To Farm or not to Farm?

Diversification of resources and livelihood strategies in Marop Atas

Interdisciplinary Land Use and Natural Resource Management (ILUNRM) 2020

Authors:

Aleksandra Czuchaj, Federico D'Ascanio, Polina Blinova, Sebastian Lukman

Supervised by:

Torben Birch-Thomsen & Kristine Juul & Frauke Tom H. Mennes

Abstract

A livelihood strategy is an organized set of lifestyle choices and activities influenced by human, natural, economic, social and physical resources undertaken by households to provide a means of living. In the village of Marop Atas in Malaysian Borneo, we conducted a research to determine which are the resources utilized by villagers affecting their livelihood strategies. A combination of both natural and social methods helped us answer our research question. The most fundamental strategies we identified in the village are farming and not farming activities which have a direct effect on the environment. Most of the villagers also apply to Federal schemes, which are provided by the government of Sarawak and implemented as rural development projects to alleviate poverty.

Keywords: Livelihood Strategies, Resources, Diversification of activities, Governmental Schemes, Environment, Rural Development

Acknowledgments

This report is the product of the course “Interdisciplinary Land Use and Natural Resource Management (ILUNRM)” and the content is based on data collected during a study in MaropAtas, Sarawak, Malaysian Borneo, between 26th of February to 8th of March.

We wish to thank all the people who helped make the SLUSE an amazing experience for all of us. Firstly, we would like to thank the University of Copenhagen and our supervisors Dr. Torben Birch-Thomsen, Dr. Kristine Juul and Frauke Tom H Mennes for their constant support, guidance and feedback before, during and after the field trip.

Furthermore, we would like to thank the coordinators and professors of UNIMAS Dr. Haslina Hashim, Dr. Tay Meng Guan and other coordinators and professors for their generous support throughout the research.

We want to thank our UNIMAS counterparts Farah, Abigail, Melissa and Razzak for being collaborative partners to work with and for sharing their knowledge with us. We would also like to thank our interpreters Leo and Niru, for their patience and great help in group discussions and for defining interaction with the community regarding fundamental topics and keywords, relevant for our research.

Finally, we would like to express our sincere gratitude to the longhouse community of Marop Atas, especially the headman Langkop ak Sedom, for their hospitality and willingness to participate in our fieldwork research. Last but not least, a special thank you to auntie Gelok anak Sedo for giving us the opportunity to stay in her house, who kindly let us use her kitchen, washing machine and generously cooked for us for the entire period.

To all, a big thank you, *terima kasih*.

List of Figures

List of Tables

Table of Contents

List of abbreviations

DOA - Department of Agriculture

FAO - Food and Agriculture Organization of the United Nations

FELCRA - Federal Land Consolidation and Rehabilitation Authority

FRA - Forest Resource Assessment

GFS - Gravity Feed System

GPS - Global Positioning System

ILUNRM - Interdisciplinary Land Use and Natural Resource Management

JVC - Joint Venture Concept

KU - Københavns Universitet

MRP – Minor rural project

NCR - Native Customary Right

NTFP - Non-Timber Forest Product

RH - Rumah (Iban 'for house')

RISDA - Rubber Industry Smallholders Development Authority

MYR - Malaysian Ringgit

RTP - Rural transformation project

SALCRA - Sarawak Land Consolidation And Rehabilitation Authority

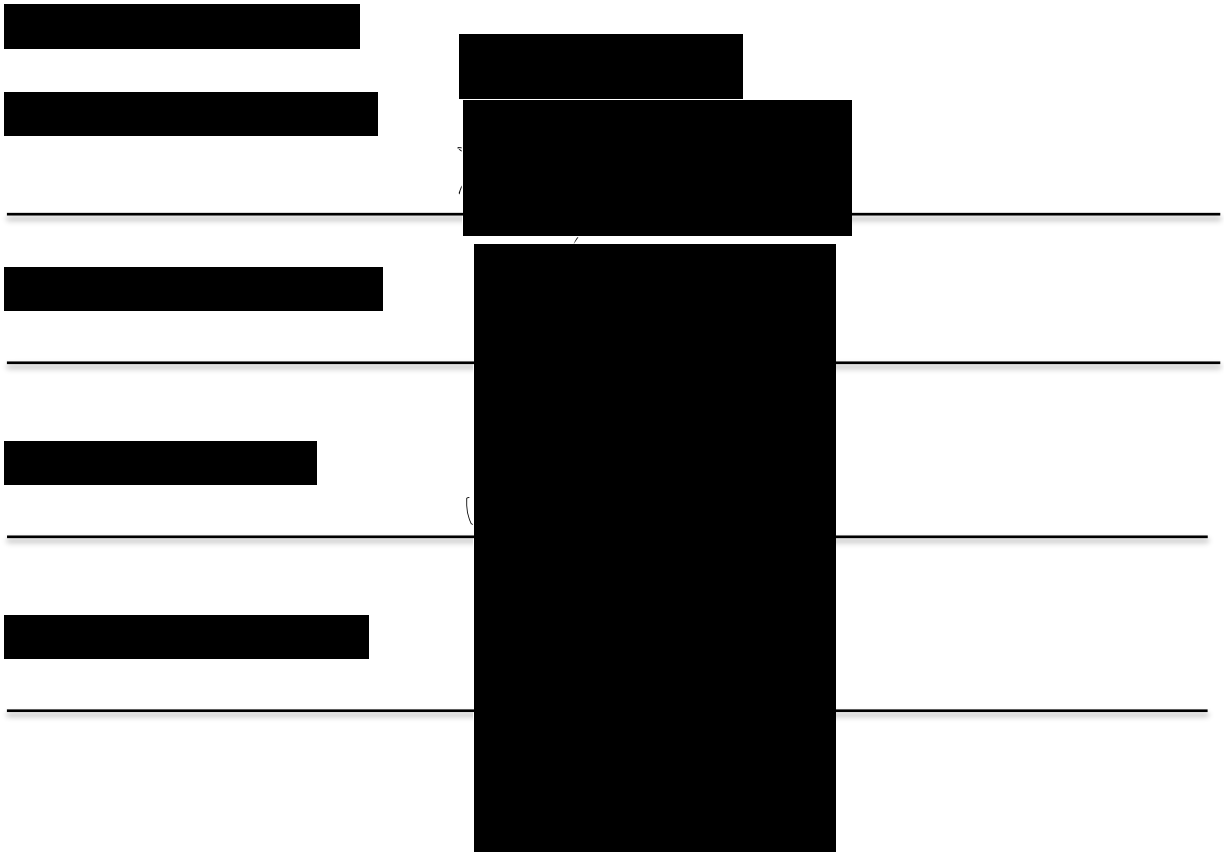
SLF - Sustainable Livelihood Framework

SSI - Semi Structured Interview

UNIMAS - University of Malaysia Sarawak

Table of Authors

Section	Main authors	Contributing authors
Acknowledgments	**All**	
Abstract	**All**	
Introduction	**Aleks, Federico**	**Polina, Sebastian**
Methodology		
Social Science	**All**	
Natural Science	**All**	
Findings and results	**All**	
Discussions and Conclusions	**Aleks, Polina**	**Federico, Sebastian**
Challenges	**Polina, Federico**	**Aleks, Sebastian**



1. Introduction

Sarawak is located in the north-western part of the island Borneo and is bounded by the sultanate of Brunei and Sabah (Malaysia) on the north and by the Indonesian part of Borneo (Kalimantan) on the east and south. The capital of the region is Kuching. Sarawak is the largest of 13 states in Malaysia, covering an area of approximately 124 thousand square kilometers (Encyclopaedia Britannica, 2020). Although Sarawak is the richest in natural resources and considered the richest state by GDP in Malaysia, it is the state with the poorest people (Furuoka, 2014). According to Philip Alston (2019), UN special rapporteur on extreme poverty and human rights, "the percentage of low-income earners in Sarawak is higher than the national-level figure". This is verified by 15.5% of households in Sarawak have a total family monthly income of less than MYR 2,000, whereas at the national-level, 8.8% of households in Malaysia have a monthly income of less than MYR 2,000 in 2019 (Alston, 2019). The population of Sarawak is around 2.81 mil. inhabitants with an urban population constituting approximately 54% of people, while the rural population is around 46% (DOA, 2020). The most important driver for the Sarawak economy is the exports of primary commodities, such as liquefied natural gas (LNG) and crude petroleum, however the majority of Sarawak economy is based on agricultural production (Bujang, 2019). In the past decades, there has been increasing deforestation of Borneo's tropical and primary rainforests, leaving Sarawak as the last frontier of agricultural expansion in Malaysia. The alarming process has been met with worldwide contestation and significant public indignation due to negative environmental consequences of this deforestation. Between 2000 and 2017, 6.04 million hectares of old-growth forest were lost in Borneo, a decline of 14% (Forestnews, 2019). In which, Sarawak lost 2.29 million hectares of forest and gained 1.85 million hectares of plantations. The demand has been invigorated by the hot, wet and humid climate, ideally suited for growing several different cash crops, in particular, oil palm, rubber, pepper, cocoa and timber that deforested land has been mostly devoted too. Currently, Malaysia remains one of the world-largest producers of these commodities. (FAO, 2020).

The national government has made large investments in infrastructure and agriculture since to raise living standards of the rural population of Sarawak. These actions are greatly in accordance with the definition of the rural development concept proposed by the UN: 'Rural development can be understood as the unfolding of capitalism in rural areas and as that package of policy and project interventions that aim to foster socio-economic change and human improvement in rural areas. Education, entrepreneurship, environment, physical and social

infrastructure all are assets that play a significant role in developing rural regions (UN Report, 2015).' National and state government elites in Malaysia have created development narratives aimed at lifting people out of poverty, fighting backwardness of pre-existing agricultural practices and bringing modernity to villagers in Sarawak. However, there is no consensual agreement regarding both paradigms and policies implemented in order to achieve the above-mentioned goals. Furthermore, the expansion of the federation powers in recent years has caused tensions and complexities of state-federal relations, such as authority division and revenue sources.

The largest ethnic group (600 000 people) that inhabit Sarawak is the Sea Dayak, also known as the Iban tribe. They are an indigenous community with the majority of people being Christians. In which, they live in groups in the Iban longhouses typically located near the waterfront (Anggo and Laja, 2018).

Each longhouse is formed by multiple households, each known as *bilek*. According to Freeman (1970), "bilek is the word which the Iban use to refer to the family group which owns and occupies one apartment of a longhouse". In turn, each settlement has one or several headmen, *Tuai rumah*, who are responsible for maintaining safety and security of the community (Anggo and Laja, 2018). Traditionally, the Iban people practiced swidden agriculture, which consist of a rotation of slashing and burning forest land, crop cultivation and fallow periods. However, circumstances have changed over years and so has land-use and diversification of livelihood strategies, with off-farm employment of an increasing importance for the Iban.

In one of such villages in Sarawak, our fieldwork was held between 26th February to 8th March 2020.

1.1 Area of study

The fieldwork was carried out in the village of Marop Atas in Sarawak, Borneo, Malaysia. It is positioned on the coordinates N 01°07'04" E 111°38'20" and is located in the district of Lubok Antu, Sri Aman division (Figure 1).

The village of Marop Atas consists of two longhouses and located very close to the town of Engkilili. During our study, we stayed in the upper hill longhouse, in the household number 10, but our research took place in the whole village.

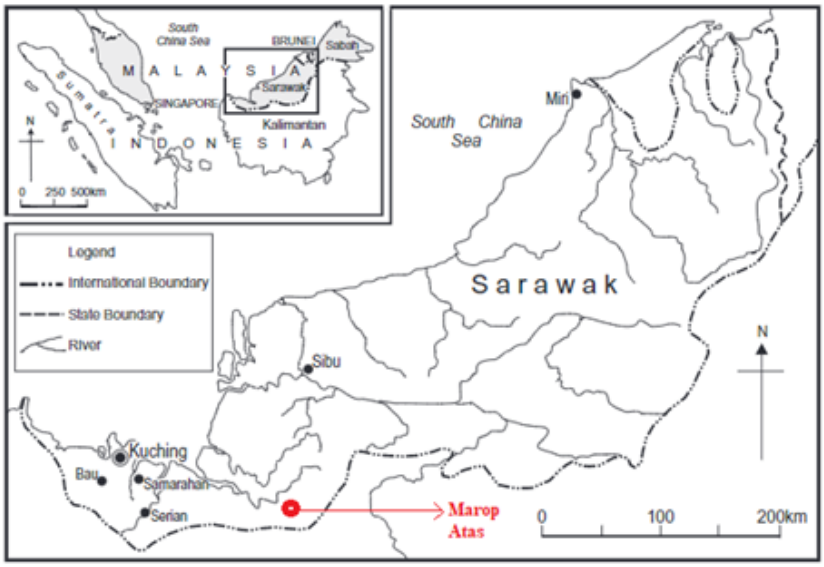


Figure 1: Location of Marop Atas within Sarawak and Malaysia (Morrison et al. 2006)

Figure 2: Geographical location of the two longhouses (source: Authors, Google Earth)

1.2 Research Objectives, Questions and Conceptual frameworks

Aforementioned arguments and current state-of-art found in Marop Atas have led us to decide upon key research objectives. However, it must be reflected that our directions and ideas regarding the study have been changing several times due to numerous new, broad inspirations, as well as our unbridled curiosity about villagers' way of life. As a first objective, we have investigated livelihood strategies present among people in the longhouse. Throughout the report when we relate to livelihood strategies, we understand it as the definition of: 'LS comprises the capabilities, assets (including both material and social resources) and activities required for a means of living'. Furthermore, we want to determine what are the factors affecting the diversification of livelihood strategies. As a point of departure, we will apply some parts of Sustainable Livelihoods Framework (SLF). The SLF is based on understanding people's access to assets that typically include natural, human, social, physical and financial (Reed, 2013). Other forms of capital, such as information, cultural/traditional and institutional, will also be used in our analysis. Our overall objective is to learn how people manage their resources, assets and entitlements that together, give them the capabilities to pursue effective livelihood strategies. Results will then be analysed in relation to the context of Marop Atas, its climate, demography, history, rural development initiatives and institutional/social processes (e.g., organisational arrangements and land tenure). Moreover, we want to explore what is the impact of villagers activities on the surrounding environment (natural assets).

Therefore, we formulated the following research questions:

What are the livelihood strategies present in Marop Atas and which factors are affecting their diversification?

Subquestion:

How villagers manage assets and how their activities affect the environment in the surrounding area?

The next section covers methods that were conducted during the field research in order to best answer our objectives and questions.

2. Methodology

A set of interdisciplinary methods from natural and social science fields that were conducted during the research process in an attempt to gather quantitative and qualitative data.

2.1 Social science methods

2.1.1 Interview with the headman

We have decided that having an interview with the headman would be our first step towards our further research. As long as the headman represents the whole village and its community, we assumed that he may give us an overall picture of the Marop Atas village.

