Impact of the Introduction of Mechanized Agriculture on a Traditional Rice-Growing Community in Sarawak, Malaysia

by

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ABSTRACT

IMPACT OF THE INTRODUCTION OF MECHANIZED AGRICULTURE ON A TRADITIONAL RICE-GROWING COMMUNITY IN SARAWAK, MALAYSIA

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University of Guelph, 2015

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The village of Bario, in Sarawak, Malaysia, has introduced modern technology to replace traditional methods of rice cultivation. The thesis describes historical and current resource use and rural-urban migration patterns in Bario, documents the mechanization process, and analyzes its impact on the livelihood strategies of landowners.

The study combines the sustainable rural livelihood and asset index conceptual frameworks to describe the livelihood system of Kelabit landowners in Bario; to identify key drivers of livelihood change and evaluate their impact; to analyze the transformation from traditional practices to mechanized farming; and to derive policy lessons for project implementation in a rural setting. These objectives were addressed through surveys, interviews, focus group discussions and participant observation.

This study demonstrates a need to gather information not only on farm production, but on livelihood strategies based on external factors such as social relations and remittances that have little to do with agricultural linkages.
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Chapter 1

Introduction

"While economic and agricultural development theories have exerted a powerful influence on rural development policies throughout the past half-century, the practices of donors and governments have also been influenced by broader thinking about social, non-agricultural and national development." (Ellis and Biggs, 2001: 444)

This chapter will provide a brief description of the Malaysian agricultural scene, and the problems of achieving self-sufficiency in rice production as the amount of land devoted to rice cultivation decreases. The Malaysian government’s response to these problems has been to promote increased mechanization of rice agriculture. This national goal has led to its decision to invest in modernization project of rice cultivation in Bario, a rural community in the highlands of Sarawak known for its local varieties of rice. The present study uses the sustainable livelihood framework to examine the effect of this decision on Bario and its people. At the end of this chapter, the author describes the study’s goals, objectives and structure.

The rural economy in Malaysia has been agriculture-based since the 1960s. Agricultural policy has been used to transform a poverty-stricken rural community into a commercial-oriented sector (Ashard and Shamsudin, 1997). Agrarian reform has been used to increase agricultural productivity, improve local food supply (food security) and enhance the livelihoods of rural people.

Agricultural productivity enhancement programmes in developing countries are generally carried out by introducing new strategies and expanding existing farming techniques. Rural developers tend to see the development and adoption of improved technology as a vehicle for
increasing the productivity, output and income of farmers, including paddy farmers (Feder et al, 1985; Barrett et al., 2004; Najim et al, 2007; World Bank, 2012; FAO, 2013).

In Malaysia, current agricultural planning falls under the National Agro-Food Policy (2011-2020) which aims to increase agro-food commodities by 4% a year, both to achieve self-sufficiency and to generate income from export markets (Dardak, 2015).

As part of the National Agro-Food Policy, in October 2011 the Malaysian government created the National Key Result Area (NKEA) program to identify and address problem areas in the agriculture sector (PEMANDU, 2012). NKEA Programs are intended to increase food production through optimization of sustainable land, develop and upgrade agricultural infrastructure, increase food quality and safety by expanding compliance with local standards, strengthen human capital to ensure a sufficient skilled agricultural labour force, and introduce modern technology and mechanization to reduce dependency on manpower. The government also provides sector-based incentives to encourage investment in agriculture and agro-based industries.

The challenges faced by the agricultural sector in Malaysia have especially affected those engaged in rice cultivation, a type of agriculture that requires intensive work. The government has sought to achieve self-sufficiency in rice production, but traditional methods have failed to produce enough rice in a year, and farmers have continued to either abandon their rice fields, convert them to higher yielding crops, or move to the cities (rural-urban migration).

As a solution to these problems Malaysia has encouraged mechanization (both to increase efficiency and to revive abandoned rice fields) by introducing price distorting policies (i.e. providing imported rice subsidies, fertilizer, pesticides and farming incentives) and concessions aimed at increasing production (Ministry of Agriculture and Agro-Based Industries, 2011).
Concessions have included awarding management contracts to private entities such as Ceria Sdn Bhd. (this study) and Padi Beras National Bhd (BERNAS), a group of companies that is now the government's partner in the domestic paddy and rice industry.

