Rumah Meran Community

Past, Present and Future

Final report for field trip to Rumah Meran, Loagan Bunut National Park, Sarawak

By

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Abstract

This report investigates how the establishment of the Loagan Bunut National Park in Sarawak has affected the livelihood strategies of the Rumah Meran community, which is located inside the borders of the National Park, and assesses the community's impact on the resources of the National Park. Despite providing the Meran community with access to new resources through an improvement in infrastructure and market access, the establishment of the national park has to a certain extent inhibited the development of the community; firstly by restricting their rights to engage in commercial land-use activities, and secondly by threatening their rights to land they claim to be their own. In spite of this, the average income in the community is significantly higher than that of the surrounding communities, and is generated from diversified individual enterprises with no immediate relation to the national park. However the industrious behaviour of the community members, may cause future problems for the environmental sustainability of the national park.

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Chapter 1 - Thematic Context

Malaysia is a developing country that has experienced significant economic growth during the last two decades. This economic growth is to a large extent generated from the exploitation of the country's natural resources. Apart from the rich oil fields in the South China Sea, Malaysia is the worlds leading manufacturer of palm oil and one of the leading suppliers of tropical wood, which is extracted from the tropical rain forest. The rain forests of Malaysia are one of the mega diversity centres of the world, which has been put under serious pressure from the logging and oil palm industry, and areas with undisturbed primary rain forest are disappearing rapidly. (Brookfield et al 1995)

Sarawak, one of the two Malaysian states on Borneo, has been, and still is, subject to extensive logging and the establishment of oil palm plantations in logged areas is rapidly expanding. The policy of the state administration is to continue this development, but under the umbrella of sustainable development, meaning that National parks should be established in order to preserve and protect the biodiversity. This dualism can be found in the formulation of contradicting visions, *e.g.* in the National Policy on Biodiversity (1998) the goal is "to transform Malaysia into a world centre of excellence in conservation, research and utilisation of tropical biodiversity by the year 2020" (NPB 1998). But in the third National Agricultural Policy (1998), two approaches are addressed, that are immediately incompatible with the one put forward in the NBP: the agroforestry approach, in which agriculture and forestry are viewed as mutually compatible and complementary; and the product-based approach that reinforces and complements the agro-industrial development (NAP 1998). However there are more factors in play than biodiversity vs. economic growth. The rain forests of Borneo are although sparsely populated, still populated by more than 30 different ethnic groups[1], who have lived in and from the rain forests for centuries. These native groups are, not necessarily keen on having their traditional habitat transformed into either oil palm plantations or protected national parks.

The rights of these groups are recognized primarily through the term 'native customary rights' (NCR), which gives them the rights to use and extract resources for subsistence purposes – also within the boundaries of national parks, and engage in some kinds of commercial endeavours. The state has long-term goals for targeting NCL[2] for plantation agriculture (by the year 2010 the government aims to have 1 mill. Ha of oil palm, compared to close to 300 000 ha in 1999). There are a number of reasons for targeting NCL for plantation agriculture: shortage of land suitable for agriculture, requests from native communities for their land to be developed a.o.. However the NCR is not, as such, a title to the land, and does not grant the native groups full rights to use the areas for commercial purposes and especially not the right to sell it. The matter of land rights become even more blurred since, in many cases, more than one group claims NCR to the same area of land.

[1] www.earthisland.org/borneo/borneo/sarawak3.html
[2] Native customary land - Land not held under title but subject to native customary rights

One of the ways this is sought to overcome is to involve the communities actively in nature preservation, and allow them to both uphold a certain right to continue with their traditional practices, and provide them with new opportunities to benefit from the externalities generated by the establishment of a national park. These externalities may include improved income opportunities through jobs in the management of the national park and through tourism activities in the park. However, accepting a role as tourist guides or caretakers of a national park implicitly implies an acceptance of not having supremacy of the land on which the park is established. This is a possible cause for multiple problems, especially if the local community have no particular interest in merely maintaining their traditional practices, but are rather more interested in pursuing new ones.

As such three competing interests for the development of Sarawak can be identified: The continued extraction and use of natural resources, for the sake of financial profit and economic development; the preservationist concerns for protecting the tropical rain forest and its associated biodiversity; and finally the native population's interest in keeping the land that they perceive to be theirs. All of these competing, and potentially conflicting, types of interests are explicit in the area that has been chosen for the field work, which forms the empirical foundation of this report.

1.1 Case specific Context

The field site of this study is located in Loagan Bunut National Park (LBNP) in the Tinjar River catchment, Miri Division of the state of Sarawak, Malaysia. Gazetted in 1990 and inaugurated in 2001, the national park has been declared by the International Union for Conservation of Nature (IUCN) as a region management category II, *i.e.* area managed for ecosystem preservation and recreation (IUCN 1994). The national park contains Sarawak's largest natural fresh water lake, which, together with the associated peat swamp forest, is the main conservation value of interest (UNEP 1992). Altogether the park covers about 10.000 ha, which makes it one of the smallest national parks in Sarawak

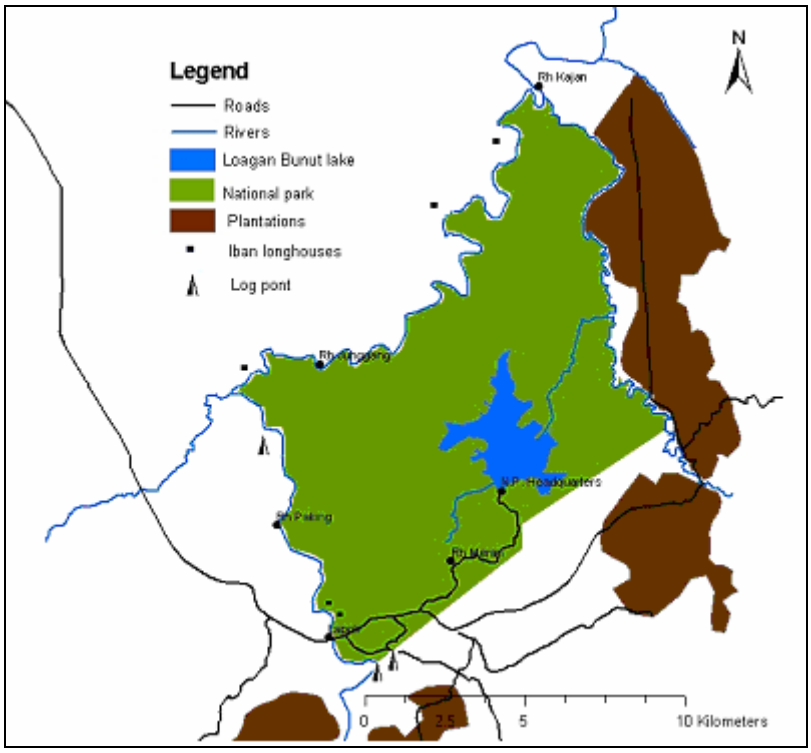

Fig. 1.1 Loagan Bunut National Park. *The area covers 10,736 hectares, bounded by the Tinjar and Teru rivers. The peat swamp forest covers about 7,000 hectares.*

In and surrounding the perimeter of the national park there are 9 communities of three different ethnicities (Iban, Berawan and Penan). The park is surrounded by 3 logging camps and a number of oil palm plantations (Fig 1.1). Currently, only the Berawan have officially been granted rights to use the resources in some of the areas within the park, however, the extents of these are somewhat unclear and subject to disputes. Within the actual boundary of the park there are three communities, which are officially illegal settlements. The two illegal Iban communities are located very close to the boundary of the park and have been asked to abandon their longhouses. The status of the illegal Berawan community (Rh Meran), which is located in the centre of the park, is, however, not that clear. The Berawan believe that their NCR allows them to settle within the park, but this has not, as yet, been officially recognized.

The community of Rh Meran originates from the Berawan village of Long Teru, located to the north of the LBNP (Fig. 1.1). Rh Meran composes of 27 households (app. 115 people), and a new longhouse is currently under construction. The Rh Meran community was established following the burning down of the longhouse in Long Teru in 1998, after which the Long Teru community split into two. The people of Rh Meran moved to the current area, located in the south-west of the national park. The field work was conducted in this community.

As mentioned above, the three main groups of stakeholders are all identifiable in the context of this area. The commercial interests by the logging companies and the oil palm estates; the preservationist concerns are represented by the national park. Whereas the commercial and the

preservationist interests are immediately contradictory, this is not necessarily the case for the interests of the native groups. Their interests are related to having the power to decide what to do with the land, and not to be reduced to tenants on what they consider to be their property. Exactly what the Native groups, and in this case the Berawan of Rh Meran intend to do with their land and how this relates to the other stakeholders is the primary focus of this report. That is, all three issues are addressed, but they are primarily viewed and analysed from the perspective of the Rh Meran community.

One of the externalities generated by the establishment of the national park is improved infrastructure due to the construction of a tar road running right past the community, and several of the community members dispose of cars, which has greatly increased their mobility and given them access to a number of new income generating activities. How this major change in the community's mobility affects the livelihood strategies of the community members is a central issue of concern not only for the Berawan community in question, but also in the more general context on how people adapt to radical changes from external forces. At this point it is, however, important to note that the people of the Rh Meran community does not necessarily share a common interest, and cannot as such be addressed as a uniform entity. The extent to which the community act with common goals, or whether each household or each individual household members are pursuing own goals and interests is a central point of concern in order to reach an understanding of how the community interact with, and relate to, the opportunities and constraints represented by the national park, the oil palm estates and the logging companies.

Addressing the reasons for the recent relocation of the community is an entry point for the level of community integration. The relocation could either have initiated a stronger sense of social cohesion in the community, or it could have (together with other external factors) caused the community to become socially fragmented. New income opportunities exist, both on-farm, for example cash cropping instead of hill rice farming, and off-farm, for example working in tourism. The extent to which the villager's adopt these new income opportunities or conform to traditional practices will have a major influence on the future of the community, as well as on the future ecological sustainability of the national park (Rigg 1998, Birch Thomsen 1999). A potential paradox comes into play since many of the new opportunities for alternative livelihood strategies, that are now available for the members of the community are directly linked to the establishment of the park, and it is precisely the potential expansion of these opportunities that, in the long run, can bring the community member's livelihood in direct conflict with the more preservationist considerations that was the initial purpose for the establishment of the national park.

1.2 Research question

How has the change of location and establishment of the National Park affected the livelihood strategies of the Rh Meran Community; and what impact will the community have on the resources of the National Park?

The report is, however, not an attempt to holistically analyse all aspects, which relates to the overall research question, which would be an overwhelming task given the limited duration of the field work and the overall frame of this report. Thus, the report will, apart, from a general presentation of the case context, focus the analytical discussion in four key areas of interest:

Initially we will address the issues regarding land rights and land tenure, which also addresses the legal status of the Rh. Meran community. After this, the preservationist value of the park will be addressed. That is, how the official preservationist objectives for the establishment of LBNP correspond to the encountered realty, and to what degree the activities of the Rh Meran community influences the natural resource base of the park. Following this is a critical examination of the changing livelihood strategies of the members of the community. This also includes their degree of economic dependency on the national park, both the resources within the park as well as the externalities generated by the establishment of the park, and how this is connected to the division of the Long Teru community. The final analytical chapter looks into the farming practices within the park. How this practice is changing according to the new income opportunities, and relates to the land rights issue, as well as its effects on the natural resources in the park. This will lead us to a conclusion that integrates the complex relationship between the three different types of interests outlined in the thematic context as seen from the perspective of a small indigenous community in north-western Sarawak. A more schematic overview of the reports contents is presented in the following page.

1.3 Report Design

Thematic context	The general scientific context of the report and the premises for the field work.	The introductory part of the report, where the research objectives, the theoretical approach and the general methodology is outlined.
Methodology	A general description of the methods applied during the field work, and the methodology used for systematizing and analysing the data.	
Land Tenure/Land rights	A presentation of the official laws and legislation (with all the bias included in these) regarding the rights of the Berawan people to use the land within the national park.	The analytical part of the report, where the data collected during the field work is presented and interpreted. The strengths and weaknesses of the specific methods used will be discussed in close connection with the actual data. This also goes for the more theoretical considerations from which the methods are developed.
Assessment of the parks Natural resources	A presentation of the natural resource base of the Loagan Bunut National Park, how this correlates with the official descriptions of the park and to what extent the human settlement has had an impact on the Natural resources of the park.	
Livelihood strategies	A brief presentation of the basic demographics of the Rh Meran community, an assessment of the social structure of the community and a discussion of the development of the livelihood strategies of the people in the community.	
Farming	A presentation and analytical discussion of the farming methods and technologies applied by the community, with specific considerations as to how this relates to both the issue of land tenure/land rights and to the general livelihood strategies of the community.	
Conclusion	Summarising the findings presented in the four analytical chapters, and relating these to the overall research objective of the report. A discussion of the general validity of the findings, an assessment of the broader picture which the report is inscribed in, and suggestions for further studies within the context.	The final and summarising part of the report, in which the general validity of the report's findings is discussed.

Chapter 2 - Methodology

In this chapter the methods applied during the field work, their strengths and weaknesses, and thus the general validity of the results presented in the report, is presented and subjected to critical examination.

As described on the previous pages the context for the fieldwork was a community that had undergone massive structural changes in the recent past (e.g. the relocation, the establishment of the national park, the evolving tourism). The main focus of the overall research objective has been to evaluate what impact these changes have had and will have on the community and the national park. The general context for this report is essentially multidisciplinary and is a result of a joint effort by 9 students from 4 different continents and a variety of scientific disciplines ranging from business financing to veterinary and marine biology. The difference between the disciplines, the cultural differences and the interpretation have led to some bias in the data, and in the following it is described in more detail what kind of bias as well as what was done in order to overcome this bias. This chapter is however, not an attempt to evaluate each and every single method used for data collection. Rather it is an outline of the general approaches on the different surveys that were undertaken. But first, a bit about the more general methodological approach that we made use of.

Given that the data for the report had to be collected within a 10-day period in the field some of the more standard methods of data collection were not possible. This was especially the case for the assessments of the natural resource base. Assessments of for example the extent of soil erosion or the creation of a biodiversity index would require more in-depth studies in order to conclude anything about anthropogenic impacts on the natural resource base. Since this was not possible the data collected on these and related topics are essentially a 'snapshot' of the current conditions.[3] For assessing how these conditions have changed, we rely heavily on information from interviews with key informants.

Prior to the field trip, we were aware that the existing data of the park and the community's past development was very limited, which gave us no valid comparison for the data collected during the fieldwork. Bearing this in mind it was obvious that we had to rely on the information that could be retrieved from key informants within the community and the national park. Excepting a few cases all the interviews were done with the mediation of a translator, which caused some difficulties and misunderstandings along the way.

2.1 Organization of data collection

Probably the biggest challenge of the actual data collection was to establish a common consensus within the group regarding what kind of data that should be collected. The multitude of scientific disciplines that the group was composed of made it rather complicated to agree upon a common

[3] Here and now meaning app. March 1.

approach. The approach we eventually agreed upon was, in many respects similar to the one outlined in the thematic context with the focus on the relationship between changes in the physical environment and changes in social patterns.

Within this common approach a questionnaire for a household survey was designed, but for the more specific surveys it was decided to split the group into three working teams to make optimal use of the academic competences and skills of each group member. The three teams that were established was one that looked into the preservationist value of the park in terms of natural resources, one that investigated the farming practices of the community, and one that looked into the more socio-economic aspects. To ensure that this practical organization of the groups resources did not evolve into three different research projects a joint meeting was held every morning to compare findings and make slight adjustments to the overall research plan. The three 'Danes[4]' who are responsible for this report each joined a different working team, thus the research undertaken by each team can be read from the individual working calendars (Appendix 2.1). The aim of the morning meetings was also to attempt to prevent overlaps in data collection and to inform the group of important findings. However, at times communication did falter and important information, both academic and logistical, was not shared, resulting in minor delays and misunderstandings.

2.2 Household Survey

As described above the household survey was the starting point for the research. The aim of the survey was to get a basic overview of the community, including income levels, dependency on natural resources within the park, land use practices as well as basic demographics. To address the issue of social change the year 1998 was selected for comparison with the present state of affairs. !998 since this was the year when the longhouse in Long Teru burned, following which the Meran community was established. Questionnaires are generally good for establishing an overview on the state of affairs in a given context, but their appliance is more limited when the task is to understand the deeper lying structures and relations of the context, and the social processes that have led to the current state of affairs. In general terms it can be said that questionnaires are good at getting answers to the 'hows' and the 'whats' but not very good at the 'whys'. The aim of the questionnaire was therefore not solely to produce data for further analysis, but just as much to get the necessary information that would enables us to pick out the best key informants for the in-depth interviews and ask these respondents the relevant questions. The respondents selected for the questionnaire were the household heads (defined as the head of each bilek), mainly because we perceived it to be culturally insensitive to start asking questions to individual household members before talking to the household head. However, for some of the questions it was quite clear that the household head was not the best person to ask, especially in regards to the household's expenditure, where it quite clearly was the women who knew most (the men's answers simply did not add up).

[4] Meaning from the Danish universities, respecting that the Danish part of the group is not exactly Danish.

The composition of the final questionnaire was the result of a full-days meeting with our Malaysian counterparts. Firstly, we had to attempt to find consensus regarding our research questions, and then negotiate what the questionnaire should include. This was no easy task, and we ended up meeting halfway on many aspects, so the questionnaire ended up being somewhat inconsistent. The final version of the questionnaire (Appendix 2.2) was made after having tested the questionnaire on 4 household heads, and making the relevant adjustments. Furthermore we made a common translation of the questionnaire to make sure that the questions were asked in the same manner to all respondents. This did not succeed entirely. First of all because the translation was made into Iban since neither our translator nor any of the Malaysian students had knowledge of Berawan[5], secondly because some of the questions needed additional explanations in order to make them comprehensible to the respondents. In spite of this we ended up having four slightly different versions of the questionnaire. This was primarily due to practical problems (we ran out of paper for the printer, and eventually our laptop broke down because of the irregularities in the electricity) following which there was some confusion on which questionnaire was the final final version and eventually made it necessary to record answers from different interviews on the same questionnaire. These unfortunate circumstances made the SPSS processing a bit more creative than it should have been. In the end we managed to undertake 18 questionnaires out of the total 26 households. The 8 households missing were not in the longhouse during the period we stayed there[6].

2.3 Participatory rural appraisal (PRA)

The PRA methods applied were community mapping, farm transects and focus group interviews. The community mapping session, whilst providing us with an excellent overview map of the project area and a land-use map, was not performed entirely according to plan. This was due to the fact that the villagers had done this activity before, and therefore knew the exercise and simply drew a map without much facilitation. The farm transects ended up actually being semi-structured interviews, which took place on the respondents own farm – the location of the fields did not allow for a walk 'transecting' various production systems. The focus group interviews functioned well, though translating open discussion between participants did prove problematic.

2.4 Key informants interview

In the synopsis these interviews were dubbed 'Semi structured in depth interviews'[7]. The majority of data that this report is based on comes from these interviews. The structure of the interviews did not evolve around specific questions, but around certain predefined themes, which, of course, varied according to which respondent we were doing the interview with. The idea was to select the key informants on basis of the information gathered from the household survey, but as a part of the terms for our stay in the longhouse all contact to the community members had to go through the

[5] All the respondents spoke Iban, and without being linguists, it seems as if the Iban and Berawan language are not that different.
[6] The reasons for their absence will be addressed in chapter 5
[7] See synopsis Appendix 6, p. 7 for a more elaborate definition.

headman, which gave him a very powerful position as gatekeeper, and our research an obvious problem. However, the headman was extremely helpful in all respects, and it was not our impression that he actively prevented us from talking to some members of the community; it rather seemed as if his mediation gave us access to key informants we would not have had the opportunity to talk with otherwise. After the first week our presence in the longhouse had become so accepted that we more or less could talk to whomever we wanted without going through the headman first.

Another possible bias in the information from the key informant's interviews was the fact that one of the Malaysian group members was a high-ranking officer in the national park administration.

2.5 Informal conversations and observations

The informal conversations and observations was an essential element in our data collection. Not only did they help us find out what kind of questions we should ask in the more formalized interview sessions, the informal interaction with the community members also significantly contributed to us becoming accepted by the community. Our informal interaction[8] ranged from playing a local variety of foot/volleyball with the young men to teaching the women how to make potato salad. During these activities topics of great relevance, that we would not otherwise have come aware of came up which solved a lot of puzzles and aided us in our further research.

Apart from the informal interaction we also undertook more direct observations of various kinds including the state of construction of the longhouse, the extraction of forest resources, observation of working skills and methods, traditional offerings to shrine, hygiene etc.

Our primary way of organizing this blur of information was our field diaries which we all kept with us at all times. None of us have come home with less than 60 pages of notes, primarily from the informal interaction with the community members.

Chapter 3 - Land tenure in Rumah Meran

The aim of this chapter is to present the issue concerning land rights which the people of Rh Meran face. The villager's insecurity regarding their land rights was an aspect that emerged frequently during our research. The villager's future choices and opportunities are highly dependent on their access and right to decide what to use their land for, particularly, as mentioned in the thematic context, since there are other competing interests present. Therefore, it is relevant to present and discuss the complexity of the land problems facing the villagers and what possible outcomes there are.

Traditionally, Berawan land tenure is community based - the rights to land and resources are

[8] It should be noted that we engaged in these activities as much for our own pleasure, and not specifically with the cynical aim of getting data.

assigned and enforced by the community's own administrative entity. Since the establishment of the National Park, the people of Rumah Meran have been in doubt about their legal rights to their land. This is an issue, which, due to the economic and cultural importance of land, brings a great sense of insecurity to the community.

To understand the conundrum of the land rights issue in Rumah Meran, it is necessary, firstly, to briefly summarise some important aspects of the development of land policies relating to customary tenure in Sarawak. James Brook, who took control of Sarawak in 1842, aimed to create a codification of land tenure, resulting in the 1863 Land Regulations. Land that was regarded as *'unoccupied and waste land'* became the property of the 'crown' (Cleary & Eaton, 1996). This regulation is considered to be the basis of problems for native communities, since *'unoccupied and waste land'* covered all land regarded as uncultivated, including fallow land, land used for subsistence (such as rattan supply) and land deliberately left uncultivated for ecological reasons (Majid Cooke, 2002). This regulation meant that indigenous groups no longer could automatically acquire additional land by clearing forest outside their existing territory, instead permission from the government was required (Cleary & Eaton, 1996). During the colonial period, from 1942 to 1963, further efforts to regularise customary tenure were made through the 1948 Land Classification Ordinance and the 1958 Land Code. The Land Classification Ordinance and Land Code divided land into five categories:

1. Mixed zone - no restrictions on who can acquire rights to the land.
2. Native area land - in which only legally defined natives can hold a title.
3. Native customary land - land not held under title but subject to Native Customary Rights[9] (NCR).
4. Reserved land - reserved to government, comprised within a national park, forest reserve, protected forest or communal forest.
5. Interior area land - a residual category.