We have prepared a set of questions related to the following topics:

- The role of the headman and his responsibilities
- Farming and non-farming activities in the village
- Development projects in the village
- Government subsidies

It was the first method we used, that is why we had some difficulties. Mostly they were related to our roles as researchers and the distribution of tasks among us. However, after the interview we have learnt some key lessons on how to work as a team and how to respect one another including the locals. In order to avoid further issues, we had decided on everyone's role and some basic patterns of behaviour when we are among the villagers.

2.1.2 Transect walks

At the very beginning of the research, we had two days of walking tours with guides in the area to observe and get familiar with all zones important for villagers (Figure 4). During those tours, we asked questions to identify problems that are affecting villagers' life and daily activities. Based on the transect walks, we realized that some methods needed to be changed, such as testing of soil in different locations.

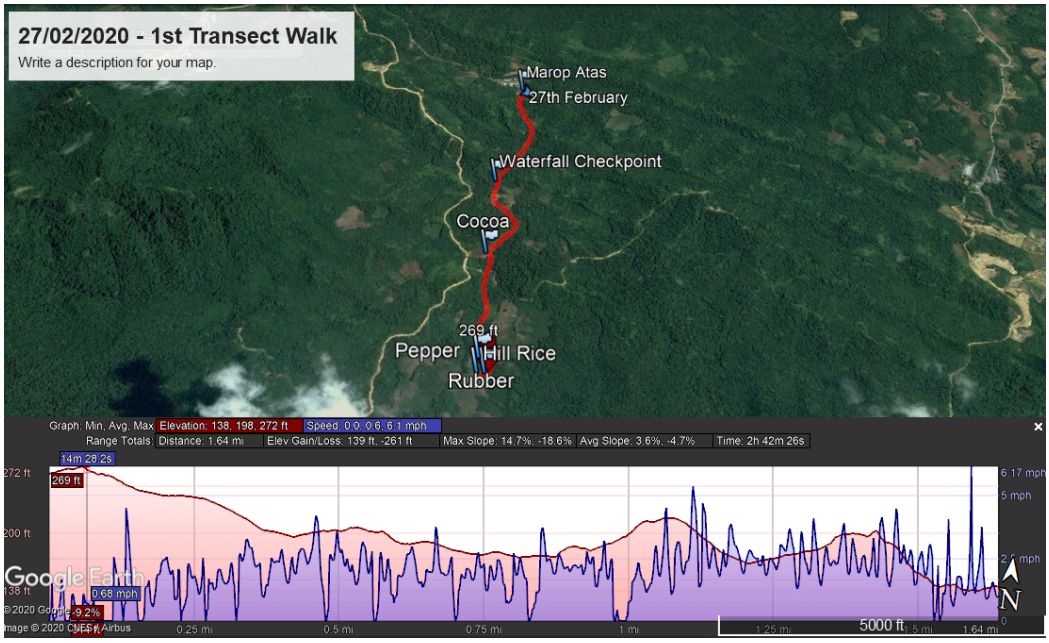


Figure 4: First transect walk (source: Google Earth, Garmin GPS Device)

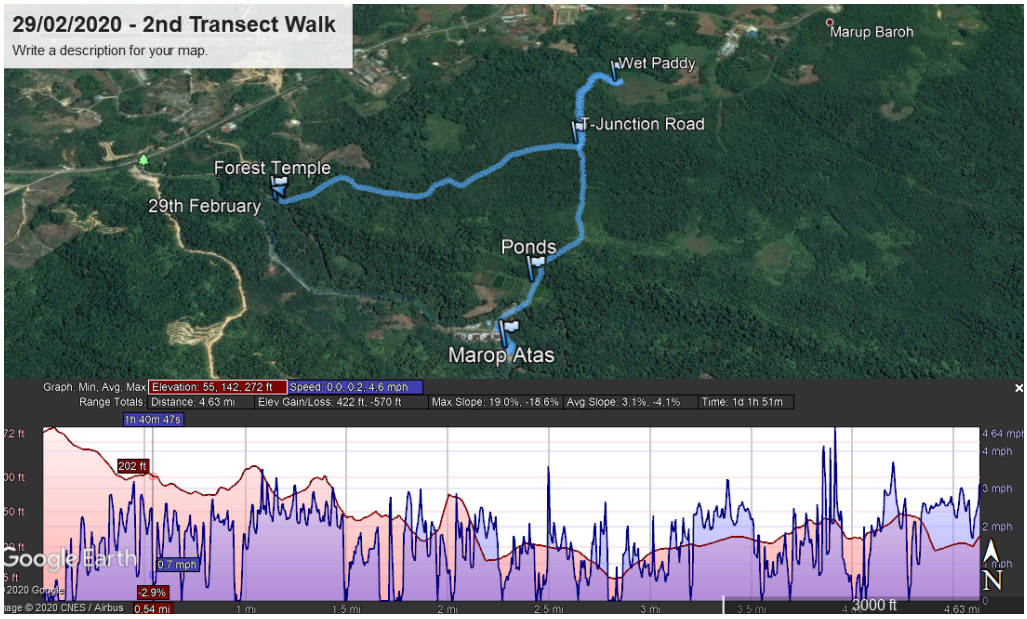


Figure 5: Second transect walk (source: Google Earth, Garmin GPS Device)

2.1.3 Questionnaires

One of the primary parts of our research was a questionnaire survey. We decided to apply this method to obtain an overview of daily activities of villagers in Marop Atas, their perceptions and problems. It was definitely a tool that helped us pave a further direction for efficient use of other methods. We conducted a questionnaire with 29 individuals, constituting 28 pintus (doors to separate households) out of 36 that are under headman Langkop ak Sedo. As a result of

miscommunication between us and our counterparts we interviewed two members of the same household – wife and husband.

Unfortunately, it was not possible to do the survey with all pintus as their residents were absent during our stay in the longhouse mostly due to work commitments. We aimed to talk to the head of each household, which is known in Iban as tuai bilek – a person that holds a primary responsibility in the matters of household resource use and decision making process. In our case these positions were mostly appointed by senior members, inherited or resulting from the longest working experience. We considered that they would have the best overview about the household and in total managed to talk to 24 of them. Other 4 individuals were interviewed due to absence of the head of their households.

Our questionnaire was divided into 9 sections with open and closed answers. Each section is devoted to different themes.

After conducting a pilot questionnaire we realized that some questions are too complex and it takes an unexpectedly longer time to finish one survey. Hence, we decided to make some changes and shorten the sections. We also encountered some major problems with the definition of the household and its perception by villagers. Some of them were not sure about the number of household members and counted as members their children who for years no longer live in Marop Atas. Then, we also noticed that they do not know what is the number of their pintu in the longhouse which caused troubles in our own numeration system of households, as we didn't manage to write down all names of our participants. Having names of our participants could have been useful when we were in the village and now, while writing our report. Another struggle was defining remittances. Some of the participants considered that if for example, husband works 5 weekdays in the city and comes back home for the weekend, the money he brings back are remittances, but other participants did not. Last challenge worth mentioning is that some of the households were not sure if they take part in any governmental scheme, because most projects in the longhouse are carried out collectively and not necessarily on the individual level.

2.1.4 Focus group

After finalizing our questionnaires, we discovered that a certain number of households had members who earned their main source of income from non-farming activities. Therefore, we decided to conduct one focus group discussion, consisting of four males that were selected based on their answers in questionnaires, in order to find out reasons for their off-farm employment.

We had three main underlying aims for applying this particular method. First of all, we wanted to understand what were the factors that pushed participants to focus on non-farming activities. We asked the group to brainstorm on these drivers and then we wrote them down on individual notes. In the last step, they were able to rank their reasons behind switching to non-farm occupations from the most important to the least relevant. Secondly, we hoped to examine what were the effects of a change on their life situation, regarding income, living conditions, social relations and status in the longhouse. And thirdly, we wanted to find out how they, as parents, see the future of their children.

Individuals professions that showed up include Joice who is a janitor in Engkilili school, Oswald who is a security guard, Bruno who is a teacher of science and basic education in Sri Aman and Rakri who is a construction worker, currently building a highway passing nearby Marop Atas.

Our participants turned out to be not equally talkative. The situation became focussed on answering our questions instead of solid discussions amongst ourselves. An observation concerning the group was that two of the participants played leading roles in the discussion, perhaps this was due to having higher educational backgrounds and confidence as well as some understanding of English. Sometimes they even tried to explain things to us directly in English, while the two others were quieter and less responsive.

Our group discussion resulted in the facilitation of useful information and data, but few things could have been done more to stimulate the enrichment of a more dynamic discussion. Mainly as a result of language barriers, our interpreter Niru turned out to be the person mostly setting the pace of the discussion. An honest viewpoint was that we should have been more active and try to gain more control of the situation. A good idea would have been to prepare more little sticky notes with different themes to put in front of participants from the beginning to provoke them to have deeper discussions with one another. We could also have made them more aware

of the fact that their answers should be presented less on an individual level, and more representative to the whole group of people working with non-farming activities as a main source of income.

2.1.5 Participatory observation

In order to gain a better insight into daily activities of the community in Marop Atas, as well as of their relationships and interactions, a participatory observation was carried out. Throughout the involvement with people in many practices, we had an opportunity to make several relevant observations written in the form of casual notes and reflections by all of our group members on an ongoing basis. The ultimate goal was to use them in the analysis after the field trip. By accompanying farmers to their fields, we could understand what type of way and obstacles they have to overcome to reach their plantations. It was a good opportunity to ask questions on land-use, biodiversity in the area and agricultural management of each crop. Moreover, we witnessed the process of cacao drying and collecting pineapples. We also took part in a challenging expedition with few inhabitants to check the water pipe condition, walking through a deep and dense forest up to the water source. By participation in community celebrations, we learnt about their rituals and experienced an incredible atmosphere of festivity. Undoubtedly, it helped us in better understanding the villagers' cultural environment.

2.1.6 Semi-structured interviews

Our semi-structured interviews were conducted with six different informants, which we selected based on the questionnaire' answers. All six of them are farmers that are practicing different agricultural practices and growing different crops depending on the size of their land, labour availability, market prices and climate variability. The reason we decided to have semi-structured interviews is that farming remains one of the main sources of income amongst the villagers. That is why it is crucial for us to see what farmers grow, how much do they suffer from pests, to what extent they depend on market prices and the effects of climate variabilities. Also, answers received from the informants were used in composing a crop calendar per each crop.

We could have done SSI with more farmers to obtain further data. As for questions, we wish we asked more about oil palm plantations.

2.1.7 DOA Interview

Initially, we were considering interviewing official representatives of some major institutions, aid of which is available in the area. From conducting other methods, we realized that the most common source of subsidies is the Department of Agriculture (DOA). It was important to interview an official representative of the department as one of data triangulation elements and to see the situation from their perspective. During the interview at the local DOA office in Sri Aman we covered the following topics:

- Types of aid and support farmers get from the local DOA office
- What are the objectives of the DOA?
- How does DOA communicate their programmes and schemes to farmers?

Our expectations were based on the assumption that every farmer can receive the required subsidies as long as he fulfills the DOA requirements. Furthermore, we wanted to see how the whole process is organised, where is the initiative coming from and what are the potential challenges.

2.1.8 Community resource mapping

We used this mapping method to get a spatial overview of significant natural resources in the area and usage of these resources. We organised a community mapping with around 6 people that were recommended by the headman as possessing the best knowledge. The participants were asked to draw a map presenting information on land use, crops fields, forest resources, water resources (river, waterfalls, fishponds) and surrounding infrastructure. There was little disagreement among them regarding where to place what on the map. This was a fun exercise and an efficient way of illustrating how villagers organized their land and where natural resources are gathered within the community.

2.2 Natural science methods

2.2.1 Area mapping

To conduct a proper area mapping, we used the GPS device, to get a detailed picture of the area which villagers, for instance, are using for their agricultural production (Figure 4&5). With the GPS device, we recorded different tracks and waypoints important for our research.

Furthermore, we gathered information to determine how far is the distance from the longhouse to agricultural plots, forest and water sources.

Figure 6: The GPS device we used throughout our all fieldwork research: *Garmin Etrex10*

2.2.2 Soil sampling

We conducted soil sampling to determine if the soil was fertile. Our initial plan was to take soil samples in two different areas: the Old Forest and the agricultural production area and then compare the characteristics of those samples. However, after looking at the soil map and transect walks, we realized that there are more soil types where farmers are growing their agricultural crops. Consequently, we decided to conduct soil sampling in five different locations based on the soil types.

"Feel method"

Soil texture was tested in the field by "feel" method to observe which soil textural classes they have in the area. Furthermore, this method was applied to check if the different types of soil match with those that we saw on the soil map of the area given to us before arriving at the village. These measurements provided us with relevant information about the soil and helped us to understand if soil characteristics are affecting agricultural strategies of the villagers.

pH level

This method was used to determine if the soil in the area is acid, alkaline or neutral. We took 20 small centrifuge tubes for the measurements into the field and each of them was filled with 20 ml of water, then we added 15 ml of soil inside of them and then we shaked this mixture. This procedure was conducted five times, every time in a new location according to the different agricultural crop cultivated or different soil texture.

Auger testing

With the auger device we took samples from 5 different locations chosen based on the crops cultivated or soil type previously detected by us on the soil map. We took two different layers from each sample, the upper level (from 0 to 6 cm) and the lower (6 to 12 cm) to analyse nutrition in the soil.

2.2.3 Water quality assessment

Water quality testing through the estimation of amount and level of chemicals is needed to verify if the water is clear, safe and meets local and international water standards. Therefore, we applied the following scientific methods:

- Chemical water quality assessment
- Biological water quality assessment
- Mini SASS (Stream Assessment Scoring System).
- pH test

We picked three locations to conduct our water quality assessment (Figure 7):

- Uphill water catchment area, where the villagers get their daily water supply through a gravity-fed water pipe system
- Marop river next to the agricultural production to test the effect of fertilizers
- T-junction area, where the two rivers are merging in one, right after the agricultural production area
- Wang ajong waterfall, used by both villagers and tourists for recreational activities

Figure 7: Location of the 3 water stations tested (source: Google Earth, Authors)

2.2.4 Chemical water quality assessment

We took samples of water from each of the three locations mentioned above and then together with professor Dr. Tay tested them back at the longhouse.

Figure 8: the Group is testing the quality of the water catchment area

Every sample was tested twice for the following chemical properties:

- Chemical oxygen demand (COD - amount of organics in water)
- Ammonia nitrogen (mg/l)
- Phosphate (mg/l)
- Turbidity

The test was conducted by using the HACH DR890 Colorimeter, a device that measures the absorbance of particular wavelengths of light by a specific solution. Each sample was prepared with respective HACH reagents. With the HACH DR890 Colorimeter we have also measured the turbidity of each sample.