The desirability of mechanization as an agricultural development technique has been debated (World Bank, *op. cit.*; FAO, *op. cit.*). Some view mechanization as a way to increase production while reducing labour costs, and as a symbol of an efficient and developed agriculture. Others argue that it substitutes scarce capital for unskilled labour, leading to higher unemployment, greater income disparity and an increase in rural-urban migration. It is therefore important to study the design and implementation of mechanization projects in order to understand rural livelihoods and the institutions that affect them, to assess their potential and desirability, and to determine their impact on the livelihoods of traditional farming communities.

In this study, the author set out to determine the impacts of the introduction of agricultural mechanization on the livelihood of the rice-growing Kelabit people of Bario, a highland community in the state of Sarawak, East Malaysia. Bario was selected for study because of its natural capital, and because it has been the subject of a 5-year pilot project, now entering its final year, involving the introduction of combine harvesters (Bario Rice Development Project, 2011 – 2015). The project provided a timely opportunity to study the social and economic impacts of agrarian change.

The study uses the sustainable livelihood framework to examine positive and negative impacts of the introduction of modern agricultural methods (e.g. contract farming, irrigation) and intensive mechanization of rice cultivation on livelihoods in Bario, and particularly on the livelihoods of landowners whose fields are located within the mechanization project. It is based on the views of the local community, including farmers and landowners participating in the
project, those who have left the region, community leaders and government officials, and personnel from the private company involved in the project.


This study examines the social and economic aspects of agrarian change in the Kelabit community in Bario in order to establish a baseline for further research, and to suggest mitigation methods that could be used to avoid or minimize harmful effects on the region and its people. It is hoped that this study may become a useful working document for addressing issues of agricultural mechanization and livelihoods in rural communities.

**Summary** - This chapter has described the policy background behind the decision to invest in mechanization of rice cultivation in Bario, and the author’s decision to make the impact of this decision on the livelihoods of its people the subject of the present study. Subsequent chapters will review the literature on the theoretical framework applied to this research (Chapter 2), provide a history and background of the study area (Chapter 3), outline the research methods used (Chapter 4), introduce the mechanization project (Chapter 5), present the results of the author’s field research (Chapter 6), synthesize these results (Chapter 6) and present the author’s conclusions and recommendations (Chapter 7).
Chapter 2

**Literature Review: Theoretical Framework**

Chapter 2 surveys the literature on the sustainable livelihood framework, the model approach that has provided the theoretical underpinning for the methodology adopted for the author’s field research in Bario. The rationale for, and the structure and operation of, the sustainable livelihood framework will be discussed, as well as the author’s justification for applying this model to his research. Local examples will be provided showing how the framework has been applied to the particular social and economic conditions in the Bario region.

In order to understand the situation in Bario following the introduction of mechanization, any examination should contain economic, social and human elements. It is crucial not to concentrate on one to the exclusion of the others. The economic base of any society must produce the resources required for livelihood, but researchers and planners should also have a people-centred approach in order to understand the grassroots situation and to ensure that the local community is an active participant in the process of development.

"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base." (Chambers and Conway, 1992: 7)
Theoretical Framework: Sustainable Livelihoods Framework

In this chapter the relevant literature on introduction of modernization and/or agricultural mechanization in a rural agrarian community (World Bank, 2012; FAO, 2013), and its impact on the livelihoods of its inhabitants, is explored through the application of the sustainable livelihood (SL) approach (Chambers and Conway, 1992; Carney, 1998; Scoones, 1998; Helmore and Singh, 2001; McDowell, 2002).

The SL approach can be applied using the sustainable livelihood framework (SLF) developed by the UK Department for International Development (DFID, 2001). This framework underlies both the research design of this thesis and the interpretation of literature in this review. A sustainable livelihood approach can reveal actual problems at the village level (Helmore and Singh, 2001).

