Jela and why they live away.

Make it known that they were chosen on the basis of questionnaire survey conducted few days ago and inform them that they can decline to answer any question at any time.

Ask permission to record the conversation.

Section A: Reasons for moving away

- **a.** What are the reasons for leaving?
- **b.** Were you influenced by anyone to move out?
- **c.** What are the challenges / benefits of living outside Nanga Jela?
- **d.** Do you thinks it is better to have a job that is not farming? Why?
- **e.** What is different about living away from the long house?
- **f.** What do you like about living where you are now?
- **g.** What do you miss about Nanga Jela while you are gone?

Section B: Relations to Nanga Jela

- **a.** How often do you come back to Nanga Jela? Do you like coming back here?
- **b.** Do you think it is important to visit the community? Why?

c. Do you feel it is important to preserve your Iban culture? If yes, how do you preserve it?

d. Who helps your parents to tend the land?

e. Do you know how to tend the land?

f. How would you imagine your life if you had to stay here and farm?

g. If you have a job outside, do you send money home?

h. Do you contribute to the household in Nanga Jela?

i. Do you have any concerns about the family you leave behind?

j. Do you think that Nanga Jela community is changing due to the fact that many young people are leaving? How so?

Notes from SSI with the youth informant – Gloria

Conducted by: Praerana & Amalie

Occupation: Student

Just finished her Diploma

Pursuing bachelor - wants to be a geologist

Motivation

To meet other people with same interests, meet people outside the Iban community

Uncle is engineer and live in Kuching, gets inspiration from him. Inspired by famous scientist like Einstein. Thought if they can, so can I.

Don't come from a wealthy family, but she will strive to be successful.

Important to have an education to get a good job to provide for your family

Decision making

Her own decision to take the education, but her parents support her.

Being away

Lives at boarding school, can be hard to fit in

Has learned to be more confident, being on her own, better at communication, interact with people she don't know

Personality has changed a bit being out of Nanga Jela as she is more confident

University is close to Kuching, comfortable being so close to the city, likes living at boarding school.

Often missing Nanga Jela, family and traditions when she is away

Being in Nanga Jela

Likes to visit to see her family and help with farming

Like that is it comfortable and feeling free living in NJ, because everybody knows each other

Experience changes, because relationships with people in NJ is not as close as before

Only talks about her studies if people in NJ ask, because some are a bit jealous

Future

Plans to engage in family business. Fx. expand the fish farm and making it commercial

Plants to engage in fish farm along with studying

If she should stay in NJ as a farmer life would be a lot harder

Thinks that the young generation getting educations will benefit the community, if they come back to NJ and bring new knowledge to the community

Some who have left for studies don't come back to visit NJ, but some do.

Thinks it is important to preserve the Iban traditions, to remember where they come from

Appendix 5: SSI with Aunty

SSI guide with key informant.

Respondents' Name/s: **Date:** __ March, 2015

Note: Make a brief introduction on the field study. Enlighten the informant regarding the interview and we want to understand what people do in Nanga Jela.

Inform that they were chosen on the basis of questionnaire survey conducted few days ago and inform them that they can decline to answer any question at any time.

Ask permission to record the conversation.

Section A: General Questions

a. What does she and her husband do?
b. Does she enjoy farming?
c. How does the income she gain contribute towards the household?
d. Does she feel land pressure? What about the others in Nanga Jela?
e. Do you grow your own crops?
f. What are your future hope for your children?

Notes from SSI: Key Informant Interview - Sangau Ak Chanting (Aunty)

Conducted by: Praerana

** We stayed at her house during our field study in Nanga Jela and decided to do a SSI with her as there was bond / closeness developed with her and would be an ideal person to interview.

General

Got married at 19 years and has two children. Son studies in Kuching and daughter lives with her husband.

Moved to Nanga Jela when she got married. Originally she is from Betong (nearby community)

Husband is an accountant in Hilton Batang Ai resort.
She tends to the farms and grows rubber, pepper and padi.

Farming

Grows Padi, rubber and pepper. Farming very difficult job
Her living room was built and renovated through the income received from selling rubber, when rubber prices were high. In 2012 – 2013 the average rubber price was around RM 10 per kilo and now it is around RM 2 per kilo.
Recently started intensely growing pepper as the price is very high. On average can get around RM 32 per kilo for pepper.
Her husband's salary was mainly used to buy cars and pay for children's education

Land Problem

Once a week she buys fruits and vegetables from Lubok Antu Sunday market as the little vegetable she grows is not enough.
Feels that the soil is different now, therefore cannot grow more crops and has to rely in the market and if the soil was better she would grow more fruits and vegetables and save more money.
Many people in Nanga Jela buy weekly crops and vegetables as you cannot grow enough to sustain the household. There is land problem here in Nanga Jela, some people are lucky they have land and some do not which can be very difficult.
Some people rent land but don't know where.

Wide-ranging answers

Men and women in Nanga Jela share equal responsibility in Nanga Jela, there is no difference between us. If she needs help in the fields then her husband helps. Help is required during the harvest season.
People are helpful in Nanga Jela.When they initially built the house she had to share / get electricity from other households but now SESCO has provided her own electricity.

Daughter is already married and has a daughter but she hopes that with all the education her son has attained, he does not become a farmer as there is not much scope in this filed. Wants him to get a job in the city.

Appendix 6: Template for SSI with 4 households with off – farm activity / income.

Note: Make a brief introduction on the field study.

Inform that they were chosen on the basis of questionnaire survey conducted few days ago and inform them that they can decline to answer any question at any time.

Ask permission to record the conversation.

Key Informant's name: **Date: __ March, 2015**

Questions

1. What do you do to make a living?
2. Why did you get into off farm in the first place and when?
3. Were your parents involved in off farm work? No
4. What is the things you most like about off-farm work? And what don't you like (any challenges)?
5. Would you prefer to farm exclusively if you were able to earn enough money? Yes
6. What are the main things you spend your off farm money on?
7. How else does it contribute to the household?
8. How was life before the off farm income and how is it now?
9. If tomorrow you lost your job what would that mean to your family? Consequences?
10. If you did not have off farm jobs what would you be doing instead? Same
11. What have been the greatest benefits of off farm?
12. What has been the biggest change?

Wealth indicators

- **a.** How often do you go to the city?
- **b.** Do you have a satellite TV?
- **c.** So you have a separate freezer?
- **d.** Do you have a washing machine?
- **e.** When/where did you get your clothes?
- **f.** What was the last big expenditure?
- **g.** Do the women go to the salon to get a haircut?

h. Do you have a computer? If, yes, how did you get it?

i. Do you have a cell phone? How much do you spend per month?

j. Do you have access to gas line?

k. Do you have a car? When did you get it?

l. Do you consume meat? How often?

m. What do you eat on a normal day?

Notes from SSI 12 (Household receiving remittances)

Conducted by: Amalie, Praerana & Mahfuza

Pintu no.: 12

Grandparent: Mr. Jampang Father: Mr. Jimmy Date: 07 March, 2015

1. **What do you do to make a living?**

   Foreman of a big ship in Rig department.

2. **Why did you get into off farm in the first place and when?**

   Since 2007, he started off-shore job. Earns more income from this job.

   For his job he has been sent to China, Mexico, Angola, Taiwan and Thailand.

3. **Were your parents involved in off farm work?**

   No. He is doing only farming activities.

4. **What is the things you most like about off-farm work? And what don't you like (any challenges)?**

   He likes his job

5. **Would you prefer to farm exclusively if you were able to earn enough money?**

Yes, would be closer to home.

6. **What are the main things you spend your off farm money on**?

   Through getting off-farm income he had spent to build his house and bought a car.

7. **How else does it contribute to the household?**

   Shares his income with households like paying electricity bill and expenditure on education purpose.

8. **How was life before the off farm income and how is it now?**

   Life is easier, different life style and more savings than before.

9. **If tomorrow you lost your job what would that mean to your family? Consequences?**

   It might be worsen for his family, no extra income source, more struggle. Look for another work somewhere.

10. **If you did not have off farm jobs what would you be doing instead?**

    He must be try to find another job through his experience, getting certificate from another job and training experience.

11. **What have been the greatest benefits of off farm?**

    He can save extra money to use in the future.

12. **What has been the biggest change?**

    Bought a new car, built another house in Sri Aman

Wealth indicators

a. How often do you go to the city? **Once / Twice a week. Go to the Church on every Sunday**

b. Do you have a satellite TV? **Yes**

c. Do you have a separate freezer? **Yes, Both**

d. Do you have a washing machine? **Yes**

e. When/where did you get your clothes? **Bought from town, Sri Aman**

f. What was the last big expenditure? **Bought a car in last year (2014), they have another car which had been bought in 1997.**

g. Do the women go to the salon to get a haircut? **Women 3 times, Son- 1 times per month in barber shop**

h. Do you have a computer/Laptop? If, yes, how did you get it? **They have three laptop, one sponsored from Govt. and another two had been bought.**

i. Do you have a cell phone? How much do you spend per month? **They have two cell phone. They spend mobile cost maximum 200 RM per month**

j. Do you have access to gas line? Yes

k. Do you have a car? When did you get it? **Yes. Two car. One in 1997 and the another in 2014**

l. Do you consume meat? How often? **Yes, Everyday buy from nearest market**

m. What do you eat on a normal day? **Rice, Vegetables, Meat, Fish**

Observation

They have another house in Sri Aman. They get also some cash from that house which helps to renovate his father house in Nanga Jela. They have two motorbike (one is broken, not usable), telephone. Generally they goes to the markets in Sri Aman to buy their cloths. They goes to the nearest market to buy their meat, fish and another grocery shop. He is away from home for three months and a months in home. His daughter also studied in secondary school in Sri Aman. She wants to be Engineer in future. She spends 30RM/week for her own cost and her tuition fee is 140 RM/month. And he paid same tuition fee for his another child.

Appendix 7: SSI HH 28

Notes from the SSI with household with off farm work / income.

Conducted by: Praerana, Amalie & Mahfuza

Pintu Nr. 28

Name: Lantan Anak Biang **Date:** 07th March, 2015

1. **What do you do to make a living?**

   Livelihoods: The father works at Hilton Hotel as a pool attendant and has had the job since 2000. The mother is a housewife and the grandparents are farmers who takes care of the land. They have three boys who go to primary school.