Figure 9: representation of the device HACH DR890 Colorimeter

2.2.5 Bacterial water quality assessment

The main task is to detect the presence of Total Coliform bacteria, which are a group of bacteria regularly present in environmental waters. The most important bacteria we need to see the presence of in our samples is Escherichia coli (E. coli), which is a part of the Fecal Coliform group. Although most strains of E. coli are harmless, others can make humans very sick. Some kinds of E. coli can cause diarrhea, while others cause urinary tract infections, respiratory illness, pneumonia, and other illnesses. (source)

The whole process required a special filter pump, 6 petri dishes and agar, which is a nutrient used to culture microorganisms. Firstly, we put one filter paper in each dish that had agar in it, then sealed them properly and left until the next day for further observation. The next day, we counted the colonies and recorded the data.

2.2.6 Measurement of pH

The purpose of this method is to see if water in all three stations has a neutral pH level. For measuring it, we used a waterproof pocket tester - ecoTestr pH1 (Figure 10). To do so, we

dipped its sensor in at least 20 mm of test water and then recorded pH values. In order to receive more accurate data, we had three attempts per each location.

Figure 10: representation of the device ecoTestr pH1

2.2.7 Mini SASS

Mini SASS is an easily accessible, and quick method used to test the quality of water based on the collection of macroinvertebrates, small organisms living in the water and their sensitivity to water quality. To catch the invertebrates we used two nets, one bigger than the other and then we put the catch in the box with a small amount of river water. Using magnifying glass and with the help of a guideline, we managed to identify the different organisms. The sensitivity grading system of the collected invertebrates, determined by the sensitivity score of each individual species, provided us the measure of the general river health and water quality in the selected river (Table 1).

GROUPS	SENSITIVITY SCORE
Flat worms	3
Worms	2
Leeches	2
Crabs or shrimps	6
Stoneflies	17
Minnow mayflies	5
Other mayflies	11
Damselflies	4
Dragonflies	6
Bugs or beetles	5
Caddisflies (cased & uncased)	9
True flies	2
Snails	4
TOTAL SCORE	
NUMBER OF GROUPS	
AVERAGE SCORE (miniSASS Score)	
Average Score = Total Score ÷ Number of groups	

Ecological category (Condition)		River Category	
		Sandy Type	Rocky Type
	NATURAL CONDITION (Unchanged/untouched – Blue)	> 6.9	> 7.2
	GOOD CONDITION (Few modifications – Green)	5.9 to 6.8	6.2 to 7.2
	FAIR CONDITION (Some modifications – Orange)	5.4 to 5.8	5.7 to 6.1
	POOR CONDITION (Lots of modifications – Red)	4.8 to 5.3	5.3 to 5.6
	VERY POOR CONDITION (Critically modified – Purple)	< 4.8	< 5.3

Table 1: List Of Groups, Sensitivity Score and Ecological category for mini SASS analysis

2.2.8 Forest assessment and evaluation

A forest resource assessment and evaluation was performed through both natural and social methods in order to gather knowledge on how villagers are using forest resources and about the biodiversity and density of forests in the Marop Atas area.

After randomly marking the area with three poles to get a triangulation shape, we measured the diameter and height of the trees with clinometer and diameter tape and to classify the species, we asked our guide for the specific names. This method was performed in the Old Forest (Figure 11), an area which is used by the villagers to collect fruits, and both medicinal and aromatic herbs.

Figure 11**:** Position of the Old Forest and Forest Resource Assessment (source: Authors, Google Earth)

2.2.9 Biological survey

Through questionnaire and semi-structured interviews, we collected information about pests, which are attacking cultivated crops and causing production problems. Hence, we decided to conduct two different methods in two different locations to catch and identify some of the pests in the area - rice field rat and dusky fruit bat. The method we used to catch rats was a humane rat trap with a banana slice as bait (Figure 12). We set 50 traps all over the selected farm and left them overnight. The next morning we came to check the results.

Figure 12: **(**Left) A representation of a rat trap; (Right) humane trap

For catching bats, we installed a harp trap that captures bats when they are attempting to turn perpendicular to the ground to pass between the trap's strings and then drop unharmed into a

collection chamber (Figure 12). The trap was installed in the waterfall area, which is a 15 minutes walk from the longhouse. After the trap was installed, we came back in the evening to see the results.

3. Findings and results

In this chapter we will introduce our general findings in relation to how villagers are utilizing the assets available to them. All the relevant results will be presented following the structure below:

- Life in Marop Atas
- Diversification of the livelihood strategies
- Institutions
- Management of natural resources and its impact on the environment

3.1 Life in Marop Atas

Back in 1995 there were 29 households in the village of Marop Baruh, which is located two kilometers away from Marop Atas (Figure 13). However, due to some internal conflicts, 15 households have decided to move out from Marop Baruh and settle down in a newly built wooden house alongside the Marop River. At that moment, there was already another house, built in 1992, and together with it they have formed a new Marop Atas. In 2002, families living in the wooden house moved to a new house, more solid in terms of its structure and living conditions. The same year the local government has brought electricity to both longhouses, as well as built a new asphalted road that connects Marop Atas to the highway. Currently, there are 44 households living in two longhouses and 10 individual houses: 13 households are based at the upper hill longhouse area, whereas 31 households are located in a slightly lower hill longhouse area. Five families are multilocals, meaning that they also have a house elsewhere, outside of the village. Marop Atas has two headmen - Nancy Jampang who is responsible for 8 households and Langkop ak Sedom who became a headman in 2013 and has 36 households under responsibility. Our headman, whose main duties include taking care of local people and being a link between the villagers and the state government, was our initial source of information regarding the life in the village.

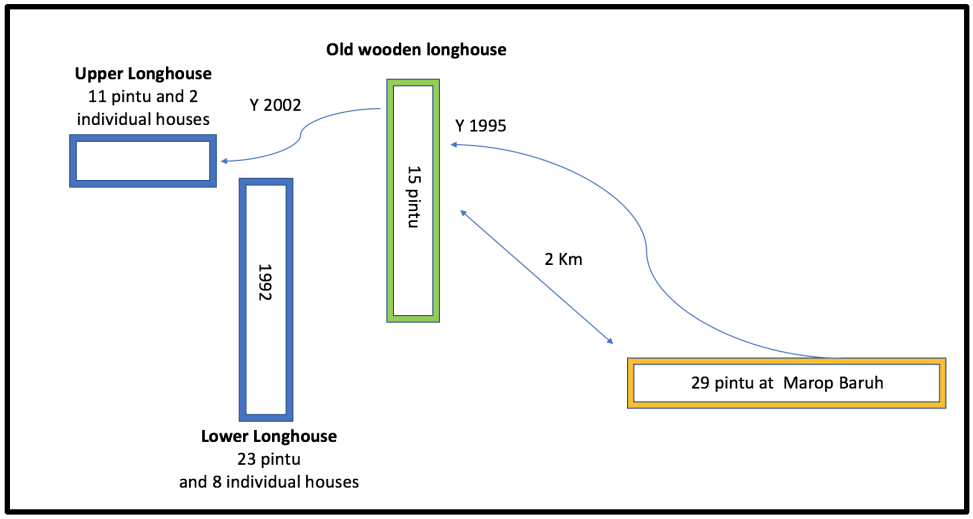


Figure 13: A historical map of longhouses in Marop Atas

Since we arrived at Marop Atas, we immediately noticed the demographic of adults do not constitute the majority of inhabitants and that women are far more present than men. However, we also noticed quite a few children running across the longhouse and playing outside with one another. Our first impressions of the community coincided correctly with further observations and informal talks with villagers. Further study results confirmed that the villagers of Marop Atas fall into the category of an ageing society, which means a shift in the distribution of, in our case the population of longhouses composed of elderly. This is reflected in the average age of all our respondents was 57 and a median age at 59. Conclusively, these results emphasises that this ageing trend will continue within the community for a few reasons. Firstly, we determined that any form of out-migration from Marop Atas has been occurring in 25 households. One type of out-migration is a group of people whose children decided to leave the village and start a life in the city. The second type consists of people who work out of the village for some various periods of time but this will be discussed later in this chapter as off-farm occupation/activities. Relatives of people who migrated claim their decision was driven by access to education opportunities or higher chances for a stable and better paid employment with children not considering moving back to the village on a permanent basis. Secondly, we expect out-migration rate to increase in upcoming years when the present youth will be entering the job market. In which, the main contributing factors is the decrease of interest in farming, availability of more attractive non-farm occupations and global rural–urban migration trend. Thus, this process together with an aging population pose threats for the preservation of traditional life in Marop Atas.

Most villagers do not have a high educational background (Figure 14). When asked, if they wished they had proceeded with higher education, only 4 people agreed. The rest considered their level of education to be sufficient as traditionally their main occupation has always been farming.

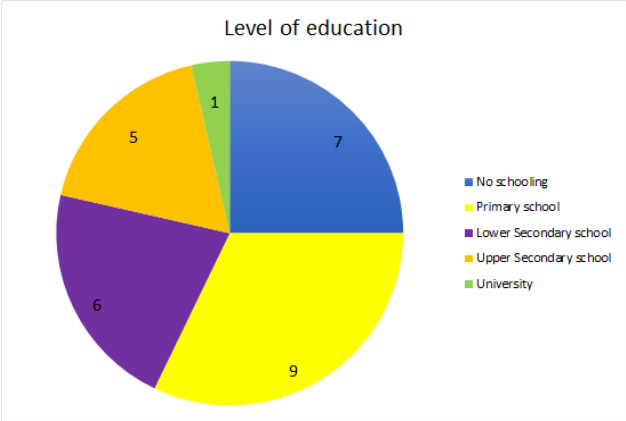


Figure 14: Level of education in the village. The information was obtained through the questionnaire

Villagers live in a collective manner. Together they celebrate important events, often organize communal dinners, share food among themselves when having a surplus and some of them even share their land for crop cultivation.

Before they make any major decisions regarding life in the village, they discuss it during longhouse meetings which are held once a month. Prior to each meeting, committee members of the village are gathering together to debate upcoming news amongst themselves. The committee is the internal structure of hierarchy and authority in Marop Atas presented in figure 15.

Figure 15: Organizational chart of Marop Atas

When speaking of households that have more than one member, 19 of them claimed the decision-making process takes place amongst all household members. Among the respondents, there is only one household where decisions are made by the head of the household. He claimed that the position was inherited from his father.

Residents do not pay taxes related to the longhouse, although individuals that have a separate property, such as our headman, have an obligation to pay taxes. Additionally, the state taxes are only paid by those who have a fixed salary and their monthly income exceeds 3500 MYR. The exact tax rate also depends on the number of people and children living in the household.

As a daily source of information most villagers use TV and Radio. In regards to global and national news, they rely on these means of information the most. Knowledge about local events mainly comes from relatives. Those who can read fluently, also use local newspapers. Only three of the interviewed villagers claimed that they use the Internet as a primary source. This could be explained by the remote location of Marop Atas that obstructs maintenance of a stable Internet connection. This is an obstacle, especially for young inhabitants. There are 26 households that stressed the importance of having a fixed Internet connection as they believe it would widen their perceptions about the world.

3.2 Diversification of Livelihood Strategies

Recent studies have drawn attention to the enormous diversity of livelihood strategies at every level - within geographic regions, across sectors, within households and over time. Rural populations have become more occupationally flexible, spatially mobile and increasingly dependent on non-agricultural income generating activities. (FAO, 2020) Although farming is still an important activity it is increasingly unable to provide a sufficient means of living in rural areas, such as Marop Atas. Diversification is recognised as a central concept to the links between poverty, vulnerability, livelihoods and access to natural resources. In that sense diversification is a positive trend and scientific evidence shows that it can lead to accumulation of capital assets and conservation of natural resources. (FAO, 2020)

Results from Marop Atas seem to be confirming this theory. Figure 16 indicates the number of households for which farming, non-farming occupation and remittances are the first, second or third sources of income. For instance, for one household farming could be their first source of income, when for another household is the second. The same situation is for non-farming sources of income and remittances.

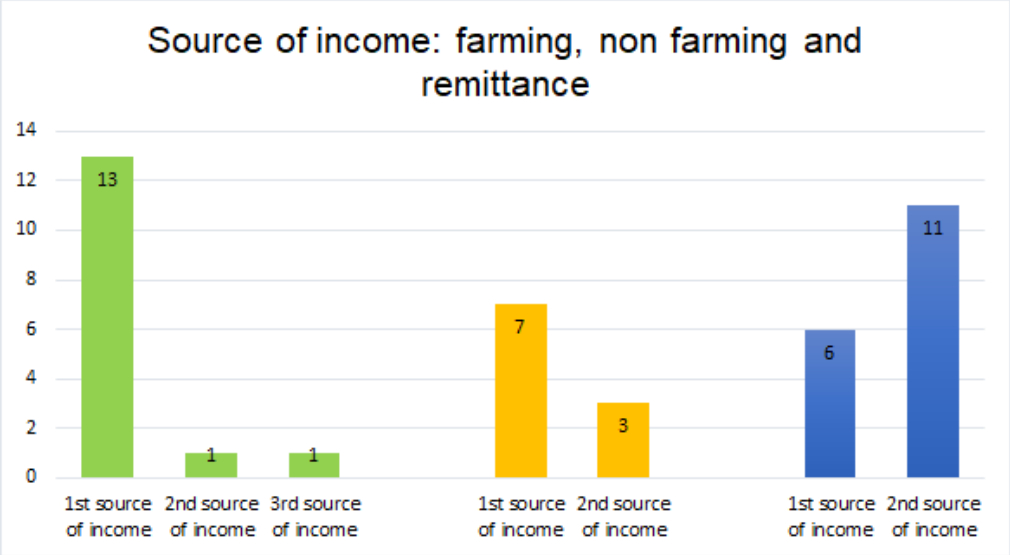


Figure 16: Graph shows number of households for which farming, non-farming occupation and remittances are the first, second or third sources of income. The information was obtained through the questionnaire.

3.2.1 Farming

Most of the households (23) are involved in farming, but not necessarily with the purpose of selling. Some households are growing certain crops only for self-consumption. For instance, cultivation of rice is solely intended for this purpose, with a small exception of two farmers among our respondents that still receive income from selling it. We have also noticed that some individuals are working on the land of their neighbours in a form of hired labour. In fact, 12 households admitted that they hire external workers from the village (non-family members) to work on their land. According to the figure 16 for 13 households farming is the main source of income, when for one household it is the second source of income and one household treats farming as the additional type of earnings. Also, what caught our attention, for 13 households among our respondents farming is the main daily occupation, but it doesn't mean that farming provides them with most of their income.