Sustainable livelihoods can be defined and explained in many ways (Chambers and Conway, 1992; Johnson, 1997; Carswell, 1997; Ahmed and Lipton, 1997; Ellis, 2000; DFID, 2001 and FAO, 2005). The most widely used definition of sustainable livelihood is that provided by Chambers and Conway (1992; see above). Allison and Ellis (2001) suggest that a livelihood comprises natural, physical, human and social capital. The indicators of sustainable livelihood can include consumption levels, access to assets, levels of human capital and processes such as resilience and adaptation (Carswell 1997). Using such indicators enables us to encompass both the quantity and quality (in terms of health and well-being) of livelihoods. Carswell indicated that to achieve a sustainable livelihood, a trade-off between productivity, equity and sustainability is critical. Johnson (1997) suggests that sustainable livelihoods are about the ways resources (i.e goods or services individuals use to pursue, and ideally satisfy, their interests) are used for survival.
Poverty level is often the key criterion in the assessment of livelihoods (Scoones, 1998). Bario, a resource-dependent community (Bailey and Pomeroy, 1996), is faced with challenges to social and economic stability as a result of its reliance on particular natural resources for income and employment. The relevance of the SLF approach to such a situation is that it recognizes the importance of capabilities, assets and activities required for a means of living, while understanding the links between individual or household assets and the activities in which households engage with a given set of assets. The SLF can be applied at a range of different levels to measure and assess livelihoods (Scoones, 1998), and is specifically designed for application to research problems in developing country contexts (McDowell and de Haan, 1997; Carney, 1998; McDowell, 2002). Those who apply the SLF often face research problems involving high levels of migration, an aging population, underdevelopment and change in natural resource use in a developing country context. Bario is no exception. Further, the SLF has the potential to guide local development planning. By systematically ‘unpacking’ the various elements making up livelihoods, it allows for the identification of areas in which investments to promote sustainable livelihoods could best be focused (McDowell, 2002).

As a measure of wealth, welfare and other indicators of well-being, purely economic measures such as household income, expenditures and consumption (Chen and Ravallion, 2000) have limitations in both accuracy and measurement, particularly in the context of developing countries (Moser and Felton, 2007). Rural communities in general have different kinds of assets, not all of which are financial. Other methods of assessing their status include capital investment analysis, asset index analysis (Moser and Felton, 2007) and consumption-based measurement (Ravallion, 1992). The analysis of assets and their accumulation is intended to complement the measurement of well-being.
**Sustainable Livelihood Framework (SLF):**

The SLF provides a conceptual model to access the “capital and capabilities” of a household’s livelihood (e.g. Scoones, 1998, Bebbinton, 1999 and DFID, 2001) for the integration of environmental issues (Johnson, 1997; Carney, 1998) and structural adjustment of sustainable rural livelihoods (Ahmed and Lipton, 1997). It allows for the incorporation into the analysis of the shift from traditional natural resource-based activity to modernized practices. It recognizes the importance of capabilities, assets and activities required for a means of living. These assets can be categorized as follows (FAO, 2005):

1. **Natural assets**: Access to residential sites and arable land; size of arable holdings; crop diversity and yields; livestock holdings; and use of ‘wild’ natural resources.
2. **Physical assets**: Ownership of agricultural equipment and transportation assets; housing infrastructure and building materials used.
3. **Human assets**: Household size; rates of absenteeism; employment rates; and household education.
4. **Social assets**: Family and kinship networks; inter-household cooperation; leadership structures; and development committees.
5. **Financial assets**: Sources of income and rates of saving.

FAO (2005) suggests applying the sustainable livelihood framework (SLF) to understand how household livelihood systems interact with the outside environment, both the natural environment and the policy and institutional context. FAO (2005) and DFID (2001) defined five concepts that are crucial for understanding the linkages within the framework – the vulnerability context, livelihood assets, institutions, livelihood strategies and livelihood outcomes.
Figure 1. Sustainable Livelihoods Framework

The left-hand section of the diagram above (Figure 1) shows how the vulnerability context impacts the livelihood assets of rural people, denoted by a pentagon. Livelihood assets are influenced by outside policies, institutions and processes. Livelihood strategies of different categories of households are shaped by their asset base and by the policy and institutional context in which they live. Livelihood outcomes of different types of households are influenced by the vulnerability context – people’s exposure to unexpected shocks – and their ability to withstand the shocks, which depends on their asset base (FAO, 2005).

The SLF can be applied at a range of different levels, from individuals to household clusters, extended kin groupings, villages, regions or even nations, with sustainable livelihood assessed at different levels (Scoones, 1998). It is important to identify the range we choose to study. Since the introduction of mechanization extends throughout Bario, this study analyzes the interaction between households in terms of net livelihood effects. Once the range is identified, the SLF can be used to understand the links between individual or household assets and the activities in which households engage with a given set of assets (e.g. rice cultivation and children’s remittances). This approach brings together various critical factors (i.e. migration,
remittances from family members working and living in the cities, pensions) that affect the vulnerability or strength of survival strategies.