2. **Why did you get into off farm in the first place and when?**

   The father is not familiar with farming and works off-farm because he wants to learn English, build a network, work experience and earn an extra income.

3. **Were your parents involved in off farm work?**

   No

4. **What is the things you most like about off-farm work? And what don't you like (any challenges)?**

   The benefits he experiences is learning English, networking and work experience.
   He is not satisfied with his salary
   He works at the Hilton Hotel every day from 8-15
   Kind of hard work, because the transportation to the hotel is difficult (located on an island).

5. **Would you prefer to farm exclusively if you were able to earn enough money?**

   Yes, maybe would be easier.

6. **What are the main things you spend your off farm money on?**

   The money he earns he shares with the household and uses it for the childrens' school, house expenses, small renovations in the house and to buy for a motorbike.

7. **How else does it contribute to the household?**

   Same as before but wants to find another off-farm job that pays a better salary.

8. **How was life before the off farm income and how is it now?**

   He thinks his job is much better than farming.

   He has no experience with farming and that is why he went to get an off-farm job.

   He says that the income from the farming is enough to provide for his family, but it is nice to earn an extra income.

9. **If tomorrow you lost your job what would that mean to your family? Consequences?**

   If he lost his job he would try to find another off-farm job, maybe in SALCRA or another company. He would do farming for a living if he couldn't find a job off-farm.

10. **If you did not have off farm jobs what would you be doing instead?**

    Same

11. **What have been the greatest benefits of off farm?**

    His off-farm job has made their lives better because of the extra income. But the salary is low so the improvements/changes happen slowly.

    He is able to send his kids to school and by clothes.

    The mother drives the boys to school in Batang Ai by their car.

12. **What has been the biggest change?**

Same

Wealth Indicators

a. How often do you go to the city? **Yes, once a week to buy food**

b. Do you have a satellite TV? **Yes**

c. Do you have a separate freezer? **No**

d. Do you have a washing machine? **Yes**

e. When/where did you get your clothes? **Sri Aman**

f. What was the last big expenditure? **Washing machine**

g. Do the women go to the salon to get a haircut? **No**

h. Do you have a computer? If, yes, how did you get it**? Yes, sponsored by the government for the children's education**

i. Do you have a cell phone? **How much do you spend per month? Yes, 50rm/month**

j. Do you have access to gas line? **Yes**

k. Do you have a car? When did you get it? **Yes, 2010**

l. Do you consume meat? How often? **The kids have meat almost every day. The adults only sometimes**

m. What do you eat on a normal day? **Rice, vegetables, meat, fish**

Observation

House looks a bit dirty and messy. There clearly has been no money for renovations in a long time. Not very well decorated. Have a motorbike, floor made of linoleum sheet, house barely done, not painted, old furniture and the 1st floor has not been completed.

Appendix 8: SSI HH 45

Notes from the SSI with household having no land and only work off- farm.

Conducted by: Lily & Praerana

Pintu No.: 45

Key Informant Name: Tuni Bong **Date:** 07 March, 2015

1. **What do you do to make a living?**

   Teacher in Kindergarten in front of the village. Before the establishment of KG she was a rubber tapper. She was applied for this job and then selected as she had training.
   She also involved in farming activities sometimes, but very rarely as she is too busy.
   Also she is continuing her study.

2. **Why did you get into off farm in the first place and when?**

   Since 1993 (After secondary school- teaching course, training)

3. **Were your parents involved in off farm work?**

   Parents are involved in farming activities. At first they were involved in Rubber tapping.

4. **What is the things you most like about off-farm work? And what don't you like (any challenges)?**

   Better time management for teaching and studying
   Good time past with the kids, does not get bored.
   Public welfare through educating the child

5. **Would you prefer to farm exclusively if you were able to earn enough money?**

   Salary depends on education, therefore undergoing further education / training.
   She had enrolled in teaching courses to increase her salary
   For her teaching profession there is a contract for five years

6. **What are the main things you spend your off farm money on?**

   She bought a car and built a new house

7. **How else does it contribute to the household?**

   Through getting salary from teaching she also spend on paying bill for electricity also education purpose for her own child.

8. **How was life before the off farm income and how is it now?**

   Parents were struggled before but now she has a good job to support her family.

   Before he had teach in daytime and tapped rubber at night time

9. **If tomorrow you lost your job what would that mean to your family? Consequences?**

   Once retired would make a farm of her own.

   Since getting older would not go back to farming.

   After finishing of study will plant for planting paddy for home consumption

   Stop buying every luxurious thing that they buy now.

10. **If you did not have off farm jobs what would you be doing instead?**

    Joined parents to do the farming activities.

11. **What have been the greatest benefits of off farm?**

    Buy different food for the family

    Shares income among the family

12. **What has been the biggest change?**

    She bought a car

Wealth indicators

- **a.** How often do you go to the city? **4 to 5 times per week**
- **b.** Do you have a satellite TV? **Yes**

c. Do you have a separate freezer? **No**

d. Do you have a washing machine? **Yes**

e. When/where did you get your clothes? **Gets from Kutching**

f. What was the last big expenditure? **Laptop**

g. Do the women go to the salon to get a haircut? **15 to 20 times per year**

h. Do you have a computer/Laptop? If, yes, how did you get it? **Yes, bought**

i. Do you have a cell phone? How much do you spend per month? **Yes, around RM 200 /month**

j. Do you have access to gas line? **Yes**

k. Do you have a car? When did you get it? **Yes, bought two in 2007**

l. Do you consume meat? How often? **Almost everyday**

m. What do you eat on a normal day? **Fish, pork, rice and fruit**

Observations

Very fancy and well done house with nice furniture's and painted walls. Daughter was studying while we conducting the interview.

Appendix 9: SSI HH 51

Notes from the SSI with household with only farm work / income.

Conducted by: Praerana & Amalie

Pintu No.: 51

Informant's Name: Bawang Anak Ruromg Date: 08 March, 2015

1. **What do you do to make a living?**

   Farming, paddy and rubber

2. **Why do you choose farming exclusively?**

   Only good at farming. Has no experience with other work.

3. **Were your parents involved in farming?**

   Yes

4. **What is the things you most like about farming? And what don't you like (any challenges?)**

   Enjoys farming and the possibility to grow different crops as padi, vegetables and sometimes corn.

   Challenges are the fact that it is hard work. She suffers from back pain and head ache. And the fact that they sometimes work for a full week, including Sunday.

5. **Would you prefer to work off farm? Why don't you or a family member work off farm?**

   Don't want to work off-farm because she likes the surroundings of the longhouse and doesn't like the city.

6. **What are the main things you spend your money on?**

   Uses money to buy food, sending the grandchild to school + pocket money (10rm/week), sometimes house renovations.

7. **Do you feel that you get enough income from farming?**

   Don't have enough money. Especially now when the rubber prices are low.

8. **If tomorrow you were not able to sell your crops (ex market prices went down a lot) what would that mean to your family?**

   Don’t say such things, it would be trouble!! If they could not farm they would be in trouble. But they would grow own vegetables to get food on the table and survive.

9. **Why do you choose to rent land instead of looking for off farm jobs?**

   Rent land to grow padi for their own consumption. 100rm/year.

10. **What have been the greatest benefits of farming income?**

    She likes to farm and be out in her fields and not be restricted.

11. **Do you feel like farming income will be enough in the future?**

    Farming is fine now, but she is uncertain off it will be enough in the future, but so far so good.

Wealth indicators

- **a.** How often do you go to the city? **Once a month, using public transportation. Costs 10rm/person**
- **b.** Do you have a satellite TV? **No**
- **c.** Do you have a seperate freezer? **No, only fridge**
- **d.** Do you have a washing machine? **No**
- **e.** When/where did you get your clothes? **Lubok Antu, doesn't like to do shopping**
- **f.** What was the last big expenditure? **None**
- **g.** Do the women go to the salon to get a haircut? **No**

h. Do you have a computer/Laptop? If, yes, how did you get it? **Yes, from the govt. for the boys education.**

i. Do you have a cell phone? How much do you spend per month? **No**

j. Do you have access to gas line? **Yes**

k. Do you have a car? When did you get it? **No**

l. Do you consume meat? How often? **Very little, once a month, depends on budget**.

m. What do you eat on a normal day? **Rice, green veggies, fruits, grown by herself.**

Additional notes

She was born in Batang Ai. They have four daughters who got married at a young age and went to live in the city. One of the daughters got pregnant and left the boy with the grandparents to take care of him. The daughters rarely comes to visit, but sometimes in the holidays, and then only stay for a couple of days. She is not happy about this! The boy likes to be outside and play with his friends not interested in going to school. . She would like him to be a policeman/soldier. Wants him to be successful. Never gets money from the daughters, who work in the private sector. Wish to get some money, but that is never going to happen. Son in law gave money to buy alcohol, but she bought food instead. Her husband sometimes like to drink alcohol.

Observations

House looks unfinished, limited/ if not hardly any furniture, plastic as floor, walls not painted.

Appendix 10: FGD dis-satisfaction with SALCRA

Notes from Focus Group Discussion with respondents who reported being unsatisfied with SALCRA management

SALCRA Focus Group – 5th March 2015 **Conducted by:** Praerana, Lily & Amalie.

Participants:

1. Mr. Edwin Ak Impin
2. Mr. Kenneth Ak Banting
3. Mr. Labang Ak Embol
4. Mr. Hendang Ak Sigung
5. Mr. Tuking Ak Nyehgang

Reasons for not being satisfied

- Not satisfied with how SALCRA divided land among villagers; not given what was promised
- Want some part of SALCRA oil pam plantation
    - Want equal titles to the land, land is not divided fairly.
    - Don't know what exactly was promised… were young kids when the agreement was made
    - Hard for them to get a reply from SALCRA and all the information is classified

Will they renew their agreement?

- Won't because no Dusun lot. Aside from the Dusun lot, people of Nanga Jela do not have any land.
- All lands belong to SALCRA. Not too sure when they will get it back.
    - After 60 years (as promised, SALCRA will give lands back to the people)—been approximately 29 years.