(Cramb & Wills, 1990)

The headman of Rh. Meran has approached Land and Survey requesting them to register theBerawan's lands, as he expressed worry that they are not allowed to clear new land. However, he hasn't heard anything from them (and it has been a matter of years). The land which the Berawan of Rh. Meran claim to be theirs is located both within the boundaries of LBNP and outside the boundaries. In fact, the land that the Berawan (of both Rh. Kajan and Meran) claim is an area

[9] Section 5 (2) of Land Code specifies 6 methods through which customary rights may be acquired by: (a) the felling of virgin jungle and the occupying of the land thereby created; (b) the planting of land with fruit trees; (c) the occupation or cultivation of land; (d) the use of land for a burial ground or shrines; (e) the use of land of any class for rights of way; or (f) any other lawful method. The Code has a provision that for recognition of customary rights, such land should have been occupied prior to 1958. Section 5 (2) of the 1958 Land Code has since been amended, where point (f) regarding 'any other lawful method' was removed., thus restricting land claims after 1958 based on *adat* (customary law) (Majid Cooke, 2002).

approximately three times the area of LBNP, including the whole area of the national park. A map (produced by the Berawan), showing the land considered Berawan land, was used in a land dispute with an Iban longhouse in 1992, and has been recognised and approved by the District Office. The Loagan Bunut National Park Ordinance in the Sarawak Government Gazette recognises the rights of the Berawan in the National Park. The Berawan have been accorded exclusive rights to fish, hunt and collect forest resources in the park, albeit for own consumption. However, there is a condition in the ordinance stating: *'All NCR land which falls within the (aforementioned) boundary of the National Park should be excluded from the park'* (Quoted from National Park Ordinance). This condition gives rise to a serious conflict of interests, the Berawan claim native customary rights in the National Park, whilst the Ordinance only allows them to use the land for own consumption - restricting their right to practice activities of economic interest. The fact that the government paid the Berawan compensation for the land used to build the road in the park can perhaps be interpreted as proof that the State recognises the Berawan's native customary rights. The question here is if NCR land were to be excluded from the National Park, would the park cease to exist, or conversely, if the State was to survey NCR land in the park, how much land would be accorded the Berawan? This is the crux of the land tenure problem facing the Berawan. The NP ordinance actually, in a circular way, seeks to avoid a land conflict by stating the condition that '*all NCR land should be excluded from the Park'*, but will this ever be done?

Another important aspect to consider is what would happen if Land and Survey did come and survey land for registration. For land to be registered, the Berawan would first have to be considered legal occupiers of the land prior to 1958, or would need proof that they had acquired customary rights over their land. The onus of proof is on the claimant; therefore this issue may be problematic, despite the fact that the Berawan have been accorded certain rights in the National Park. Problems may arise regarding the area of land the Berawan claim, and what will actually be surveyed as their land. There may also be more than one ethnic group that would stake their claim on the lands the Berawan consider theirs (despite the fact that the NP ordinance provides the Berawan exclusive rights to the land in the NP). Having gone through the complicated process of claiming their rights, the land can be registered. However, registration of land does not make natives landowners in the eyes of the law (Majid Cooke, 2002); it is merely a *'registration of…rights, not a registration of any estate or proprietary interests in the land'* (Fong, 2000 in Majid Cooke, 2002). Despite this, registration of their land would allow the Berawan to partake in a JVC[10], for example.

The prospects of the Berawan receiving official titles to all their land are not bright. They seem to be rather in the dark about what is going to happen and are powerless; they lack any influence to push the process of land registration. During our stay in the longhouse, we felt that in many instances, particularly the headman went out of his way to stress certain points regarding land

[10] JVC's are Joint Venture Companies, which are created for the development of oil palm plantations and promoted by the Land Custody and Development Authority.

rights, showing us all the burial grounds, and in one informal conversation appealing to us to help them make their voices heard[11]. Hypothesising, the most likely outcome is that the state will maintain status quo, and the Berawan's claims will never be realised.

Chapter 4 - Assessment of the Natural Resource Base in LBNP

In this section, the overall objective is to assess the relationship between the natural resources of the national park and the community. How important are natural resources from the NP for the community? Furthermore, the human impact on the national park's resources is investigated. What is the current state of the PSF and its associated lake? Is the impact of the community on the resources of the national park noticeable? Special emphasis will be on water quality not only in terms of fishing but also for the protection of the local watershed, as it is hypothesized that the main value of conservation in LBNP is the lake.

The aim is not to achieve a complete data set of plant and wildlife species in the area, but to relate the observations, impressions and findings to the community and if at all possible tourism. The essence and function of the NP, i.e. for nature conservation and recreation are questioned. Should the NP be treated as recreational commodity or should it be preserved? Finally, a discussion is presented, where the reasonability of findings is debated and compared to other results in related studies.

4.1 Data Collection

To assess the natural resource base, three topics were examined: flora and fauna, fish quantity and species composition; and water quality. General for all these aspects is that apart from the collection of hard data, the assessment of the community's reliance and impact on the resources from the national park were based partly on the results from the household survey, but also on observations, informal conversations and interviews with selected respondents.

Interviews were made to obtain information about fishing techniques, quantity and species composition and the national park's opinion on the community's consumption of forest resources. Informal conversations were applied to identify plants of ethnobotanical value[12] and to elaborate the list of plants of special value to the community.

[11] During this conversation, we had to spell out to the headman the nature of our fieldwork, and that we unfortunately could not help.

[12] This was a visit to a local medicine man. He was not a member of the Meran Community but he had been living in the area for a long time.

The number of species recorded can be affected by a number of factors, some of them spatially varying (e.g. predation and migration) and others temporally varying (e.g. climatic and temporal variation, disturbances, etc.) (Towsend et.al 2000), which complicates the collection of fauna and flora species. The "time" factor, i.e. seasonality, not being able to observe some events during the rainy season; lack of opportunity to replicate transects and extend the sampling area, will affect the final results because the dominance or rarity of some species cannot be assessed.

For flora and fauna, the data collection consisted of species identification from observations in the PSF, Tapang trail (MDF) and area surrounding L.B. Here, the results were limited by insufficient expertise to identify species, restricted access to the area (only trails authorized by the NP were used). The latter implied that a representative picture of the area was not feasible. However, exploring the area could give an idea of the potential of tourism in the national park. The park is considered an ideal spot for bird watchers.

Water quality assessment in terms of fishing, recreational purposes and to assess the human impact (effect of agriculture and faecal deposition in the lake) was carried out. The data has been analyzed using the Interim National Water Quality Standards of Malaysia (INWQSM- Ref to Appendix 4.1). The number of samples was limited to 4 due to practical reasons. The sampling points are shown in Fig. 4.1. Best quality results were expected from station 3, as it was believed that the peat filters the water penetrating from Sg. Teru.

Fig. 4.1 Water Sampling Points. Station. The upper point is near the peat swamp forest (St. 3); followed by the Sg. Bunut sampling point (St. 2) and the sampling point near the national park headquarters (St. 1). The last point was at the outlet from Sg. Bunan.

4.2 Identification of flora and fauna species

Common plant species in the PSF were *Shorea albida*, *Lithocarpus sp.* and *Nepenthes sp.* Forest structure consisted of medium stature trees, not markedly dense secondary vegetation with gaps dominated by rattan species, the most important non-timber forest resource in Malaysia. Natural as well as man-induced disturbance significantly increases the emergence of rattan plants, which need light for establishment and growth. Several stumps from recent cuttings were also observed. In the Tapang trail (MDF), *Eugenia sp.* were the most common. The MDF contains a large proportion of relatively large trees dominated by species from *Dipterocarpaceae* family (Refer to Appendix 4.2).

Edible fruits, leaves and vegetables dominate the list of plants of special value to the community. Rattan is used for multiple purposes such as basket weaving, rope for fish cage and furniture. The

list of birds and mammals recorded includes those identified during the field trip and those familiar to the community. It is worth noting the presence of the black and Oriental pied hornbill in the area (Refer to Appendix 4.3).

4.3 Fish quantity and species composition

Data was analyzed by meaning condensation of the four interviews. The themes were: fish quantity (output pr trip, [kg/trip]) in terms of fishing intensity (trips/week, except for the Selambau) and change of location; and the effect of introduced species on fish species composition (Table 4.1). A list of common fish sp. with a total of 25 native and 4 introduced species was provided by one of the fishermen (Appendix 4.4).

Table 4.1 Fish quantity and species compositions. *Results from condensation of four interviews.*

Themes	***Statements***
Fish quantity	1. Generally a decrease in output/trip [kg/trip].
Fishing intensity	2. Most respondents said there was no change.
Change of location	3. Increased production due to easy access to the resource and low costs of transport.
Fish species composition	4. Quantity of small fish, pady and mengalan affected.
Effect of introduced species	5. Biawan (high competitive ability) and Toman (carnivorous) affected quantity of native sp.

In Table 4.1, statements 1 and 3 are contradictory. This is probably due to the way a question is formulated and perceived by respondents: e.g. does output = production or does the latter include low costs of production. What exactly causes the contradiction is not known.

4.4 Water quality

The results from each sampling point have been classified according to the standards set by the INWQSM. The results are summarized in Table 4.2.

Table 4.2 ***Main Results from water sampling analysis.***

St.	**Description**	**Problems**	**Comments**
1	Outlet from L.B.to Sg. Bunut	DO,; BOD5, COD	Agriculture: nutrients and turbidity: No marked effects.
2	Middle of Loagan Bunut	DO: BOD5; COD	Agriculture and turbidity: No apparent effects
3	PSF area (near Teluk Udang)	DO: BOD5; COD	Agriculture and turbidity: No apparent effects
4	At Sg. Bunan (close to Rh. Meran)	DO: BOD5; COD	Agriculture and turbidity: No apparent effects. Higher E. Coli readings and phosphorous, yet not a problem

4.5 The Community's reliance on natural resources

Data from the questionnaire to estimate the community's consumption of natural resources from the national park yielded interesting results. When asked about whether there was a change in the availability of forest products after the settlement in the NP (year 1998), a cumulative percentage of nearly 50% experience no change, whereas decrease was perceived by 22 %. It is important to mention that nearly 28 % of respondents did not answer this question (see more aspects of change in chapter 5) (Fig. 4.2 – A).

When asked about how important forest resources were, up to 72 % answered that they were important (61% very important, NR 17%). Similar results were obtained about the importance of the lake, 78% responded that it was very important (No response (NR) was 22%). This is supported by the results from the use of forest resources. About 89% of the respondents said that they were utilizing forest products and 83% were farming in the park (Fig. 4.2 - B). The term "importance", however, caused confusion among respondents because it was difficult for them to comprehend the exact meaning of the word.

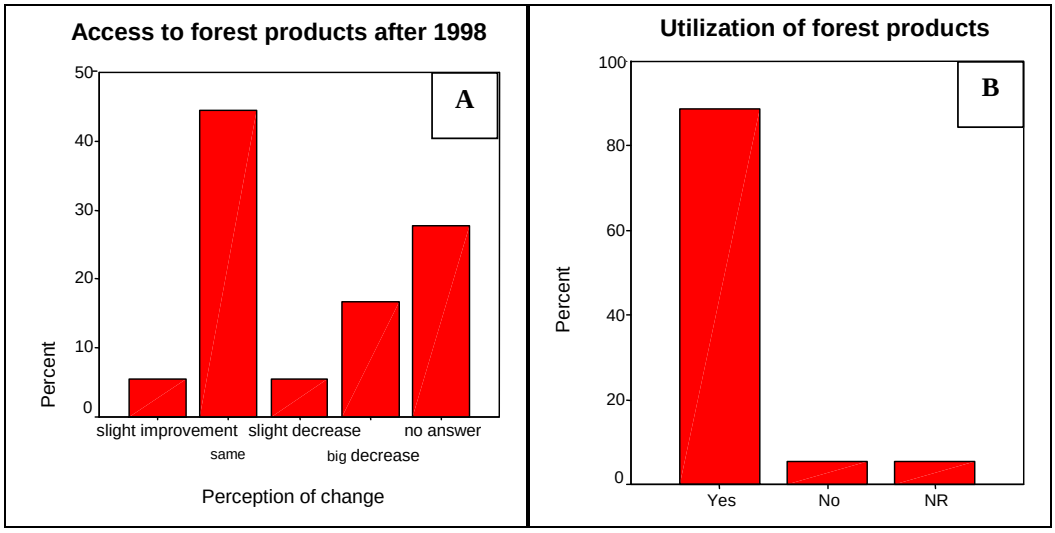

Fig. 4.2 Perception of respondents regarding change and use of forest products. *Note the high degree of non response in Fig. 4.2 – A. contrasting the high response in Fig. 4.2 – B. (Source: Household Survey, Appendix 5.1).*

Consumers of timber and medicinal plants were not interviewed, as it was not clear to determine from the household survey, the extent to which these resources were extracted from the forest. We know that, except for the softwood, most of the timber used for the construction of the long house was from the national park. The results from the household survey on the topic of consumption and source of fruit, vegetables and fish resources, on the other hand, show that the community relies to a great extent on the these resources (Fig. 4.3).

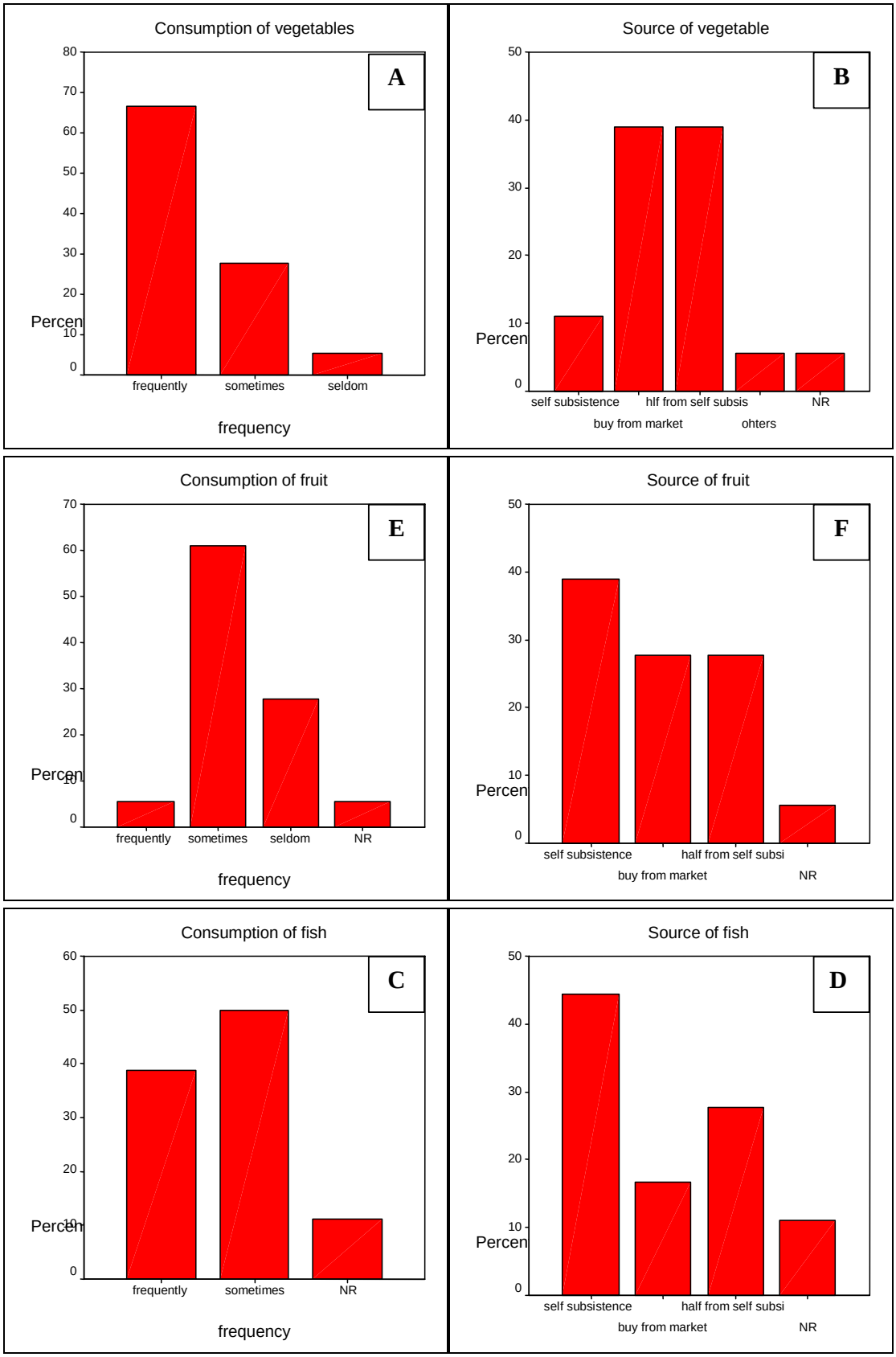

Fig. 4.3 (A-F) Consumption and source of selected natural resources*. Although not stated explicitly in the answers, "self-sufficiency" in Fig. 4.3-B, F and D could be interpreted as "from the forest" (Source: Household survey, Appendix 5.1).*

Direct employment by the park is limited. It was not possible to conclude from the interview with the key informant from the NP what was the official perception regarding the community's consumption of forest and fauna resources (Appendix 4.5)

4.6 Discussion

Species diversity

In this study, true samplings on plant and fish species were not effectuated. Results were mostly based on observations rather that sampling techniques. The limited time to differentiate between sampling areas resulted in the elaboration of lists that do not reflect species diversity in each habitat. Biodiversity of species from both ecotypes is significantly higher than the results obtained[13].

A categorisation of the studied area will require zoning and determination of factors affecting species biodiversity in each zone. Each habitat with its own ecology and dynamics deserves special treatment. In Page et.al (1999), *e.g.* a categorisation of a PSF in Indonesia was determined by peat surface topography, thickness, hydrology, chemistry and determination of peat age.

The relatively high fish species diversity cannot solely be used as an indirect indicator of good water quality as the species may have the ability to specialize and adapt to different environmental or anthropogenic stresses. Of more relevance is therefore to identify threaten species. One example is the hornbill bird species. The fact that this species has become almost extinct has resulted in the use of paper "feathers" in women's traditional costume instead of the original. Whether this is due to over hunting or decline in bird species diversity as consequence of loss of habitat (changes in vegetation) is not known.

Fishing techniques and water quality

The results from fishing techniques show that different techniques yield different outputs due to the variation in time spend on the activity, seasonality and net size used (size of fish caught), aspects that were not included in the questions. In the case of the selambau technique, e.g., the fishing intensity is low the output/trip is relatively high because the activity takes place once, over a longer period of time, when the lake is drying out.

As can be seen from the water quality results, the only problem area is the level of oxygen in the water. All other parameters are within Class I or II and according to the standards in the INWQSM.

[13] A study of e.g. Lambir Hills' MDF forests show that this forest ecotype has probably the highest biodiversity of tree species in the world with approximately 1,200 species in a 52 ha plot (CTFS 2004).

This would class the water as being 'clean' and 'acceptable for all fish species'. The amount of oxygen present in the water would classify the lake as being Class V, making the water not acceptable for any activity. However there are two important reasons to stress behind the low oxygen level in the lake. Firstly, seasonality, no flow in the lake due to high water levels, secondly, decomposition of organic matter taking place in the peat swamp demands for oxygen[14].

The community- resources relationship

Prior to the establishment of the national park, the area had been logged over and exposed to burning activities. Removal of plant material in massive quantities has therefore affected the sustainability of the PSF[15]. In a multi-disciplinary assessment for L.B.N.P. carried out in 2003 (MA 2003), it is stated that the vegetation of the area is severely disturbed by previous logging and past shifting cultivation practices. High-risk issues identified were: fire (for land clearing), fragmentation of habitats, negative impact on wildlife (as a consequence of hunting and logging/felling of trees), negative change in vegetation and pollution (mainly from Sg. Teru). The majority of these threats were associated with the local community's practices. The latter is disputable. In its broad definition[16] deforestation in Southeast Asia has not been correlated with extraction of forest resources for human consumption, but rather logging and large-scale agricultural conversion of land (Wunder 2000). The Malaysian Government as part of the development strategy promoted logging. According a local medicine man, extreme changes in species diversity were experienced after the logging activities.

Whether the Meran community relies on the natural resources from the national park is also questionable. During the field trip, no collection of forest resources from any of the members of the community was observed. This, of course, can be due to seasonality. Only fishing activities, fish sales in the local market and one man going hunting, who came back empty-handed, were observed.

The function of the National Park

In the IUCN classification, national parks are areas managed mainly for ecosystem conservation and recreation. The members of the Meran community are allowed to hunt and extract timber and

[14] This is consistent with Mortedza *et.al* 2003, who explain variation in water quality results as being related to the source of flood water. When the lake is replenished by the runoff from PSF the water will reflect the characteristics of peat water, i.e. relatively low pH, low dissolved oxygen and high content of organic matter. When the lake is flooded by Sg. Teru, water quality results will be dominated by high amounts of sediment and cohesive particles such as phosphate. Samples from Sg. Teru could therefore be used as reference in this case, but again these were not carried out due to limited time and resources.

[15] The PSF is a dual ecosystem of forest and peatland that is sensitive to changes taking place at the superficial layer. The forest supplies plant material to the peat, which in time is decomposed and nutrients become available for subsequent plant uptake. The most important factors affecting the organic matter accumulation potential of the peat, biodiversity and structure of the forest are hydrological intactness and nutrient availability (Page *et.al* 1999).

[16] The broad definition includes forest degradation and reduction of forest quality (density and structure, ecological services, species diversity, etc. (Wunder 2000)

other forest products as well as to cultivate the land for own consumption purposes. Thus, the major functions of the NP become those of nature protection and human resource utilization. The felling of trees or hunting rights that the Meran community is granted are therefore contradictory to the essence of the NP.

Zoning of areas designated for nature conservation and of limited human impact and those of permanent settlement and continuous land use will help to avoid potential conflicts. Clear definition of rights will prevent divergences of any character. Furthermore, local people should not be neglected but rather seen as a decisive factor in the management of natural resources.

In theory, national parks can become areas that attract tourists who are interested not only in relatively unaltered natural environments but also in the integrity of a rich culture with a long history. The growth of mass tourism, however, can threaten the sustainability of the different ecosystems (the extent of tourism will be addressed in Chapter 5).

Chapter 5 - Socio-Economic perspectives

The purpose of this chapter is to evaluate and discuss the livelihood strategies with special interest in the income generating activities of the Meran community and the changes of these. Special regard is given to the three different types of interest presented in the thematic context. That is the community's economic benefit from the natural resources of the park, their benefit from the externalities generated by the park establishment, and their relation to the commercial interests from the logging operation and oil palm plantations.

5.1 Overall Methodology

Our strategy for trying to obtain some valid data for these rather abstract questions was to start off with the more concrete facts, that is, to start of with the more material aspects of the community members' lives. First step being the household survey, which provided some very rough data (as described previously in chapter 2), and helped us to pick out key informants for later interviews. Second stage was a number of interviews with key informants, with questions that were still quite oriented towards obtaining information about concrete facts, and material aspects. It was during this phase of our investigation that 4 sections were selected as focus points for the interviews: Longhouse Economy, economy of fishing, economy of Tourism and Household economics. Third stage was re-interviewing some of the key informants, actively addressing the contradictions, bias and misunderstandings that our initial interviews revealed. Fourth stage was a systematic comparison of notes and basic coding of these.

The backbone of the investigation into the socio-economic aspects was the semi-structured interviews, but other methods were applied as well, including focus groups, statistical reviews, genealogy charts, observations and informal conversations.