3.2.1.1 Cultivation of crops

According to our informal interviews with the farmers, questionnaires, observations and transect walks with the guides, farmers of Marop Atas are growing the following crops: Rice, pepper, rubber, cocoa, pineapple, oil palm, durian. Rubber, cocoa, and oil palm are solely produced for sale, when pepper, pineapple and durian can be also consumed in case of a surplus. The majority of cultivated land is under Native Customary Right (NCR) and only some

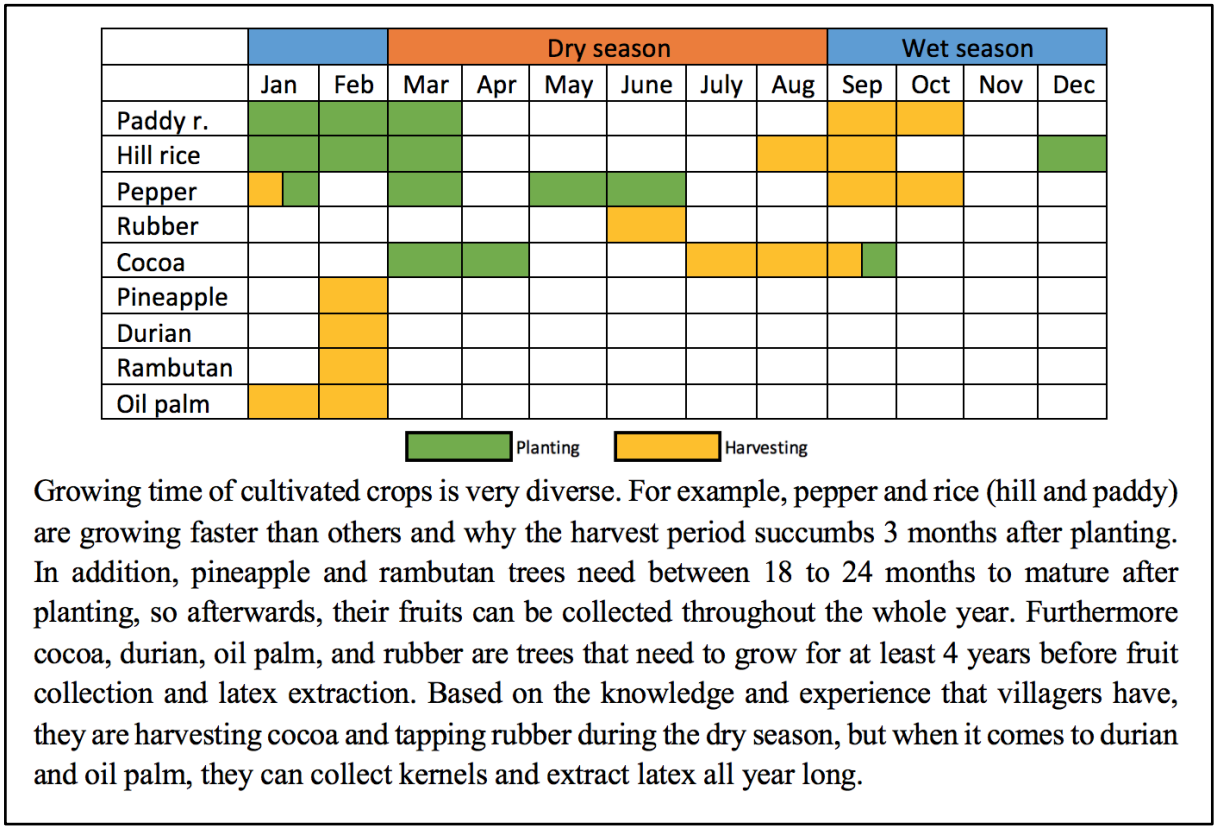
of the farmers are in possession of the land title. Among the interviewed farmers, the biggest land is 7 ha, when the smallest is 2 ha.

Every farmer in the village is applying fertilizers, pesticides and herbicides to maintain and boost their agricultural production, especially rice. The most common institution is DOA, but some farmers are also getting subsidies from RISDA for production of rubber.

What is also very important to mention, that barely any farmer owns any livestock. Those that do, have only a few animals such as pigs, ducks and chickens.

Based on the results from the semi-structured interviews conducted with farmers, we have created a detailed table in relation to the type of crops, size of the land and its ownership, purpose of growing, production quantity, and the year farmers started to cultivate certain crops (*Appendix 4).*

Based on information we received from the farmers we have also created a crop calendar, which is presented below in Figure 17**.**



Growing time of cultivated crops is very diverse. For example, pepper and rice (hill and paddy) are growing faster than others and why the harvest period succumbs 3 months after planting. In addition, pineapple and rambutan trees need between 18 to 24 months to mature after planting, so afterwards, their fruits can be collected throughout the whole year. Furthermore cocoa, durian, oil palm, and rubber are trees that need to grow for at least 4 years before fruit collection and latex extraction. Based on the knowledge and experience that villagers have, they are harvesting cocoa and tapping rubber during the dry season, but when it comes to durian and oil palm, they can collect kernels and extract latex all year long.

Figure 17: Cropping calendar

3.2.1.2 Pricing

Furthermore, we managed to obtain information about the market prices per each crop. There are two different ways of how farmers are selling crops: through a Chinese middleman or independently in the market. Depending on the type of realization, farmers are getting a different price. Price also depends on the quality and size of the product. Depending on the crop and farmer's decision, some are selling their products once or twice a month, whereas others realize their goods once a year. According to the results from the questionnaires, 15 farmers are claiming that the most income is coming from selling pepper and rubber. However, what we can see in the *Appendix 4*, that summarizes information on prices per crop in relation to each farmer we interviewed, oil palm seems to be the most profitable crop to cultivate, even though there are only 10 farmers in the whole village that do so.

3.2.1.3 Challenges

According to all the farmers we managed to talk to, we have realized that the major problems that alter crop production are related to pests and diseases. The damages that they cause affect all stages of production, including the storing period. Pests that are causing problems in agricultural production are the following: rats, ants, birds, bats, caterpillars, grasshoppers, monkeys, squirrels, wild boars, worms and the most common insects in the area such as *umpangao* and *induimpit* (Figure 18). There are also some fungus and leaf curl diseases which affect the leaves and the yields of pepper and rice in general.

Figure 18**:** (Left) Dusky fruit bat, *Penthetor lucasi*; (Right) Rice field mice, *Rattus tiomanicus*

Regarding the changes, all farmers have also mentioned fluctuation of prices. For instance, on average the price of latex has dropped from 10 MYR/kg to 2 MYR/kg and the price for black pepper changed from 14 MYR/kg to 7 MYR/kg. Furthermore, every farmer we have interviewed has stressed that different weather patterns and conditions are also negatively affecting their production. The most common issues are related to harvest and postharvest stages.

3.2.2 Non-Farming

Non-farming occupations have been picked as a crucial source of income for 10 households. The list includes mostly paid-salary jobs, such as working on the constructions, school cleaning, security sector, professional drivers or public servants: policeman, teacher, administrative worker. It brought to our attention that a group working in non-farming consists solely of males. Another relevant fact is that they accomplished higher levels of education on average than the majority of villagers involved in farming.

As we found out from focus group discussion (Figure 19), there are several factors that push people in Marop Atas to switch to non-farming. First of all, better living conditions that can be achieved through fixed-salary income. They claim that agricultural activities rely on many external factors, such as climate variability, soil fertility and water quality which are often unpredictable. Job on a permanent contract provides their families with a higher degree of security and comfort. It is also easier to obtain a loan. As a result they can afford to buy better quality goods, such as a car, a house or clothes.

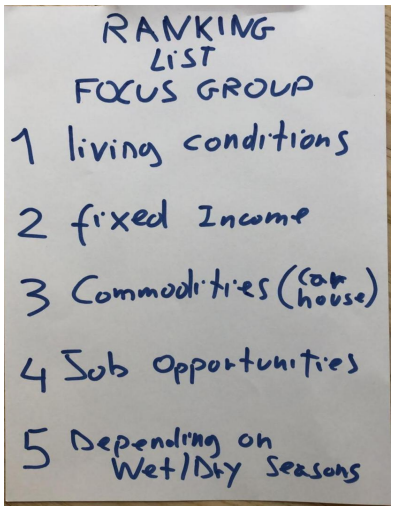


Figure 19: Ranking Importance of drivers for working in non-farming activities

It does not mean however, that they gave up on farming perpetually. They practice agricultural activities as a hobby, after working hours, during weekends or are planning to, once they retire.

Off-farm workers admitted that their social network expanded since they switched occupations, allowing them to have a better platform for sharing experience and ideas with alike minds/people. Moreover, they gained more diversified points of view on the world. Although their social status increased, they say that it didn't change their relationships with other villagers - there is no sense of superiority. Due to their knowledge and skills - fluency in reading and writing some of them were chosen as committee members. They are considered as a reference point and asked for advice regarding complex for Marop Atas matters, especially those working in the public sector.

Men working in off-farm say that they see no disadvantages regarding their decisions to switch occupations. They try to give their children the best possible education, so they can follow their fathers' steps and achieve even more.

I am a teacher of basic education and science in secondary school. I hope that my son can become a university teacher in future.

- Bruno, Teacher

3.2.3 Remittances

Remittances are an essential part of life for 17 households, as their first or second source of income. Money comes from relatives that migrated from the village to settle down in the cities, mostly Kuching or Kuala Lumpur where they have higher chances on the job market, as well as a variety of positions available. This group consists mostly of children of people we interviewed. They are not visiting their parents often and so it is normal for the villagers to not see their kids for 2-5 years.

3.3 Institutions

Governmental institutions play a pivotal role for the social and economic welfare of countries. Their actions are especially important in developing countries, which are putting great efforts to get rid of poverty and to attain higher living standards.

Through questionnaires, we learnt that almost all of our households are involved in at least one governmental scheme or subsidy provided by the following organisations:

- DOA
- RISDA
- MRP
- RTP

The DOA is the institution that farmers in Marop Atas are the most engaged with. As a leading agency under the Ministry of Modernisation of Agriculture, Native Land And Regional Development aims to modernize agriculture to continuously improve the income of farming communities. DOA tries to enhance agricultural practices by technology and knowledge sharing to change agriculture into agribusiness. The Chief we met with in Sri Aman explained that by commercialisation they will move towards a model which is inclusive for farmers but anchored on market centricity at the same time.

For that reason they run several programmes and subsidies. Extension program relies on providing assistance in crops' management by for example checking the soil quality and advising which soil would be suitable for each crop. Commodity program is the most popular for pepper and rubber and by this scheme villagers in Marop Atas receive fertilizers, herbicides, pesticides, etc. DOA supplies not cash, but ready final products approved by the national research institutes in Kuala Lumpur. These are supposedly the most advanced ones, good for soil and yields. Refreshment program mostly strives towards development and adoption of new techniques among farmers. Officials provide training and seminars for participants, often go in the field and visit many villages to promote their schemes. DOA also provides big tanks for rainwater collection in case of water shortages and some tools like a grass cutter machine and other necessary supplies if farmers ask about it. Every person who has a card of a farmer can write a letter to DOA in which it is stated what sort of help is needed. If it is accepted, a farmer will receive it. The Chief explained that the application process for schemes is simple and they assist farmers if required. They claimed that most farmers who fulfilled requirements receive

aid and that there are 900 000 farmers receiving some sort of help from the agency every year. However, they underlined that the subsidies cover land to 4ha per person, so if the field is bigger farmers need to maintain the rest without DOA help. They also stressed that it is impossible to receive the subsidies every year in the row, there are time limits which explain the fact, why some of the farmers in Marop Atas do not currently obtain rubber or pepper subsidies, but they used to. The Chief mentioned that DOA also encourages farmers to grow vegetables and fruits which are highly demanded on the market and highly profitable. We were informed that for the year 2019-2020 DOA cleared some of the area for palm oil in Marop Atas, and provided the farmers with fertilizers under The Malaysian Palm Oil Board (MPOB) scheme. However, the participation in the scheme is limited to farmers who own a land title. In the years 2009-2011 DOA was also a provider of a subsidy for maintenance of 7 fishponds for fish production present in Marop Atas.

RISDA provides a few farmers in Marop Atas with a subsidy in the form of cash (around 600 MYR) a year for rubber plantations. It is a compensation for farmers during the dry season when due to environmental reasons they cannot extract latex from rubber trees, hence losing source of income.

MRP is responsible for providing cooking utensils to villagers in Marop Atas and materials to make constructions within and around longhouses. The agency painted the walls in the longhouse and they generally support inhabitants with assistance regarding renovations.

RTP is an organization that gave the funding for the roof in the longhouses. RTP always provides aid in the form of money for particular projects.

Besides the above mentioned, there are also 3 households that receive extra financial support from the State Welfare Department for children with special needs.

3.4 Natural resources management and its impact on environment

3.4.1 Natural resources

3.4.1.1 Soil types, texture and pH

Firstly, we identified soil types in the area around Marop Atas that we assumed to be the most suitable for agricultural production.

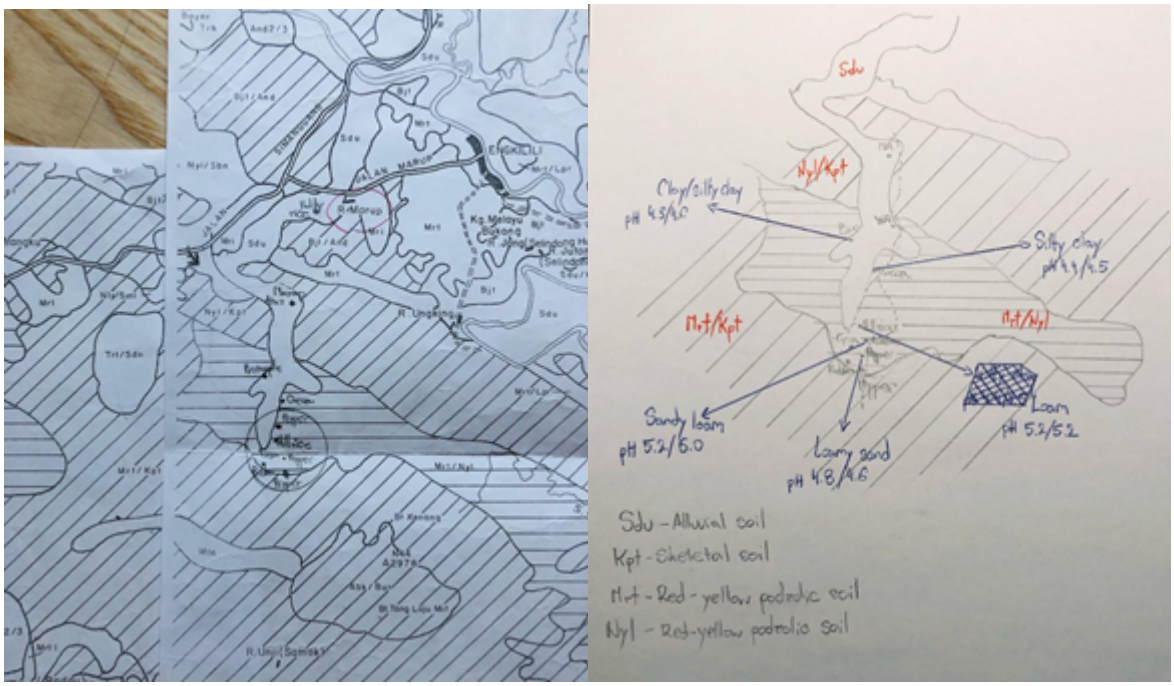


Figure 20: The Soil Map of the area surrounding Marop Atas

Most of the production is in the long valley, bordered with hills on one side and Marop River on the other. We found two different types of soil: *Merit* and *Nyalau.* They are both from the red-yellow Podzolic group which can be seen on the map above. *Merit* is typically found in moderate to very steep dissected hills, when *Nyalau* is mainly located in moderately steep hills. A minor part of agriculture production lies on the higher ground, closer to the longhouses, as shown on the map above (Figure 20). In that area we also found *Merit* and *Nyalau* t and in addition to them we found *Seduau*, which is an alluvial type of soil. Results from the "Feel" method and pH values are presented in the table below (Table 2). There is an interesting fact that caught our attention - fruit products like cocoa and pineapple are cultivated in lower pH level areas in comparison to pepper, rice and rubber.