If they could stop the SALCRA scheme now and other background information

- Would plant rubber trees, pepper and padi fields.
- Plant oil palm as owner
- Came 2 years after 1984 (1986)

- No black and white between last generation and SALCRA
    - They just agreed (trusted SALCRA)
    - Terms not clear, no land titles
- Besides dividend no other benefirs from SALCRA. Get dividends 2 times a year, in 2014 they got RM 1200 in Feburary and RM 1200 in July however in 2015 February they only got RM 300
    - The dividend received is not even half of what they received in February 2014, dividend is very inconsistent and don't know why. It is very frustrating as it is so little for such a high price.
    - Thankful for the road
        - SALCRA transportation (if someone dies)
    - SALCRA built the kindergarten building (but it's run by the government)
- No one is satisfied with SALCRA (consistent with our questionnaire sample)
- Can't grow enough of their own fruits and veggies for personal/subsistence consumption
- As for growing in between the trees…
    - Not allowed because it's hard for the oil palm to grow well when they do that
- At first they were the SALCRA workers but stopped because of the salary
    - Was only 8 RM/day (4 hrs of work/day)
    - Sometimes tenders of the plantations (from SALCRA?) hire Indonesian workers instead of using local people; contract between tender and SALCRA (tender hires the Indonesian workers)
    - SALCRA gave them the option to work with SALCRA or not to work with SALCRA—chose not to because of the low salary
        - 22 RM a day is the current salary of the Indonesian worker—still too low

Alternative livelihood strategies

- Depend on rubber but prices have dropped
    - Plant padi for consumptions so they at least have food to eat (when market prices are low)
- Youngsters

- Prefer to work outside of Nanga Jela
    - Off-shore, government servant, private sector
- They allow their kids to work outside to improve their status
- Wish that their youngsters don't follow in their footsteps as farmers because they want they status to be better than their own
- Public primary, secondary, and universities are free
- In terms of population growth—youngsters aren't supposed to divide the inherited land – have to share and look for work outside the community (don't feel that this is the primary issue for land scarcity—SALCRA is)

Best Part of living here

- Electricity, transportation, near to the town, clinic, hospital, school, health center (even open at night, and it's free)
    - These things weren't available in Batang Ai
- Bad things:
    - Theft (from other communities—road makes them more accessible to thieves)
    - New generations are influenced by modernization
        - Drug problems (wasn't the case in Batang Ai)
    - Still miss the old lands
        - No pollution/contamination; food was fresh and ample (enough lands [no land scarcity], could just catch fresh fish in the river/stream)

For the future

- Fear for family with no land and no working outside/ no education
- Parents in these situations can't provide for their children
- Want their children to modernize and not be farmers
- They know their children will be back to visit and honor the culture with festivals etc.
- feel as if they will lose their culture little by little over time
    - Christianity

        - With conversion to Christianity, they just followed it because if you're not Christian it can be hard to find land because people die and burials and cremation places require that you are Christian
        - Also schools, children need to say their religion
    - Since resettlement way of life has disappeared little by little

SALCRA

- Fertilizers and pesticides aren't an issue to the drinking water because they have their own gravity feed
- Soil degradation is an issue but the advantage is that the fertilizer run off on the edges of the plot where they plant padi and some crops.
- Sometimes SALCRA will help them pick up their padi and transport it

As for resettlement promises

- Government bought larger pieces of land from a private owner in the area and the Nanga Jela people did not actually get it all
    - The government never paid original owner for the land either
    - They know this because some now rent land from this owner
    - Never saw an actual official agreement between government and owner

Final Remarks

- Wishes SALCRA would give them a bonus from dividend within the next 5 years.
- Although they are satisfies with SALCRA providing road. If someone dies SALCRA provides vehicle to transport the body to the cemetery. SALCRA helps them bring paddy harvest when it is ready and help them bring it to their village.

Appendix 11: FGD Fish Farming

Notes from Focus group discussion with fisheries

Date: 06 March, 2015 **Conducted by** Lily, Amalie & Praerana

- Agricultural department had advertisement for people from Lubuk Antu to apply.
- Total application around 80 throughout Lubok Antu communities for the fish farming project.
- Agricultural department focussed on people who had fishing licences earlier in the project. However expanded it to everyone later on.
- To apply had to fill out some forms and get a license. Costs 40 RM/year and need to renew the licence every 2 years.

    - Jackson had his own farm
        - Since 1998-2003 on own then stopped as it was too expensive to have a farm. Still had his licence though as he renewed it.
        - Enrolled in this scheme in Batang Ai to supplement income
        - Restarted the fish farming in December 2013
        - Jackson used part of the income to buy boat and engine for boat.
        - When he had his own fish farm, he had to buy everything and it was too expensive. The government now at least helps.
    - The lady came to the office personally and Came to office in person (got lucky)
        - Had since May 2014.
        - Has made little profits as it so new but Used the income for house development, painting, repair the house build savings.

- **From fish farming got a lot of income**
    - demand increasing
    - large profit compared to expenses
        - Income devoted to expanding the fish farm, to house development (tiles, painting), education, build savings
- **Starting conditions**

    - government gives 90,000RM per person
    - requirements
        - Must expand/develop farm/sell fish, otherwise government can take it back.
        - Monthly report to the government regarding the progress.
        - All the fish farm / nets is still owned by the agricultural department, so they do random checks once a month. The nets need to be full of fish.
        - They don't have any problems with the fish farms yet, as it has benefited both.
- **Demand for the fish**
    - Sell to a middleman.
    - They have no time to sell the fish in the market therefore they sell it to middleman. Easier this way as they just come and demand for the fish, pay on the spot so they don't have to go to the market to sell.
- **Success level**
    - Both seem to be expanding
        - Since start have bought 10,000 fish

Since they have started to fish farm what has been the biggest change in livelihood?

- Extra income. It has been very helpful

What is the thing they like most about fish farm?

- Income. There is constant demand for the fish.
- Better to have fish in the dam, rather than have nothing in it.

What it would be like if they have no fish farm?

- Need to find another form of job.
- Will plant more crops to get extra income, But the money earned from the farm would not compensate what they earn from fish farm
- Husband can stay back in Nanga Jela, otherwise he would have to go into the city to find a job.

Appendix 12: Template for FGD Youth

Respondents' Name/s: **Date:** __ March, 2015

Note: Make a brief introduction on the field study. Enlighten the respondents regarding the discussion and we want to understand why they live away.

Inform that they were chosen on the basis of questionnaire survey conducted few days ago and inform them that they can decline to answer any question at any time.

Ask permission to record the conversation.

Section A: Basic information

a. What they do outside the long house in terms of their job and what they study?
b. Where do you live?
c. What do you do outside the long house? What kind of jobs they have. What grade they are in?

Section B: Reasons for moving away

a. What are the reasons for leaving?
b. Were you influenced by anyone to move out?
c. What are the challenges / benefits of living outside Nanga Jela?
d. Do you thinks it is better to have a job that is not farming? Why?
e. What is different about living away from the long house?
f. What do you like about living where you are now?
g. What do you miss about Nanga Jela while you are gone?

Section C: Relations to Nanga Jela

a. How often do you come back to Nanga Jela? Do you like coming back here?
b. Do you think it is important to visit the community? Why?
c. Do you feel it is important to preserve your Iban culture? If yes, how do you preserve it?
d. Who helps your parents to s the land?
e. Do you know how to tend the land?
f. How would you imagine your life if you had to stay here and farm?
g. If you have a job outside, do you send money home?
h. Do you contribute to the household in Nanga Jela?

i. Do you have any concerns about the family you leave behind?
j. Do you think that Nanga Jela community is changing due to the fact that many young people are leaving? How so?

Section D: Future

a. What are your plans for the future? **(include the 16 year old)**
b. Do your parents support this choice?
c. What would make your parents proud?
d. Are you going to inherit the land and what are you going to do with it?
e. In the future do you plan to come back and live here? Why / Why not?
f. Do you plan to take care of your parents when they are too old to work? If Yes, then how so?
g. What have been the biggest change in your life since leaving Nanga Jela?

Notes from FGD with youth

Date: 06 March, 2015 **Conducted by** Amalie, Praerana & Lily

Participants:

Gloria, 24 - Diploma education
Caroline, 16 - Secondary school
Erica, 16 – Secondary school
Joyce, 16 – Secondary school

Gloria is the only student who doesn't live in NJ but is on boarding school.
Challenges: never has any money
Benefits: learning how to be independent, meet new people
Boarding school close to Kuching, visits NJ every 4 month or sometimes only in holidays.
Wants to study geology

Two of the other girls wants to be engineers, one wants to be a policeman

Important to have an education to get a good job to support the family and maybe bring new

	Primary forest	**Oil palm**

development to the longhouse

Wants to make their parents proud by getting an education

The place they live will depend on their job.
They all might want to move back to Nanga Jela to take care of their parents, or have them move to the city.
They want to help the family financially, if they live in the city they will send remittances

Joyce lives in the city with her parents and comes to visit grandparents in the longhouse sometimes in the weekends. Likes to live in the city because it provides so many opportunities, easy access to everything

Appendix 13: Soil

Date	06/ 08/2015	06/ 08/2015
Waypoint	**P1 (Primary Forest)**	**OP (Oil Palm)**
	N 01º09.236' E 111º49.306'	N 01º08.849' E 111º49.109'
Elevation	133m	92m
Vegetation	Primary Forest, consist of tree species like *Cissus Repens, Artocarpus elasticus, Garcinia parviofolia, Plethiandra sp. etc.*	Oil Palm cultivation area. Also include some fern and weed.
Land Use history	Primary forest tree spp.	Cocoa plantation scheme change to Oil Palm plantation

Soil sampling site

Soil texture, clay % and colour of collected sample from primary forest and Oil palm field

Sl. no.	Sample ID	Horizon thickness (cm)	Textural classes	Characteristics	% Clay	Color (10YR)
1	**P1**	0-5	Silt	Not cohesive, somewhat floury, no grains	<12	3/3
		5-30	Loam	Moderately cohesive and moderate sand grains	8-27	4/6
2	**P2**	0-5	Silt loam	Not grainy, but distinctly floury and moderately sticky	10-27	3/3
		5-30	Loam	Moderately cohesive and moderate sand grains	8-27	3/6
3	**P3**	0-5	Silt	Not cohesive, somewhat floury, no grains	<12	3/6
		5-30	Loam	Moderately cohesive and	8-27	4/4

				moderate sand grains		
4	**OP1**	0-5	Silty clay loam	Moderately shiny surface, no grains, low plasticity	25-40	4/4
		5-30	Silt loam	Not grainy, but distinctly floury and moderately sticky	10-27	6/8
5	**OP2**	0-2	Silt loam	Not grainy, but distinctly floury and moderately sticky	10-27	4/4
		2-30	Silt loam	Not grainy, but distinctly floury and moderately sticky	10-27	6/8
6	**OP3**	0-2	Silt loam	Not grainy, but distinctly floury and moderately sticky	10-27	3/6
		2-30	Silt loam	Not grainy, but distinctly floury and moderately sticky	10-27	6/8