5.2 Community overview

As mentioned in chapter 1 the community comprises of 27 households. This does not, however, mean that 27 households are currently living in the longhouse, but that 27 of the households from the Long Teru community have signed up for joining the Meran community. The longhouse is currently under construction, and only 17 of the bileks have a roof at the moment and none of the bileks are as such completed entirely. It was rather difficult to determine how many households were actually living in the longhouse, since all households also had at least one additional residence, where they stayed at least some of the time. During our stay in the longhouse only five of the bileks were permanently inhabited, but it is difficult to say whether this was due to our presence or whether these bileks actually were the primary residence of the households in question. An indication that they were not the primary residence is that we observed no TV in any of the bileks even though the household heads of the five bileks in question stated, (during the household survey) that the household possessed a TV. These were the primary reasons why we did not get to talk with more than 18 of the household heads, many of whom were only in the longhouse on two occasions during our stay. The first when we did the interview (organized by the headman) and the second occasion was at the party on our last evening of the field trip, clearly indicating that the community at present is more a name and an idea than it is a taken for granted frame for the daily lives of the members of the community.

The 18 households counted 73 people suggesting that the community as such consists of about 115 people. It was difficult to get reliable answers for the assessment of the age of the community members. Nevertheless comparing the information from the survey with observations it seems reasonable to conclude that the three generations (grandparents, parents, children) were represented in relatively even numbers. Very few of the children were in the longhouse while we were there since they attended boarding schools elsewhere. Practically all the children received at least secondary education. (Appendix 5.1)

5.3 Income levels and the importance of natural resources

It was quite obvious that the community members where rather rich. The five households permanently staying in the longhouse during our stay possessed of 3 cars. Since they were all related the actual ownership of the cars was rather hard to establish. When the other community members came by for their interviews and on other occasions many of them arrived by car (several of them brand new 4 by 4's, which cost almost the same in Malaysia as in Denmark). Furthermore they almost all seemed to own boats with diesel engines. When asked about their income levels (Fig. 5.1[17]) they also stated quite high incomes, although no where near high enough to account for their belongings.

[17] 1 RM = app 1,5 DKR

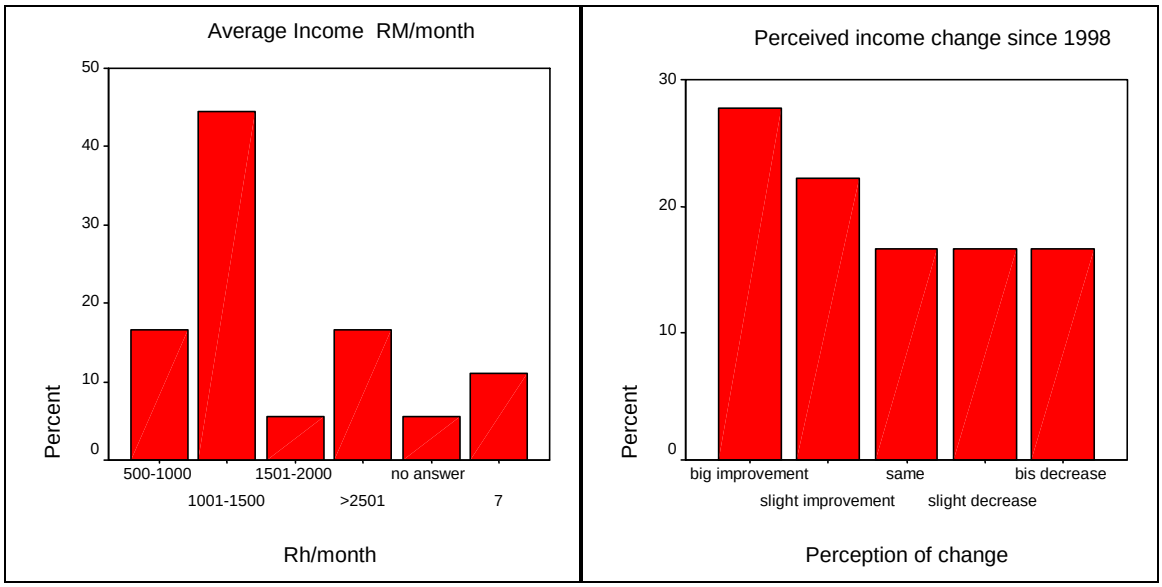

Fig. 5.1 Income and change. *Income distribution in the Meran community and the aspect of change in income. (Source: Household survey, Appendix 5.1)*

The comparison of income levels with 1998 shows that a majority of the community have experienced increasing income since 1998. Three of the respondents who stated a decrease in income were among the richest members of the community[18], and the rest of the ones who stated a decrease also stated that this was due to the fact that they had retired from working in this period. This meaning that close to all the household heads who were still actively working had experienced an increase in their level of income. There was however some confusion whether this accounted for both income levels and changes in these was for the entire household, or merely the household head. Nevertheless it shows a significant economic independence from the natural resources, since most respondents stated that they had experienced a decrease in economic output from farming since 1998. Their economic independence from farming is also indicated by the fact that only three respondents actually stated that they had any income from farming at all, even though 15 of the 18 respondents had rice fields (Appendix 5.1). These and other related farming issues will be discussed in further detail in the following chapter.

Whilst farming had almost no economic importance, fishing still had some. The Berawan are the only ones who are allowed to fish in the lake and rivers of the national park, and even though this allowance only goes for fishing for subsistence purposes the fish are sold at either the local market in Lapok or to the fish vender Indai Sanan who comes to the area 2-3 times a week to buy fish, which she sells at the markets in Miri. The quantities sold to Indai Sanan are not big, rarely more than 100 kg, and the amount of fish at the Lapok market is considerably less. Anyway a household is able to generate a quite reasonable income from fulltime fishing. Of the households interviewed only one seemed to rely primarily on fishing for generating income, which they primarily sold in

[18] One of the community members stated that his income had decreased from approximately 70.000 rh/m to around 15.000 rh/m. He owned a contracting company in the logging industry and had regular business meetings in Hong Kong and Singapore…

Lapok. In various interview sessions they stated their income from fishing to be between 800-1400 a month. Indai Sanan paid around 20% less for the fish than what could be gained from selling them at the Lapok market. Based on observations at the markets in Lapok and in Miri the prices seemed to be on the same level, but the Miri observations was never crosschecked. Indai Sanan had been the primary fish vender in the area for the last 4 years and during this time she had experienced no significant changes in neither quantities, the composition of species, nor the size of the fish that she was offered, which is contradictory to the statements put forward by the fishermen.

Fishing certainly still has a significant importance as an income generating activity, and is the only cash crop that the community extract from the national park. The fact that many of the community members stated that the primary reason for moving to rh meran was that this would decrease the expenses on diesel for the boats since Rh Meran is closer to the good fishing sites, is also a solid indicator of the importance of fishing.

5.4 The economy of tourism

Tourism represents one of the potentials for the Berawan to benefit from the establishment of the LBNP. However, the headman had been working as a tourism operator in the area since 1987, that is before the national park was even gazetted. He made a big investment of about 100.000 RM in constructing an idyllic and rather luxurious chalet on a hillside overlooking the Loagan Bunut. According to his statements his investment broke even after less than two years, and since then he has made a big profit hosting tourists[19]. This also made him quite a celebrity, and several feature articles were written about him in the Borneo Post. His initiative was soon followed by three other members of the Long Teru community who also opened chalets although not quite as luxurious as his. One of those joined the Meran community; the two others are still members of the Long Teru community. Almost all the tourists were groups, who used the chalet for conferences, seminars etc, and did not come to the area solely for the recreational value.

However since the opening of the National park Headquarters in 2001, the number of tourists staying at the private lodges has decreased significantly, since nearly all choose to stay at the lodge connected to the National Park HQ, which has better facilities (running water, flush toilets, 24 hour electricity). The income opportunities of the Berawan related to tourism is now restricted to canteen operation, and the occasional boat trip around the lake.

5.5 Summarizing discussion

There is nothing uniform about the community in terms of what the community members rely on for income. The only common feature is that their income generating activities are diversified. They all do a bit of farming, a bit of fruit trees and something on the side, but with a few exceptions the income generated from primary production is only secondary. Other activities include canteen operation, small scale oil palm operation, employment in logging and at oil palm estates, tourist

[19] According to the guest book at his chalet, he has hosted around 1500 people since he opened the chalet.

operation etc. As for the members of the community we did not manage to interview, we were told that they worked in oil palm plantations as field officers (probably meaning that they were managers of harvesting teams, consisting of Indonesians). All in all this draws a picture of a community that have embraced the paradigm or modernity to a very high degree. The longhouse is not the common point of departure and the taken for granted frame of the daily lives of the community members and it is doubtful if it will be, even when the construction is finished. We do believe that the longhouse will be completed. The headman has given a 6 month deadline for the completion of the remaining bileks, and states that he will fine the members who do not meet this deadline. The cost of completion for each bilek is between 30.000 – 50.000 RM, and this very high amount serves (deliberately or undeliberately) to exclude all but the very rich from settling in the longhouse. In a sense it can be argued that their wealth is what binds the community together. But the fact that the community members are rich, and are pursuing individual and modern income generating activities does not mean that all aspects of traditional life has been abandoned. Traditional way of life is present by the fact that the people still prioritise living in a longhouse; however, the longhouse is very much constructed as a modern house, with electricity, indoor toilets high quality building materials and using professional labour for parts of the construction. Also the longhouse and the ethnicity founds the common background, and is essential in their attempt to defend their traditional rights to the land they perceive to be theirs, however it is doubtful if the next generation will continue practicing the traditional way of living in a longhouse. The young men of the village whom we talked to (during what could be called an informal focus group) seemed very keen on getting away from the longhouse as soon as possible.

Chapter 6 - Farming in Rumah Meran

Prior to the field trip, based upon literature reviews and the course preamble, we hypothesised that the regulations imposed by the gazettement of the National Park would pose restrictions on the Berawan's traditional practices and, thereby, to an unknown extent limit their choice of livelihood strategies. In accordance with our research question, we wanted to find out, firstly, how important farming activities are to the residents of Rh. Meran, and secondly to assess changes in practices and the future potential of agriculture production with regard to biophysical and socio-economic constraints. Since much of farming activity takes place within the borders of the national park, it is also relevant to assess what impact these practices have on the resources of the national park.

This chapter comprises of a description of the methodology used to collect information, a presentation of the findings in relation to farming leading to a discussion of the future potential of farming in Rh. Meran.

6.1 Methodology

The methodology used to acquire information was primarily based on semi-structured interviews with key-informants selected from the household survey. The participatory mapping session was used to provide an overview of the community territory and the natural resource base of the village. Three of the four key-informant interviews were affiliated farm transect walks in the respective farmer's fields and home gardens.

To investigate the soil suitability for crop production, soil samples were taken from two areas. The first sample was taken from the rice padi located behind the longhouse. Samples were taken from two different areas in the padi, at depths of 0 - 15 cm and 15 - 30 cm. The second sample was taken from a fruit orchard in a home garden of one of the key-informants. Samples were taken on slope of approximately 25°, at depths of 0 - 15 cm; 15 - 35 cm and 35 - 60 cm. The samples were to be analysed for macro-nutrients; organic matter; texture; pH; and conductivity in order to assess the soil fertility and thereby suitability for crop production. However, due to unfortunate circumstances, the analytical results were not available at the time of writing. Therefore, a less specific and less detailed evaluation of the soils will be presented, based on observations and discussions from the actual sampling and based on a soil suitability map of the region, which was observed at the Agricultural department in Miri.

6.2 Findings

6.2.1 Farming systems

During the community mapping session, a separate land-use map was drawn, see figure 6.1 below. The map is not drawn to scale, nor is it totally accurate with regard to placement of rivers and roads, however, it did provide us with a basic overview of the various types of land-use practised by the villagers and the location of these in relation to the longhouse and National Park borders. The main crops cultivated are padi rice and fruits. Of the 18 households involved in the questionnaire, 16 had rice padi's. The padi fields are located in low lying areas mainly on the plot of land behind the longhouse (cleared in 1968) and various fields located near the road to Long Lama (near the north-east boundary of the National Park). The rice fields in this area are therefore both inside and outside the National Park. Most of the fruit orchards are located within secondary forest in the National Park, whilst villagers also have fruit trees in their home gardens located in their 'residential' houses. Most villagers have their own fruit orchards some also containing rubber trees and oil palm. The production of fruit is primarily for own consumption, however, one key-informant did sell some fruit at the market in Lapok. Generally though, the farming systems used by the villagers are diverse and subsistence oriented.

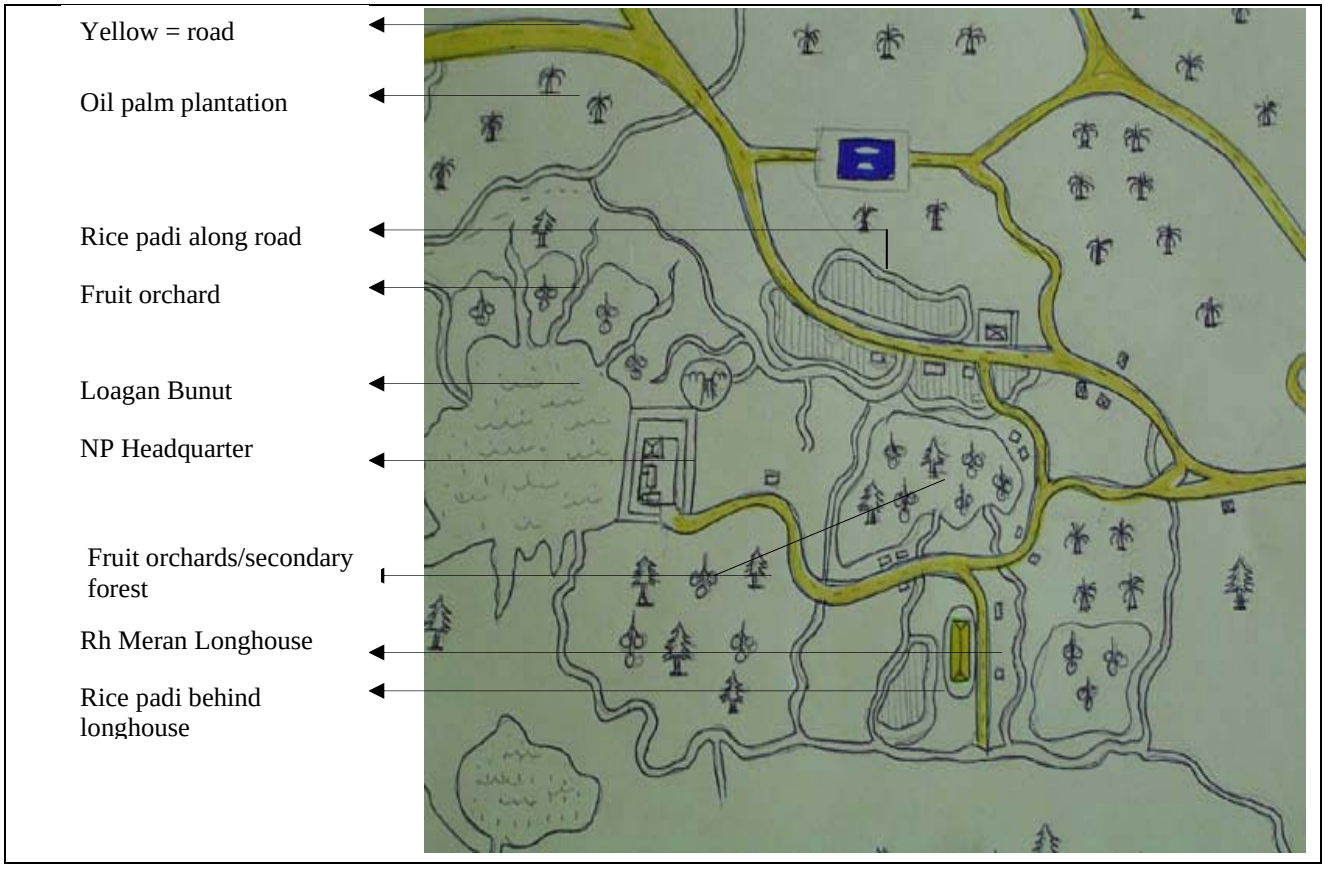

***Figure 6.1 Land-use map**. Created by villagers during community mapping.*

6.2.2 Soil suitability for rice and fruit production

Despite the limitations mentioned regarding the soil analysis, some basic information was collected regarding soil types. As this was only done through *in-situ* observation, the validity of the information is questionable – it is rather difficult to classify a soil *in-situ* without field testing equipment. The tentative results are presented in Table 6.1 and 6.2.

Table 6.1 Rice padi soil

Sample 1 - Rice padi	
0 - 15 cm	Grey and mottled brown/ bluish grey
15 - 30 cm	Top to bottom layers are similar in colour and texture.
Comments:	Grey soil, no drainage.
Probable soil type:	Entisol

Table 6.2 Fruit orchard soil

Sample 2 – Fruit orchard	
0 - 15 cm	Yellow brown, clayey loam, clay <40%
15 - 35 cm	Brownish yellow, clayey loam
35 - 60 cm	15% molten brown (parent material); red-yellow podzolic
Comments:	Slope approx. 25°
Probable soil type:	Ultisol

Entisols generally have a low to moderate natural soil fertility, though it is difficult to generalize without further analysis as it is quite an extensive soil order. Ultisols are also low to moderately fertile, however the same is valid here with regard to further analysis. The soils appear to suitable (soil suitability map agriculture department) and farmers did not mention soil fertility as a problem, however the sustainability of both soils can be questioned. The combination of the limited inputs of fertilizers and the fact that no new land is allowed to be cleared (to allow crop rotation) will, over time, mine the soils of nutrients. The entisol will be more resilient due to its regenerative properties.

The suitability of the soils for the possible future creation of oil palm plantations is an interesting aspect which, unfortunately, has not been explored due to the aforementioned limitations, though one could imagine that the soils would be found to be suitable – the land around the perimeter of the park border is already converted to oil palm plantations.

6.2.3 Production constraints

Considering production constraints and limitations related to rice cultivation, the main problem highlighted by the key-informants was the lack of resources for labour required to prepare fields prior to planting and generally the high labour requirement related to the cultural practices of rice production. Pests, weeds and disease are all major problems facing the farmers, increasing their reliance on agrochemicals. One farmer also mentioned the distance to his fields as a problem. However, regardless of these constraints, the rice yields do not seem to be decreasing. Coupled with the satisfactory fertility of the soil, the advent of pesticides, herbicides and mechanical cutters have made rice production less labour intensive compared to in the past where land had to be cleared for hill rice.

6.2.4 The impact of farming on the natural resources of the National Park

The aim of the National Park is to conserve natural resources - it is therefore paradoxical that parts of the park are cultivated. This problem is directly addressed in the National Park ordinance, where it is stated that NCR land should be excluded from the park; however as this issue has not yet been addressed (see Chapter 3) it doesn't seem likely that this will happen in the near future. The direct effects of agricultural practices on the natural resources is something that is difficult to measure.

Two key informants mentioned that the size of their padi field has reduced within the past twenty years. This is due to erosion from the steep slopes surrounding their fields. The measurement of soil erosion requires lengthy, in-depth research; the important point here is that erosion is more than likely predominant in susceptible areas in the park - areas on slopes and that have been subject to logging activities. Other agricultural effects that can be measured are in the water samples taken from the lake (discussed in Chapter 4.4)

6.3 Discussion - future potential of farming

As mentioned in the socio-economic chapter, farming has low economic importance. None of the farmers interviewed were solely reliant on their rice crop for subsistence purposes, however it should be stressed that the rice crop, especially for the less-affluent members of the community does have an economic value. During one key-informant interview, the economic cost-benefit of growing rice instead of buying rice at the market in Lapok was discussed. According to the interviewee, rice production is definitely a no profit business; the production is too labour intensive and the risk of crop failure too high. The reasons for given for cultivating rice were, firstly, because he prefers to eat fresh rice of the local variety, and secondly he expressed a fear that if he did not use his land for cultivation purposes, it may not be considered his own. This second reason is particularly important in relation to the securing of land rights, as discussed in Chapter 3. From observations of the condition of some of the rice padis, it could be seen that not much time is spent looking after the rice crop once it is established, some of the fields composed of half weed, half rice. This could be another indication of the decreased importance farming has to the community.

The most important land-use change is the fact that they do not grow hill rice any more. It appears to be twenty to forty years ago that forest last was cleared for the cultivation of rice, the main areas used for padi were cleared in the period from 1968 - 1978. The main driving force behind this land-use change is most likely the diversification of livelihood strategies that the Berawan have experienced; and also since the creation of the National Park they are not allowed to clear new land. The issue here is that they are not in a position to legally clear new land for possible intensification, and this could be a major reason behind the current importance of farming to the villagers of Rumah Meran; extending their rice farms is not an attractive option, villagers would rather opt for other livelihoods. Judging from people’s decreased interest in farming, especially the younger generation, the future importance of farming will depend greatly on the Berawan's right to choose what they want to use their land for. If their rights regarding their claim to native customary rights on their land are recognised, they will then be in a position to choose to go into commercial farming, for example in a JVC, and this is more than likely the only factor that could draw them back to farming; namely if it is a more attractive option than other income generating activities.

Chapter 7 - Conclusion and Perspectives

In the thematic context we pose the question of how the Rh Meran community relate to the different interests of preservation of nature as opposed to the interests of commercial development of the natural resources.

Regarding the preservationist value of the national park, there are no primary forests within the park. All the research undertaken revealed signs of significant human impact on both the peat swamp and mixed dipterocarp forests. This means that the forests have no preservationist value in

terms of biodiversity. Preserving the lake is the main preservationist concern for the national park. The results from the samples presented in the report indicated no immediate threats from human impact to the lake, but whether the surrounding oil palm plantations would pose a threat in the long run has not been investigated. However, it seems reasonable to assume that a further conversion of secondary forests to plantations will cause problems for the lake and the filtering mechanisms of the peat swamp forest. The establishment of the national park prevents the further development of plantations, which undoubtedly would have continued had the park not been established. There is just one problem: The establishment of the park has taken the right of the Berawan to dispose freely of their traditional land away from them.

This puts the land rights issues at the very heart of the problem. The obscurities embedded in the NCR-term, and the seemingly deliberate unwillingness to address and solve the disputes from Land and Survey only serve to make matters worse. There is little doubt that the people of Rh Meran would engage in JVC's or other commercial endeavours if they had the opportunity, but quietly taking away their property hardly seems to be a sustainable solution. The potential for a solution to the land conflicts in LBNP that will satisfy the Berawan seem rather remote, however, the nature of this conflict serves to illustrate the immediate need for a clearly defined land rights policy by the Malaysian administration. The abolishment of the vague NCR term in favour of a clearly defined zoning of areas for purposes of commercial use or nature preservation could be the right way to go.