	GPS coordinates	Soil pH reading	Soil texture
Pepper location	N 01◦06.003’ E 111◦38.396’	4.8 pH/ 4.5-4.6 pH	Loamy sand
Coco location	N 01◦06. 389’ E 111◦38.340’	4.4/4.5 pH	Silty clay
Rubber location	N 01◦06.041’ E 111◦38. 383’	5.2/ 5.0 pH	Sandy loam
Paddy upper location	N 01◦06.041’ E 111◦38. 376’	5.2/5.2 pH	Loam
Pineapple location	N 01◦06.462’ E 111◦38. 213’	4.3/4.5-4.6 pH	Silty clay/Clay

Table 2: Soil texture and pH results of 5 agricultural plots

3.4.1.2 Water quality

Water, along with soil and forest, is a primary natural resource for the daily activities of the villagers. There are three rivers surrounding Marop Atas: Marop River, Kuala River, Belian River (in length order). From the chemical water quality testing (Table 3), we can see that water from the second station has the best quality, with the lowest amount of COD, Phosphate, Nitrogen Ammonia in the water. We assume that there is no negative impact of fertilizers in this area.

	Station 1			**Station 2**			**Station 3**		
GPS Location	1° 6'30.21"N, 111°37'42.54"E			1° 6'0.18"N, 111°38'23.89"E			1° 6'22.71"N, 111°38'21.08"E		
Description	Water catchment area			Marop River			River T-junction under Agricultural production		
Replicate	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
pH	7.5	7.5	7.5	7.4	7.2	7	7.3	7.3	7
COD (mg/l)	5	0		1	0		1	2	
Phosphate (mg/l)	0.21	0.11		0.07	0.11		0.1	0.06	
Nitrogen Ammonia (mg/l)	0.07	0.05		0.02	0.02		0.09	0.06	
Turbidity (NTU)	0	0		0	2		5	5	

Table 3: Chemical water quality assessment results of the 3 stations tested

Additionally, we tested the biodiversity of small water organisms at each station. In the Waterfall area and in the Marop river the results show that there is still a natural condition,

untouched or not contaminated by any human activities. While in the water catchment area results showed fair condition of water due to human modifications in the environment.

Species	Sensitivity Score	Waterfall		Water Catchment area		Marop River	
		Number	Total Score	Number	Total Score	Number	Total Score
Minnow mayflies	5	7	35	1	5	3	15
Other Mayflies	11	2	22		0	0	0
Dragonflies	6	2	12		0	1	6
Snail/Clams/Mussels	4		0	1	4		0
Crabs	6		0		0	1	6
Shrimp	6	1	6	17	102	2	12
Stoneflies	17	6	102		0	1	17
True flies	2				0	1	2
Uncased Caddis	9				0	1	9
		18	177	19	111	10	67
AVERAGE SCORE		9.833333333		5.842105263		6.7	
Comments		Natural Condition (Unchanged/ Untouched)		Fair condition (Some-modification)		Good condition	

Table 4: mini SASS results from the 3 water locations

3.4.1.3 Forest biodiversity

Through conversations with villagers, we found out about tree species biodiversity in the surrounding area. In the table below, tree species are divided based on the locations where they can be found (Table 5). Furthermore, Appendix 6 is showing forest resource assessment results of the Old forest, located between two areas, where we found tree species from both terrains.

Lower swamp area	Nyelutung, Keruntum, Geruggang, Merebung, Engkebang, Empili
Hill area	Ratan, Nyatuh, Ubah, Lup, Libas, Puan, Pengerawan, Pelai, Jinggan

Table 5: Forest biodiversity Catalogue

3.4.2. Management of natural resources

3.4.2.1. Water for the household's activities

During the interview with the head men, we found out that in 1979, the government of Sarawak provided villagers with their first gravity-fed water supply (Figure 21, yellow arrow on the picture), from the Belian river. However, in 2001 it was replaced by a treated water supply (red arrow on the picture) from Jabatan Kerja Raya (JKR) and shared with the school in Engkilili. Due to increasing water demand among the villagers, especially during dry season, the treated water supply was insufficient. Therefore, in 2019, the local government decided to fund a new gravity-fed water pipe system (blue arrow on the picture) that is coming from the source of the Kuala River and goes all the way to the village through the forest, providing water to all the inhabitants.

They claim that water is usually enough for monthly activities, but due to the location of the water source (on the hill) people also experience water shortages if the pressure in the pipe is too high or rainfall is too heavy. To minimize occurrence of such situations they came up with the security checking system – twice a month a group of selected males go all the way up to the water source to see if there are any damages in the pipe that need to be repaired.

Figure 21: Description and of the different water pipes

3.4.2.2. Irrigation

Irrigation system is one of the ways villagers are managing water resources in the area. Throuhout SSI's, we found out that five out of six farmers are using water from the Marop River to irrigate their plots. Also, villagers provide their crops with the necessary amount of water through artificial canals (Figure 22) or by collecting water in buckets.

Figure 22: Example of one of the artificial canals used for irrigation

3.4.2.3. Wang Ajong waterfall

Villagers use the waterfall area for activities like drinking and washing. Some of them still do fishing, but many decided to stop since “it was too time consuming and inefficient” (Source: Questionnaire). Waterfall area also serves as a recreation area for villagers and tourists. When tourists visit the waterfall area or rent a motorbike, villagers are charging them a small fee: 0.5 MYR per child entrance to the waterfall, 1 MYR per adult, 1.5 MYR to rent a motorbike.

3.4.2.4. Soil nutrition and usage

As shown on the map below (Figure 23), the farmers of Marop Atas are using a large area for crop production. From SSIs we discovered that farmers are using different methods to test soil fertility. The most common indicators of soil fertility are colour and its softness. If the colour of soil ranges from yellow to chocolate brown and is very soft, then it means that soil is fertile. Then farmers are looking for worms in the soil, if they can find them then soil is fertile. The most reliable method to test soil fertility used by farmers is a “try to know” method. For example, some farmers are planting local spinach (*Ensabi*), two weeks prior to planting main crops to see if soil is fertile.

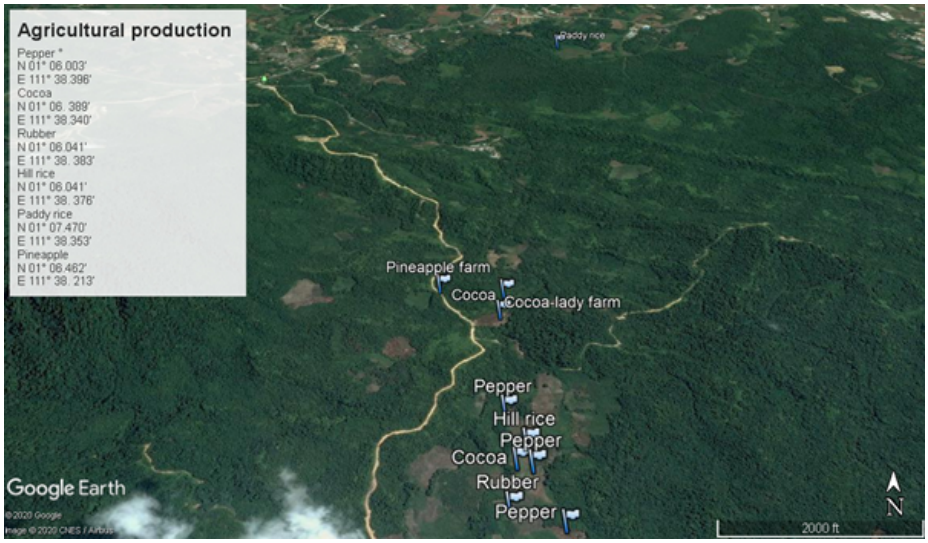


Figure 23: Map of agricultural plots of Marop Atas farmers (source: Authors, Google Earth)

Regarding the soil erosion, five farmers out of 6 do not have any problems because their production is located on the same flat ground, while only one farmer has issues - his agricultural land is located on an angular slope. However, he managed to reduce the problem of erosion by planting fruit trees. Their roots can fix the soil.

Laboratory tests of the soil samples were intended to show if there is a difference in nutrients, due to different agricultural practices. Unfortunately, because of an external factor, the outbreak of COVID-19, laboratories have been shut down.

3.4.2.5. Forest Resources

As a result of cultural traditions, some areas of the Old Forest under *"Pulan Galau"* agreement which means Protected and Reserved Forest, are not allowed to be used for collecting any forest products. A second area, called *"Tanah Pemakai Menua"* is less restricted. Villagers are allowed to collect forest products and hunt wild animals. However, only inhabitants of Marop Atas can use it freely. People from outside the village need special permission for that purpose.

Forest resources such as *Daun Sabun*g, *Daun Kesindu*, bamboo shoots are important for all our households and the majority uses them 2-3 times a week. They collect fruits and vegetables for self consumption or sale during the fruit season, such as rambutan, durian, pineapple. Furthermore, villagers also countiniue to extract woods from forest for construction of houses. Perfect example is the bamboo branch, *Engkabang*, *Merebung*, Geruggang. Few males practice hunting activity. They mostly hunt wild boars, deers, mouse deers, foxes. If they sell these products it is mostly amongst neighbours, with a few selling it at wet markets in Engkilili.

3.5. Impact on environment

3.5.1. Water contamination

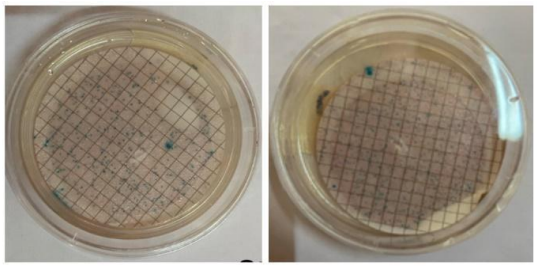
In the water catchment area we found the highest level of both COD and Phosphate, which means that there are some water pollutants. Also algae growth is the biggest in this area, which produces harmful toxins for the ecosystem.

While at the T-Junction we found out the highest level of nitrogen ammonia due to NPK form of fertilizers used in agricultural production, which means a direct negative impact on the aquatic ecosystem. Turbidity was also the highest at the T-junction, which means that there are the most solids suspended in the water, probably because of the agricultural production. The same negative impact of fertilizers used in agriculture is proved with the mini SASS results through the lowest sensitivity score, resulting in very poor water conditions (Table 6).

Species	Sensitivity Score	T-Junction area	
		Number	Total Score
Minnow mayflies	5	5	25
Other Mayflies	11		0
Dragonflies	6	1	6
Snail/Clams/Mussels	4		0
Crabs	6		0
Shrimp	6		0
Stoneflies	17		0
True flies	2		0
Uncsed Caddis	9		0
		6	31
AVERAGE SCORE		5.166666667	
Comments	Very poor condition		

Table 6**:** mini SASS results from T-junction area

From the bacterial point of view, Station 1 is the most polluted (Figure 24) compared to other two stations as the number of blue colonies (E. coli) is higher. Station 1 has a lot of animals around, such as rats, monkeys and wild boars. So, when they excrete their faeces it all goes into the water. This may have a negative impact on water as a drinking source in this area.



Station 1: Water catchment area, left (5 ml) right (10 ml)

Figure 24: Station 1

3.5.2. Waste

A few residents pointed out that when tourists are visiting the waterfall area, they are leaving a lot of trash even though there is a designated area for litter. Furthermore, 24 households agree that waste management in the village needs better planning (Figure 25). They would like to engage in programs that would create a possibility for trash recycling and utilization of it. Also, we have noticed that the area around the longhouses is polluted by domestic waste. Furthermore, farmers create rubbish pits or burn trash at their production areas to dispose of packaging from fertilizers, pesticides and herbicides. But once a month, villagers get together and clean the area around the house and waterfall.

Figure 25**:** Villagers opinion about waste management in the area

3.5.3. Deforestation

In Marop Atas there was a timber agreement with a corporation, going on from 1992 until 2017. A large portion of forest was cut down and designated for timber cultivation and agricultural production purposes. Villagers received compensation from this activity as a one time flux of money, which they shared between the households. However, more than half of them had an opinion that they haven't benefited from the agreement, although they have received financial compensation. The main argument was that substances from logging completely contaminated the river, therefore the number of fishes and water species has drastically declined. The agreement has stopped because there were no more trees left to cut in the designated area for logging.

3.5.4. Soil acidity

Unfortunately, because of the university's lab closure, we cannot prove any negative impact of farming activities on the soil. However, by testing the pH level of soil, we proved that there is slightly higher acidity of soil where farmers have their agricultural production, compared to unused land.

4. Discussion and conclusions

As mentioned in the introduction Sarawak is the region rich in resources, but income wise it is the poorest state of Malaysia. Rural development projects in Marop Atas, brought by the governmental bodies and that mostly aim to alleviate poverty, greatly fit the development narratives. More than 60% of households believe that their life has improved in the recent years mostly thanks to infrastructural projects and governmental schemes.

Schemes are important for various reasons however they are mostly oriented on agricultural development. During our interview with DOA, words such as 'modernity, progress, higher income, better life' were brought up many times, which only confirmed our hypothesis about the state approach towards rural development.

Bebbington has argued that the problem of rural development strategies is that they are always behind the times and "continue to crunch rural livelihoods into the category of agricultural and natural resource-based strategies" (Bebbington, 2019). It is becoming clear that agriculture alone doesn't have the capacity to be the engine of rural growth.

Diversification needs to be acknowledged by the government as a key process in lifting people out of poverty. Since orchestrating our studies, we have correlated that the villagers diversify their activities due to different factors. Regarding out-migration, farming as a traditional activity is decreasing. It poses threats to the community as an essential demographic is removed from their society inflicting a burden upon the ageing population who rely on support from family members to cultivate their crops. Exhibited as farmers get older, they suffer from lack of strength and as time passes farming becomes a struggle for them. They try to work as long as their health conditions allow them. Many claim that commuting to their fields, which sometimes requires crossing the river four times and climbing the hills becomes too exhausting, so eventually they have to give up on farming.

Besides the above-mentioned consequences of out-migration in regard to ageing, there is also a positive effect related to money transfers in a form of remittances that villagers receive from relatives working in the cities. They are an important support mechanism for older people and provide them with some certain level of security, also in the future in the event of inability to continue agriculture. Sadly, they cannot count on any state guaranteed pension, compared to people that work in public service, administration or on permanent contracts.