Appendix 14: Water

DOE Water Quality Index Classification (INWQS)

PARAMETER	UNIT	CLASS					
		I	IIA	IIB	III	IV	V
pH	-	6.5 - 8.5	6 - 9	6 - 9	5 - 9	5 - 9	-
Temperature	°C	-	Normal + 2 °C	-	Normal + 2 °C	-	-
Electrical Conductivity	µS/cm	1000	1000	-	-	6000	-
Salinity	%	0.5	1	-	-	2	-
Dissolved Oxygen	mg/l	7	05-jul	05-jul	03-maj	< 3	< 1
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2.7
Nitrate	mg/l	<7	>7	>7	-	5	-
Nitrite	mg/l	<0.4	>0.4	>0.4	>0.4	1	-
Phosphourus	mg/l	<0.2	>0.2	>0.2	0.1	-	-
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	> 12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	> 100
Total Dissolved Solid	mg/l	500	1000	-	-	4000	-
Total Suspended Solid	mg/l	25	50	50	150	300	300
Faecal Coliform	count/100 ml	10	100	400	5000	5000	-
Total Coliform	count/100 ml	100	5000	5000	50000	50000	> 50000
Water Quality Index (WQI)	-	< 92.7	76.5 - 92.7	76.5 - 92.7	51.9 - 76.5	31.0 - 51.9	> 31.0

DOE Water Quality Classification Based On Water Quality Index

SUB INDEX & WATER QUALITY INDEX	INDEX RANGE		
	CLEAN	SLIGHTLY POLLUTED	POLLUTED
Biochemical Oxygen Demand(BOD)	91 - 100	80 - 90	0 - 79
Ammoniacal Nitrogen(NH3-N)	92 - 100	71 - 91	0 - 70
Total Suspended Solids (TSS)	76 - 100	70 - 75	0 - 69
Water Quality Index (WQI)	81 - 100	60 - 80	0 - 59

Interim Water Quality Classification and Uses

Range of WQI Values	Class	Uses	Designated USES
100 - 92.7	Class I	Conservation of natural environment. Water Supply I - Practically no treatment necessary. Fishery I - Very sensitive aquatic species.	Represents water bodies of excellent quality. Standards are set for the conservation of natural environment in its undisturbed state. Water bodies such as those in the national park areas come under this category where strictly no discharge of any kind is permitted. Water bodies in this category meets the most stringent requirements for human health and aquatic life production.
92.6 - 76.5	Class IIA Class IIB	Water Supply II - Conventional treatment. Fishery II - Sensitive aquatic species. Recreational use body contact.	Represent water bodies of good quality. Most existing raw water supply sources come under this category. Body contact activity is not allowed in this water for the prevention of probable human pathogens. To allow for body contact or recreation purposes and conservation of sensitive aquatic species, an additional class i.e. Class IIB is established which is not used as raw water supply.
76.4 - 51.9	Class III	Water Supply III - Extensive treatment required. Fishery III - Common,of economic value and tolerant species; livestock drinking.	Use primarily for protecting common and moderately tolerant aquatic species of economic value. Water under this classification may be used for water supply with extensive/advance treatment. This class of water is also suitable for livestock drinking.
51.8 - 31.0	Class IV	Irrigation	Defines water quality required for major agricultural irrigation activities which may not cover minor applications to sensitive crops.
< 31.0	Class V	None of the above.	Represents other which do not meet any of the above uses.

WQI = 0.22 x SIDO + 0.19 x SIBOD + 0.16 x SICOD + 0.15 x SIAN + 0.16 x SISS + 0.12 x SipH

- **SIDO** Sub-Index DO (in % saturation)
- **SIBOD** Sub-Index BOD
- **SICOD** Sub-Index COD
- **SIAN** Sub-Index NH 3 N
- **SISS** Sub-Index SS
- **SIpH** Sub-Index pH

Best Fit Equations for the Estimation of the Various Subindex Values

Subindex for DO (in % saturation):

SIDO = 0 for x<= 8
= 100 or x >= 92
SIDO = -0.395 + 0.030x ^{2} - 0.00020x ^{3} or 8 < x < 92

1 Subindex for BOD

SIBOD = 100.4 - 4.23x for x <=5
SIBOD = 108* exp (-0.055x) - 0.1x for x > 5

2 Subindex for COD

SICOD = -1.33x + 99.1 for x <=20
SICOD = 103*exp (-0.0157x) - 0.04x for x >= 20

3 Subindex for AN

SIAN = 100.5 - 105x for x <= 0.3
SIAN = 94*exp (-0.573x) - 5 * I x - 2 I for 0.3 < x < 4
SIAN = 0 for x >= 4

Subindex for SS:

SISS = 97.5*exp (-0.00676x) + 0.05x for x<= 100
SISS = 71*exp (-0.0061x) - 0.015x for 100 < x < 1000
SISS = 0 for x >=1000

Subindex for pH:

SIpH = 17.2 - 17.2x + 5.02x^2 for x < 5.5
SIpH = -242 + 95.5x - 6.67x^2 for 5.5 <= x < 7
SIpH = -181 + 82.4x -6.05x^2 for 7 <= x 8.75
SIpH = 536 - 77.0x + 2.76x^2 for x >= 8.75

	Notes obtained during the water seasonal calender exercise
Note 1	The land involved has been rented for ~30 years by four families in Nanga Jela due to land scarcity for 100/200 RM a year
Note 2	Usage of fertilizers and herbicides on the field during ~30 years of cultivation of hill rice
Note 3	Other areas surrounding the gravity fed source has not been cultivated during the time they have been in Nanga Jela
Note 4	Water from the gravity fed source is not boiled before consumption
Note 5	Governmental (treated) water supply, collected from the Lemenak river, was established in 1988 with limited access only during the evenings
Note 6	Replaced governmental (treated) water supply from Lubok Anto established in 2014 with unlimited supply
Note 7	Governmental water supply has random obstruction and change in quality due to pipe (cleaning) managements by the suppliers

Appendix 15: Transect walks

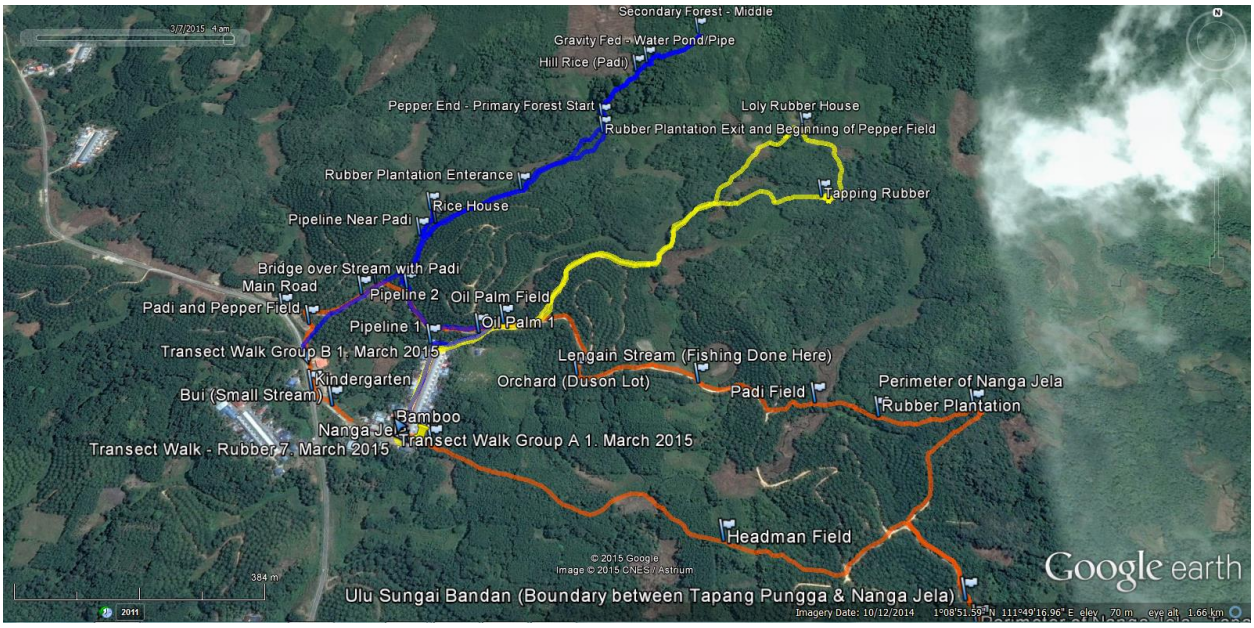


Figure 1Transect walks conducted during out time in the field.