Furthermore, it is crucial that when national parks are established where there is human settlement that the indigenous population are compensated and given the full opportunity to benefit from the externalities generated by the park. The case of LBNP where the establishment of the national park headquarters effectively has outcompeted the indigenous tourist operators should serve as a grotesque example of what not to do. The Berawan of Rh Meran are certainly not powerless victims, passively subordinating to a centrally planned agenda. Despite poor odds they have managed to obtain an income level well above that of Malaysia in general, and are actively pursuing all opportunities in the land rights matter. It cannot be excluded that the division from the Long Teru community also partly was a strategic move to further promote their rights to the land within the national park. The wealth of the people of Rh Meran is not closely bound to the utilisation of their traditional land but relies on a hugely diversified range of income generating activities. However the preservation of the Berawan culture and tradition is closely bound to the land, and to the settlement in longhouses. This is under threat from two different sides: From the external restriction on the land rights of the community and from the fact that the young people in the community show no interest in settling in longhouses and continuing traditional practices. The question remains to be answered on whether the traditional practices of indigenous communities are something that can and should be subject to deliberate preservation. This is however a research question for another project.

Of the three competing types of interests outlined in the thematic context: The preservation of nature; the commercial utilisation of the natural resources and the rights of the indigenous people. The commercial utilisation of the natural resources is by far the dominant, clearly indicated by the official policy to triple the areas used for oil palm plantations within the next 6 years. The preservation of nature and the rights of the indigenous people are left to compete for a distant second place on the agenda. The traditional and cultural practices of the indigenous population have yet to be even put on the agenda.

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Appendix 2.1 Working Calendars

Field Trip Time schedule for Aida L. Bloch

Date	Activity	
	Day	**Evening**
January 25		Arrive Miri
January 26	Briefing, depart for field site	Official welcoming ceremony Meet Malaysian students
January 27	Meeting All students: prepare proposal, questionnaire and general methodology Test of questionnaires (PM) Community Mapping (PM)	
January 28	Visited Market in Lapok Prepare proposal in NR-group Refining of questionnaire	Presentation of proposal
January 29	'Familiarisation trip' – boat trip through NP and to other longhouses, viewing of burial grounds, fishing grounds, etc.	Questionnaire/informal conversation with locals and counterparts
January 30	Transect in Peat swamp forest	Questionnaire/informal conversation with locals and counterparts
January 31	Wildlife Transect Walk in National Park	Questionnaire/informal conversation with locals and counterparts
February 1	Interview with medicine man regarding ethnobotanical species.	Questionnaire/informal conversation with locals and counterparts
February 2	Visited Sunday Market - Lapok	Questionnaire/informal conversation with locals and counterparts
February 3	Interview with NP official Visit to the doctor in Miri, problems adapting to new gastronomic experiences.	
February 4	Visit to marked in Miri. Impressed about the variety of fruits, vegetables and grain compared to marked in Lapok. Realised though, that the explanation might be they consume, what they produce.	'Rehearsal' for Farewell party. Tried to learn the traditional dance…without much success! Could not avoid to use my Latin moves!
February 5	Data Processing. Preparations for Farewell party	Farewell party. Danced lambada with the headman
February 6	Depart Rh. Meran	Prepare final presentation
February 7	Prepare final presentation	
February 8	Final presentation	Farewell party
February 9	Visited Lambir NP, and newly established JVC site and Niah Caves.	
February 10	Niah Caves	Departed for Kuching
February 11	Visit to National Resources and Environmental Board	Visited Tinnie (Malaysian student) and her husband Eddy.
February 12	Visit to Bako national park.	Crocodile safari
February 13	No programme	Depart for Copenhagen
February 14	Arrive Copenhagen	

Field Trip Time schedule for Myles Oelofse

Date	Activity	
	Day	**Evening**
January 25		Arrive Miri
January 26	Briefing, depart for field site	Official welcoming ceremony Meet Malaysian students
January 27	Meeting All students: prepare proposal, questionnaire and general methodology Test of questionnaires (PM) Community Mapping (PM)	
January 28	Visited Market in Lapok Prepare proposal in farming sub-group Refining of questionnaire	Presentation of proposal
January 29	'Familiarisation trip' – boat trip through NP and to other longhouses, viewing of burial grounds, fishing grounds, etc.	Questionnaire/informal conversation with locals and counterparts
January 30	Bilek map made with two locals. Farm transect with key informant	Questionnaire/informal conversation with locals and counterparts
January 31	Wildlife Transect Walk in National Park Farm transect with key informant	Questionnaire/informal conversation with locals and counterparts
February 1	Farm transect with key informant	Questionnaire/informal conversation with locals and counterparts
February 2	Visited Sunday Market - Lapok Discussion of land issues with Mr. Meran Soil sampling and viewing of areas with erosion	Questionnaire/informal conversation with locals and counterparts
February 3	Visited Long Teru clinic and school. Farming sub-group data discussed.	Key informant interview Informal conversation with locals and counterparts
February 4	No formal programme.	'Rehearsal' for Farewell party
February 5	Plotted cleared rice padi behind longhouse on GPS; Preparations for Farewell party	Farewell party
February 6	Depart Rh. Meran	Prepare final presentation
February 7	Interview at Agriculture Department in Miri; Prepare final presentation	
February 8	Final presentation	Farewell party
February 9	Visited Lambir NP, and newly established JVC site and Niah Caves.	
February 10	Niah Caves	Departed for Kuching
February 11	Visit to National Resources and Environmental Board	No programme
February 12	No programme	Crocodile safari
February 13	No programme	Depart for Copenhagen
February 14	Arrive Copenhagen	

Field Trip Time schedule for Torsten Bjerre Henningsen.

Date	Activity	
	Day	**Evening**
January 25		Arrive Miri
January 26	Briefing, depart for field site	Official welcoming ceremony Meet Malaysian students
January 27	Meeting All students: prepare proposal, questionnaire and general methodology Test of questionnaires (PM) Community Mapping (PM)	
January 28	Visited Market in Lapok Prepare proposal in socio-economic sub-group Refining of questionnaire	Presentation of proposal
January 29	'Familiarisation trip' – boat trip through NP and to other longhouses, viewing of burial grounds, fishing sites, etc.	Questionnaire/informal conversation with locals and counterparts
January 30	Focus group with some of the women from the community.	Questionnaire/informal conversation with locals and counterparts
January 31	Locating and interviewing fish vender Indai Sanan. Wildlife Transect Walk in National Park	Questionnaire/informal conversation with locals and counterparts
February 1	Visiting the headmans chalet, interview w. headman and reviews of statistical data regarding tourism.	Questionnaire/informal conversation with locals and counterparts
February 2	Visited Sunday Market – Lapok. Recording price levels. Interviewing National Park officer	Questionnaire/informal conversation with locals and counterparts
February 3	Visited Clinic and school in Long Teru	Key informant interview with Mr Jak Baul Aun; Informal conversation with locals and counterparts
February 4	Data processing. Informal conversations with locals and counterparts.	'Rehearsal' for Farewell party
February 5	Plotted cleared rice padi behind longhouse on GPS; Preparations for Farewell party	Farewell party
February 6	Depart Rh. Meran	Prepare final presentation
February 7	Unsuccesful attempt to locate fish vender Indai Sanan. Reviewing of price level at the market in Miri, laundry, Preparation of final presentation	
February 8	Final presentation	Yet another Farewell party
February 9	Visited Lambir NP, and newly established JVC site and Niah Caves.	
February 10	Niah Caves	Departed for Kuching
February 11	Visit to National Resources and Environmental Board	No programme
February 12	Visit to Baku National park	Crocodile safari
February 13	No programme	Depart for Copenhagen
February 14	Arrive Copenhagen	

Appendix 2.2 – Questionnaire for the Household Survey

HOUSEHOLD SURVEY: RH MERAN, LOAGAN BUNUT NATIONAL PARK
DEMOGRAPHIC & SOCIO-ECONOMIC DATA

A) INFORMATION BACKGROUND		COMMENTS
1. Longhouse / Village *(Rumah panjang/kampung)*	Rh Meran, Loagan Bunut	
2. Name of Respondent *(Nama responden)*	_____	
3. Name of Interviewer	_____	
4. Time Start Time Finish	_____ _____	
5. Age *(Umur)*	_____years	
6. Gender *(Jantina)*	[ ] 01 – Male *(Lelaki)* [ ] 02 - Female *(Perempuan)*	
7. Marital status (*Status perkahwinan)*	[ ] 01 – Single *(Bujang)* [ ] 02 – Married *(Berkahwin)* [ ] 03 – Divorce *(Bercerai)* [ ] 04 - Widow / Widower *(Duda/Janda)*	
8. Ethnicity *(etnik)*	[ ] 01 – Berawan [ ] 02 – Iban [ ] 03 – Penan [ ] 04- Others (please specify) _____	
9. Religion *(Agama)*	[ ] 01 – Christian [ ] 02 – Islam [ ] 03 – Paganism /Traditional Belief, etc. [ ] 04 – Others (please specify) _____	
10. Highest education level (*Tahap pendidikan tinggi)*	[ ] 01-No formal education *(Tiada pendidikan formal)* [ ] 02-Primary school *(Sekolah peringkat rendah)* [ ] 03-Secondary school *(Sekolah peringkat menengah)* [ ] 04-Tertiary education (*Pendidikan peringkat tinggi)*	

11. Occupation (can be more than one; rank the importance) *(Pekerjaan)*	[ ] 01- Farmer (*Petani)* [ ] 02- Self employed-trader/entrepreneur *(Bekerja sendiri/ peniaga)* [ ] 03- Government Servant *(Bekerja dgn kerajaan)* [ ] 04- Worker /labor at LBNP *(Bekerja di LBNP)* [ ] 05- Labor outside LBNP *(Bekerja di luar LBNP)* [ ] 06- Fisherman *(Nelayan)* [ ] 07- Others (please specify) _____	
12. Immediate past occupation *(Pekerjaan sebelumnya)*	[ ] 01-Farmer [ ] 02-Self employed-trade/entrepreneur [ ] 03-Government Servant [ ] 04-Worker/Labour at LBNP [ ] 05-Labour outside LBNP [ ] 06-Fisherman [ ] 07-Others (Please specify) _____	
13. Communal Position *(Kedudukan dalam komuniti)*	[ ] 01- JKKK (Village Development Committee) *(Jawatankuasa Kecil Kampung)* [ ] 02- Ketua Kampung/Penghulu [ ] 03- Church Committee [ ] 04- Area Farmers Organisation [ ] 05- Parents-Teachers Association [ ] 06- Gawai Committee [ ] 07- Other Committees (please specify) _____	_____

14. Members of Family (Spouse, Children & Dependents)
(Ahli keluarga)

No.	Relationship	Age	Stay-in (Y/N)	Highest Academic Qualification 1-No formal education 2-Primary school 3-Secondary school 4-Tertiary education	Occupation	Household Head 1-Yes 2-No	Comments
1							
2							
3							
4							
5							
6							
7							
8							

B. MIGRATION PATTERNS *(Corak imigrasi)*

15. How long has your family been staying here? (How long have they leave Rh Kajan? *(Berapa lamkah keluarga anda tinggal di sini? Berapa lamakah mereka telah meninggalkan Rh Kajan?)*	_____years. ( )
16. Origin? *(Tempat Asal)*	_____ (Village/District/Longhouse)
17. Why did your family move here? (Elaborate when possible) *(Mengapakah keluarga anda berpindah ke sini? Jelaskan jika perlu)*	_____ _____

C. LAND USE/CULTIVATION *(Guna Tanah/Pertanian)*

18. Status and area of land own? _____ (acres)
(Status dan kawasan hak milik tanah)

*State in acres

Status	NCL	NCR	Others
Inside Park			
Outside Park			

19. How is your land being used?
(Bagaimanakah anda menggunakan tanah?)

[ ] 01- Cultivation (_____ acres)
[ ] 02 – Idle (_____ acres)
[ ] 03 – Others (_____ acres)

20. Are you farming in the park?
(Adakah anda bertani di kawasan taman?)

[ ] 01- Yes (_____acres)
[ ] 02- No

21. Are you farming in the same land now as in 1998?

(Adakah anda bertani di kawasan yang sama seperti dalam tahun 1998?

[ ] 01-Yes

[ ] 02-No

If no, how much more or less?

_____

22. Do you use fertilizer?

(Adakah anda menggunakan baja?)

01.	Yes	
02	No	

23. Do you use pesticides?

(adakah anda menggunakan pestisid?)

01	Yes	
02	No	

24. Estimated production (convert to kg Yearly/ Monthly)
(Anggaran produk, unit kg/tahun atau bulanan)

	Rh. Meran (2003)			
Crops/Fruits/ Livestock/Fishes/ Prawn *(Hasil pertanian / buahan / haiwan ternakan / ikan / udang)*	*Own Consumption (Penggunaan sendiri)* Y/N	*Sales (Untuk Jualan)* Y/N	*Quantity(Units) (Kuantiti)*	*Value (RM) Nilai*

(Include production outside LBNP) - *(Termasuk produk dari luar LBNP)*

25. What are your fishing techniques?	[ ] 01-Selambau [ ] 02-Cast nets (Jala) [ ] 03-Gill net (Pukat) [ ] 04-Fishing rods/poles [ ] 05-Baited lines [ ] 06-Others	
26a. Is your family utilizing any forest products from this forest? *(Adakah keluarga anda menggunakan sumber asli dari hutan di kawasan ini?)*	[ ] Yes (Please specify, who and what) *Who:* [ ] *Wood* [ ] *Fruits* [ ] *Animal* [ ] *Wild Vegetable* _____ [ ] *Others (Specify)* _____ [ ] 02 – No	

26b. How has the output of your production changed since 1998?
(NOTE We are interested in output per unit (per acre, per boat, per fruit tree)

	Big improvement	Slight improvement	Same	Slight decrease	Big decrease	State reason
Vegetable						
Fish						
Fruits						
Game Food						
Access to Wood/forest						

D) SOCIAL-CULTURAL AND ECONOMIC PERSPECTIVE

27. Total Income *(Jumlah Pendapatan)*	RM _____/ Month/Day
28. Total Savings *(Jumlah Simpanan)*	RM_____
29a. What is your monthly expenditure? *(Berapakah nilai perbelanjaan bulanan anda?)*	RM_____ /month

Expenses	Amount (RM)
1. Food	
2. Children education	
3. Apparel (clothing)	
4. Utilities	
5. Transport	
6. Others	
Total	

E) HEALTH CONDITIONS AND LIVING FACILITIES	
31. How often do your family members fell ill/sick (per year)? (*Berapa kerapkah ahli keluarga anda jatuh sakit?)*	[ ] 01- Frequently (Monthly) [ ] 02- Sometimes (Quarterly) [ ] 03- Seldom (Half yearly) [ ] 04- Never
32. How frequently do your family members go to clinic/hospital?(per year) *(Berapa kerapkah ahli keluarga anda pergi ke kilinik/hospital?)*	[ ] 01- Frequently (Monthly) [ ] 02- Sometimes (Quarterly) [ ] 03- Seldom (Half yearly) [ ] 04- Never
33. What are the major ailments in your family for the past 12 months?	_____
34. Nutrition How frequently do they take that nutrition? (*Nutrisi Berapa kerapkah anda mengambil makanan berikut?)* 01- Frequently (daily) 02- Sometimes (weekly) 03- Seldom (monthly/yearly) 04- Never	34a, Vegetables [ ] 34b, Meat [ ] 34c, Fish [ ] 34d, Fruit [ ]
35. Source of daily nutrition (Sumber zat *nutrisi harian)* 01-Self subsistence *(Tanaman sendiri)* 02- Buy from market *(Beli dari pasar)* 03- Half from self subsistence and half from market (*Separuh dr. sendiri, separuh beli)* 04- Others (please specify	35a, Vegetables [ ] 35b, Meat [ ] 35c, Fish [ ] 35d, Fruit [ ]
36. How important is the forest to your family? *(Apakah kepentingan hutan kepada anda?)*	[ ] 05-Very important [ ] 04-Important [ ] 03-Moderate [ ] 02- Not important [ ] 01-Not important at all Comment:
37. Does your family practise shifting cultivation? (*Adakah keluarga anda mengamalkan pertanian pindah?)*	[ ] 01- Yes (_____ acres-estimated) [ ] 02-No Comment:

F. AGRO-AQUA FARMING SYSTEMS	
38. If yes, why do they practise shifting-cultivation? *(Jika ya, kenapa anda mengamalkannya?)*	[ ] 01-Self sustenance [ ] 02-Traditional /hereditary practice [ ] 03- No other alternative
39. What do you use the lake for? (*Apakah kepentingan tasik kepada anda?)*	[ ] 01- Fishing [ ] 02 -Water source [ ] 03 – Tourism [ ] 04 – Fishing and Water [ ] 05- Water & tourism [ ] 06- Fishing & Tourism [ ] 07- All
40. How important is the lake to your family? *(Berapa pentingkah tasik ini kepada keluarga anda?)*	[ ] 05-Very important [ ] 04-Important [ ] 03-Moderate [ ] 02- Not important [ ] 01-Not important at all
41. What is your perception on LBNP management? *(Apakah persepsi anda terhadap pengurusan LBNP?)*	[ ] 01- Poor, indifferent management [ ] 02- Fair management [ ] 03- Undecided [ ] 04- Good, acceptable management [ ] 05- Efficient and effective
42. How is the involvement of the community in the park management ? *(Bagaimanakah penglibatan komuniti terhadap pengurusan taman?*	[ ] 01- Reluctant to be involved (why?) [ ] 02- Passively involved [ ] 03- Indifferent [ ] 04- Participating [ ] 05- Actively involved
43. Do you know if the Govt. is implementing any project in the Park? *(Adakah anda tahu pihak kerajaan sedang melaksanakan sebarang projek dalam taman?)*	[ ] 01 –Yes [ ] 02- No
44. Have you heard about the Ecotourism project? *(Pernahkah mengetahui sebarang maklumat berkenaan projek Eco-Pelancunngan?)*	[ ] 01- Yes, [ ] 02- No
45. If yes, where do you get the information from? (*Jika ya, dimanakah anda mendapat maklumat tersebut?)*	[ ] 01-LBNP office [ ] 02- Friends [ ] 03 -District office [ ] 04-Others (specify) _____

Appendix 4.1 Analysis of Sampling

Condensation of findings – Water Quality for fishing and recreation

The data collected for the assessment of water quality for fishing and recreation has been analysed using the Interim National Water Quality Standards of Malaysia (INWQSM). The results from each sampling point have been classified by assigning each parameter a class according to the levels set by the standards. In Sarawak, the quality of river water is evaluated by calculating a Water Quality Index (WQI), which combines various water quality parameters to a common value using the WQI formula. The main objective of the WQI system is to use it as a preliminary means of assessment of a water body. The WQI provides an assessment of water quality, though it is not meant specially as an absolute measure of the degree of pollution or the actual water quality (Ministry of Agriculture, 2001). For example, if one of the parameters used in the formula is problematic, whilst all the other parameters are acceptable, the problem may become blurred. Therefore, the WQI has not been used here, each parameter has been classified according to the standards in order to retain the focus on possible problem areas.

Water Quality Data of Loagan Bunut Lake Area (Rh. Meran)

Parameter	**Unit**	**Station 1**	**Station 2**	**Station 3**	**Station 4**
Depth	Meter	1.4	2.1	2.0	2.1
Temperature	°C	27.06	27.40	27.44	25.27
pH	-	6.16	6.21	6.15	6.16
DO	mg/l	0.85	0.86	1.40	1.52
BOD_5	mg/l	3.95	3.72	4.20	4.52
E. Conductivity	Umhos/cm	0.0227	0.0272	0.0487	0.0166
TDS	mg/l	0.0145	0.0174	0.0150	0.0106
TSS	mg/l	0.0047	0.0051	0.0096	0.0090
COD	mg/l	32.0	29.5	29.0	26.0
Turbidity	NTU	10.95	8.2	45.7	26.9
Nitrate (NO_3^-)	mg/l	0.00	0.00	0.04	0.03
Ammonical-Nitrogen (NH_3-N)	mg/l	0.11	0.07	0.086	0.00
Phosphorus (P)	mg/l	0.06	0.05	0.034	0.252
Faecal Coliform Count	CFU/100ml	90	130	5	135
Total Coliform Count	CFU/100ml	360	390	135	1160

Description of the sampling point :

Station 1 – Outlet from Loagan Bunut Lake to Sg. Loagan Bunut
Station 2 – In the middle of Loagan Bunut Lake
Station 3 – Peat Swamp Forest Area (Near to Teluk Udang)
Station 4 – At Sg. Bunan (near to Rh. Meran)

Station 1: Classification of data according to INWQSM

Parameter	**Unit**	**Station 1**	**Class**
Depth	Meter	1.4	-
Temperature	°C	27.06	-
pH	-	6.16	II
DO	mg/l	0.85	V
BOD_5	mg/l	3.95	III
E. Conductivity	Umhos/cm	0.0227	I
TDS	mg/l	0.0145	I
TSS	mg/l	0.0047	I
COD	mg/l	32.0	III
Turbidity	NTU	10.95	>II
Nitrate (NO_3^-)	mg/l	0.00	I
Ammonical-Nitrogen (NH_3-N)	mg/l	0.11	IIA
Phosphorus (P)	mg/l	0.06	I
Faecal Coliform Count	CFU/100ml	90	IIA
Total Coliform Count	CFU/100ml	360	IIA

Station 2: Classification of data according to INWQSM

Parameter	**Unit**	**Station 2**	**Class**
Depth	Meter	2.1	-
Temperature	°C	27.40	-
pH	-	6.21	II
DO	mg/l	0.86	V
BOD_5	mg/l	3.72	III
E. Conductivity	Umhos/cm	0.0272	I
TDS	mg/l	0.0174	I
TSS	mg/l	0.0051	I
COD	mg/l	29.5	III
Turbidity	NTU	8.2	>II
Nitrate (NO_3^-)	mg/l	0.00	I
Ammonical-Nitrogen (NH_3-N)	mg/l	0.07	I
Phosphorus (P)	mg/l	0.05	I
Faecal Coliform Count	CFU/100ml	130	IIB
Total Coliform Count	CFU/100ml	390	IIA

Station 3: Classification of data according to INWQSM

Parameter	**Unit**	**Station 3**	**Class**
Depth	Meter	2.0	-
Temperature	°C	27.44	-
pH	-	6.15	II
DO	mg/l	1.40	IV
BOD_5	mg/l	4.20	III
E. Conductivity	Umhos/cm	0.0487	I
TDS	mg/l	0.0150	I
TSS	mg/l	0.0096	I
COD	mg/l	29.0	III
Turbidity	NTU	45.7	II
Nitrate (NO_3^-)	mg/l	0.04	I
Ammonical-Nitrogen (NH_3-N)	mg/l	0.086	I
Phosphorus (P)	mg/l	0.034	I
Faecal Coliform Count	CFU/100ml	5	I
Total Coliform Count	CFU/100ml	135	IIA

Station 4: Classification of data according to INWQSM

Parameter	**Unit**	**Station 4**	**Class**
Depth	Meter	2.1	-
Temperature	°C	25.27	-
pH	-	6.16	II
DO	mg/l	1.52	IV
BOD_5	mg/l	4.52	III
E. Conductivity	Umhos/cm	0.0166	I
TDS	mg/l	0.0106	I
TSS	mg/l	0.0090	I
COD	mg/l	26.0	III
Turbidity	NTU	26.9	II
Nitrate (NO_3^-)	mg/l	0.03	I
Ammonical-Nitrogen (NH_3-N)	mg/l	0.00	I
Phosphorus (P)	mg/l	0.252	II
Faecal Coliform Count	CFU/100ml	135	IIB
Total Coliform Count	CFU/100ml	1160	IIB