Governmental subsidies help residents and farmers that without them would not be able to pursue some activities. Good example is the fishpond subsidy that was allowing the villagers to produce fishes and was their source of income. Once the subsidy expired villagers were not able to maintain it on their own and found it cost ineffective so had to give up at all. Presently fishponds exist unused.

Around 20 households have trust in local government officials and feel that their rights and needs are taken into consideration. They also agree with the most introduced policies, considering them as benefiting development of the region. Only a few of them have negative strong opinions about state government and a few are not sure. As for the federal government, people have doubts about the positive motives of the national government in Kuala Lumpur. We could see an example during our stay in Marop Atas. When the Prime Minister was resigning from the function due to the corruption crisis in his party, some people claimed that the federal government acts as a fraudulent institute.

The Iban people have a strong connection to nature and the environment. Considering the fact that they live surrounded by the jungle, it is quite contradictory that only half of the respondents would like to improve conservation of wildlife programs by law and even less would actively participate in them. The reason why they are not in favour of wildlife conservation is because they hunt wild animals. Majority agrees (Figure 26) however that there should be wider programs for forest protection on the state level, but eight households disagree. The reason behind it is as we concluded that they rely on forest resources for their daily activities.

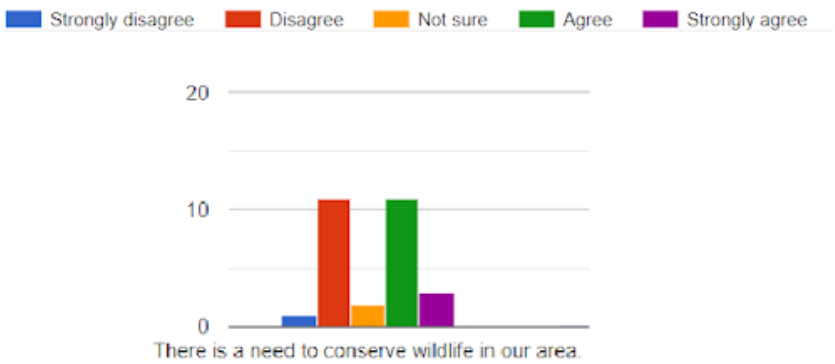


Figure 26: Opinion of villager on Conservation wildfire

However almost 75% of households agreed that environmental changes further constraining use of land and resources are considered as the major factor of negative changes forcing villagers to change livelihoods strategies. Variation in climate has been becoming substantial in recent years, with wet and dry seasons mixing in time. Changes in climate affect yield, so people left with no sources of income, some people are struggling to pay the bills and buy basic food product.

Almost all respondents view their headman and committee representatives as thoughtful, considerate and working in the best interest of villagers. They agree that their leaders ask them about their opinions regarding implementation of any major project and treat people in an equal, friendly manner. Moreover, residents highlighted that they live in a peaceful atmosphere, with no major conflicts, happy to share their lives, celebrations, and necessities with the neighbours. They claim they can ask the neighbours for help and count on them. The longhouse is the place where people feel inclusive, free to live their way and happy with their life. There is a positive social cohesion, trust and assurance among them. To conclude, by this report we demonstrated what are the livelihood strategies in Marop Atas and which interconnected factors are both positively or negatively affecting diversification of strategies. We also described villagers' links to the environment and what is the impact of their activities on the surrounding area.

"No farmer in Sarawak will be left behind!"

- Chief of DOA in Sri Aman

5. Challenges and limitations

Needless to say, while conducting any field work or research project there always will be certain challenges a team would face. Our team wasn't an exception.

As long as four of us are coming from different countries as well as from educational backgrounds, we are having different ways and styles of how to work in one team and at the same time respect everyone's opinions and ideas.

These differences were also supplemented by having four other students from UNIMAS who have their unique ways of communication and decision-making based on their culture and academic background which was solely natural science. This mix had a certain impact on our daily activities and overall goals and objectives of the whole research

Another culture related issue we had to face was to determine which questions and topics would be inappropriate to include when having our questionnaires, interviews and other data collection methods with the villagers. In this case our interpreters and Malaysian counterparts were always assisting us by giving various advice on how to avoid sensitive topics.

Although our interpreters made a big contribution to our research, yet at the start we had some difficulties in retrieving information we needed from the villagers. The root of the problem was us using a complex English vocabulary. When our interpreters translated certain questions to Iban, not every villager understood what we meant by asking these questions. Thus, some of the villagers gave us answers according to his/her understanding of asked questions. In order to avoid this problem, we started to make our questions and comments simpler, so we would not lose any valuable information in the future.

References

1. Article on Sarawak State, Malaysia. The editors of Encyclopaedia Britannica [online] Available at: https://www.britannica.com/place/Sarawak-state-Malaysia [Accessed 15 Feb. 2020].
2. A/RES/70/1 - Transforming our world: the 2030 Agenda for Sustainable Development, UN; available online at: https://sustainabledevelopment.un.org/topics/ruraldevelopment/decisions [Accessed 18 Feb. 2020]
3. Jomo K. S. & Hui, W. C. (2002) *The political economy of Malaysian federalism : economic development, public policy and conflict containment* . Helsinki: UNU World Institute for Development Economics Research UNU/WIDER.
4. Fao.org. (2020). Introduction to CBA | Guide for Monitoring and Evaluating Land Administration Programs | Food and Agriculture Organization of the United Nations. [online]Available at:

   http://www.fao.org/in-action/herramienta-administracion-tierras/module-5/practical-evaluation-guide/introduction-cba/en/ [Accessed 15 Feb. 2020].

5. Freeman J. D. (1970). Report on the Iban, London School of Economics, University of London, London: Athlone Press.
6. Fujica Anak Anggo, Louis Laja. (2018) The Function and Role in the IBAN Social Rank in their Communities. *International Journal of Engineering & Technology* [online] Available at: www.sciencepubco.com/index.php/IJET[Accessed 15 Feb. 2020].
7. Furuoka, Fumitaka. (2014) Economic development in Sarawak, Malaysia: An overview., University of Malaya,. *Munich Personal RePEc Archive* [online] Available at: online at: https://mpra.ub.uni-muenchen.de/60477/ [Accessed 15 Feb. 2020].
8. Reed, M. . et al. (2013) Combining analytical frameworks to assess livelihood vulnerability to climate change and analyse adaptation options. *Ecological Economics.*
9. Rodd Myers & Christian Pilegaard Hansen (2020). Revisiting A Theory of Access: A review., *Society & Natural Resources*

10. Statement by Professor Philip Alston, United Nations Special Rapporteur on extreme poverty and human rights, on his visit to Malaysia, 13-23 August 2019. [online] Available at:

https://www.ohchr.org/en/NewsEvents/Pages/DisplayNews.aspx?NewsID=24912&LangID=E [Accessed 17 Feb. 2020]

11. Turner, R. & Daily, G.C.. (2008). The Ecosystem Services Framework and Natural Capital Conservation. *Environmental & Resource Economics.*

12. Bujang, A. (2019) Outwardly rich, inwardly poor, Sarawak top three richest state but has 7 out of 10 poorest districts in M'sia, says economic analyst. https://www.theborneopost.com/2019/02/01/outwardly-rich-inwardly-poor/

13. Alston, P. (2019) Malaysia vastly undercounting poverty https://www.ohchr.org/en/NewsEvents/Pages/DisplayNews.aspx?NewsID=24915&LangID=E [Accessed 1 Apr. 2020]

14. *Anggo and Laja, 2018) The Function and Role in the IBAN Social Rank in their Communities*
https://www.researchgate.net/publication/326725559_The_Function_and_Role_in_the_IBAN_Social_Rank_in_their_Communities [Accessed 19 Mar. 2020]

15. Forest news (2019) Is deforestation in Borneo slowing down?

Appendix

Appendix 1: Research schedule

27.02.2020	Interview with the headman/area mapping/observation
28.02.2020	PRA/transects/questionnaire
29.02.2020	questionnaire/PRA/timeline/semi-structured interview
01.03.2020	questionnaire/soil sampling/agr. observation/water quality test
02.03.2020	semi-structured interviews/forest assessment and valuation/PRA/wealth ranking
03.03.2020	farmers interview/soil/forest assessment and valuation/community mapping
04.03.2020	Engkilili - interview with gov./market observation
05.03.2020	interview/agriculture walk - plots, trees, and ponds/area mapping
06.03.2020	Collecting additional relevant informations
07.03.2020	Collecting additional relevant informations
08.03.2020	Research presentation

Appendix 2: Farmers interview

GPS point/Household number:	**Interviewer:**
Date and time:	**Translator:**
	Note taker:

We are students from the UCPH and UNIMAS and today we would like to have an interview with you about your agricultural production. The interview will take 15-20 minutes of your time to answer these questions but if you feel uncomfortable to answer some of them you can skip them. Data collected from this interview will be used to show different agricultural practices used in the Marop Atas area and farmer's perspective about their agricultural production.

Section A: Agricultural production

Crop type	**Size**	**Land ownership**	**Usage of the crop (SC/S/SCS)**	**Year started (event)**	**Production quantity(kg)**

TOTAL:					

1. What agricultural practices are you using in your agricultural production (monoculture/polyculture/intercropping/agroforestry)?

_____

2. Which crop requires the most labor and which the least?

_____

3. Have you moved your agricultural production from one plot of land to another since you moved to the new longhouse?

Yes / No

4. Are you still using old forest area, agricultural land close to the longhouse?

Yes / No

If yes, can you tell us what are you growing there?

_____

5. Have you started cultivating on the new area since you moved to the new longhouse?

Yes / No

If yes, can you tell us why?

_____

6. Do you own any livestock?

Yes / No

If yes, can you tell us which and how many?

_____

7. If you compare the size of your farm with the farms of other villagers, how big is it?

Smaller / Same / Bigger

8. Are you getting any subsidies for your agricultural production?

Yes / No

If yes, can you tell us from who, and for what are you getting subsidies?

_____

Section B: Cropping Calendar

Crop type	Planting	Growing	Harvesting

9. Have you noticed any changes in the cropping calendar per each crop? If yes, what are the changes and would you think that are the reasons for change?

_____

Section C: Economic review

10. Do you sell any crops that you grow?

Yes / No

If yes, what crop you are selling, to whom, where and how often?

_____

11. What is the price that you get for each crop per farmer's unit (kg, per product)?

_____

12. Do you think that you are getting a fair price for your agricultural products? (RM/kg)

Yes / No

13. Have you noticed any price changes of agricultural products that you are selling?

Yes / No

If yes, how often and how does this affect you?

_____

14. Does the price change due to the different climate season (wet and dry season)?

Yes / No

If yes, can you give us an example?

_____

15. Have you noticed any changes in the yield per crop?

Yes / No

If yes, please specify

_____

16. Are you happy with the yields of each crop separately (yes/no)?

_____

Section D: Soil Fertility and irrigation

17. What do you think about the soil fertility for each crop (fertile, not fertile, can't decide)?

_____

18. Do you use fertilizers in your agricultural production?

Yes / No

If yes, what type of fertilizers (liquid, compact), where are you getting them from, and for what crops?

_____

19. Are you practicing slash and burn method?

Yes / No

If yes, when did you use it, for which crop and for what reason?

_____

20. Do you use any kind of irrigation system for your agricultural production?

Yes / No

If yes, can you tell us what kind?

_____

21. Do you have problems with the soil erosion?

Yes / No

If yes, how do you cope with that?

_____

22. Do you use any methods to test soil fertility for your agricultural production?

Yes / No

If yes, can you name them?

_____

Section E: Agricultural production problems

23. Do you have problems with the pests in your agricultural production?

Yes / No

If yes, can you name some of them?

_____

24. Do you have problems with the diseases in your agricultural production?

Yes / No

If yes, can you name some of them?

_____

25. Do you have some problems before harvest?

Yes / No

If yes, can you name some of them?

_____

26. Do you have some problems after harvest?

Yes / No

If yes, can you name some of them?

_____

27. How do you store crops after harvest?

_____

28. Do you have any problems while storing them?

_____

29. Have you ever considered to stop being a farmer, if yes, can you tell us why?

_____

Appendix 3: Questionnaire Template Kampung Marup Atas

We are students from the UNIMAS and UCPH and today we would like to fill out a questionnaire with you about your livelihood strategies. This questionnaire will take about 30-35 minutes of your time, however if you feel uncomfortable about answering some of the questions you may skip them. Data collected from this questionnaire will be used to show different livelihood strategies used in the Marop Atas village and villager's perspective about their livelihood strategies.

Household (*pintu*)number:	Interviewer:
Date and time:	Translator:
	Note taker:

Section A: Personal Background

1. Are you a head of your household?

□ Yes □ No

1. Gender:

☐Male ☐Female

1. Are you a part of organizational structures of the longhouse?

☐ Yes ☐ No

1. Age: …….. years old
1. Marital status:

☐Single ☐Married ☐ Divorced ☐ Widow/Widower

1. Ethnicity:

☐Iban ☐Other, (please state: ……)

1. Education Level:

☐No Schooling ☐Primary School (*UPSR*) ☐Lower Secondary School (*PMR*)

☐Upper Secondary School (*SPM/STPM*) ☐Collage/Institute/University

1. Do you as a household have another home elsewhere?

☐ Yes ☐ No ☐Not Sure

Section B: Occupation

1. What is your main occupation?

:……

1. Income per month:

…….

1. Which of the following are you also involved in?

	Occupation
☐	Farming crops/livestock *(Bertanam/bertupik)*
☐	Forestry (*perhutanan*)
☐	Fishing (*perikanan*)
☐	Education services (e.g. teaching/*mengaja*)
☐	Public service (e.g. firefighter, policeman)
☐	Public administration *(kerja perintah)*
☐	Construction (*Kerja pembinaan/Pan Borneo*)
☐	Households (*Suri Rumah*, cleaning, cooking, etc)
☐	Retired (*Pesara Perintah/Kerajaan*)
☐	Other non-farming activities (private companies, manufacturing, NGOs, etc). Please specify

1. Please rank them from the one providing the most income to the one providing the least income.

    1. Paid-salary income (*pendapatan tetap bulanan*)
    2. Farming (*Hasil jualan berkebun/bertupik*)
    3. Investment (*KWSP, Amanah Saham Sarawak)*
    4. Running Business (*Kedai kecil)*
    5. Remittances (*ahli keluarga -anak/adik beradik/saudara mara*)

1. Information about other members of your household:

No	Gender	Education	Occupation	Are they still living here? If not, where?	The last time he/she visited you?
1.					
2.					
3.					
4.					
5.					

Remark
M*-Male****, F****-Female*
Uni- *Collage/Institute/University,* ***HS-*** *High School****, LS-****Lower School,* ***NS-****No School*

Section C: Agriculture

1. Are you engaged in any agriculture activity now (*Pada masa sekarang*)? (If no, then skip questions 14, 15 and 16)

☐ Yes ☐ No

1. Have you been involved in any agriculture activity in the past?

☐ Yes ☐ No

1. If yes, which one and why have you stopped?

…….

1. Please list which crops are you cultivating and numerate which are of the most importance for:

a) your household self-consumption?

b) your household income?