There is a wide range of ways to use SLF to assess livelihood outcomes. For the purposes of this thesis, the SLF is used as a tool to improve understanding of livelihoods, particularly the livelihood of the traditional agrarian community in Bario. The framework is used to analyze access to “capitals and capabilities” (e.g. DFID, 2001; Scoones 1998) in order to understand a household’s livelihood transition from traditional to mechanized rice farming. The SLF is relevant for this process as it recognizes the importance of capabilities, assets and activities needed for a means of living (Allison and Ellis, 2001), understands the link between individual household assets and the activities in which households engage with a given set of assets (Carney, 2002), and brings together various critical factors that affect the vulnerability or strength of survival strategies (Ahmed et al. 2008). This thesis uses the SLF to examine and explore the influence of access to various livelihood capitals.

**Physical Capital**

Physical capital includes the basic infrastructures and producer goods essential for supporting livelihoods, such as transportation, roads, markets, water supply, schools, clinics or health care facilities, communication, community development programs and many other non-family services (DFID, 2001; Bebbington, 1999; Ahmed et al., 2008). The livelihood approach uses two ways to measure physical capital in a household using the asset index category (Moser and Felton, 2007): the infrastructure and services made available for the household to use, and the materials used to build the house and consumer durables owned by a household. In the asset index category (Moser and Felton, 2007), physical capital is generally defined as comprising the
stock of plant equipment, infrastructure and other productive resources owned by individuals, businesses and the public sector (World Bank, 2000).

In this study, however, physical capital is of more limited scope, including only the range of consumer durables households acquire (e.g. television, telephone, generator, toilet, kitchen) and their housing (identified by the type of material used to construct the house). Agricultural equipment, including shovels and grass cutters, is treated as communal property within the longhouse rather than the property of single households. Other physical capital, including proximity to services, may also have important implications for the decisions made by farmers. Households located closer to the airport and markets, or nearer transportation arteries and community services including education and health facilities, have more options than other households. Janowski (2005) found that those living closer to the airport, the fastest mode of transportation out of the village, had a higher tendency to exit farming. Those most likely to exit farming may be from households close to the airport, and also from communities with a large proportion of non-farm households.

**Financial/Productive Capital and Natural Capital**

Financial and natural capital are often linked. According to DeJanvry (1981) and Findley (1987) natural resources or natural capital are also part of financial capital, because access to land provides employment and income to farmers. Financial/productive capital comprises the monetary resources available to households (Moser and Felton, 2007) while natural capital includes all natural resources stocks, such as land, flora and fauna, water, air and environmental services, from which livelihoods are derived (Bhandari, 2013). Evidence suggests that an
increase in the access to operational land reduces the tendency to exit farming (Glauben et al. 2006; Goetz and Debertin, 2001; Kimhi and Bollman, 1999; Pietola et al., 2002).

Farm survival is dependent on farm size (Kimhi and Bollman, 1999) and livestock and crop production, which are interlinked (Gurung, 1987). Therefore, ownership of land increases control over other resources such as income earned from land, political influence, and access to other institutions such as banks (Bhandari, 2013). Owners of large farms are also at an advantage because they have better access to economic/financial capital such as income, savings and credit, and have the capability to use these resources to strengthen their livelihood (Bhandari, 2013).

Natural capital includes the stock of environmentally provided assets such as soil, atmosphere, forest and water. Although financial and natural capital are generally quantified in rural research (Bhandari, 2013), differences are only likely to be significant if the households have significantly different land sizes, crops grown on the land, and livestock. This is true in Bario, where landowners formerly practiced a 50% crop sharing system with labourers from Indonesia. Those that did not own land continued to farm, while landowners that collected 50% of the income from crop sharing could move to town and continue collecting “rent”.

**Human Capital**

DFID (2001) defines human capital as the amount and quality of labour available, skills, knowledge and health that together enable individuals or households to pursue different livelihood strategies to achieve their livelihood objectives. FAO (1986) and Low (1986) suggest that the availability of working-age family members directly used in household production determines the size of the household farm labour force. According to Moser and Felton (2007), human capital assets refer to individual investments in education, health and nutrition, which
affect people’s ability to use their labour and change the nature of their return from their labour. In order to sustain livelihood outcomes, human capital such as the quality and quantity of available labour is a building block for acquiring livelihood objectives (Bhandari, 2013).