General Rating Scale for the Water Quality Index (WQI)

General	Very Polluted					Slightly Polluted	Clean	
Water Class	V			IV	III		II	I
Public Water Supply	Not Acceptable			Doubtful	Necessary Treatment Becoming more Expensive		Minor Purific Required	Purification not Necessary
Recreation	Not Acceptable	Obvious Pollution Appearing	Only for Boating	Doubtful for Water Contact	Becoming Polluted Still Acceptable Need Bacteria Count	Acceptable for all Sports		
Fish, Shellfish and Wildlife	Not Acceptable		Coarse Fish Only	Handy Fish Only	Doubtful for Sensitive Fish	Marginal for Trout	Acceptable for all Fish	
Navigation	Not Acceptable		Obvious Pollution Appearing	Acceptable				
Treated water Transportation	Not Acceptable	Acceptable						

INTERIM NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA (INWQS)

Parameters	(Units)	Classes					
		I	IIA	IIB	III	IV	V
Ammonical Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2
BOD	mg/l	1	3	3	6	12	> 12
COD	mg/l	10	25	25	50	100	> 100
DO	mg/l	7	5 - 7	5 - 7	3 - 5	< 3	< 1
pH	-	6.5-8.5	6.5 - 9.5	6 - 9	5 - 9	5 - 9	
Colour	TCU	15	150	150			
Electrical Conductivity	mmhos/cm	1000	1000		-	6000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	$^{o}/_{oo}$	0.5	1	-	-	-	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solids	mg/l	500	1000	-	-	-	-
Total Suspended Solids	mg/l	25	50	50	150	300	> 300
Temperature	^{o}C	-	Normal +2	-	Normal +2	-	-
Turbidity	NTU	5	50	50	-	-	-
Faecal Caliform*	counts/100 ml	10	100	400	5000 (2000)@	5000 (2000)	-

INTERIM NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA (INWQS) (continued)

Parameters	(Units)	Classes				
		I	IIA / IIB	III[@]	IV	V
A1	mg/l	NATURAL LEVEL	-	(0.06)	0.5	LEVEL SABOVE IV
As	mg/l		0.05	0.4 (0.05)	0.1	
Ba	mg/l		1	-	-	
Cd	mg/l		0.01	0.01* (0.001)	0.01	
Cr(Vl)	mg/l		0.01	1.4 (0.05)	0.1	
Cr(lll)	mg/l		0.05	2.5	-	
Cu	mg/l		1	-	0.2	
Hardness	mg/l		250	-	-	
Ca	mg/l		-	-	-	
Mg	mg/l		-	-	-	
Na	mg/l		-	-	3 SAR	
K	mg/l		-	-	-	
Fe	mg/l		0.3	1	1 (leaf) 5 (others)	
Pb	mg/l		0.05	0.02* (0.01)	5	
Mn	mg/l		0.1	0.2	0.2	
Hg	mg/l		0.001	0.004 (0.0001)	0.002	
Ni	mg/l		0.05	0.9*	0.2	

Se	mg/l		0.01	0.25	0.02	
Ag	mg/l		0.05	0.0002	-	
Sn	mg/l		-	0.004	-	
U	mg/l		-	-	-	
Zn	mg/l		5	0.4*	2	
B	mg/l		1	(3.4)	0.8	
Cl	mg/l		200	-	80	
Cl_2	mg/l		-	(0.02)	-	
CN	mg/l		0.02	0.06 (0.02)	-	
F	mg/l		1.5	10	1	
NO_2	mg/l		0.4	0.4 (0.03)	-	
NO_3	mg/l		7	-	5	
P	mg/l		0.2	0.1	-	
Si	mg/l		50	-	-	
SO_4	mg/l		250	-	-	
S	mg/l		0.05	(0.001)	-	
CO_2	mg/l		-	-	-	
Gross-a	Bq/l		0.1	-	-	
Gross-b	Bq/l		1	-	-	
Ra-266	Bq/l		< 0.1	-	-	
Sr-90	Bq/l		< 1	-	-	

APPENDIX 4.2 List of Plant Species in the transect survey

LIST OF FLORA ALONG TRANSECT 2, PEAT SWAMP FOREST

No	Species	Local name
1	*Xanthophyllum amoenum*	Menyalin
2	*Gonystyllus maingayi*	Ramin batu air
3	*Shorea platycarpa*	Meranti paya
4	*Copaifera palustris*	Sepetir
5	*Eugenia sp*	Bungkang
6	*Horsfieldia crassifolia*	Kumpang
7	*Dyera polyphylla*	Jelutong paya
8	*Sindora leocarpa*	Tampar hantu
9	*Vatica managachapoi*	Resak paya
10	*Nephellium maingayi*	Serait
11	*Santiria sp*	Seladah
12	*Shorea albida*	Alan batu
13	*Pithecellobium sp*	Jering hutan
14	*Chrystostachys lakka*	Pinang lakka
15	*Lithocarpus sp*	Empili
16	*Eleocarpus sp*	Emperdu
17	*Combretocarpus rotundatus*	Keruntum
18	*Tristaniopsis obovata*	Selunsur merah

LIST OF FLORA ALONG TAPANG TRAIL

No	Family	Species	Local name
1	Palmae	*Licuala petiolutata*	Gernih
2	Oleaceae	*Chionanthus cuspidatus*	Perangsang udok
3	Tiliaceae	*Grewia fibrocarpa*	Bunsi
4	Chrysobalanaceae	*Atuna excelsa*	Merbatu
5	Myristicaceae	*Myristica papyracea*	Kumpang
6	Hypericaceae	*Cratoxylon formosum*	Patok tilan
7	Annonaceae	*Goniathalamus cylindrostigma*	Selukai
8	Moraceae	*Artocarpus elasticus*	Tekalong
9	Rubiaceae	*Pleiocarpidia enneandra*	Ensabak/Sabar bubu
10	Leguminosae	*Fordia brachybotrya*	Biansu
11	Lecythidaceae	*Barringtonia pendula*	Langkong
12	Hypericaceae	*Cratoxylon cochinchinense*	Manding/patok tilan
13	Euphorbiaceae	*Baccaurea macrophylla*	Tampoi
14	Burseraceae	*Dacryodes rostrata*	Keramuh/kemayau
15	Myrtaceae	*Eugenia subrufa*	Ubah putih
16	Euphorbiaceae	*Aporusa nitida*	Jangau
17	Myristiceae	*Knema cinerea*	Kumpang engkiong
18	Zingiberaceae	*Alpinia aquatica*	Panyun
19	Moraceae	*Artocarpus nitidus*	Selangking
20	Meliaceae	*Aphanamixis polystachya*	Segera
21	Combretaceae	*Terminalia foetidissima*	Kedandi

List of birds seen

Black hornbill, Oriental pied hornbill, Great argus, Brahminy kite, Great tailed racket tailed drongo, Black magpie, Crow, Great coucal, Stork-billed kingfisher, Black and red broadbill, Hill myna, Brahminy kite, Egret

List of birds presence identified by the community

Common golden backed woodpecker, Blue-headed pitta, Black-headed bulbul, Yellow-bellied bulbul, Pied fantail, Asian paradise flycatcher, Storm's stork, Bushy crested hornbill, Rhinoceros hornbill, Helmeted hornbill

List of mammals identified by the community

Sambar deer, Bearded pig, Prevost's squirrel, Long-tailed macaque, Giant squirrel, Pig-tailed macaque, Black banded langur, Small-toothed palm civet, Lesser mouse deer, Greater mouse deer, Plain pigmy squirrel, Western tarsier, Barking deer, Flying fox

Appendix 4.3 - List of plant species of special value for the coummunity

No	Local Name	Uses
1	Kubok (Ib.)	Wild vegetable
2	Miding (Mal., Ber.)	Wild vegetable
3	Maggu (Ber.)	Bamboo shoot-wild vegetable Medicinal plant – urinary tract infection
4	Fish-tailed palm, Opit (Ber.)	Edible part – shoot
5	Birup paya (Ib.), Diong nyuk (Ber.)	The leaf-Wrapping rice & cake
6	Ridan (Mal.) Diong chang (Ber.)	Fishing rod, separating paddy from stalk by stepping on (filter), The inner part of stalk use for cork, blow pipes arrows
7	Wild banana, Tisek (Ber.)	All parts are edible except leaves and roots
8	Rattan, Wai achi bitang (Ber.)	Basket weaving
9	Akar bingan (Ber.)	Young fruit – edible
10	Simpoh (Mal.) Diging teluk (Ber.)	Edible shoot, leaves for wrapping
11	Lembah (Keny.), Gelombang (Bid.)	Edible fruit, the leaves use as rope, use for ritual
12	Rattan, Wai Mala (Ber.)	Use as rope for fish cage and furniture
13	Diong sitat (Ber.)	Edible plant
14	Rotan, Wai delok(Ber.)	Basket weaving, edible shoot
15	Kubal (Ib.), Lo'ong sapek (Ber.)	Edible fruit
16	Tekalong, (*Artocarpus elasticus*)	Edible fruit, the bark use for traditional dance custom (man) and rope
17	Belian (*Eusideroxylon zwaggeri*)	Building construction
18	Kiten (Ber.)	Young shoot edible
19	Tuku (Ber.), Siguniek (Bid.)	Edible fruit, the bark for floor mat
20	Buluh betung (Ber.), bamboo	Edible shoot, building construction
21	Buluh bijeh (Ber.), Dimorat (Bid.)	Making music equipment – the flute, for blow pipe and making 'nyiru'
22	Lo'ong pecok (Ber.), Pauh (Mal.) (Bacauria lenceolata)	Edible fruit, cooking spices
23	Are tana' (Ber.), Sirih tanah (Mal.)	Edible leaves
24	Asam kandis (Mal.) (Garcinia sp.)	Edible leaves, cooking spices

Appendix 4.4 – Meaning Condensation of fishing techniques

Themes	Respondent 1	Respondent 2	Respondent 3	Respondent 4
Output pr trip (kg/trip)	S: 400-600 b.; 200-300 a. CN: 50 b; 10-20. GN: 10b:5a. BL: 50b;5-10a.	S:100b;50a. CN: 20b;5a. GN:100b;20a. BL: 30b; Nil.	S:100b; 10a. CN: 30b. 20a. GN: 30b 20a BL: 5b 3a.	S : 500b; 100a CN : 20b; 5a GN :Nil; 30a BL : Nil; 30a
Fishing intensity (trips/week)	S: same (1). CN:3b./anytime a.; GN: same; BL: 21.	S: difficult to estimate; CN: same (2); GN: same;	S: same (2). CN: same (2.5) GN: same (3.5) BL: depends on the	S: same (1) CN: same (3) GN: nil b; 5a. BL: nil b; 7a.
Introduced sp.	Biawan has higher competitive ability than native species.	Biawan affected the number of native species caught	Padi and Mengalan decreased since 1985 due to introduced sp. (Lampan Jawa, Sembilang & Toman)	Introduced sp. (Toman, carnivorous) caused reduction of small fish. Biawan has the aggressive characteristics and their relative abundance 4 times more than Mengalan and Padi. Small fish such as Enseluai still remain the same amount.
Change of location	Higher production due to more access to the resource, less distance to lake and low costs (transport).	Production has increased due to less distance to lake.	Increased production due to less costs (transport)	No change in production because total catches before and past are same.

S: Selambau (During dry season only), **CN**: Casts Net, **GN**: Gill net, **BL**: Baited lines.

NR: no response; **b:** before, **a**: after

LIST OF COMMON FRESHWATER FISH SPECIES IN THE L.B. LAKE

No.	Local name	Scientific name	comments
1	Biawan	*Helostoma temminckii*	Introduced sp
2	Baung	*Mystus nemurus*	Native sp
3	Betutu	*Oxyeleotris marmorta*	Native sp
4	Mengalan	*Puntioplites waandersi*	Native sp
5	Kaloi	*Osphronemus goramy*	Native sp
6	Keli	*Clarias teijsmanni*	Native sp
7	Sembilang (African Catfish)	*Clarias gariepinus*	Introduced sp
8	Toman	*Channa sp.*	Introduced sp
9	Banta	*Osteochilus microcephalus*	Native sp
10	Enseluai	*Rasbora caudimaculate*	Native sp
11	Lajung	*Pangasius sp.*	Native sp
12	Lais	*Krytopterus parvanalis*	Native sp
13	Tapah	*Wallago sp.*	Native sp
14	Merah Mata (Padi)	*Osteochilus melanopleura*	Native sp
15	Lampan Jawa	*Barbodes gonionotus*	Introduced sp.
16	Palau		Native sp
17	Juak	*Hampala bimaculata*	Native sp
18	Puyu	*Anabas testudineus*	Native sp
19	Tilan (Tuding)	*Mastacembelus unicolor*	Native sp
20	Kacong	*Osteochilus sp*	Native sp
21	Udun	*Channa sp*	Native sp
22	Bueng	*Cyclocheilichthys sp.*	Native sp
23	Sepat	*Tricogaster pectoralis*	Native sp
24	Belida (Belirih)	*Notopterus borneensis*	Native sp
25	Sakam	*Mystus wyckii*	Native sp
26	Daun	*Cynoglossus sp.*	Native sp
27	Sambil (like Baung udang)	*Mystus nigriceps*	Native sp
28	Pelisik		Native sp
29	Tilapia Hitam	*Tilapia sp.*	Native sp

APPENDIX 4.5 – Interview with key informant from the national park.

1. Introductory questions.

1.1 About history of N.P.: *Gazetted in 1991, open in Oct. 2002….*

1.2 Information about respondent:

Costumes service assistant, working at N.P since Nov. 2001

1.3 About N.P:

Previously 16 employees, now 6. The parks offers two trails, lake and bird watching and trips along long houses. Needs improvement.

2. Tourism

2.1 How important is tourism in this area in terms of income/budget (found, finances, economic dependence)

Very important for conservation of lake and for the nearby community. SFC-founding. Before under the minister of tourism, now under the Forestry Department. Hopes that in the future the park will be able to pay itself through lodging and other activities.

2.2 How many tourists did you receive last year? Get statistics, define tourist (e.g. researchers, national foreigner)

In 2003 – 732. Visitors are mostly Malaysians (135 foreigners). Only "true" tourists are part of the statistics.

3. Clarifying questions

3.1 How does the N.P. see the Rh. Meran community's involvement/or lack thereof in the implementation of the park? Explain.

Hard to say, initially the community did not support the idea, now they do.

3.2 Most of the respondents in Rh. Meran have said that the land they have belongs under the NCRL category. Can you explain how the N.P. registers this type of information, i.e. how many acres/ha are registered under this category?

The area is only inhabited by Berawan. Burial grounds are prove of the previous presence of Berawan.

About how to register….I leave it to higher authorities.

3.3 Why do you think some of the members of Rh. Kajan moved to the actual location (Rh. Meran)?

The longhouse burned, so they decided to split.

3.4 Do you think that the native population are utilising natural resources properly? i.e. no significant negative impact in natural vegetation, fauna and water ecosystem?

3.5 How do you feel about the fact that the N.P's establishment of tourist facilities (lodges) has affected the economy of some of the local people?

Visitors stay at both places.

4. <u>Ending questions:</u>

4.1 The forest department is now under the jurisdiction of the Sarawak Forestry Cooperation. How do you think this will affect the management of natural resources in the L.B. area?

Cannot answer this question

4.2 Is the N.P planning to give technical assistance to some of the local people (English skills, guide courses, workshops, etc.)

The N.P needs proper organisation, specially in enforcement. ¾ staff ? Organises one talk guide course. Refers to the example of Mulu N.P. where Berawan participate in tourism.

4.3 What are your plans in relation to facilities, services, promotion, expansion, etc?

Cannot answer this question.

Appendix 5.1 – Results from the household survey.

1. Change

fish change since 1998

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	1	5,6	5,6	5,6
	slight improvement	1	5,6	5,6	11,1
	same	2	11,1	11,1	22,2
	slight decrease	6	33,3	33,3	55,6
	big decrease	4	22,2	22,2	77,8
	no answer	4	22,2	22,2	100,0
	Total	18	100,0	100,0	

fruits change since 1998

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	4	22,2	22,2	22,2
	slight improvement	6	33,3	33,3	55,6
	same	3	16,7	16,7	72,2
	slight decrease	1	5,6	5,6	77,8
	no answer	4	22,2	22,2	100,0
	Total	18	100,0	100,0	

game food change since 1998

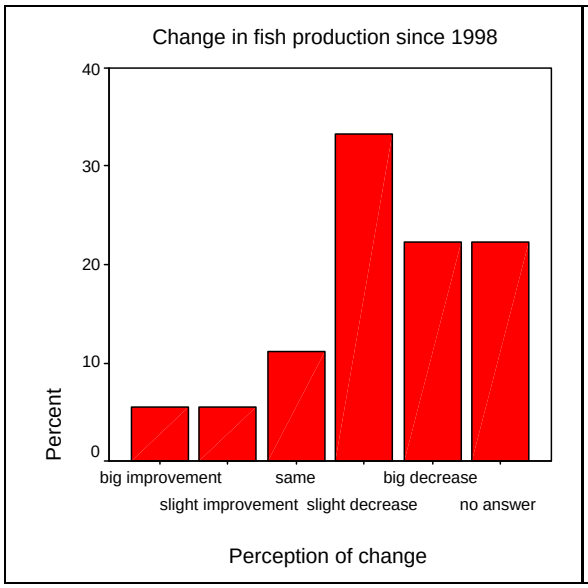
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	slight improvement	1	5,6	5,6	5,6
	same	2	11,1	11,1	16,7
	big decrease	7	38,9	38,9	55,6
	no answer	8	44,4	44,4	100,0
	Total	18	100,0	100,0	

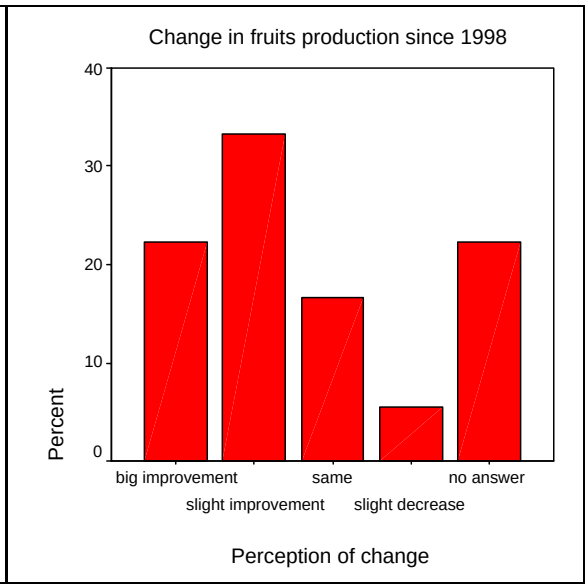
vegetable change since 1998

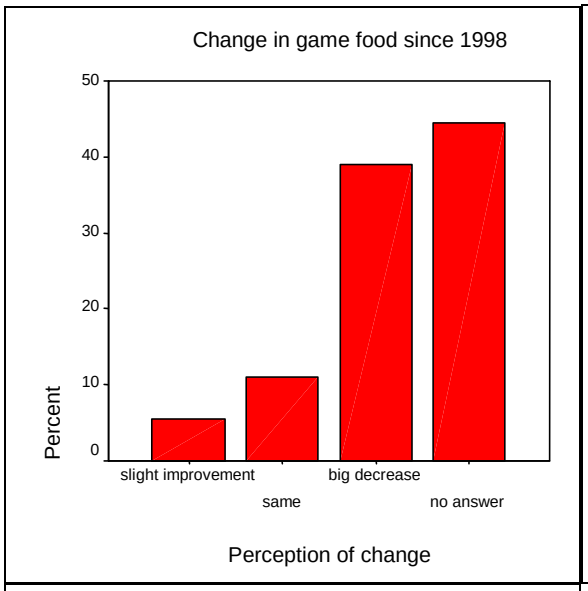
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	5	27,8	27,8	27,8
	slight improvement	3	16,7	16,7	44,4
	same	3	16,7	16,7	61,1
	big decrease	1	5,6	5,6	66,7
	no answer	6	33,3	33,3	100,0
	Total	18	100,0	100,0	

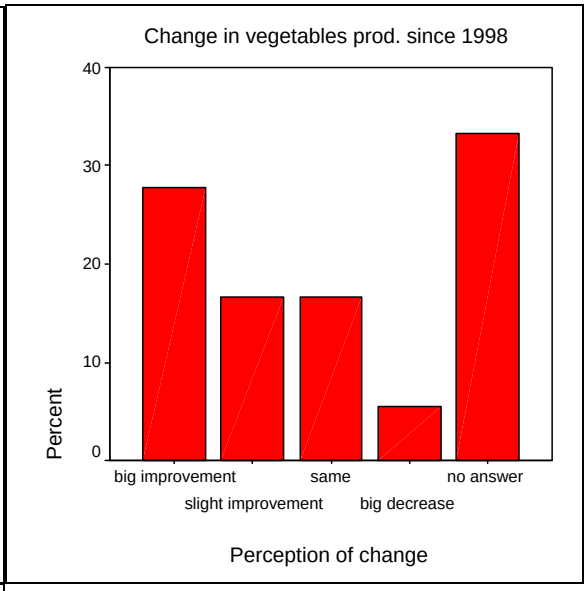
income change since 98

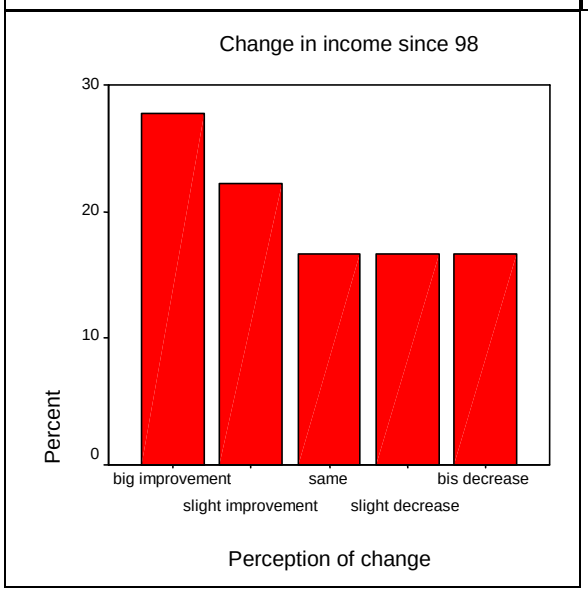
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	5	27,8	27,8	27,8
	slight improvement	4	22,2	22,2	50,0
	same	3	16,7	16,7	66,7
	slight decrease	3	16,7	16,7	83,3
	bis decrease	3	16,7	16,7	100,0
	Total	18	100,0	100,0	


Change in fish production since 1998
Percent
40
30
20
10
0
big improvement
same
big decrease
slight improvement
slight decrease
no answer
Perception of change


Change in fruits production since 1998
Percent
40
30
20
10
0
big improvement
same
no answer
slight improvement
slight decrease
Perception of change


Change in game food since 1998
Percent
50
40
30
20
10
0
slight improvement
big decrease
same
no answer
Perception of change


Change in vegetables prod. since 1998
Percent
40
30
20
10
0
big improvement
same
no answer
slight improvement
big decrease
Perception of change