N	Crops	Self- Consumption	Source Income	Land ownership	Size
1	Rice				
2	Pepper				
3	Rubber				
4	Oil palm				
5	Pineapple				
6	Cacao tree				
7	Durian				
8	Other:				
9	Other:				
10	Other:				

1. What are your main challenges with the agricultural activities?

☐ Pests

☐ Commuting to and from the field

☐ Inputs (costs of fertilizers, transportation, etc.)

☐ Labour Input

☐ Time Input (to grow, to harvest, etc.)

1. Are you hiring extra workers to help you with your agricultural activities?

☐ Yes ☐ No

Section D: Forest Resources

1. Do you still use Forest product (*lauk kampung ari babas*)

☐Yes ☐No ☐Not Sure

1. If yes, please fill in the table below.

No	Type of fruits and vegetables		If for sell, then how much you earn per month?		
		S. C	Sell	both	
1	*Daun Sabung*				
2	Bamboo Shoot				
3	*Kemiding*				
4	*Paku ikan / paku keru (fern)*				
5	*Buah Binjai*				
6	Other:				

1. In your opinion, are the forest resources (*lauk enggau jelu kampung*) important for your living?

☐ Yes ☐ No ☐Not Sure

1. If yes or not sure, how often are you using resources from the forest?

☐ Every day ☐ 2-3 times a week ☐ Once a week

1. Do you practice hunting (*ngasu berburu*) activity?

No	Type of Animal		If for sell, then how much you earn per month?		
		S.C	Sell	both	
1	Wild boar (*Babi Hutan*)				
2	Rusa *(deer*)				
3	Pelanduk (*mouse deer*)				
4	Musang (*fox*)				
5	Other:				
6	Other:				

1. Where do you sell forest resources?

☐ Engkilili town ☐ Sri Aman town ☐ Lubok Antu town ☐ Among the villagers

☐ Others, please state: …….

1. Do you extract woods/trees from the forest for your own purposes?

☐ Yes ☐ No

If yes, what is the usage?

☐ House construction ☐ handcraft ☐ commercial (*nyual ramu/kayu*)

1. Type of the trees?

☐ *Nyelutung* ☐ *Keruntum* ☐ *Geruggang* ☐ *Merebung* ☐ *Engkabang*

☐ *Rotan* (Rattan) Others :…….

1. We heard that previously your village was involved in commercial logging. Did you receive any benefits as a household from the timber logging agreement (1992-2017)?

☐ Yes, ☐ No ☐Yes, only financial

Section E: River utilization

1. a) For what purpose do you use the river?

Purpose	Current Use	Past Use
Drinking		
Washing		
Fishing		
Irrigation *(agriculture)*		
Recreation		
Others		

b) If the pattern of the river changed, what is the reason?

……

1. Have you been receiving any income from tourism activities conducted in the waterfall area?

☐ Yes ☐ No

1. What is your opinion about people from outside the village that are visiting waterfall area?

☐Positive ☐Negative ☐I don't care/I'm not concerned

Section F: Governance and schemes

1. Are you engaged in any governmental schemes?

☐Yes ☐No

1. What kind of government scheme/program are you involved and what kind of support do they provide (exp: money/fund/feritilizer/herbiside/pesticide/seminanar/training/other)

	Governmental scheme	Kind of support
☐	DOA	
☐	SALCRA	
☐	RISDA	

□	MRP	
□	RTP	
□	Other	

1. Have you participated in other governmental schemes in the past that you no longer participate in?

□ Yes □ No

1. If yes, please state

a) which schemes ……

b) why you do not participate now?

☐I am not interested ☐They are not running nowadays ☐I was not satisfied

☐I have no access to them

I. Have there been any infrastructural projects implemented in the village by the government? Please choose from the following list:

☐electricity ☐road ☐water supply ☐ other……

1. Did they contribute to the overall well-being of the community?

☐Yes ☐No ☐Not Sure

1. What is your source of information on current local and global events?

☐TV

☐Radio

☐Neighbors

☐Local newspaper

☐Relatives

☐Other (please specify……)

SECTION G: Household and livelihood strategies

1. How are you making household related decisions?

☐ As a household ☐ One person for the household ☐ Each member for himself/herself

1. If there is only one person chosen to be responsible for a decision making in household, on which criteria he/she has been chosen?

☐ Income ☐ Age ☐ Gender ☐ Working experience ☐Not Sure

1. Have there been any changes in household livelihood strategies (*Sara hidup/pencarian*) since you moved to the new longhouse?

☐Yes ☐No

1. If yes, what was the reason of change?

☐ Environment ☐ Land Use/ Resource constrain ☐ Government schemes

☐ Increased income ☐ Household interest ☐ Infrastructure projects ☐ Market trends

SECTION H: Food and water security

1. Where do you buy the food that you are not producing/collecting?

☐ Wet market ☐ Supermarket ☐ Barter system ☐Others, please specify……

1. If you have surplus of food production, what do you do with it?

☐ Sell it ☐ Store it ☐ Give to relatives or friends

1. How much from your income (MYR) do you spend per week on food?

☐ MYR 50 ☐ MYR 50-100 ☐ MYR 101-150 ☐ > MYR 150 ☐ Not sure

1. Is your water supply enough for all your monthly household activities?

☐ Yes ☐ No

1. Do you ever experience any water shortages/interruption?

☐ Yes, please specify……. ☐ No

SECTION I: Personal opinions and feelings

Instructions: For each statement below, please state the quality of your agreement honestly by indicating (√) the space provided.					
Statement	**Strongly Disagree**	**Disagree**	**Not Sure**	**Agree**	**Strongly Agree**
There is a need to conserve wildlife in our area.					
The local community should be involved in conservation programs.					
I have trust in the local government officials.					
I have/had sufficient access to education.					
I would like to have a stable internet connection on my phone.					
There is a need to create better waste management projects.					
State government cares about our village.					
Federal government cares about Sarawak.					
Laws and policies benefit economic development of the village.					
State government should protect forests/land in our region.					
My rights, needs and interests are taken into account by local government.					
Representatives of our village are good in organizing actions to improve the progress of longhouses.					
Our representatives are always fair to us.					
I have a good relationship with all residents in the longhouse.					
I am proud to introduce my community to others.					
I am always asked about my personal opinion regarding any major project in my village.					
I can ask for any help from longhouse residents.					
I feel very happy with life in the longhouse.					

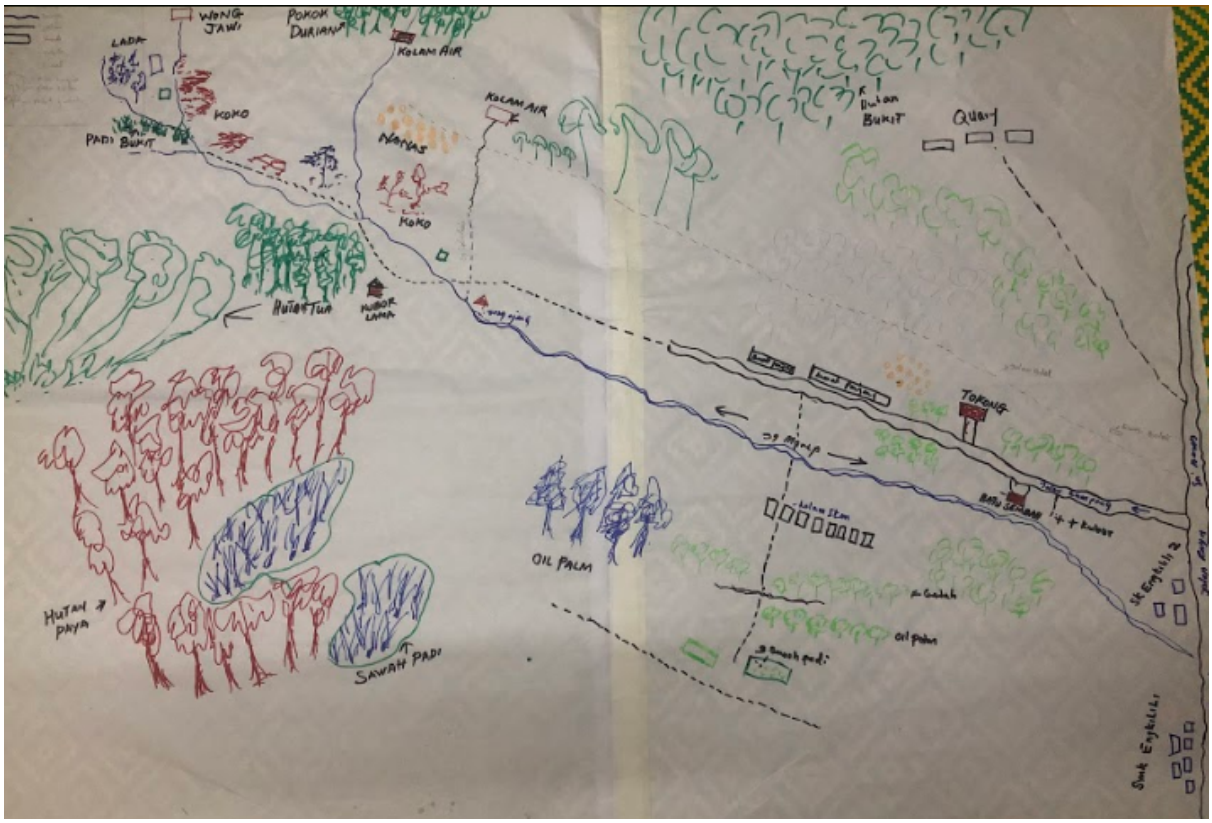
Appendix 4: Agricultural production

No.	Total ha	Rice					Pepper					Rubber				
		S	LO	U	YS	PQ	S	LO	U	YS	PQ	S	LO	U	YS	PQ
3	7 ha						2ha	NCR	scs	2012	1t/year	2ha	NCR	s	2004	250kg/year
6	-	0,4ha	NCR	SC	2000	18bags/year	0.1ha	NCR	-	2019	-					
14	2ha	0.4ha	NCR	sc	1960	20bags/year	0.4ha	NCR	sc	2014	16kg/year	0.4ha	Ind.	s	1970	20kg/year
15	7.1ha	0.8ha	Ind.	sc	1994	10bags/year	0.1ha	Ind.	s	2010	2bags/year	6ha	Ind.	s	2008	13sheets/harvest
19	6 ha	2ha	NCR	sc	1988	40bags/year	1.2ha	NCR	scs	2000	100kg/year	1.5ha	NCR	scs	1989	50kg/year
20	2.8ha	0.6ha	NCR	sc	1960	20bags/year	0.2ha	NCR	scs	2012	4bags/year	0.8ha	NCR	s	1988	2sheets/day

No. - household number, S – size, LO – land ownership (NCR-native community right, Ind.-Individual, U – usage (s-sell, sc-self consumption, scs-both, YS – year started, PQ- production quantity

No.	Cocoa					Pineapple					Oil palm					Durian				
	S	LO	U	YS	PQ	S	LO	U	YS	PQ	S	LO	U	YS	PQ	S	LO	U	YS	PQ
3	2ha	NCR	s	2016	50kg/year	1ha	NCR	scs	2017	8p/harvest										
6	0.3 ha	NCR	s	2009	20kg/harvest	1.5 ha	NCR	s/scs	2009	15/harvest										
14	0.4 ha	NCR	s	2019	25kg/year	0.4 ha	NCR	scs	2019	9p/harvest										
15						0.1 ha	Ind.	scs	1996	5p/harvest						0.1 ha	Ind.	scs	1960	14p/harvest
19	0.2 ha	NCR	s	2005	25kg/year	0.1 ha	NCR	scs	2000	10p/harvest						0.3 ha	NCR	scs	1984	50p/harvest
20	0.4 ha	NCR	s	2014	1bag/year						0.8 ha	NCR	s	2012	2t/month					

Appendix 5. Community resource mapping



Appendix 6. Natural resource assesment

Tree no	Species	Diameter (cm)	Distance (m)	% up	% down	Height (m)
1	Mentawa	84	15	118	12	19.5
2	Empaling	61	12	124	12	16.32
3	Engkebang kampong	92	13	128	18	18.98
4	Ubah	21	10	60	15	7.5
5	Kayu malam	84	15	146	10	23.4
6	Engkebang	24	10	92	15	10.7
7	Engkebang	55	16.4	134	9	22.88
8	Engkebang kampong	12	6	32	22	3.24
9	Mentawa	210	20.8	128	6	27.87
10	Empile	220	22.7	110	9	27.01

Appendix 7: Final synopsis

Impact of rural development on the local community and their livelihood strategies in Marop Atas
27/02-07/03

Source: english.astroawani.com, “The life of Iban community in Sarawak longhouses”

Polina Blinova, Aleksandra Czucha, Federico D’Ascanio, Sebastian Lukman

University of Copenhagen, Faculty of Science

1. Introduction

Sarawak comprises the north-western part of the island Borneo and is bounded by the sultanate of Brunei and Sabah (Malaysia) on the north and by Indonesian part of Borneo (Kalimantan) on the east and south (Encyclopaedia Britannica). Although Sarawak is the largest of 13 states in Malaysia, covering an area of approximately 124 thousand square kilometres, it is the poorest region in the country (Furuoka, 2014). According to Philip Alston (2019), UN special rapporteur on extreme poverty and human rights, "the percentage of low-income earners in Sarawak is higher than the national-level figure". He pointed out that in Sarawak, "15.5% of households have a total family monthly income of less than RM 2,000".

Sarawak joined the Malaysian Federation together with neighbouring Sabah in 1963. Under constitution the state has gained special autonomy and rights to enjoy a privileged treatment within the new federation. National government has made large investments since then to raise living standards of rural population of Sarawak. However, the expansion of the federation in the recent years has been causing tensions, and complexities of state-federal relations such us authority division and revenue sources are growing dramatically (Jomo et al., 2002).

The largest ethnic group that inhabits Sarawak is the Sea Dayak which is also known as the Iban community. The majority of this community live in groups in the Iban longhouse, typically located near the waterfront and close to the highway to facilitate daily activities and communication with each other (Anggo and Laja, 2018).

Each group is formed by multiple households, each known as *bilek*. According to Freeman (1970), "bilek is the word which the Iban use to describe the separate enclosed rooms of a longhouse, but it is also a term used, by the Iban themselves, to refer to the family group which owns and occupies one apartment of a longhouse". In turn, each settlement has one or several headmen, Tuai rumah, who are responsible for maintaining safety and security of the community (Anggo and Laja, 2018).

The study site where our research will be conducted is a Marop Atas village which consists of two longhouses. There are currently 44 households living in two different longhouses – 13 households are based at the upper hill longhouse whereas 31 households are located in a slightly lower hill longhouse. This village has two headmen and each of them is responsible for 36 and 8 households respectively. Prior to the current settlement, villagers from Marop Atas were living along the Marop River, but in 2000 there was a decision to relocate.