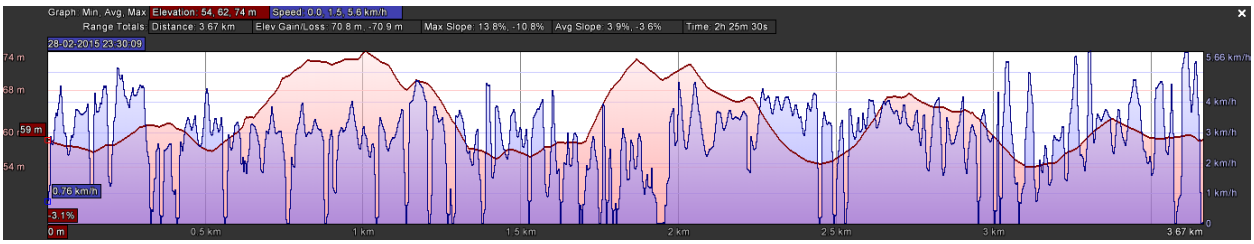


Figure 2 Transect walk in the fields

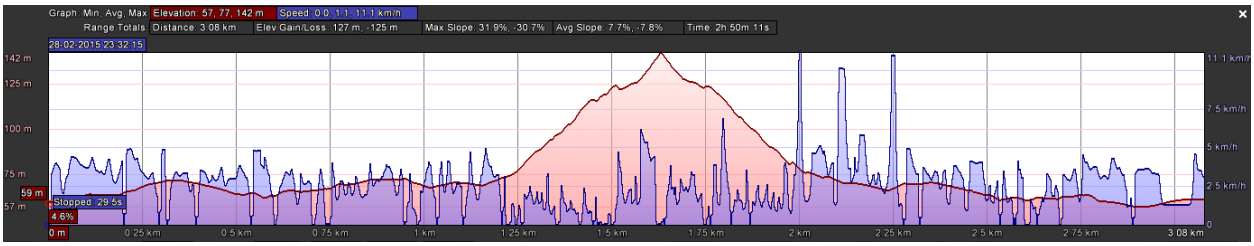


Figure 3 Transect walk to gravity feed water pipe

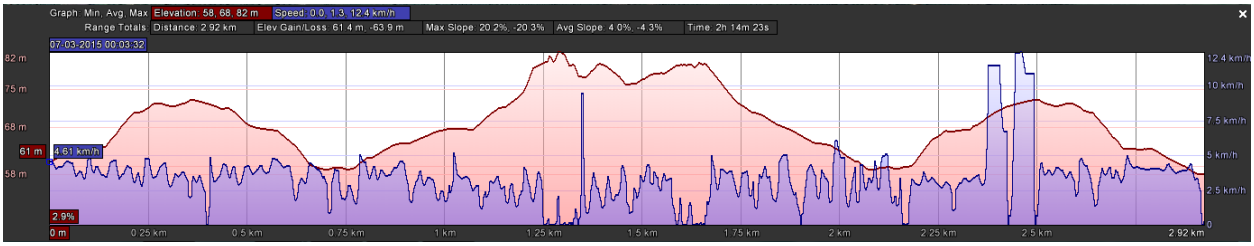


Figure 4 Transect walk to rubber field

Figures A, B & C show the topography from the three transect walks respectively. X- axis marks the km walked from base and Y axis is the altitude above sea level. The purple line shows the topography while the blue shows the average speed frequency in km/hr.

Transect Walk (Group 1: Through the fields)

Notes on the trance walk

Date: 01 March / 2015

GPS Location: **Time:** 7:30am – 9:53am

Name of the guide: Jambah

GPS Waypoints information

003 Bui (Small Stream) 004 Kindergarten

005 Padi and Pepper field
006 Padi Field
007 Oil Palm Field.
008 Orchard (Dusun Lot)
009 Lengain stream (Fishing done here)
010 Padi Field
011 Rubber Plantation
012 Perimeter of Nanga Jela
013 Perimeter of Nanga Jela – Tapanga Pungga
014 Ulu Sungai Bandan (Boundary between Tapang Pungga & Nanga Jela)
015 Headman Field

The pepper and padi field (waypoint 005), the residents of Nanga Jela bought it and planted it themselves. It is less than 1 year old.

Jamba's opinion while doing transect walk.

Land scarcity because: population expanded beyond the longhouse after resettlement.

He still owns land in Batang Ai, some of the lands that are not flooded.

SALCRA promised new equal lands when re- settled but not given. Just bought over those re – settled wetlands.

Dividends given by SALCRA -- pays the village and the village divides it equally among everyone.

Jamba does not feel land scarcity.

New generations – No new land given but inherited. These are the people who live outside the long house. These lands are shared among siblings and family members.

SALCRA hires Indonesian workers to harvest the oil palm. Jamba feels that the pay from harvesting oil palm is not good. Hence is indifferent to the migrant workers.

Nanga Jela residents do not want to harvest the oil palm as the pay is not good.

General tend toward cash crops on new lands but have old lands too, for other things

Rubber price is inconsistent (Market price Dependent), therefore many people go for the oil palm as there is a source of steady income.

Rubber tree is given by the agricultural department. SALCRA gave the Nanga Jela Community new technology to tap rubber i.e. to get more rubber, however it is not sustainable.

Use gas (New technology – provided by SALCRA) to tap more rubber. Too strong hence the rubber trees die.

Oil Palm SALCRA gives dividend at the end of the year, but very little. Cannot depend on this.

Use river to catch fish for own consumption

In the orchard, people are planting rubber trees in place of fruit trees. The household decide on the type of tress / plants to grow. It is entirely up to them and not a community process.

The residents of Nanga Jela have planted cocoa tress before but it did not grow well so they switched to pepper, now growing pepper intensely as prices are very high. Grow rubber too and little bit oil palm. Pepper and rubber price is market dependent.

Transect Walk (Group 2: To the gravity water source & primary forest)

Date: 01 March / 2015

GPS Location: **Time: 7:30am – 10:20am**

Name of the person: Jackson

GPS Waypoints information

001 Pipe1 – Water pipe, near longhouse

002 Palm1 – SALCRA oil palm plantation starts

- SALCRA runs it, all members receive dividends (equally destributed)
- 2nd Cycle – Oil palm grown in cycle's – 1 cycle = 25 years

003 PipeUp – Entrance into oil palm plantation (shortcut) 5 meters from water pipe "upstream"

004 PadiDivide – Common field of land. Though at the time it is considered to be the head man's padi field because it is him who has invested in the crops (soyh of the rice house). But it is possible for everybody to grow padi in the field if they want to invest in it.

005 Rubent – Rubber entry. One HH owns this land.

- Right now the market price for rubber is low, so they don't harvest and instead focus on other crops.
- Low price (now) 500 rm/month
- High price (2010-2013) 7000 rm/month
- Uses traditional harvesting methods

006 + 007 Rubend and pepper end – White and Black

- Takes three years to mature pepper plants/pepper corn (check up!)
- Market prices for pepper are high. Due to this, the government is supporting the pepper industry through the 2020 vision.
- Current prices for white pepper: 37 rm/kg
  Black pepper: 26 rm/kg.

008 Hillricebeg – Primary forest south of this mark.

House Owner – Key Informant interviews

Don't really use old lands. It is too far

Only 1% of Nanga Jela go to their original place

Thinks land scarcity is an issue because land division is fixed bu the population is growing and changing.

Appendix 16: Daily Activity log

Day / Date	Activity Log
Day 2: 1/March/2015	Transect Walk Interview with headman Round 1 – Questionnaire Participatory Observation
Day 3: 2/March/2015	Revaluating research objective and questions Presentation preparation Round 2 – Questionnaire Participatory Observation Begin logging of questionnaire data for statistical analysis
Day 4: 3/March/2015	Presentation of the initial revised research proposal PRA activity- Evaluate the fisheries in Batang Ai Lake Round 3 Questionnaire Logging of questionnaire data for statistical analysis
Day 5: 4/March/2015	Water Sampling and analysis Presentation feedback: Further refine research question, objective and methods Logging of questionnaire data for statistical analysis Participatory Observation
Day 6: 5/March/2015	PRA activity – Timeline with the elders SSI with key informant – SALCRA PRA activity – Focus group activity with household who were dissatisfied with SALCRA Participatory Observation
Day 7: 6/March/2015	Soil Sampling PRA activity – Focus group with households involved with fish farming. SSI with key household informant – Sangau Ak Chanting PRA activity- Ranking exercise

	Participatory Observation
Day 8: 7/March/2015	PRA activity - Second transect walk to the farm (triangulate data from questionnaires.) SSI with key informant – Household receiving remittances. SSI with key informant – Household with husband involved in off farm work. SSI with key informant –Household having no land & members working off farm. PRA activity – focus group water seasonal calendar. Participatory Observation
Day 9: 8/March/2015	Sunday market visit. PRA activity – Focus group with youths SSI with key informant – Gloria (youth informant) SSI with key informant – Household having no off –farm work and relying on income from farming. Preparation for final presentation.
Day 10: 9/March/2015	Presentation Farewell dinner get-together.

Appendix 17: Synopsis

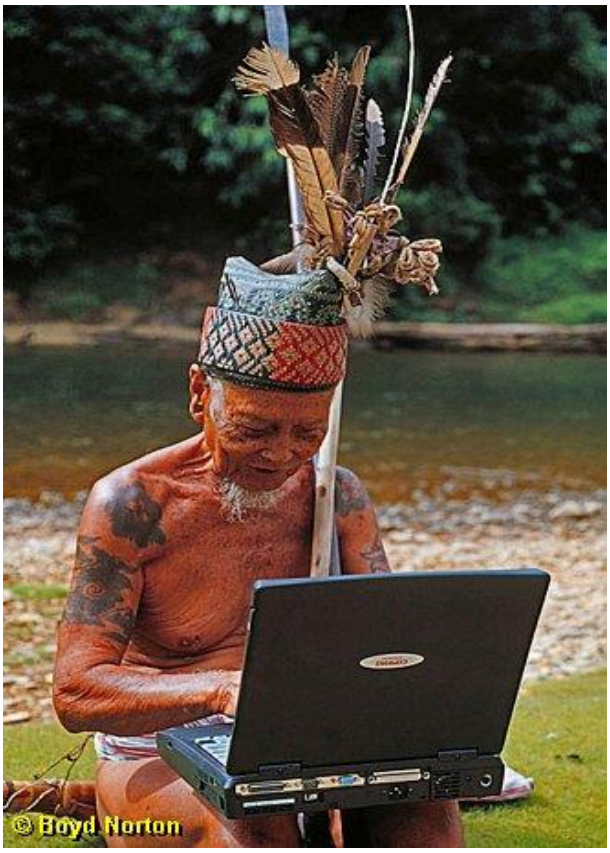
University of Copenhagen

Interdisciplinary Land Use and Natural Resource Management

(ILUNRM)

Research Synopsis

Research Topic: We will examine the livelihood strategies of the Nanga Jela community under conditions of land scarcity.



By: Amalie Christensen, Lily Cichanowicz, Praerana Gyawali,

Tue Kofod & Mahfuza Pervin

CONTENTS

INTRODUCTION

Malaysia's efforts to modernize and expand its role in the global market by 2020 (Aiken et. al 2011) have come into conflict with the traditional livelihood strategies of the Iban people, a subgroup of the Dayak that is indigenous to Sarawak, Malaysia. Historically, the Ibans' practiced shifting cultivation to grow rice padi and other crops. Over the past fifty years, however, the Malaysian government's 2020 campaign towards industrial development has led to the integration of the Iban people into the expanding national economy, often at the expense of their claims to the land, subsequently posing a threat to their traditional livelihood strategies. One of these resettled Iban communities is Nanga Jela.