Change in income since 98
Percent
30
20
10
0
big improvement
same
bis decrease
slight improvement
slight decrease
Perception of change

2. Income, Expenditure and Savings

income from farm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100-500	3	16,7	16,7	16,7
	NR	15	83,3	83,3	100,0
	Total	18	100,0	100,0	

income from fish

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100-500	2	11,1	11,1	11,1
	501-1000	3	16,7	16,7	27,8
	NR	13	72,2	72,2	100,0
	Total	18	100,0	100,0	

income from others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1501-2000	1	5,6	5,6	5,6
	NR	17	94,4	94,4	100,0
	Total	18	100,0	100,0	

status of saving

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	9	50,0	50,0	50,0
	no	3	16,7	16,7	66,7
	no answer	6	33,3	33,3	100,0
	Total	18	100,0	100,0	

expenses from food

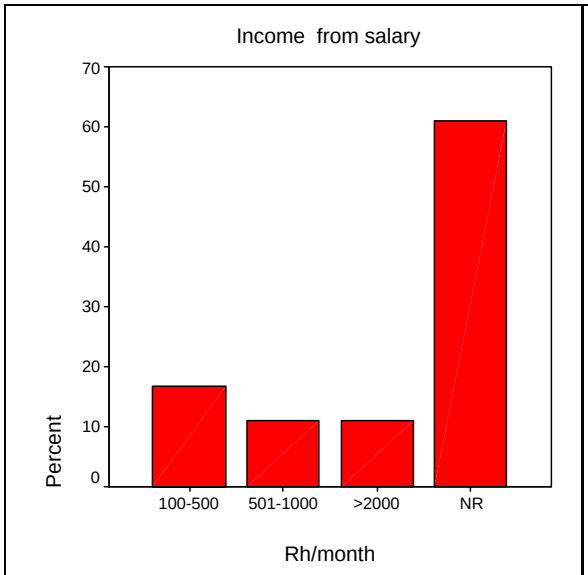
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-500	14	77,8	77,8	77,8
	501-1000	2	11,1	11,1	88,9
	NR	2	11,1	11,1	100,0
	Total	18	100,0	100,0	

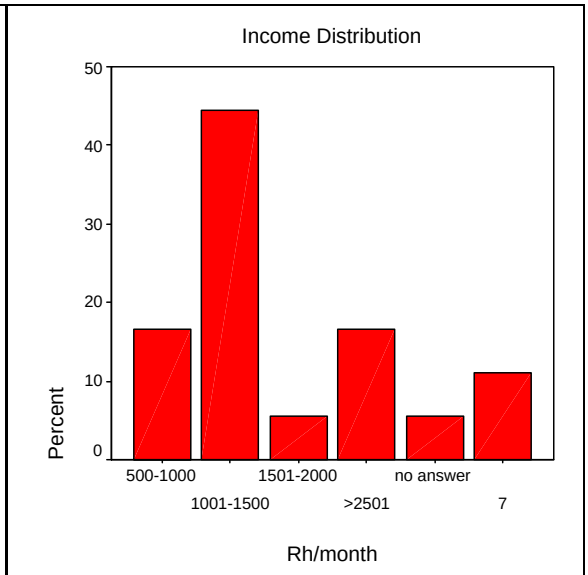
expenses from education

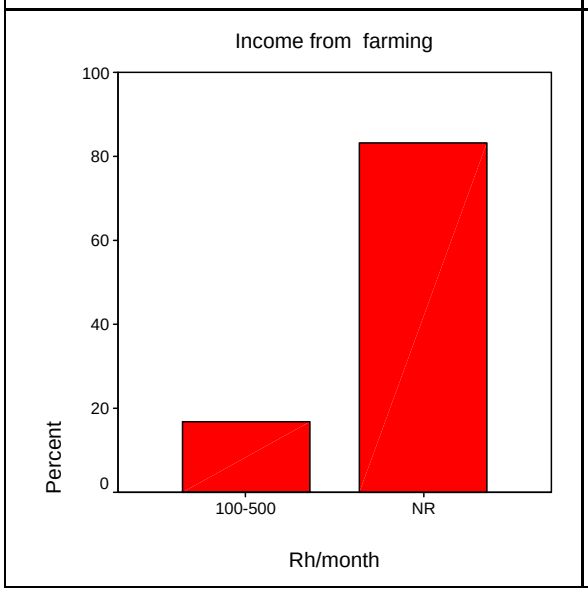
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-500	8	44,4	44,4	44,4
	1001-1500	1	5,6	5,6	50,0
	NR	9	50,0	50,0	100,0
	Total	18	100,0	100,0	

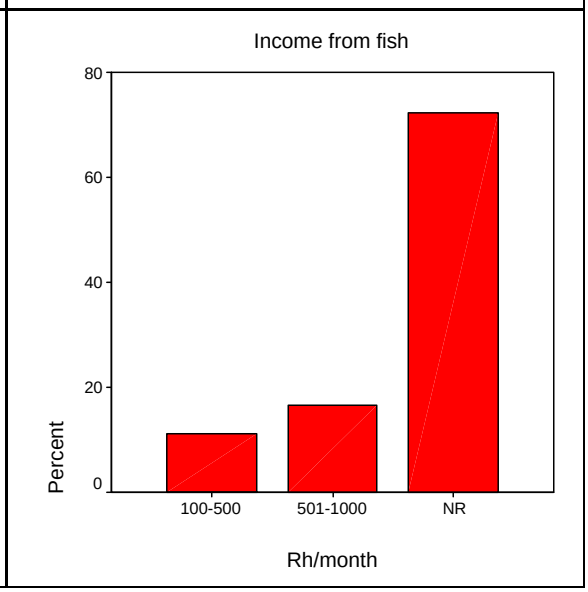
expenses from utilities

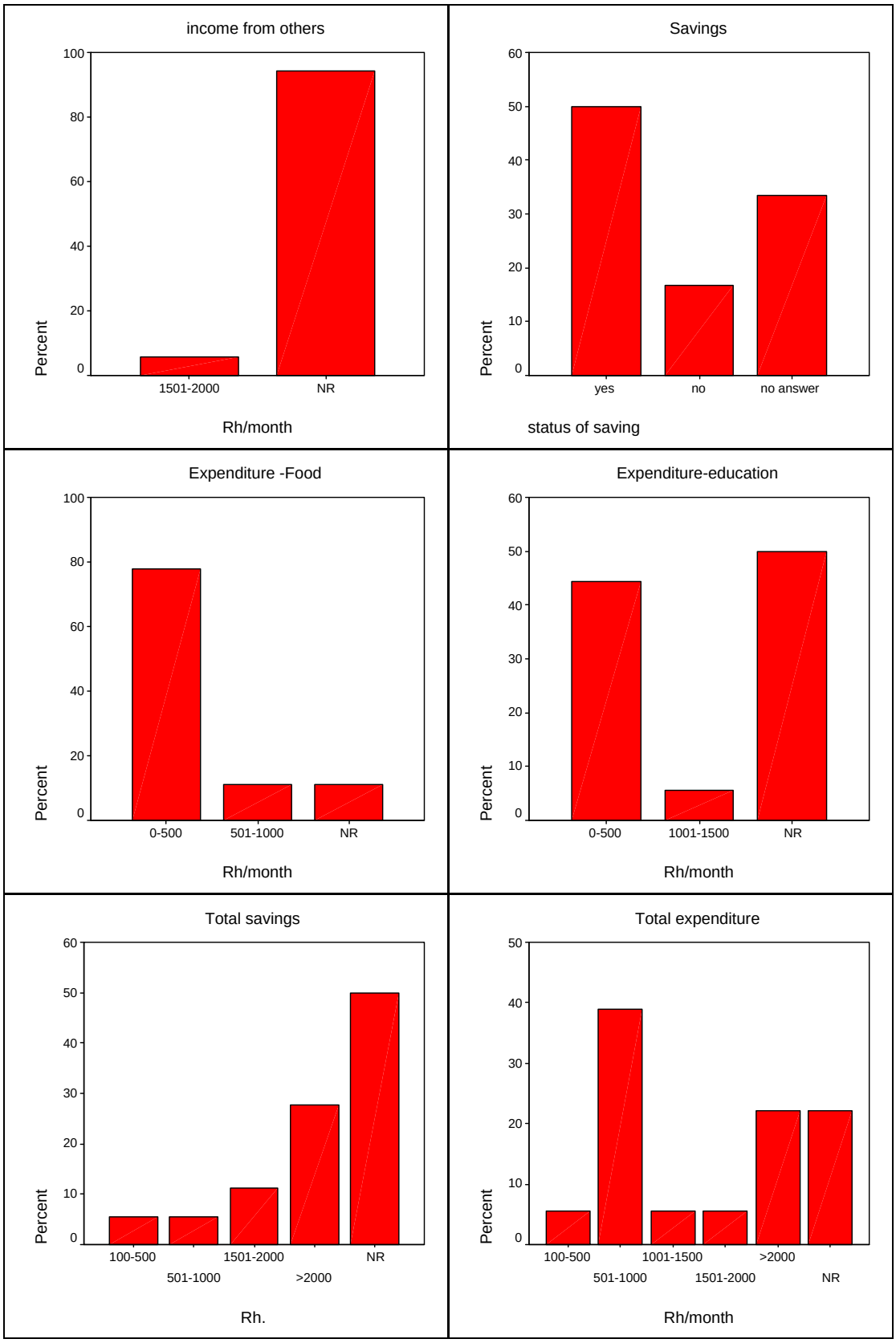
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-500	7	38,9	41,2	41,2
	NR	10	55,6	58,8	100,0
	Total	17	94,4	100,0	
Missing	System	1	5,6		
Total		18	100,0		

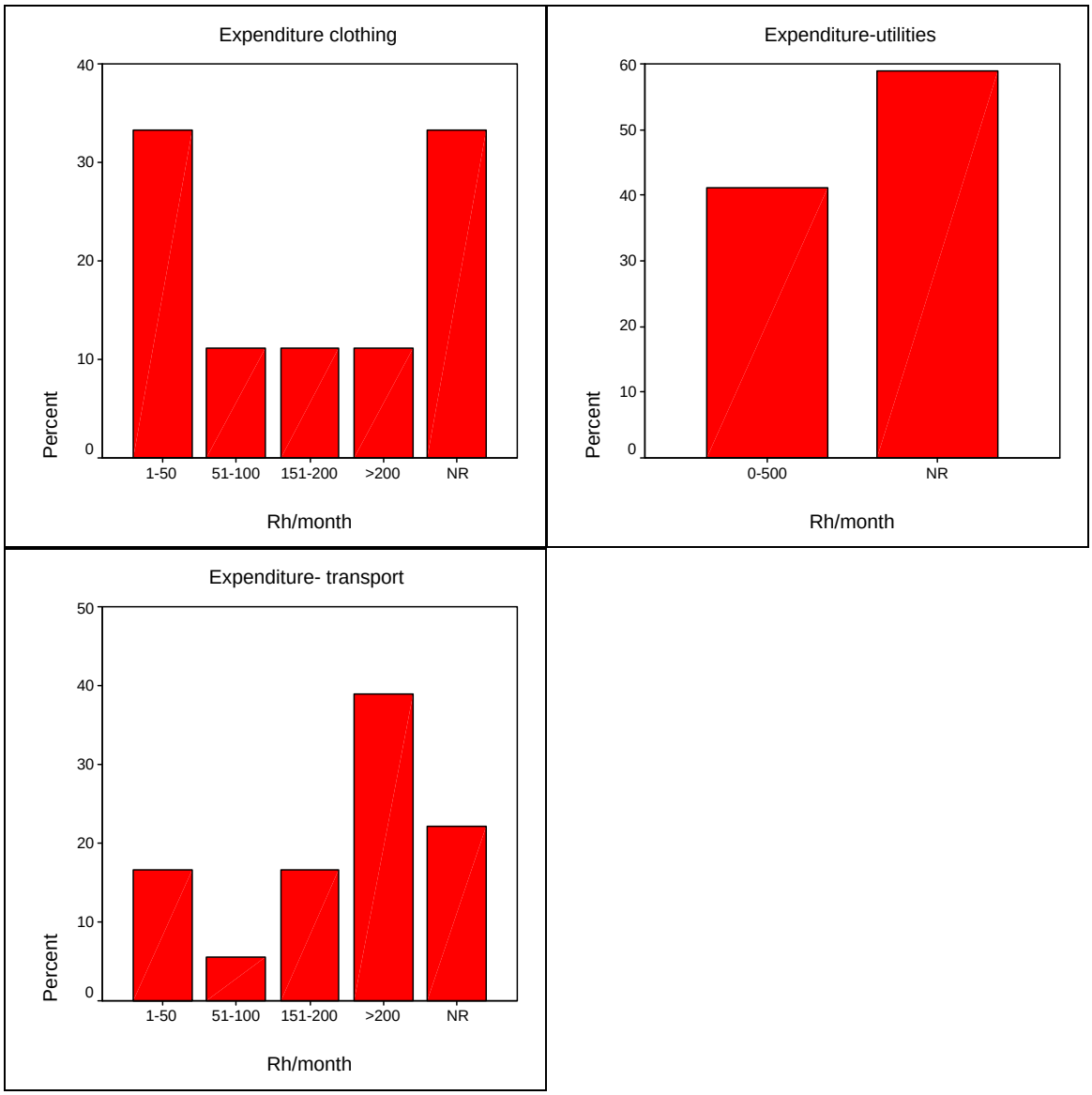









income from others
Percent
100
80
60
40
20
0
1501-2000
NR
Rh/month
Savings
Percent
60
50
40
30
20
10
0
yes
no
no answer
status of saving
Expenditure -Food
Percent
100
80
60
40
20
0
0-500
501-1000
NR
Rh/month
Expenditure-education
Percent
60
50
40
30
20
10
0
0-500
1001-1500
NR
Rh/month
Total savings
Percent
60
50
40
30
20
10
0
100-500
501-1000
1501-2000
>2000
NR
Rh.
Total expenditure
Percent
50
40
30
20
10
0
100-500
501-1000
1001-1500
1501-2000
>2000
NR
Rh/month



3. Agriculture and Land Tenure

Land area under use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-20	4	22,2	22,2	22,2
	21-40	5	27,8	27,8	50,0
	41-60	2	11,1	11,1	61,1
	60-80	2	11,1	11,1	72,2
	>80	3	16,7	16,7	88,9
	no answer	2	11,1	11,1	100,0
	Total	18	100,0	100,0	

NL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	outside	1	5,6	5,6	5,6
	both	1	5,6	5,6	11,1
	NR	16	88,9	88,9	100,0
	Total	18	100,0	100,0	

NCRL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	inside	5	27,8	27,8	27,8
	outside	1	5,6	5,6	33,3
	both	11	61,1	61,1	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

NL & NCRL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NCRL	15	83,3	83,3	83,3
	both	2	11,1	11,1	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

quantity of inside NL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NR	18	100,0	100,0	100,0

quantity of inside NCRL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	8	44,4	44,4	44,4
	11-20	4	22,2	22,2	66,7
	21-30	1	5,6	5,6	72,2
	41-50	1	5,6	5,6	77,8
	51-60	1	5,6	5,6	83,3
	61-70	1	5,6	5,6	88,9
	NR	2	11,1	11,1	100,0
	Total	18	100,0	100,0	

quantity of outside NL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NR	18	100,0	100,0	100,0

quantity of outsideNCRL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	6	33,3	33,3	33,3
	11-20	1	5,6	5,6	38,9
	21-30	2	11,1	11,1	50,0
	31-40	1	5,6	5,6	55,6
	71-80	1	5,6	5,6	61,1
	>81	1	5,6	5,6	66,7
	NR	6	33,3	33,3	100,0
	Total	18	100,0	100,0	

purpose of land for cultivation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	17	94,4	94,4	94,4
	no	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

same land now as in 98

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	11	61,1	61,1	61,1
	no	4	22,2	22,2	83,3
	NR	3	16,7	16,7	100,0
	Total	18	100,0	100,0	

purpose of land (Idle)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	11	61,1	61,1	61,1
	no	2	11,1	11,1	72,2
	no answer	5	27,8	27,8	100,0
	Total	18	100,0	100,0	

Land pupose

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cultivation	8	44,4	44,4	44,4
	Idle	1	5,6	5,6	50,0
	Cultivation and Idle	9	50,0	50,0	100,0
	Total	18	100,0	100,0	

shifting cultivation practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	6	33,3	33,3	33,3
	no	11	61,1	61,1	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

Purpose of land under shifting cultivation practices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	self sustenance	4	22,2	22,2	22,2
	Traditional/heredinary pratice	2	11,1	11,1	33,3
	NR	12	66,7	66,7	100,0
	Total	18	100,0	100,0	

farming in the park

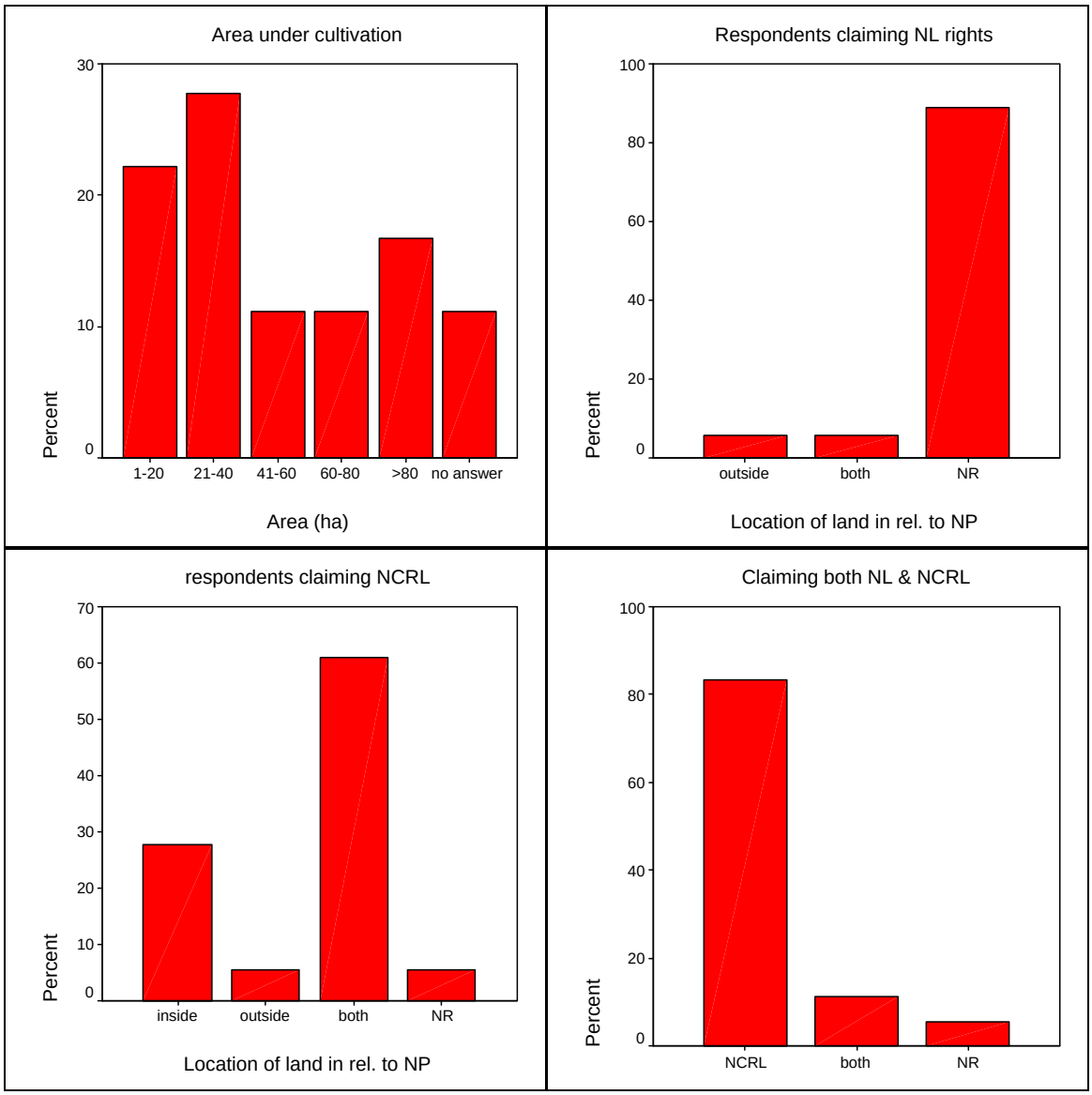
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	15	83,3	83,3	83,3
	no	2	11,1	11,1	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

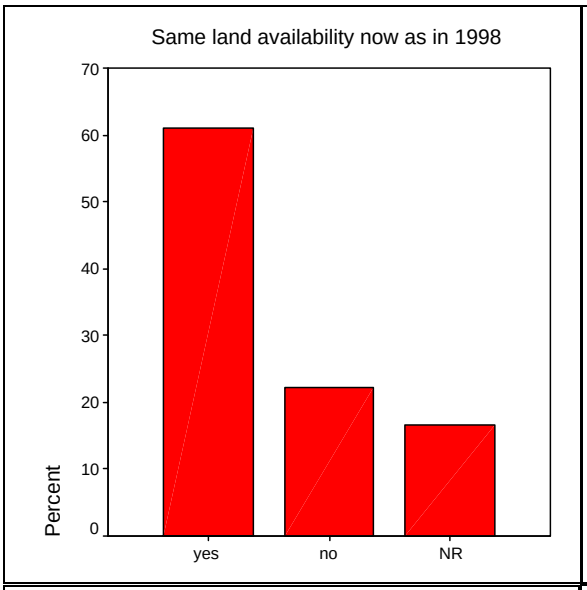
fertilizer

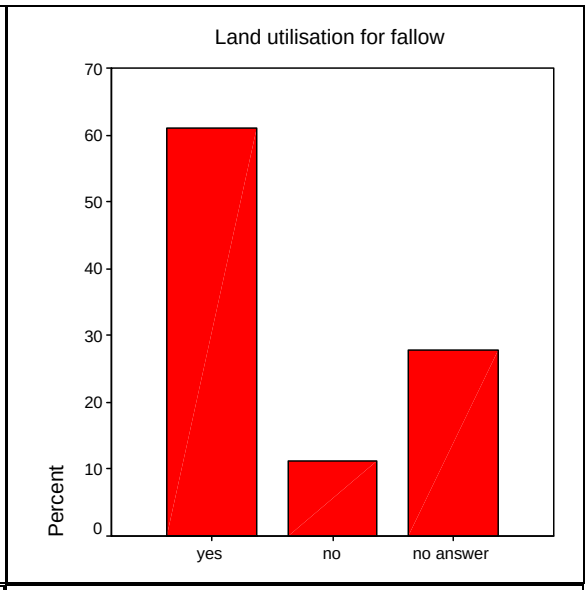
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	10	55,6	55,6	55,6
	no	8	44,4	44,4	100,0
	Total	18	100,0	100,0	