As the majority of Iban community, villagers of Marop Atas are very much dependent on the natural resources for their livelihood such as river, forests and the land. However, land is perhaps the most important asset for the Iban population of Marop Atas. The main economic activity of the villagers is farming. Most families cultivate wet and hill rice, pepper, cocoa, oil palm and rubber trees. The choice of which crop to cultivate based on land properties, accessibility to the roadside, water supply, labour availability and governmental schemes and projects.

It is critical that the resources are managed sustainably with or without assistance from the relevant government agencies. Some of the current farming and non-farming livelihood strategies are based on their indigenous knowledge as well as knowledge disseminated by government agencies. However, some economic activities may cause severe problems of environmental degradation and social dissonance in rural areas. Hence, it is crucial to strike a balance between economic development and environmental protection.ri

2. Research objectives

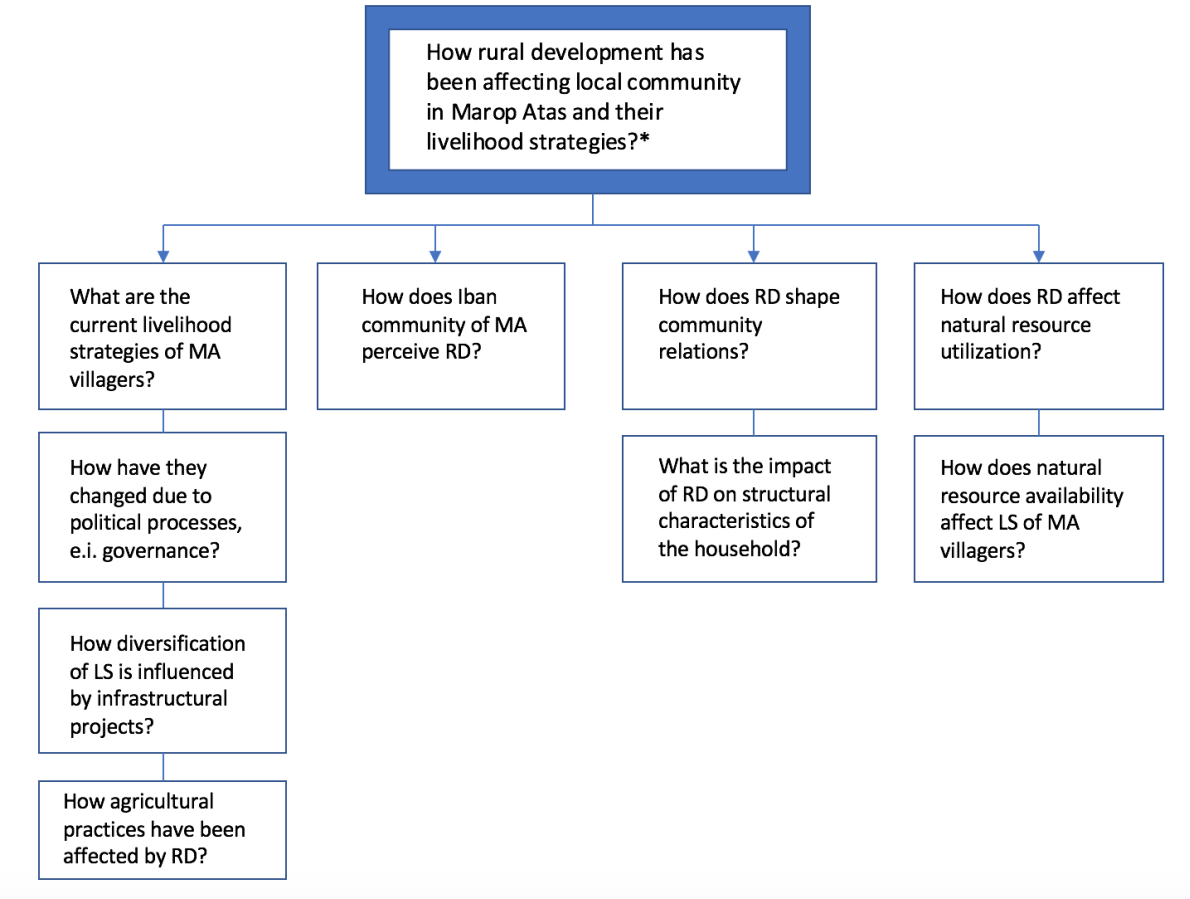
After analyzing valuable insights on the background and history of Sarawak as well as the study site of Marop Atas, we have managed to decide upon the overall objectives of our research.

Firstly, we want to examine what livelihood strategies are present among villagers of Marop Atas and how diversification of those has been changing over time. We aim to find out what is the role of external factors, such as key political and socio-economic drivers on the adoption of certain strategies and their further effect on household well-being and social relations. These will be studied through, among others, infrastructure improvements, labor in community, mobility capabilities, inequalities, exclusion/inclusion, poverty reduction, family structures and various forms of access i.e. to information. Moreover, we will present the study in the wider concept of global development paradigms promoted by government and big corporations and their empirical influence on the way frontier areas are defined, known and affected at the community level. We will analyse what are the consequences of implemented *in situ* development projects and how they fulfill both social and economic objectives they were expected in reality. In this context, we will examine what is the impact of rural development on resources (forest, soil, water) availability and agricultural practices among villagers. Our aim is also to look up at these processes from Iban perspective – how do they

perceive changes, 'modernity' and community development as well as to recognize their needs, attitudes and knowledge about the surrounding environment.

3. Research questions

Our objectives and interests have further led us to formulate following research question:



*** RD - Rural Development, MA - Marop Atas, LS - livelihood strategies**

As we will be operating with the term of 'rural development' throughout the report, it is important to first clarify the definition of it. According to the UN Rural Development relates primarily to areas that have a relatively low population density compared to cities, areas where agriculture and related activities usually dominate the landscape and economy, and places where transport and communications need to cover relatively large distances making travel and service provision relatively difficult and costly. Rural development can be understood as the unfolding of capitalism in rural areas, and as that package of policy and project interventions that aim to foster socio-economic change and human improvement in rural areas. Education,

entrepreneurship, physical infrastructure and social infrastructure all play a significant role in developing rural regions (UN Report, 2015).

4. Research schedule

The schedule of research is 10 days, from the 27th of February until the 7th of March. In the first days when we arrive in the Marop Atas village, we will try to get basic information about the village and people living there through questionnaires and our observations. After we get basic information we will start using more specific social and natural science methods for our research. In the middle period of our stay there, we will do soil sampling, water quality, and forest resources assessment to get answers for the natural part of our research and in-depth interview with the headman and semi-structured with some households to get more information about their livelihood. The last days spent in Marop Atas will be focused on gathering extra information about the livelihood of the households and agricultural practices that they use.

5. Methodology

5.1. Analytical frameworks

Our study will be embedded in a combination of few theoretical frameworks. As a point of departure we agreed on Sustainable Livelihoods Framework (SLF). The SLF is based on understanding people's access to assets that typically include natural, human, social, physical and financial factors. Other assets are increasingly being used in such analyses, such as information, cultural/traditional and institutional. Access to these assets are then analysed in relation to the context of that livelihood (e.g., climate, demography, history and macro-economic conditions), institutional and social processes (e.g., organisational arrangements and land tenure), and the livelihood strategies that are used (Reed et al., 2013).

In relation to our research questions, this framework will help us to identify different assets in Marop Atas and analyse what mix of activities people choose to undertake to achieve their livelihood goals as well as determine their outcomes and impact on the surrounding environment. . SEP

Second framework is the ecosystem services framework (ESF) which highlights the long-term role that healthy ecosystems play in the sustainable provision of human wellbeing, economic development and poverty alleviation. Efficient and effective management of ecosystems (living natural capital) can sustain the provision of vital ecosystem services such as climate stabilisation, drinking water supply, flood alleviation, crop pollination, recreation opportunities, amenity and cultural assets (Turner et al., 2008). Hence, in our case, the ESF

will provide us with a way to research sensitivity of livelihoods in Marop Atas to changes in quality, stocks and flows of natural capital.

We will also use Theory of Access. It emerges within power structures and differentiates access from property ownership. Access is defined as "the ability to derive benefits from things" (Myers & Hansen, 2020). It will help us in placing differential relations among actors in Marop Atas, mapping the flow of particular benefit of interest and mechanisms of control maintenance over them.

5.2. Methods

5.2.1. Social science methods

Questionnaires

A questionnaire is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. We will use the questionnaire as a means of measuring the behaviour, attitudes, preferences, opinions and intentions of villagers in Marop Atas. We expect to obtain quantitative data on various background information such as e.g. agricultural activities, local market access, land use changes, views and expectations regarding the governmental subsidies and schemes. The questionnaire will give us information about each household and help to have a clearer view of what is happening in the village.

Semi-structured interviews

Semi-structured interviews will be used to obtain qualitative data on villagers perspectives concerning several of our sub research questions. Since questions are open-ended and without a strict, formal order, informants will be encouraged to express themselves in a detailed manner which may also result in shifting focus to different, equally important aspects of a specific issue.

Observation/participatory observation

Its aim is to gain a close and intimate familiarity with a given group of individuals and their daily practices, rituals and interactions throughout the involvement with people in their cultural environment. Furthermore, observation of the local market and access to it will also help us to achieve a deeper understanding of their lives and values.

PRA – Participatory rural appraisal

The approach aims to incorporate the knowledge and opinions of rural people in the planning and management of development projects and programmes. In turn, PRA has the following techniques:

Timeline - Timeline provides the opportunity to learn about the significant events and ongoing changes that have taken place over time in the study area, pointing them out on a timeline.

Transects - At the very beginning of field research we will conduct a walking tour through areas of interest to observe, listen, get to know different zones or conditions, and to ask questions to identify problems and possible solutions.

Community mapping/system mapping/venn diagram - This technique will help us map and characterize external and internal stakeholders, organizations, groups, important persons that have a relationship, whether direct or indirect, with the village and their relation to one another in terms of contact, cooperation, flow of information, distribution of services etc.

Wealth Ranking - We will use this method to investigate perceptions of wealth differences and inequalities in a village and understand local indicators and criteria of wealth and well-being.

5.2.2. Natural science methods

Forest resource assessment and evaluation

We are going to use the forest resource assessment and valuation of forest resources used in the area to gather knowledge of how villagers are using forest and how big an influence a forest resource has on their livelihood strategies. The forest resources assessment method is going to provide information about the biodiversity and density of the forest in the Marop Atas area by measuring the number of trees in the chosen area and looking at the different species at the same time. Chosen areas will be those who have value for the villagers of the Marop Atas community, rubber tree production area, oil palm plantations and some areas in the forest where villagers are spending a certain amount of time. Forest resource evaluation will show what outputs (fruit, building material) are most commonly used by the villagers in the community.

Soil sampling

With soil sampling methods we are going to measure pH, the electrical conductivity of the soil to determine the percentage of the soil salinity, and we will look at the soil texture to see what soil types they have in the area and on what type of soil they are doing their agricultural production. These measurements are going to provide us information about the soil in the area and help us to understand if soil characteristics are affecting agricultural strategies of the villagers. The plan is to take measurements in two different areas of production, in the old forest area where they are still cultivating paddy, rubber, pepper and fruit trees and compare that with soil characteristics of new agricultural land they use.

Water quality

The water quality method is going to help us determine water quality in the area where villagers carry on their everyday activities. Looking at the organisms that live in the water we will grade water quality of the Kula river which villagers of Marop Atas area use as their additional gravity-fed water supply. Also, we will look at the basic characteristics of water used in the village (color, smell, clearness, taste).

Area mapping

Area mapping with GPS devices will help us to get a better idea of the Marop Atas size. Also, by utilizing this method, we will complement the community mapping with the gathered information to get the final image of how households are separating their agricultural land and what are the boundaries between them.

6. Conclusion and limitations

The project itself is an amazing opportunity for all of us to put in practice what we've all learned so far in our academic education. By creating our research questions, we are planning to gain our own autonomy and responsibilities within the fieldwork, with the ultimate goal to answer them objectively and deeply.

To accomplish these results, we need proper knowledge on multiple disciplines, such as natural sciences and the measurements, social sciences which include political policies and sociological analyses, economic investigations, statistical data collection and more to come. A relevant characteristic of the fieldwork are interdisciplinary skills, therefore sharing an individual knowledge within the group members is essential for the final outcome of the project.

Learning to work in a team, supporting each other's and creating a positive and mainly productive atmosphere was one of our goals in order to make a good report. However, since the beginning of the group formation, we have been aware that we will encounter limitations or obstacles on the way such as cultural and social differences or language barriers. An important factor is also a time constraint. Due to different backgrounds and hence personal interests and ambitions we can also expect a challenging collaboration with our counterparts in Malaysia.

7. References

16. Article on Sarawak State, Malaysia. The editors of Encyclopaedia Britannica [online] Available at: https://www.britannica.com/place/Sarawak-state-Malaysia [Accessed 15 Feb. 2020].
17. A/RES/70/1 - Transforming our world: the 2030 Agenda for Sustainable Development, UN; available online at: https://sustainabledevelopment.un.org/topics/ruraldevelopment/decisions [Accessed 18 Feb. 2020]
18. Jomo K. S. & Hui, W. C. (2002) *The political economy of Malaysian federalism : economic development, public policy and conflict containment* . Helsinki: UNU World Institute for Development Economics Research UNU/WIDER.
19. Fao.org. (2020). Introduction to CBA | Guide for Monitoring and Evaluating Land Administration Programs | Food and Agriculture Organization of the United Nations. [online]Available at:

    http://www.fao.org/in-action/herramienta-administracion-tierras/module-5/practical-evaluation-guide/introduction-cba/en/ [Accessed 15 Feb. 2020].

20. Freeman J. D. (1970). Report on the Iban, London School of Economics, University of London, London: Athlone Press.
21. Fujica Anak Anggo, Louis Laja. (2018) The Function and Role in the IBAN Social Rank in their Communities. *International Journal of Engineering & Technology* [online] Available at: www.sciencepubco.com/index.php/IJET[Accessed 15 Feb. 2020].
22. Furuoka, Fumitaka. (2014) Economic development in Sarawak, Malaysia: An overview., University of Malaya,. *Munich Personal RePEc Archive* [online] Available at: online at: https://mpra.ub.uni-muenchen.de/60477/ [Accessed 15 Feb. 2020].
23. Reed, M. . et al. (2013) Combining analytical frameworks to assess livelihood vulnerability to climate change and analyse adaptation options. *Ecological Economics.*
24. Rodd Myers & Christian Pilegaard Hansen (2020). Revisiting A Theory of Access: A review., *Society & Natural Resources*

25. Statement by Professor Philip Alston, United Nations Special Rapporteur on extreme poverty and human rights, on his visit to Malaysia, 13-23 August 2019. [online] Available at:

https://www.ohchr.org/en/NewsEvents/Pages/DisplayNews.aspx?NewsID=24912&LangID=E [Accessed 17 Feb. 2020]

26. Turner, R. & Daily, G.C.. (2008). The Ecosystem Services Framework and Natural Capital Conservation. *Environmental & Resource Economics.*