Nanga Jela's resettlement took place in 1984, during Phase II of the Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) scheme. The Nanga Jela community initially resided in the lower Engkari River. Due to the Batang Ai hydroelectric project the community was relocated northward up the river. The Nanga Jela community as we know it today is one characterized by land scarcity. As compensation for the resettlement, SALCRA allocated enough land for each Nanga Jela's thirty seven households to receive five acres. Only thirty years later, the lands are not evenly distributed among them.

This is largely the case because shortly after the completion of the resettlement scheme, SALCRA established an oil palm plantation on the resettled lands of Nanga Jela. These factors combined with demographic shifts increasing the population of the community from 37 households to 58 households since the resettlement has put constraints on the land.

Under emerging land constraints, many community members have turned to wage labor. Furthermore, the amount of physical space in the resettled Nanga Jela occupied by the oil palm plantation necessitates income diversification away from other cash crops like pepper and rubber (Teik). Some households have even turned to off-farm livelihood strategies like fishing or migration. The community is also compensated with dividends from oil palm profits, a cash flow which is often inconsistent (Field Site for Sluse Field Course 2015).

During our time spent in Nanga Jela we will get better picture of the main drivers of land scarcity (i.e. population changes, the establishment of oil palm plantation, resettlement itself) so that we can approach our research questions with a contextual understanding of life after resettlement.

Our aim is to analyze the current livelihood strategies employed by the Nanga Jela people. From here, we will examine the responses of land scarcity among the Nanga Jela people and the impact that land scarcity has had on environmental degradation of the resettled lands.

STUDY SITE

The resettled longhouse of Nanga Jela is located on the Northern side of Borneo, Malaysia (marked by a purple star). It is 160 km from Sarawak's regional capital of Kutching and about 11 km North of the Indonesian border. The nearest towns are Lubok Antu, which is 11 km South of Nanga Jela, and Engkilili, which is 17 km west of the longhouse. The total area of lands belonging to Nanga Jela is unknown. There is a road stretching east to west, which suggests the

lands occupied by the Iban reach as far as to the Batang Ai Lake, which is located 1.3 km northeast of the longhouse.

OBJECTIVE & RESEARCH QUESTIONS

To investigate the livelihood strategies that the residents of Nanga Jela adopt in the face of land scarcity**.**

Research questions

1. **What characterizes the livelihoods of the residents in Nanga Jela**
    a. What are the demographic characteristics of the households in Nanga Jela?
    b. How do the residents of Nanga Jela manage their land?
    c. What are the off farm activities?
    d. What is the division of labor in on-farm activities?

2. **What have been the responses to land scarcity among the Nanga Jela people?**
    a. Has marginal land been cultivated due to land scarcity? i.e change in cropping pattern
    b. Has the oil palm plantation had an influence on socio-economic status?
    c. Are certain crops leading to more success or better reputation among community members?
    d. Is land scarcity leading to diversification of off farm income? (diversification out of agriculture)

3. **Has land scarcity led to natural resource degradation?**
    a. What is the quality of the soil under conditions of land scarcity?
    b. Is population growth leading to resource degradation (in terms of access to quality water etc?

METHODOLOGY

To answer the research questions, a combination of social and natural science methods will be implemented. The data collected will consist of both qualitative and quantitative data.

SOCIAL SCIENCE METHODS:

KEY INFORMANTS

Once we arrive in Nanga Jela, it is essential that we introduce ourselves to the headman, TR Endawie ak Janting, because he will be able to indicate the key informants and members of the longhouse who will provide the essential information regarding the community. Introducing ourselves to the headman also indicates to the members of the long house that permission has been granted for the fieldwork.

QUESTIONNAIRE

A questionnaire is a quantitative method for gaining a comprehensive statistical overview on the field of study. Questionnaires will help us identify the households for our semi-structured interviews. We will systematically sample households in the long house to participate in the questionnaire so that we survey half of the 58 households. The questionnaire will contain information concerning demographic characteristics of the household, like wealth, ages of its members, sources of income, farming activities, water utilization, and agricultural practices, along with a prima facie scope of day-to-day livelihood activities and land management. These criteria will serve as indicators of areas for further exploration in our semi-structured interviews.

INTERVIEWS

Key informant

In depth interviews will be conducted with our key informant, the headman, who will provide background information related to our study. The interview with the headman will give an overview of the livelihood strategies employed by the residents of Nanga Jela.

Semi-structured

Semi-structured interviews (SSI) will be useful when we interview selected heads of household. An interview guide with a set of questions along with background data from our questionnaire will serve as a basis for these SSI. The benefit of doing a SSI is that it is flexible and its informants can provide interesting information about a topic, which was not considered in the interview guide. SSI is open to what the informant thinks is valuable for discussion. Moreover, in-depth interviews with selected heads of household can provide a different point of view than the headman.

We will interview longhouse members participating in the oil palm scheme and longhouse members not participating, to extract comparative data. We have allocated a maximum of one hour for these SSI with households. We will interview heads of household that represent a comprehensive range of livelihood strategies. Within this sample of interviews, we will include a proportionate number of heads of household involved in oil palm cultivation and heads of household that farm on marginal lands. A second set of semi-structured interviews will be conducted with heads of household that report having multiple sources of income as a means of assessing the extent of income diversification under conditions of land scarcity. One of the components in determining whether access to quality water has been impacted by drivers of land scarcity (namely, population growth) is by conducting a third set of semi-structured interviews with heads of household that reported varying levels of satisfaction with their access to quality water.

PARTICIPATORY RURAL APPRAISAL

The Participatory Rural Appraisal (PRA) approach allows local people outline their own problems and to deduce their own possible solution to it with limited contribution from the researcher. PRA methods are normally pictorial, thus ensuring that any the villagers are able to contribute despite literacy level. This method permits researchers to make interpretations about local activities, practices, and interactions between households giving us a better understanding community dynamics. In Nanga Jela, we plan to conduct PRA exercises selected members of the community.

Transect Walk + GPS

Global Positioning System (GPS) is used taking aerial measurements and marking the positions of relevant places. Using GPS, we will map the area of the community during our initial transect walk. This walk will be conducted with the headman. We will ask him to show us the important areas in Nanga Jela. It is informal and no specific questions are prepared. Instead, the researcher needs to be open to the flow of conversation. This can be useful for gaining an overall idea of practices, problems, and structures within the long house hence enabling us to redefine the research questions of our study as needed. The use of GPS will be relevant for all methodologies involved in our study, whether it is to map the community, mark the households we interview or map water and soil sampling sites.

Ranking

We will undertake crop ranking to identify farmers' criteria for a certain crops in order to assess whether or not certain crops are perceived more highly than others and why. In doing so we can infer as to whether or not the introduction of crops such as oil palm to the area have been beneficial to community livelihood. We will select farmers that cultivate a representative range of crops. We will place pictures of the different crops on a table and have the farmers place markers on crop they prefer under various criteria prompted by the researcher (i.e. most lucrative, most robust, etc.). We have selected for our research two techniques: problem ranking to identify main problems related with land scarcity and matrix ranking for identification of major crops grown in that area. This exercise will be concluded with a debrief where we ask the farmers to share reflections on their ranking choices.

Village mapping

A mapping exercise will be conducted to get an overall indication of how the long house members see the land and what they consider to be its most important resources Through PRA mapping, "…researchers understand the cultural landscapes, composed of ideas, categories, values and knowledge of the people" (Strang, 2010). Mapping in Nanga Jela's case should

provide us with information about crops grown, household location, land distribution etc. Beginning with the transect map, will give us a good starting point for assessing land scarcity and the ways that it has impacted livelihood strategies. Strang states, "…mapping provides participatory opportunities of understanding the places of study and the everyday life the people have within." Therefore, this active and collaborative method produces a relationship between the researcher and informant. Our informant will be selected heads of household from that represent a comprehensive variety of land use practices so that we are able to discern a more complete picture of village lands by including a broad range of perspectives. Results yielded from this mapping exercise can be compared with aerial photographs and GPS mapping for comparative analysis.

NATURAL SCIENCE METHODS

SOIL SAMPLING

The condition and quality of soils used for the various crops can be assessed through soil sampling with a 100 cm^3 volume of soil core. Position of sampling will be carefully chosen in relation to observed and/or local suggested sites of interest (e.g. noticeable areas of colour change in crops on the same field). Multiple samples of the soil crops in different depths and positions in the same field will be performed in order to obtain accurate values. The soil analyses of different crops are then compared to "clean" soils from primary and secondary forests.

1. Samples will be collected in the field, stored in plastic bags, and dried near the longhouse.
2. Soil bulk density will be measured when the samples are dried.
3. Analyses of total nitrogen and carbon will be conducted in Copenhagen through isotope-ratio mass spectrometry (IR-MS) at the Department of Plant and Environmental Science upon return.

WATER QUALITY ASSESSMENT

The use of the single gravity-fed water source in Nenga Jela will be carried out in order to understand if land scarcity has led to the degradation of quality sources of water. It is also possible that we will identify other water sources, which will also be incorporated into the study. The water utilization study will carried as follows.

1. Identifying water source(s) through **mapping** and **interview** with the headman.
2. **Observations** of the actual conditions of the water sources and their origins will be conducted to readily identify possible sources of water pollution.
3. In our **questionnaire** we will ask household members about their satisfaction with water quantity and quality (incl. season variations), utilization and frequency. Results will be plotted into a percentage table. The results from the questionnaire will help us select heads of household for semi-structure interviews to understand in-depth reasons for various levels of reported satisfaction with the water supply in order to determine whether there is a link between water quality and land scarcity.
4. **Chemical analyses** will include water temperature, pH, nitrate, phosphorus, salinity (EC), microbial level measurements (incl. Faecal coliform count (FCC) and total coliform count (TCC) using Paqualab system), total suspended solids (TSS), biochemical oxygen demands (BOD) in the water taken from the source, water storage(s) near the house (if one or more exists) and other sources, if available. Multiple water samples will be performed in order to obtain an accurate values.

SAMPLING STRATEGIES

The sampling strategy that we will employ for our questionnaires is systematic sampling, and for our interviews, we will use purpose sampling. We will administer the questionnaire to atleast half of the households (~24), selected by going to every-other chamber in the longhouse because each of these translates to one family unit. From here we will select informants for our SSI interviews based on profiles indicated through the questionnaire. We have three main subjects for interviews with heads of household: land management strategies, diversification of income, and water quality assessment. Our natural science sampling strategies will include taking multiple samples from a given source in order to ensure accuracy.