Age:

Age of household head is an important demographic variable (Bhandari, 2013). Younger individuals are more likely to change occupations, and are more likely to prefer non-farm work, than older individuals (Mahesh, 2002; Moore, 1966; Ogena and De Jong, 1999). This has led to the drain of the younger population from rural areas, leaving the older inhabitants behind. The human capital situation in Bario is similar to that described from developed countries. Glauben et al. (2006), Kimhi and Bollman (1999), Pieta et al. (2002) and Vare and Heshmati (2004) suggest that the age of a farm operator (or land owner) positively contributes to the likelihood of farm exit. This relationship holds true in countries such as the United States and Canada, where retirement plans are available for farmers. Government retirement plans for farmers do not exist in developing countries such as Nepal (Bhandari, 2013), where the elderly continue farming as long as they can contribute to the family farm. An aging population has fewer chances of off-farm employment, and a change of livelihood may not be a viable option.

Number of children and child involvement:

Involvement of children in family farming is significant in poor agrarian communities in developing countries (Karan and Ishii, 1996; Filmer and Prichett, 1997; Loughran and Pritchett, 1997). Cain (1977) suggests that children provide support to their parents in a variety of productive activities (both farm work and outside the farm) as well as enabling labour, for
example food preparation and child care (Kumar and Hotckiss, 1988; Skoufias, 1994). Children may take over farm responsibilities from their parents as successors (Glauben et al., 2006), though this has not been the case in Bario (Janowski, 1988). There is a positive effect of the size of family on farm succession, and a negative effect on farm exit (Stiglmaier and Weiss, 2000). There are also reasons for children to leave the farm, as households with children receiving education and jobs in the town (Janowski, 2005) may be relatively risk averse, and would not risk coming back to the farm and leaving their current occupation unless the expected income from farming is significantly higher than their current income.

**Gender:**

Women’s involvement in agriculture is significant in developing countries (Boserup, 1971; Patnaik and Debi, 1991), including in Bario (Janowski, 2006). Women play a crucial role in overall agricultural development (Prasad and Singh, 1992). However, some agricultural operations are gender-specific (Janowski, 2006, Acharya and Bennet, 1981; Agarwal, 1992; Boserup, 1971, 1990; Prasad and Singh, 1992; Rani and Malayaviya, 1992; Sachs, 1996; Singh et al., 1992). Agarwal (1992) found that while land preparation for crop cultivation, irrigation and threshing of grains are predominately performed by men, transplanting of rice, sowing, manure application, weeding, intercultural operations and harvesting are primarily done by women. This is true in many communities, where women spend longer hours performing farm labour than their male counterparts (Acharya and Bennet, 1981; Jackson, 1995; Kumar and Hotchkiss, 1988). This scenario applies as well to Bario. Therefore, the gender composition of family labour may also affect the livelihood decisions of the household in the Bario region.
**Education:**

Education is a key determinant of structural change in agriculture (Bhandari, 2013). Human capital can be measured in monetary terms as it is often used to value skills in the labour market (Moser and Felton 2007). Stiglbauer and Weiss (2000) suggest that education increases access to information, which enhances a farmer’s ability to process information and ultimately helps to increase their income. Increased income from farming will increase an educated farmer’s likelihood of continuing to farm. Conversely, an increase in education also increases skill and the opportunity for employment outside agriculture. Because the off-farm sector is believed to be more rewarding, an educated individual would be expected to take up off-farm sector employment rather than agriculture as a profession (Watts, 2009). However, we should not assume that the higher the education obtained the higher the human capital, because residents of rural areas with low education and no employment receive remittances from relatives who are in the workforce in urban areas. If a person with low or no education is disproportionately absent from the formal economy, then the estimation of returns from low levels of education might be biased upward because only the most talented of the poorly educated have cash income (Moser and Felton, 2007). In the meantime, other characteristics such as the availability of working age men and women, the elderly, and children may have important implications in farming.

**Social Capital**

Social capital refers to various “social sources upon which people draw in pursuit of their livelihood objectives” (DFID, 2001: Section 3.2). Moser and Felton (2007) define social capital as the rules, norms, obligations, reciprocity and trust embedded in social relations, social structures, and societies’ institutional arrangements that enable its members to achieve their
individual and community objectives. According to DFID (2001), these resources are developed through (i) networks and connections that increase people’s trust and ability to work together and expand their access to wider institutions; (ii) membership in formalized groups, which is often a reflection of adherence to mutually-agreed or commonly accepted rules, norms and sanctions; and (iii) relationships of trust, reciprocity and exchanges that facilitate co-operation and may provide the basis for informal safety nets.