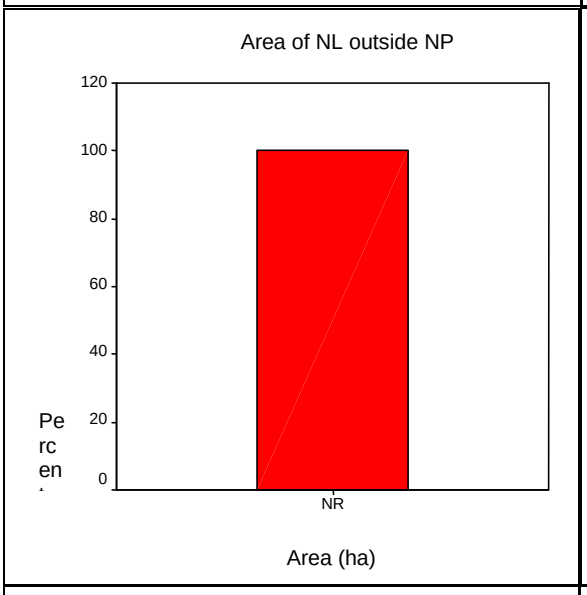
pesticides

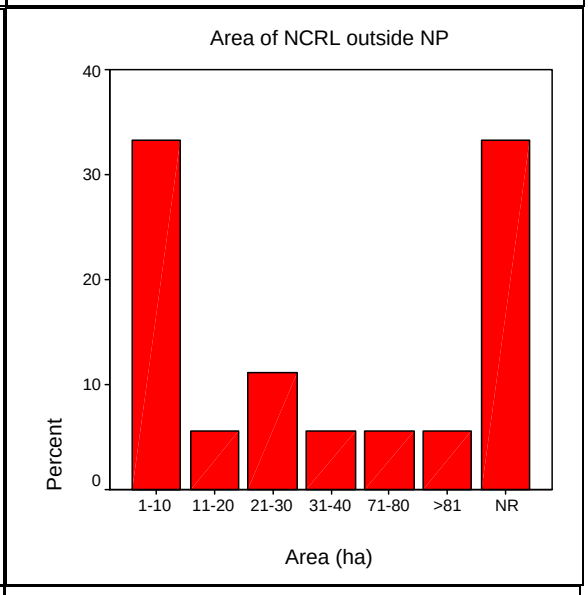
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	13	72,2	72,2	72,2
	no	4	22,2	22,2	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

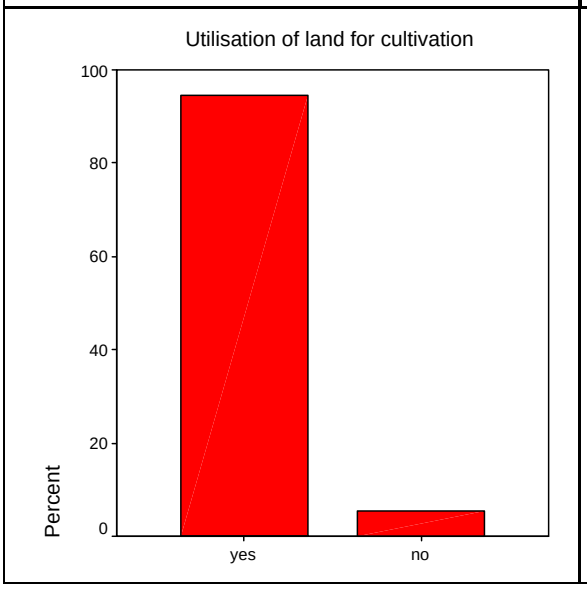

Area under cultivation
Percent
30
20
10
0
1-20
21-40
41-60
60-80
>80
no answer
Area (ha)
Respondents claiming NL rights
Percent
100
80
60
40
20
0
outside
both
NR
Location of land in rel. to NP
respondents claiming NCRL
Percent
70
60
50
40
30
20
10
0
inside
outside
both
NR
Location of land in rel. to NP
Claiming both NL & NCRL
Percent
100
80
60
40
20
0
NCRL
both
NR
Area of NL inside NP
Percent
120
100
80
60
40
20
0
NR
Area (ha)
Area of NCRL inside NP
Percent
50
40
30
20
10
0
1-10
11-20
21-30
41-50
51-60
61-70
NR
Area (ha)

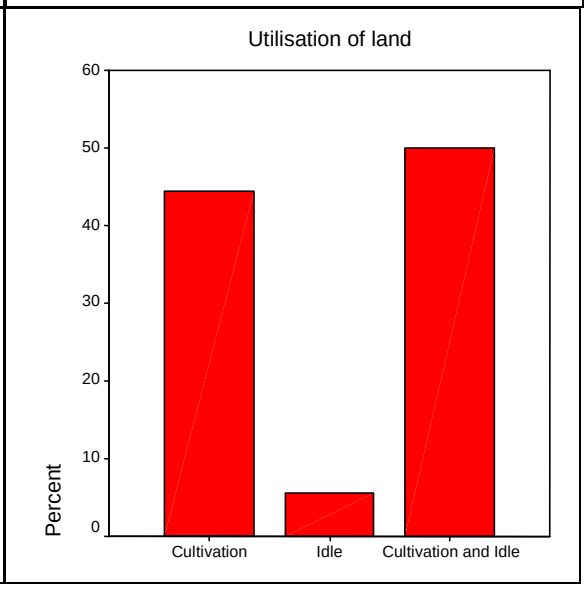

Same land availability now as in 1998
Percent
70
60
50
40
30
20
10
0
yes
no
NR

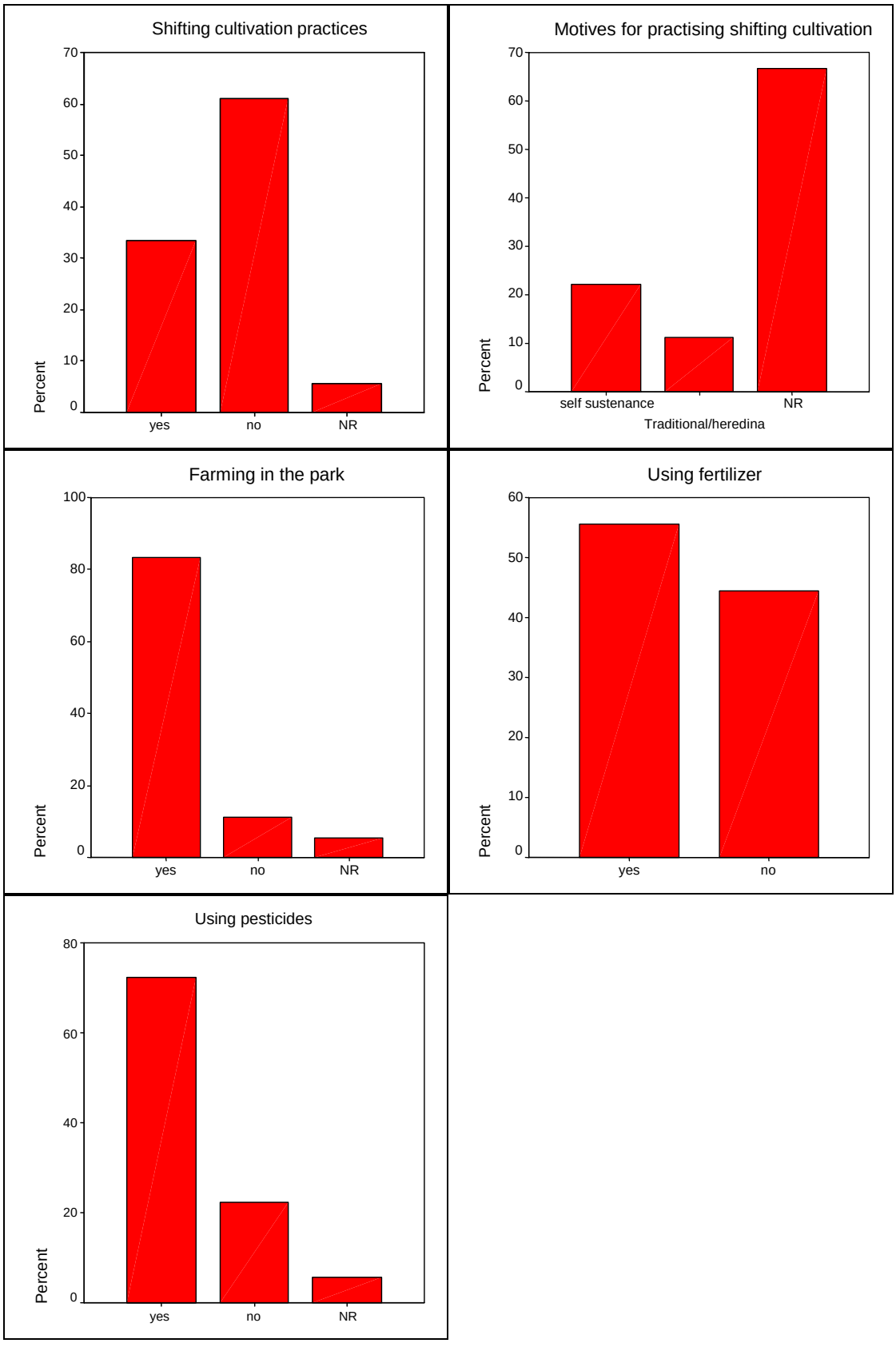

Land utilisation for fallow
Percent
70
60
50
40
30
20
10
0
yes
no
no answer


Area of NL outside NP
Percent
120
100
80
60
40
20
0
NR
Area (ha)


Area of NCRL outside NP
Percent
40
30
20
10
0
1-10
11-20
21-30
31-40
71-80
>81
NR
Area (ha)


Utilisation of land for cultivation
Percent
100
80
60
40
20
0
yes
no


Utilisation of land
Percent
60
50
40
30
20
10
0
Cultivation
Idle
Cultivation and Idle


Shifting cultivation practices
Percent
70
60
50
40
30
20
10
0
yes
no
NR
Motives for practising shifting cultivation
Percent
70
60
50
40
30
20
10
0
self sustenance
NR
Traditional/heredina
Farming in the park
Percent
100
80
60
40
20
0
yes
no
NR
Using fertilizer
Percent
60
50
40
30
20
10
0
yes
no
Using pesticides
Percent
80
60
40
20
0
yes
no
NR

4. Park related issues.

fish change since 1998

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	1	5,6	5,6	5,6
	slight improvement	1	5,6	5,6	11,1
	same	2	11,1	11,1	22,2
	slight decrease	6	33,3	33,3	55,6
	big decrease	4	22,2	22,2	77,8
	no answer	4	22,2	22,2	100,0
	Total	18	100,0	100,0	

fruits change since 1998

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	4	22,2	22,2	22,2
	slight improvement	6	33,3	33,3	55,6
	same	3	16,7	16,7	72,2
	slight decrease	1	5,6	5,6	77,8
	no answer	4	22,2	22,2	100,0
	Total	18	100,0	100,0	

game food change since 1998

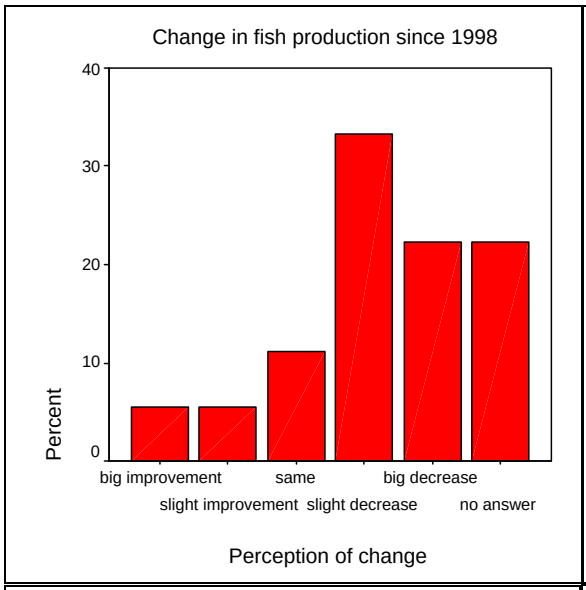
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	slight improvement	1	5,6	5,6	5,6
	same	2	11,1	11,1	16,7
	big decrease	7	38,9	38,9	55,6
	no answer	8	44,4	44,4	100,0
	Total	18	100,0	100,0	

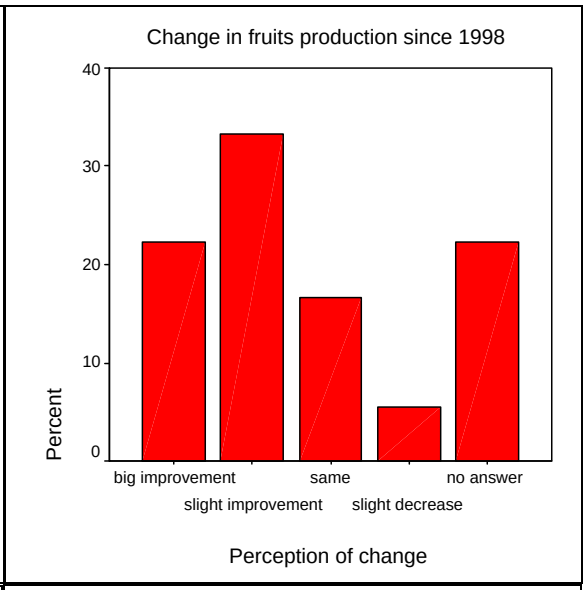
vegetable change since 1998

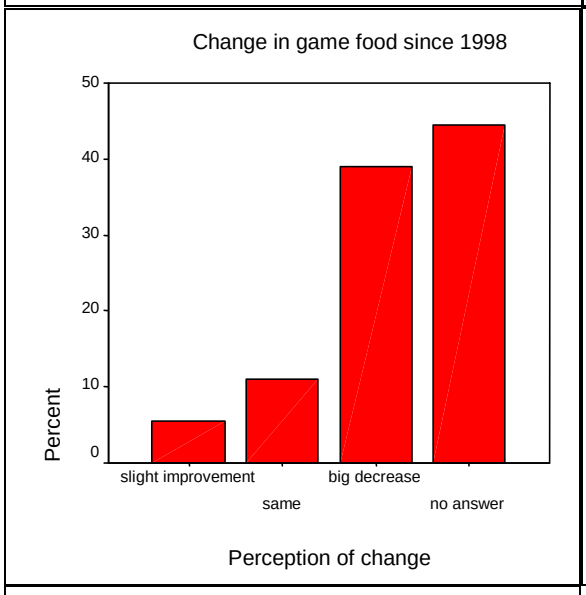
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	5	27,8	27,8	27,8
	slight improvement	3	16,7	16,7	44,4
	same	3	16,7	16,7	61,1
	big decrease	1	5,6	5,6	66,7
	no answer	6	33,3	33,3	100,0
	Total	18	100,0	100,0	

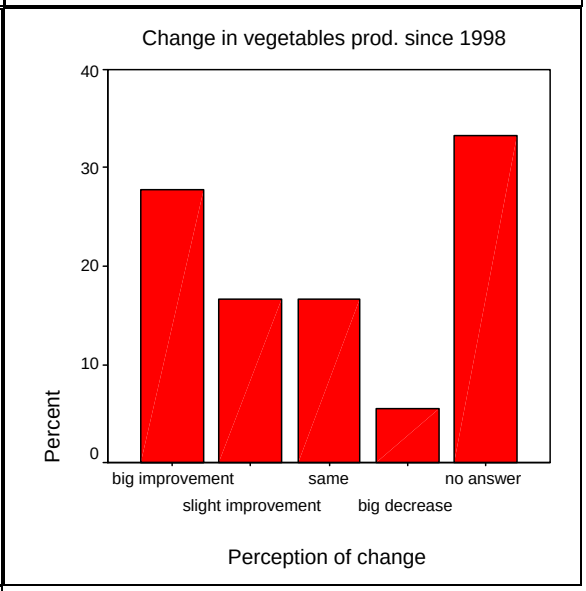
income change since 98

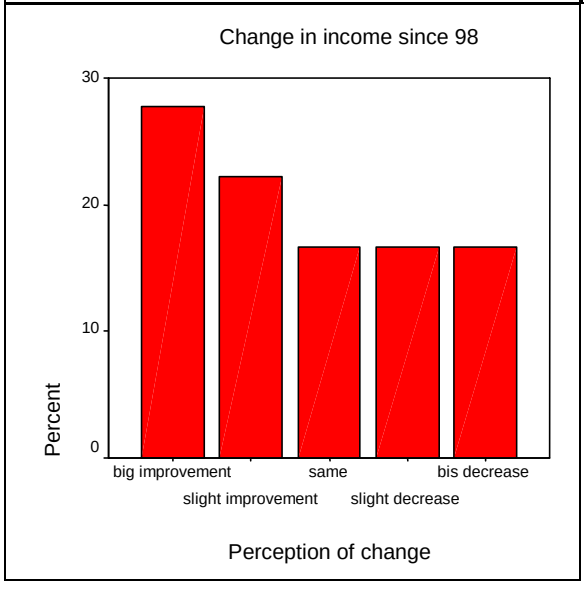
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	big improvement	5	27,8	27,8	27,8
	slight improvement	4	22,2	22,2	50,0
	same	3	16,7	16,7	66,7
	slight decrease	3	16,7	16,7	83,3
	bis decrease	3	16,7	16,7	100,0
	Total	18	100,0	100,0	


Change in fish production since 1998
Percent
40
30
20
10
0
big improvement
slight improvement
same
slight decrease
big decrease
no answer
Perception of change


Change in fruits production since 1998
Percent
40
30
20
10
0
big improvement
slight improvement
same
slight decrease
no answer
Perception of change


Change in game food since 1998
Percent
50
40
30
20
10
0
slight improvement
same
big decrease
no answer
Perception of change


Change in vegetables prod. since 1998
Percent
40
30
20
10
0
big improvement
slight improvement
same
big decrease
no answer
Perception of change


Change in income since 98
Percent
30
20
10
0
big improvement
slight improvement
same
slight decrease
bis decrease
Perception of change

wood/forest change since 1998

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	slight improvement	1	5,6	5,6	5,6
	same	8	44,4	44,4	50,0
	slight decrease	1	5,6	5,6	55,6
	big decrease	3	16,7	16,7	72,2
	no answer	5	27,8	27,8	100,0
	Total	18	100,0	100,0	

Important of forest

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	2	11,1	11,1	11,1
	moderate	2	11,1	11,1	22,2
	not important	2	11,1	11,1	33,3
	not important at all	12	66,7	66,7	100,0
	Total	18	100,0	100,0	

important of the lake

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	1	5,6	5,6	5,6
	moderate	1	5,6	5,6	11,1
	not important at all	15	83,3	83,3	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

utilize of forest products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	16	88,9	88,9	88,9
	no	1	5,6	5,6	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

farming in the park

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	15	83,3	83,3	83,3
	no	2	11,1	11,1	94,4
	NR	1	5,6	5,6	100,0
	Total	18	100,0	100,0	

perception on LBNP management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	poor	2	11,1	11,1	11,1
	pair management	3	16,7	16,7	27,8
	undecided	5	27,8	27,8	55,6
	good	8	44,4	44,4	100,0
	Total	18	100,0	100,0	

knowing the Gov implement project

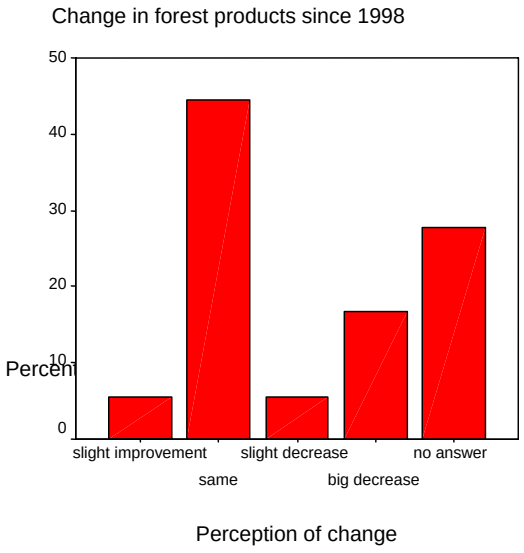
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	10	55,6	55,6	55,6
	no	8	44,4	44,4	100,0
	Total	18	100,0	100,0	

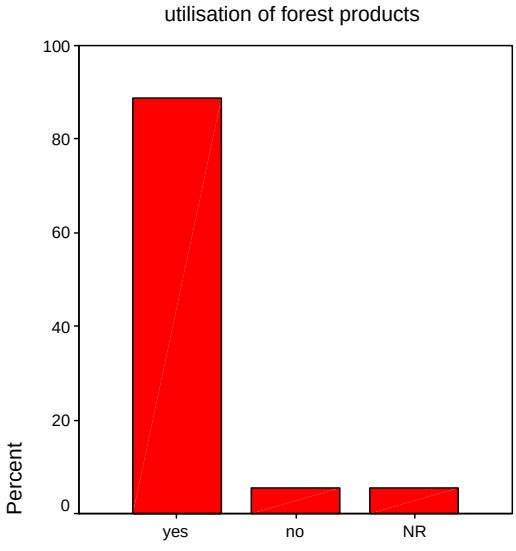
tourism project

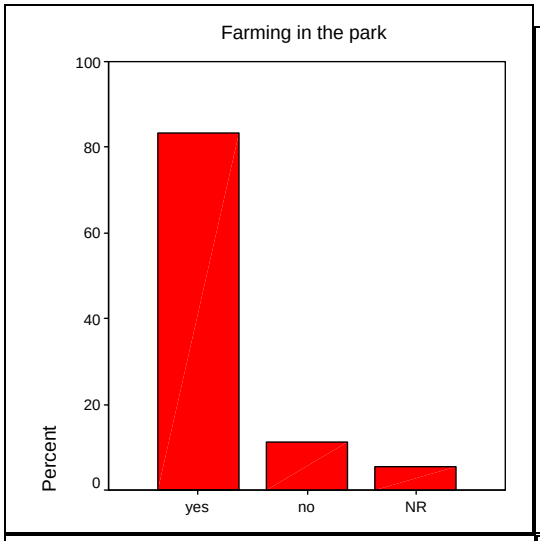
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	12	66,7	66,7	66,7
	no	6	33,3	33,3	100,0
	Total	18	100,0	100,0	

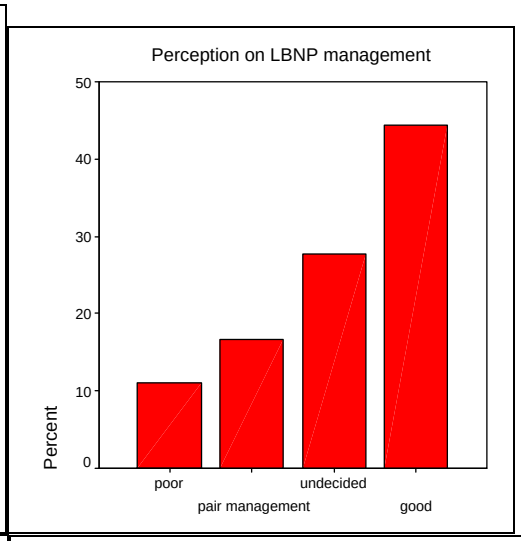
Source of information about tourism project