COLLABORATION WITH COUNTERPARTS

We plan to use our counterpart's linguistic abilities and cultural capital to help build rapport with the community. Our counterparts also have experience with soil and water sampling techniques, which will be helpful. Lastly, one member of the Malaysian team has expertise in plantations in the area, which will help us to understand the role of the oil palm plantation in land scarcity. We will also consolidate our questionnaires and integrate our interview strategies and execution.

REFERENCES

Aiken, S.R. & Leigh, C.H. 2011, "In the way of development: Indigenous land-rights issues in Malaysia", *Geographical Review,* vol. 101, no. 4, pp. 471-496.

Al-Zubaidy, S. & Rigit, A. 1997, "Performance investigation of a hydroelectric power station at Batang Ai-Sarawak", *International Journal of Energy Research,* vol. 21, no. 15, pp. 1405-1412.

Ambalam, K. 2014, "Food Sovereignty in the Era of Land Grabbing: An African Perspective", *Journal of Sustainable Development,* vol. 7, no. 2, pp. p121.

Banerjee, N. & Bojsen, K.P. 2005, "Negotiability and limits to negotiability—land use strategies in the SALCRA Batang Ai Resettlement Scheme, Sarawak, East Malaysia", *Geografisk Tidsskrift-Danish Journal of Geography,* vol. 105, no. 1, pp. 17-28.

Bruun, T.B., Egay, K., Mertz, O. & Magid, J. 2013, "Improved sampling methods document decline in soil organic carbon stocks and concentrations of permanganate oxidizable carbon after transition from swidden to oil palm cultivation", *Agriculture, Ecosystems & Environment,* vol. 178, pp. 127-134.

Cramb, R. 2013, "Palmed off: incentive problems with joint-venture schemes for oil palm development on customary land", *World Development,* vol. 43, pp. 84-99.

Hall, D. 2011, "Land grabs, land control, and Southeast Asian crop booms", *Journal of Peasant Studies*, vol. 38, no. 4, pp. 837-857.

Horowitz, L.S. 1998, "Integrating indigenous resource management with wildlife conservation: a case study of Batang Ai National Park, Sarawak, Malaysia", *Human Ecology*, vol. 26, no. 3, pp. 371-403.

Ichikawa, M. 2007, "Degradation and loss of forest land and land-use changes in Sarawak, East Malaysia: a study of native land use by the Iban", *Ecological Research*,vol. 22, no. 3, pp. 403-413.

Khoo, B.T. 2010, "Social movements and the crisis of neoliberalism in Malaysia and Thailand", .

Liew, K. & Lepesteur, M. 2006, "Performance of the rural health improvement scheme in reducing the incidence of waterborne diseases in rural Sarawak, Malaysia",*Transactions of the Royal Society of Tropical Medicine and Hygiene*, vol. 100, no. 10, pp. 949-955.

Lund, C. 2014, "Of what is this a case? Analytical movements in qualitative social science research", *Human organization*, vol. 73, no. 3, pp. 224-234.

Majid Cooke, F. 2002, "Vulnerability, control and oil palm in Sarawak: globalization and a new era?", *Development and Change*, vol. 33, no. 2, pp. 189-211.

McCarthy, J.F., Vel, J.A. & Afiff, S. 2012, "Trajectories of land acquisition and enclosure: development schemes, virtual land grabs, and green acquisitions in Indonesia's Outer Islands", *Journal of Peasant Studies*, vol. 39, no. 2, pp. 521-549.

McMichael, P. 2011, *Development and social change: A global perspective*, Sage Publications.

Mikkelsen, B. 2005, *Methods for development work and research: A new guide for practitioners*. 2nd Edition. New Delhi, Thousand oaks, London: Sage Publications.

Ngidang, D. 1995, "The politics of development in longhouse communities in Sarawak, East Malaysia", *Development in Practice*, vol. 5, no. 4, pp. 305-312.

Norton, B.," Even Headhunters Have to Keep Ahead. Iban Elder and Laptop, Iban Tribe, Former Headhunters, Rainforest Skrang River, Sarawak, Borneo, Malaysia.",*Boyd Norton Wilderness Photography*. Accessed on: Web. 13 Feb. 2015. http://boydnorton.photoshelter.com/image/I0000Ne2dBkAT3uo

Oosterveer, P., Adjei, B.E., Vellema, S. & Slingerland, M. 2014, "Global sustainability standards and food security: Exploring unintended effects of voluntary certification in palm oil", *Global Food Security,* vol. 3, no. 3, pp. 220-226.

Pletcher, J. 1991, "Regulation with growth: the political economy of palm oil in Malaysia", *World Development,* vol. 19, no. 6, pp. 623-636.

Sadeghi, O., Fazeli, A., Bakhtiarinejad, M., Sidik, C. & Azwadi, N. 2015, "An Overview of Waste-to-Energy in Malaysia", *Applied Mechanics and Materials*Trans Tech Publ, pp. 792.

Scoones, I. 2009, "Livelihoods perspectives and rural development", *The Journal of Peasant Studies,* vol. 36, no. 1, pp. 171-196.

Sovacool, B.K. & Bulan, L. 2012, "Energy security and hydropower development in Malaysia: The drivers and challenges facing the Sarawak Corridor of Renewable Energy (SCORE)", *Renewable Energy,* vol. 40, no. 1, pp. 113-129.

Tanaka, S., Tachibe, S., Wasli, M.E.B., Lat, J., Seman, L., Kendawang, J.J., Iwasaki, K. & Sakurai, K. 2009, "Soil characteristics under cash crop farming in upland areas of Sarawak, Malaysia", *Agriculture, Ecosystems & Environment,* vol. 129, no. 1, pp. 293-301.

Torrez, F. 2011, "La Via Campesina: Peasant-led agrarian reform and food sovereignty", *Development,* vol. 54, no. 1, pp. 49-54.

APPENDICIES

Appendix A: Data Matrix

The data matrix gives an overview of issues we wish to investigate, data we need to collect and methods to collect these data. The data matrix will be used as a guide to which issues we can investigate and which methods we can apply in relation to our research question.

Objective	Research question	Sub question	Data required	Methods/Activities	Equipment
To investigate the livelihood strategies that the residents of Nanga Jela assume/adopt in the face of land scarcity.	**1. What characterizes the livelihoods of the residents in Nanga Jela**	a. What are the demographic characteristics of the households in Nanga Jela?	- Age - Wealth -Land use - Land size - Health status - Sources of income/livelihood activities -Division of labour within household	- Questionnaire -GPS	-Paper -Writing utensil -Translator - GPS
		b. How do the residents of Nanga Jela manage their land?	-Observation & field notes -Accounts from farmers/heads of household -Maps -Overview testament from headman	- Participatory observation - SSI interviews w/ heads of household practicing different forms of livelihood and w/ head man - PRA mapping -Transect map - GPS	-Tape recorder -Notebook -Paper and markers for mapping -Translator - GPS
		c. What are the off farm activities?	- Accounts from heads of household -Account from headman	- Questionnaire - SSI interviews w/ heads of household & headman - GPS	-Paper -Writing utensil -Translator - Tape recorder - GPS
		d. What is the division of labour in on-farm activities?	- Observation of division in farming activities & field notes -Accounts from heads of household	- Participatory Observation - Questionnaire -SSI interviews w/ heads of household	-Notebook -Writing utensil -Tape recorder -Paper -Translator

					-Translator
	2. What have been the responses to land scarcity among the Nanga Jela people?	a. Has marginal land been cultivated due to land scarcity? (i.e. change in cropping patterns)	-Map of community lands -Accounts of headman and heads of household	-Transect map -Questionnaire - SSI interviews w/ headman and heads of household who farm on marginal lands - PRA mapping	-Paper (incl. large for mapping) -Coloured markers & writing utensil -Tape recorder -Camera -Translator
		b. Has the oil palm plantation had an influence on socio-economic status?	-Demographic data indicating who grows oil palm and who doesn't -Comparative accounts of people growing oil palm and people not growing oil palm	- Questionnaire - SSI interviews w/ heads of household involved in oil palm cultivation and those not involved - Crop ranking exercise	-Paper (incl. large for mapping) -Writing utensils - Tape recorder -Translator -Markers for crop ranking (candy?)
		c. Are certain crops leading to more success or better reputation among community members?	-Indicators of differences in wealth among households -Perspectives on social perceptions of crops -Field notes	- Questionnaire - Crop ranking exercise - Participatory observation, -Transect map	-Paper -Writing utensil -Notebook -Camera -Translator -Markers for crop ranking exercise (candy?)
		d. Is land scarcity leading to diversification of	-Accounts from heads of household (selected based on reported	- Questionnaire - SSI interviews w/ selected heads of	-Paper -Writing utensil

		income away from agriculture?	diversification of income strategies) -Account of the headman	household that reported diversification of income strategies & w/ headman	-Tape recorder -Translator
	3. Has land scarcity led to natural resource degradation?	a. What is the quality of the soil under conditions of land scarcity?	-Testing carbon levels in soil	-Soil sampling -GPS	-Camera -Bags -Place to dry the soil -GPS
		b. Is population growth leading to resource degradation (in terms of access to quality water etc?)	- Accounts of heads of household with varying levels of satisfaction w/ water quality - Field notes about water use and sources -Chemical analysis of water	-Questionnaire - SSI interviews with selected heads of household - Participatory observation - Water sampling - GPS	-Paper -Writing utensil -Tape recorder -Translator -GPS

Appendix B: Time Schedule

Appendix C: Questionnaire

Nanga Jela, Malaysia

Date:

Household:

GPS

Activities	Day 1 27/02/2015			Day 2 28/02/2015			Day 3 01/03/2015			Day 4 02/03/2015			Day 5 03/03/2015			Day 6 04/04/2015			Day 7 05/03/2015			Day 8 06/03/2015			Day 9 07/03/2015			Day 10 08/03/2015			Day 11 09/03/2015			Day 12 10/03/2015		
	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E
Group Discussion with Malaysian Counterpart	x	x	x																																	
Departure and arrival in				x																																
Primary introduction with Headman					x																															
Primary introduction with						x																														
Social Event																																				
Assess the need for modification of research question / Gather initial data							x	x	x	x	x	x																								
Presentation of modified synopsis										x																										
Presentation of results to village & local officials											x																									
Field work / Observations																																				
Indepth / Semi Structured interview with the chief													x																							
Questionnaire														x	x		x																			
Group meeting and discussion of primary data														x		x		x																		
Transcet walk with GPS															x																					
Key informant group interview (elders)																x		x																		
Group meeting and discussion of data																			x																	
PRA: Mapping																				x																
PRA: Ranking																							x													
SSI with households																				x	x		x	x						x						
Group meeting and discussion of data																						x														
SSI with farmers																								x	x											
Soil Sampling																									x	x										
Group meeting and discussion of data																											x									
Water sampling																												x								
Gather information and prepare for presentation																														x	x	x				
Presentation at Batang Ai																																	x			
Depart village																																			x	

Location:

Section A: Demographic of Respondent

1. Gender: Male ☐ Female ☐
2. Age: _____years
3. Ethnicity: _____
4. Role in Family: _____
5. Main Occupation: _____
6. Total members of household: _____
7. Numbers of years living in Nanga Jela: _____
8. Highest level of Education: _____

Section B: Land

9. Do you own any land? **Yes** **No**
10. How much land do you have in total?

    _____

11. How did you get the land?

    Bought

    Inherited

    Other Specify: _____

12. Is there an equal distribution of land? **Yes** **No**

13. What do you use your land for? Do you lease it out? Do you grow crops?

    _____

14. List the important cash crop you grow (Crops that generate income)

    a. _____ c. _____

b. _____ d. _____

15. What types of crops do you grow?

a. _____ c. _____

b. _____ d. _____

16. Do you still grow these crops? **Yes** **No**

17. If No, Why did you change to the current crops?

_____

_____

18. Do you have any livestock?

_____

_____

19. Where is your land located?

a. Near the river c. Near the plantation

b. Slope of a hill d. Other Specify: _____

20. Do you rent land from others?

_____

_____

21. Who is responsible for:
    a. Harvesting _____
    b. Getting water _____
    c. Planting crops _____
    d. Tending to the crops _____

22. What are your off farm activities?

_____

_____

Section C: SALCRA

23. Do you let SALCRA develop on your land? **Yes** **No**
24. Why or Why not have you agreed to SALCRA developing your land?

_____

_____

25. Have you been restricted to developing/using this land?

_____

_____

26. When did you start growing this oil palm?

_____

_____

27. Have you received any form of agricultural input from SALCRA? **Yes** **No**

28. If yes, then what types of input?

_____

_____

29. Do you use fertilizer or pesticide in your crop field? **Yes** **No**
30. Do you use any organic fertilizer or green manure in your field? **Yes** **No**
31. Has soil nutrient been depleted by oil palm plantation? **Yes** **No**
32. Have you received any financial support from SALCRA? **Yes** **No**
33. On average how much money do you get per year?
    a. Monthly_____ b. 3 months _____
    Yearly _____
34. Does this dividend from SALCRA support your family or do you need other form of income?

    Yes **No**

Section D: Income

35. To what extent going out and having jobs outside normal?

_____

_____

36. Is it more attractive?

    Yes **No**

37. What are your other sources of income?

_____

_____

Section E: Water Utilization

Preferable performed on the household member who is the most responsible for fetching water from source(s) to the household.

4. Gender : Male Female
5. Age : _____years
6. Role in Family : _____
7. What types of water supply do you have access to?

Access to type of water

Access to water supply	Gravity Feed	Mechanical Pump	Rain water tank	Dug well
Still have water				
Had water				
Never had water				

8. Are you satisfied with the quantity and quality of the water, by type?

Satisfaction of type of water supply

Usage and satisfaction	Gravity Feed	Mechanical Pump	Rain water tank	Dug well
Satisfaction with quantity				
Always				
Formerly				

Never				
Satisfaction with quality:				
Always				
Formerly				
Never				

9. What various domestic activities do you use the water for by type and frequency.

Frequency of water usage for various domestic activities

Utilization & frequency	Gravity Feed	Mechanical Pump	Rain water tank	Dug well
Drinking:				
Always				
Often				
Never				
Dishes:				
Always				
Often				
Never				
Laundry:				
Always				
Often				
Never				
Bathing:				
Always				
Often				
Never				
Cooking:				
Always				
Often				
Never				
Farming:				
Always				
Often				
Never				

Flushing latrines:				
Always				
Often				
Never				

Appendix D: Guide for SSI for the head man in Nanga Jela

Date:

GPS location:

Name of Headman: Endawie Anak Janting

***Presentation of interviewer, explanation of project and the objective of the interview, and how it will be carried out.**

1. **General questions for the chief**
    a. How old are you?
    b. How long have you been the headman of Nanga Jela?
    c. How did you become the head man (by selection or?)

2. **Description of Nanga Jela**
    a. How many households in Nanga Jela?
    b. Do the children go to school? (If yes, where?)
    c. Do you have a health center?

3. **Description of land use**
    a. Does Nanga Jela have any approaches for using the land?

b. How do the residents manage their land?
c. What have been the major land changes in the past few decades?
d. Is there land scarcity? What are the main causes for land scarcity?
e. What is your general thoughts on land scarcity and access to resources?
f. Who is does the farming? (Only residents or perhaps the immigrants from Indonesia?)
g. How important is farming for the people?
h. How has farming evolved over the years?
i. Do the village/farmers receive subsidies/help from the government?
j. How do you cope with an increasing population and limited access to land?
k. How is the land distributed between the households? (Is it equal?)
l. What are the off farm activities?
m. What is your opinion on income diversification? Has it benefited the community or not?
n. Have people migrated from Naga Jela? Why are they migrating? Has it benefitted the community? Is land scarcity leading to diversification of income?

4. Oil palm farming

a. Who is involved in the oil palm plantation?
b. Can people choose not to be a part of the oil palm plantation and engage in other kinds of land use?
c. In which ways are Nanga Jela affected by SALCRA?
d. Who negotiates with SALCRA for the oil palm scheme?
e. How does Nanga Jela benefit from cooperating with SALCRA?
f. When is the completion/end of contract of the oil palm scheme?
g. Has the oil palm scheme had an influence on socio-economic status?

**Need to ask the chief to identify key informants of the longhouse

Appendix E: Guide for semi-structured interview with head of households

Date:

GPS Location:

Name: **Sex:**

***This interview guide can be modified depending on the context and few questions relevant for other interviews (i.e interview with farmers) can be selected.**

****Presentation of interviewer, explanation of project and the objective of the interview, and how it will be carried out.**

General Questions

1. How many household members?

Members	**Age**	**Occupation**	

2. What does your normal day look like?
3. How long have you been farming / fishing for?
4. What are your main crops?
5. What is your main source of income?
    - Oil palm
    - Agricultural farming
    - Off-farm What kind of work:_____ Where:_____

Land

1. How much land do you have in total?
2. Do you rent any land? Why do you rent?
3. How is land distributed? Is there equal distribution of land?
4. Where is your land located?
5. How much land is available for agricultural crop production?
6. What types of crops grow well in your field
7. How much land is available for oil palm plantation?
8. How do you manage your land?
9. What kind of inputs do you use?
    a. Fertilizer: Organic:_____ Chemical:_____
    b. Pesticides What kind: _____
10. What have been the major changes of land use in the past few years?
11. Is there land scarcity/ Do you feel land pressure? What are the main causes for land scarcity?
12. Has marginal land been cultivated due to land scarcity?

Income

1. What are the off farm activities you/ your household members engage? Is there any benefit derived from these off farm activities?
2. Why did you/ your household member choose to engage in these off farm activities?
3. Is land scarcity leading to diversification of income?
4. Are these off farm activities a form of income diversification? What is your opinion on income diversification? Has it benefitted your household?
5. Do your children go to school? Do you pay for their school fees?
6. Have any of your family members move to the city? For what purpose?

SALCRA

1. Has the SALCRA oil palm scheme benefitted you?
2. Is it dangerous to work with oil palm?

3. Has the oil palm plantation had an influence on socio-economic status
4. Does the income from SALCRA even fulfil/satisfy the needs of "unavoidable expenses" and possibility to expand "modernize"?
5. What is your opinion with SALCRA?
6. Do Indonesian migrants (arranged by SALCRA) ever work on land belonging to longhouses? What is your opinion of these foreign labour?

Appendix F: Guide for PRA ranking exercise

* Presentation of the exercise with an explanation of why and how the exercise will be carried out.

General information on the participants:

Name: Age: Years living in village:

Years of farming experience:

Purpose: To get an understanding of what the important crops are in Nanga Jela based on the types of crops grown in various lands in different parts of Nanga Jela.

This exercise will give us an understanding of how various crops can be important to farmers based on where their farming land is located.

Participants: Two groups of 4 – 5 men along with 4 – 5 women who work in agricultural farming.

Expected results: A schematic presentation of the major sources of crops and income and their importance.

Criteria	Crops grown								
	Rice		Vegetables			Fruits		Cash crops	
	Hill rice	Swamp rice	Yam bean	Sweet potato	Chayote	Rambutan	Jackfruit	Oil palm	Pepper
Labour requirements									
Income cash									
More yield									
Consumed most									
Moe durable storage									
Market value									

Problem	Problem ranking on different constraints from respondents					Total score	Ranking
	HH1	HH2	HH3	HH4	HH5		
Drought							
Flooding							
Cost of inputs							
Agricultural inputs							
Suitable land							
Labor shortage							
Electricity							
Transportation							
Marketing channel of products							
5=Most important, 1= least important							

Appendix G: Guide for PRA mapping exercise

* Presentation of the exercise with an explanation of why and how the exercise will be carried out.

Guidelines for the conductor of the session:

- You want to stimulate participation hence you should limit directing the session with a lot of information.
- Only one person should be drawing in order to keep it coherent however he / she only draw when there is consensus among the group members.
- While giving direction make it as clear as possible, so that it is clear for everybody to understand.

General information on the participants:

Name: Age: Years in the village:

Any special status in the village, e.g. member of a committee, elderly etc.

Purpose: To get an overall understanding of events that has affected livelihood, identify what is going on in the village.

Participants: A group of 5– 6 longhouse members comprised of elders and youths.

Expected results: A representation of major events that has occurred in Nanga Jela and their importance of how it has changed their lifestyles.

Question guideline for the mapping process:

a. Please draw you long house on the center of the paper.
a. What land do the villagers own?
b. Where is your field? What is grown on these fields?
c. What land does the government own?
d. Where is the oil palm?
e. When was the road built?
f. When did the village first get electricity?