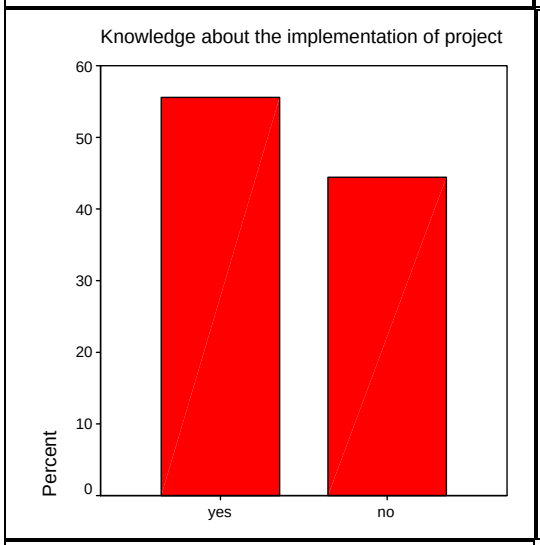
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	LBNP office	1	5,6	5,6	5,6
	friends	7	38,9	38,9	44,4
	others	3	16,7	16,7	61,1
	NR	7	38,9	38,9	100,0
	Total	18	100,0	100,0	

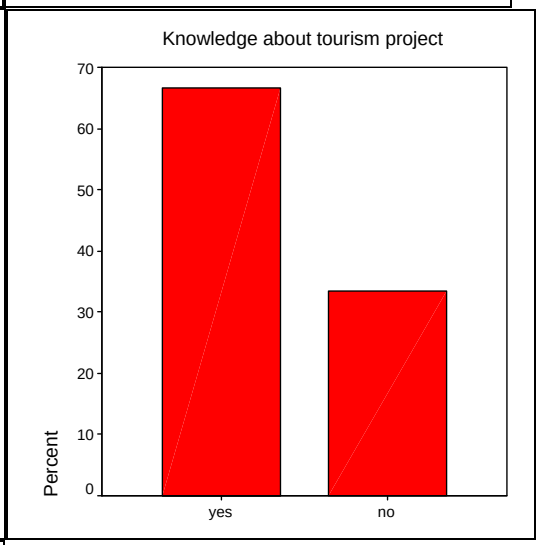


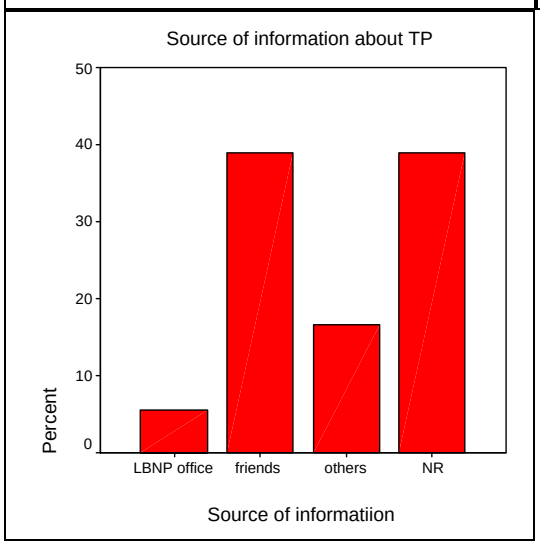



Farming in the park
Percent
100
80
60
40
20
0
yes
no
NR


Perception on LBNP management
Percent
50
40
30
20
10
0
poor
undecided
pair management
good


Knowledge about the implementation of project
Percent
60
50
40
30
20
10
0
yes
no


Knowledge about tourism project
Percent
70
60
50
40
30
20
10
0
yes
no


Source of information about TP
Percent
50
40
30
20
10
0
LBNP office
friends
others
NR
Source of informatiion

Appendix 6- Synopsis

Rh Meran Community – past, present and future

Synopsis for field trip to Rh Meran community, Loagan Bunut National Park, Sarawak

By

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Introduction

The field site of this study is located in Loagan Bunut National Park (LBNP) in the Tinjar River catchment, Miri Division of the state of Sarawak, Malaysia. Gazetted in 1990 and inaugurated in 2001, the national park has been declared by the International Union for Conservation of Nature (IUCN) as a region management category II, *i.e.* area managed for ecosystem preservation and recreation (IUCN 1994).

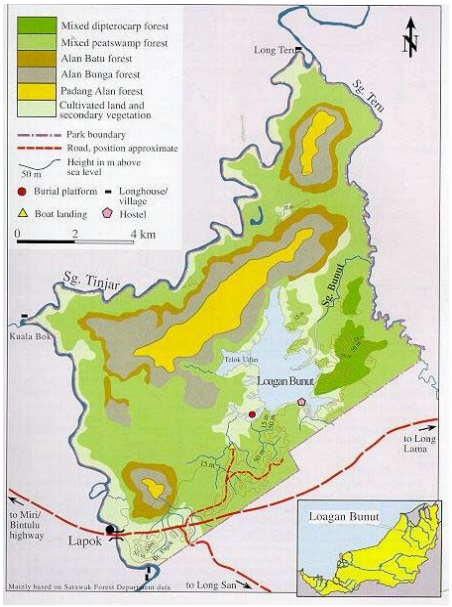

Figure 1. Loagan Bunut National Park (Murtedza *et.al* 2003)

The national park contains Sarawak's largest natural fresh water lake, which, together with the associated peat swamp forest, is the main conservation value of interest (UNEP 1992). The settlement of Rumah (Rh) Meran is situated within the boundaries of LBNP. The community of Rh Meran originates from the Berawan village of Long Teru, located to the north of the LBNP (Fig. 1). Rh Meran composes of 27 households (130 people).

Thematic Context

When a national park is established on a location where there is human settlement, the human settlement is often perceived as an obstacle to the main purpose of the national park which is nature preservation. How appealing this perception may seem it is a rather simplified one. Recent research and implementations of nature preserving policies suggest that the more successful initiatives towards nature preservation are those that involve the local communities actively, and allow the locals to both uphold a certain right to continue with their traditional practices, and provide them with new opportunities to benefit from the externalities generated by the establishment of a national

park. This practice is not unproblematic, especially not if the local community have no particular interest in merely maintaining their traditional practices, but are rather more interested in pursuing new ones. There are no easy solutions or quick fixes to these issues, and the intent of this particular study is not to provide a ready made solution to the particular conflicts and problems that arise in and around the Loagan Bunut national park and the Rh Meran community. Rather the main objective of the study is to provide case specific knowledge on how and under which circumstances conflicts between different actors on different levels arise and take shape

The Rh Meran community was established following the burning down of the longhouse in Long Teru in 1989. The people of Rh Meran moved to the current area, located in the south-west of the national park. The reason given for the relocation of the Rh Meran community was that they were already farming and fishing in the new area. The national park was gazetted a year after the relocation of the Rh Meran community. A longhouse, which is the traditional homestead, has now been constructed on the upper reaches of the Bunan river, but the individual families still have to complete their respective *bileks*, hence the longhouse is currently uninhabited (ILUNRM 2003). In Long Teru, the inhabitants have traditionally been farmers and fishermen, practising shifting cultivation and paddy farming.

The establishment of the Loagan Bunut National Park (LBNP) was done in agreement with the Berawan population of Long Teru. When Natural Resource Management policies are implemented it is necessary to analyse hidden objectives of institutions, power relations, interest groups and the effect of government control mechanisms in field reality (Merlo & Paveri 1997, Mayers & Bass 1998, cf. Overgaard *et al* 2000). The identification of the main stakeholders, their objectives and how they can influence (or are affected by) processes needs to be investigated as well. As indicated by Horowitz: *"a respected local authority structure and cultural framework that includes beliefs, morality, and a sense of community are often more important factors in determining patterns of behaviour than are laws created and enforced by a distant central authority.*" (Horowitz 1998).

The national park recognises the traditional rights of the Berawan Rh Meran community and they have been granted Native Customary Rights (NCR) to use and extract natural resources. The definition of NCR is considered vague and controversial, and the degree of local people's land rights and control over land is not clearly defined. The classification of land as Native Customary Rights Land (NCL) conflicts with local perceptions of land ownership and rights to land resources, and the local population are in doubt as to what their exact land rights are (Horowitz 1998). The fact that the villagers are not allowed to develop new land conflicts with their traditional method of shifting cultivation. The NCR also demand that resource extraction from the area should be for subsistence purposes only. The extent to which the villagers respect them is unknown. Such restrictions, which are enforced to protect the forest resources, may have detrimental effects on the livelihoods of the villagers, who traditionally rely on fishing and farming as income generating activities.

An important aspect of the establishment of the national park is its contribution to the development of local infrastructure, and how this has affected the livelihood strategies of the villagers. The new road, leading to the National Park HQ, has provided the people of Rh Meran with access to new resources and employment opportunities. Members of the village are involved in tourist activities within the park whilst others with access to cars are employed in logging and plantation companies and in Miri (ILUNRM 2003).

Because the community is situated within the physical boundaries of the National Park, the effects of land use and consumption of forest resources will have an impact on the quality of the preserved natural resources of the National Park.

The sustainability of the natural resources available to the villagers for agriculture and fishing will have an influence on their choice of livelihood strategies. Threats to the sustainability of natural resources can have their root in various factors, for example a combination of increasing population pressures, poverty, limited alternative livelihood options and poor land-use practices (Mohamad 2003). In Rh Meran the threat posed by farming and fishing practices on the sustainability of the natural resources will depend upon the importance of the activities to the livelihoods of the villagers. If the activity is an important income generating one, then resources may become limited or exploited, and hereby degraded. This can restrict the villager's future choices of livelihood strategies. For example, if the water quality in the river cannot sustain a healthy fish population, many fishermen's livelihoods will be drastically altered.

Agricultural policies, such as the new land development concept, and the provision of extension services, both of which support a move away from shifting cultivation by subsidising the production of commercial crops, will also have a large influence on the future importance of shifting cultivation to the village, as will other factors such as off-farm work opportunities (Hansen & Mertz 2003).

The relocation and establishment of the Rh Meran community has undoubtedly had a significant effect upon various aspects of the new community's livelihood strategies. Therefore, it is essential to consider conflicts that can arise due to changes that occur during the restructuring and re-establishment of the Rh Meran community. The relocation could either have initiated a stronger sense of social cohesion in the community, or it could have (together with other external factors) caused the community to become socially fragmented (Horowitz 1998). The rapid socioeconomic changes occurring in the region and a transition to a more commercialised and modernised society will have an effect on the livelihoods of the people of the Rh Meran community (Horowitz 1998). New income opportunities exist, both on-farm, for example cash cropping instead of hill rice farming, and off-farm, for example working in tourism. The extent to which the villager's adopt these new income opportunities or conform to traditional practices will have a major influence on the future of the community, as well as on the future ecological sustainability of the national park (Rigg 1998, Birch Thomsen 1999). A potential paradox comes into play since many of the new

opportunities for alternative livelihood strategies, that are now available for the members of the community are directly linked to the establishment of the park, and it is precisely the potential expansion of these opportunities that, in the long run, can bring the community member's livelihood in direct conflict with the more preservationist considerations that was the initial purpose for the establishment of the national park.

The aim of this research project is to investigate the causes and impacts of the changes in livelihood strategies of the Rh Meran community since their break-away from the village of Long Teru.

Research question

How has the change of location and establishment of the National Park affected the livelihood strategies of the Rh Meran Community; and what impact will the community have on the resources of the National Park?

Objectives

- To appraise the human and physical environment and the socio-economic conditions of the village.
- To assess constraints and future perspectives of the traditional Selambau fishing system.
- To assess the impact of the Rh Meran community on the peat swamp forest.
- To evaluate tourism and its effect on the community
- To evaluate the reasons for the relocation of the community.

Methodology

As described on the previous pages the context for the fieldwork to be conducted is a community that has undergone massive structural changes in the recent past (e.g. the relocation, the establishment of the national park, the evolving tourism) The key element in the general assignment for the study is to evaluate what impact these changes will have on the future of the community and the national park. The existing data of the park's and the community's past development is very limited, which gives us no valid comparison for the data we are able to collect during the fieldwork. Thus, we are in need of a general methodology that addresses past, present and future within a local context and that can produce reasonably valid results during a 10 day long fieldwork.

Socio-economic theoretical considerations

As mentioned in the thematic context we are interested in investigating the relationship between the recent structural changes and the community's adaptation to these. Especially whether this adaptation takes place in the form of community enforced action, a change in household livelihood strategies, or a change in individual livelihood strategies. In Naila Kabeer's (1999) adaptation of Pierre Bourdieu's methodological approach (Bourdieu 1997), she conceptualizes the change in livelihood strategies not as being one or the other (individual, household, community enforced), but rather as being both and the same in a dependent relationship. Her approach to the study of social

life is concerned with processes, and renounces the idea that the socio-economic reality is something that can be measured and schematized, but essentially is one that should be subject to context bound description. In regards to the description of the individual's ability to exercise strategic life choices she has developed the three following interrelated concepts

Resources understood broadly as to include both access and future claims to human, social and material resources.

Agency understood both as formal decision making processes, but also the less tangible aspects such as negotiation, deception and manipulation

Achievements understood as outcomes (Kabeer 1999, 436ff)[20]

This approach to the study of social life has shaped and will further shape the way we design and interpret our methods, observations and analysis in the field.

Schedule

In relation to the actual fieldwork we are going to conduct, we have divided the methods we into 3 interconnected phases. First the preliminary surveys in which we will try to get an initial overview of the community. In this phase PRA methods be applied (community map, transect, wealth ranking). This phase is scheduled to last the first two or three days we spend in the village.

The second phase is an intermediate phase and the key element of this is to conduct a household survey where each of the 27 households in the community will be asked to spend about an hour answering the questionnaire that we have prepared and have altered in accordance with what we have learned from the preliminary phase. The aim is to finish the questionnaires in three days which will leave us four days to the final phase of our survey.

Finally, the third phase will primarily consist of in depth semi-structured personal interviews with respondents carefully selected on basis of the information gathered from the questionnaire. Furthermore an essential piece of information will be our fieldwork diaries in which we will note our immediate observations of the daily routines taking place within the community.

Specific methods

Questionnaire:

As described above the questionnaire is the essential component in the second (the intermediate) phase of our survey. Questionnaires are generally good for establishing an overview on the state of affairs in a given context, but their appliance is more limited when the task is to understand the deeper lying structures and relations of the context, and the social processes that have led to the

[20] Another interesting theorist who is conducting research within this field, and is frequently referred to by Kabeer is the Socio-economist Amartya Sen. His concepts are somewhat different (capabilities and entitlements) but basically the two share the same approach. Sen has written copious amounts of articles which are widely accessible.

current state of affairs. In general terms it can be said that questionnaires are good at getting answers to the 'hows' and the 'whats' but not very good at the 'whys'. The aim of this questionnaire is therefore not solely to produce data for further analysis, but just as much to get the necessary information that enables us to pick out the best respondents for the in-depth interviews and ask these respondents the relevant questions. The respondents for the questionnaire are the household heads.
The attached questionnaire (Appendix 1) should not be thought of as the first version of the actual questionnaire, but rather as a listing of the data we wish to get. We are well aware, that we need to do a lot a work in translating the terms we have used into something that is meaningful and comprehensible to our respondents. We hope that our Malaysian counterparts can assist us in that matter (we need to agree with our counterparts on a joint questionnaire anyway).

Semi structured in depth interviews.
The respondents for these interviews will be selected on the basis of the information we have gathered from the questionnaire, and will enable us to select respondents who differ in both social status and main occupation. This will give us information about the processes and deeper lying structures behind the various income generating activities that are being carried out in the community (e.g. farming, forestry, fishing), but also about the daily 'taken for granted' practices within the community. These 'taken for granted' practices (e.g. gender specific division of labour, decision making capability, ritual and religious practices) are essential components in the identity building of the individual community members, and are thus crucial in an analysis of social change since they will tell us a lot about the capacities of the community members to alter their livelihood strategies in accordance with the more explicit changes that have occurred in their surroundings.

The structure of the interview does not evolve around specific questions, but around certain predefined themes which of course will vary according to which respondent we are doing the interview with. An interview guide needs to be defined for each interview, since it is not the intention that each interview should be carried out according to the same themes, but rather be differentiated in accordance with the 'profession' that can be ascribed to each respondent. However there should be some themes that are common for all the interviews. The common themes can tell us something about how individuals who occupy different positions in the social system view the same phenomena.
The final guide for the interviews should not be made before we are in Rh Meran and have a better 'feel' of the community, but themes that might be considered as common features could include:

- Perceptions of government/state influence on life in the community
- Wealth ranking of the community according to the respondents own criteria for wealth
- Expectations in regards to how tourism will affect the community
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Expectations to the concrete future of both the individual respondent, the household and the community

More sector-specific themes could, for example in the case of a farmer, include: man-days spent on various activities; transport time to fields; land tenure; pest and disease problems, inputs, yield trends; change in attitude towards shifting cultivation; length of fallow.

Individual/household mobility map:
The idea is that by asking people about the spatial range of their physical mobility on both daily and occasional basis, opens up the possibility to address the spatial range of their social relations. The spatial range of the social relations is important when analyzing the scope of factors that have importance for the livelihoods of the community members. It also helps avoid treating the community as an enclosed entity without relations to the outside world. The mobility map can be carried out on both individual and household basis preferably during either the questionnaire or the in depth interview.

Micro scale commodity chain analysis:
It is our general assumption that the road leading to the NP HQ, has improved the community's access to markets. However this does not necessarily mean that the money flow into the community has increased since this depends on a wide range of other factors. A commodity chain analysis can help us address these other factors and value their importance. It can also provide valuable information regarding the distribution of wealth within the community. The simple idea is to follow the commodity going one way through the system and the money going the other. Since bookkeeping probably is not a very wide-spread phenomenon in all the chains we will probably have to rely on rough estimates that we can retrieve from the interviews.

Informal conversations and observations:
These are essential if we are to grasp the fundamentals of the aspects of culture and tradition within the community which are so taken-for-granted that they have become naturalized; that is not spoken about, nor reflected upon, but determining in how the labour is divided and the daily routines are organised. Our primary source in organizing this kind of data will be our field diaries.

Measurements in Peat Swamp Forest
In tropical regions growth is regulated by favourable soil-water conditions. Information about age, and annual increment within and between species will not be determined. Instead the different tools mentioned here will be used to evaluate the change before and after the relocation of the Rh Meran Community. The biodiversity index and species composition will be compared with the botanical/ecological description of peat swamp forests in studies from other areas (*e.g.* Indonesia).

- **Remote sensing:** to compare with satellite pictures from former years.
- **Biodiversity index:** the estimation of an index of biodiversity will be performed *in situ*.
- **Crown coverage** (% of the land area; very sparse, sparse, moderate, dense).

- **Basal area** of trees at 1.3 m above ground
- **Species composition** strata identification: density of pioneer and shade tolerant species.
- **Observations (peat swamp forest):** *e.g.* distance to village and farmland, history of clearing, forest for farming, official boundaries, religious and cultural uses,

The community territory map

This PRA tool will be used to give us an overview of the community territory and the natural resource base within the village and its inherent quality. It will provide us with spatial information about the community, the infrastructure, existing resources and their placement and other physical characteristics. This PRA tool is quite flexible according to the facilitator's requirements, and can be adapted to also identify areas with specific problems, as well as with information about aspects which the community considers important (Carvajal et Al 1999).

Community/farm transect

This PRA tool will be used for the appraisal of the sustainability of the farming system(s) in the village. A community transect is a transverse 'cut' of the community, or farming area, in which various technical and production-related aspects can be identified, described and analysed. Information can be acquired on aspects such as: soil management, types of crops and other aspects related to natural resource management (Carvajal et Al 1999). The transect walk will; together with the in-depth interview give us an idea of where to take soil samples.

Soil fertility

To get an idea of possible biophysical constraints to production within the farming sector, soil samples will be taken. In conjunction with the in-depth interviews and transect, the relevant areas will be found for soil sampling: areas with different lengths of fallow and under different cropping systems to get an idea of the variation of the soil fertility within different systems in the village. To get an idea of soil fertility, parameters such as: texture, pH, conductivity, organic matter content and nutrient content will be measured. Due to time constraints, a representative area will probably be chosen – how representative the chosen area will be is something to discuss in the final report.

Water quality

To assess the possible physical constraints of the Selambau fishing system, various parameters will be measured with regard to the quality of the river water. There are various methods that can be used to assess river water quality. Attributes that could give an idea of the water quality can be measured are: dissolved oxygen; BOD; pH; temperature; nutrient content, electrical conductivity; pesticide content; turbidity, suspended solids and Coliform bacteria content (Karr, 1999; Chu & Karr, 1999). In Sarawak, the Interim Water Quality Standards are used in assessing water quality.

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Appendix 1: Outline of a Questionnaire

Household stratification

The purpose of these questions is to select specific members of the households for the in-depth interviews, rather than always speaking with the formal head of the household. It also gives us a general idea of the distribution of tasks and chores within the household (see Table 1).

Table 1. Household Stratification

Household members	Gender	Age	Main occupation	Secondary occupation	Contribution to household economy	Domicile	Marital Status

Sectoral analysis of household activities

To be conducted in three versions (10 years ago, 5 years ago, present and maybe also a future version). This gives us a general idea of how the recent structural changes have affected the livelihoods of the households. As for the questions regarding working hours and annual income, we would be very happy with rough estimates. It doesn't really matter what scale the respondents use when answering these two categories of questions, as long as we note the scale we can do the transformation to a uniform scale afterwards. Refer to tables 2 and 3 ?

Table 2. Household Activities.

Sector	Importance	Cash or subsistence	Annual income	Work hours per week
Farming				
Fishing				
Waged labour				
Tourism				
Livestock				
'forestry'				
Other				

Longhouse Completion

Table 3.

Completed and living in bilek	Completed but not yet living in bilek	Working on the bilek	Haven't started on bilek completion but intend to	No immediate intentions of completing the bilek

Reliance on National Park Resources

This covers all the resources that are not explicitly grown or cultivated *i.e.* timber, non-timber products, hunting, fishing and non-consumptive resources (recreation, biodiversity, tourism, etc.). We also have to be aware that both the availability and the use of some of the resources may be seasonal. Again the main purpose of this part of the questionnaire is not to get hard data to be used in the report, but rather to get an idea of which questions need to be answered in the in-depth interviews.

Table 4. Resources from the National Resource

Which resource	Amount	Cash, subsistence or ritual use	Working hours

Appendix 2 – Water sampling methods

The evaluation of the extent of overfishing will require detailed and long term research, therefore we will have to rely on local knowledge of the increase or decrease of fish stocks. Another method is to use benthic macro-invertebrates as biological indicators to assess water quality. The two methods complement each other - animal and plant communities respond to intermittent pollution which may be missed in a chemical sampling programme (Mason, 1996). Stream benthic macro-invertebrates differ in their sensitivity to water pollution, provide information about the quality of a stream over long periods of time and are relatively easy to collect and identify (Chu & Karr, 1999).

The approach to be used in the village is as yet not finalised. There are a number of constraints to the two above mentioned methods. Firstly, it is important for us to know exactly where the fishing takes place. Do they fish in the major rivers in the area (that are influenced by upstream human activities) or in the smaller tributaries located around the village site (that will have very little or no influence from upstream activities)? We will lack reference conditions with which to compare the data collected. If the fishing is done mainly in the lake, the use of biological indicators will be irrelevant. Another constraint is that the chemical data collected will be seasonal and therefore it may be difficult to draw conclusions from it. However, data collected from the two methods may give us a good general idea of the health of the aquatic ecosystem, and the quality of the water for drinking purposes.