Social capital has been commonly cited as an intangible asset (Moser and Felton, 2007). It is also the most contested type of capital (Bebbington, 1999). The development of the concept of social capital is based on theoretical work, for instance by Putnam (1993) and Portes (1998). Moser and Felton (2007) argue that social scientists find social capital extremely difficult to measure because the assets are non-physical and difficult to translate into monetary terms. However, they can be measured in terms of binary variables such as household participation in various different activities and groups using the asset index framework (Moser and Felton, 2007).

In the Kelabit Highlands, the author considered the socio-cultural context (i.e. being part of a “prestige” group in the community; Janowski, 2005). Although Bulan and Lian-Saging (1989) and Talla (1979) (all Kelabit themselves) acknowledge the fact that four ‘classes’ existed in Kelabit society before the Second World War, they disagree quite radically (Janowski, 2003b) as to the labels to be attached to these classes, their relative size, and who belongs to them. Janowski (2003b: 99) suggests that “the essence of the relationship between generations is that the ascending generation provides the rice meal for the descending generation; the essence of the relationship between relatives (kinanak) is that they share the same source of rice meals, and they depend for rice upon the same “big people”. She termed this a “rice-based kinship”. Janowski
(2003b) concludes by saying that hierarchical differentiation among the Kelabit can be determined by the success in leading the basic residential and kin unit and the ability to provide a rice meal regularly for their children and grandchildren within the hearth-group that they head (Janowski’s rice-based kin system). In other words, being a grandparent in the Kelabit community earns prestige.

Those with such “prestige” are believed by the community to have the greatest access to various economic and non-economic opportunities. This form of prestige generates social capital realized through membership in social networks or structures at different levels, ranging from household to market place and political system (Moser and Felton, 2007). Tiffen et al (1994) examined institutions such as “family, mutual help groups, markets and local community leadership….missions, government and commercial organizations,” and found that “an expansion in number and complexity of institutions which convey and process knowledge or capital, or which allow manipulation of the changing economic and political situation, through a broadening of the leadership base at village level.” (Tiffen et al., 1994: 152-3). The study by Tiffen et al (1994) mirrors the impetus for the Bario Rice Project, in which the communication process between local community leaders and the government made it possible in order to discuss economic development reflecting the growth in the capacity of social institutions in Bario.

In the case of Bario, those residing closer to the town centre are more likely to receive government aid or even NGO attention because they are able to harness greater social capital than those residing in areas isolated by mountainous terrain. Carswell (1997) suggests that access to social capital enables a community leader to communicate and draw on resources and expertise through government, churches, coops and NGOs, and enables people to pool
knowledge, capital and labour than in the past. The fact that Bario received federal attention to develop the Bario Rice Project could have been due to the ability of its community leaders to approach policy makers.

Summary - The forgoing examination of the literature on the sustainable livelihood framework has explained how both its theoretical and practical aspects have made it an appropriate choice for the present study. Using the framework as an approach has allowed the author to define and describe the study area in a fruitful manner. Its application to the research area in particular has provided the basis for the author’s focus on the physical, financial/natural/productive, human and social capital aspects of livelihoods in the Bario area, as will be described in detail in the methodology section of this paper. The next chapter describes the historical and cultural context of the study area (Bario) where the author conducted his research.
Chapter 3

Context of the Study: The Study Area

This chapter introduces the study area, providing maps and illustrations, and addressing its physical setting and climate, the history and culture of the Kelabit Community, the role of rice cultivation in Bario culture, the relevance of land tenure, and the current challenges facing rice cultivation in Bario, including labour scarcity. The Bario community differs in many ways from the typical rural farming communities of developing countries, and an understanding of its characteristics is important for an appreciation of community attitudes towards the mechanization project and of the social and economic challenges faced in the region.

The Bario Region

"The Kelabit have no stories of migration into the Kelabit Highlands as a people, although they tell of in-migration of individuals and groups from other parts of the highland area; they believe that their ancestors have always lived in the highland areas. They grow rice in both dry swidden and wet fields, and hunt and gather in the forest. Groups of Kelabit have a sense of attachment to specific parts of the highlands; although they regularly moved their longhouses until the 1970s, this was within a limited area, usually the watershed of a given river or stream. Since the 1960s, when an air service began to Bario, now the main population centre in the Kelabit Highlands, many Kelabit have left the highlands for education and work. Most of these in the town of Miri on the coast. Many people spend periods of time in the highlands and periods of time on the coast, making the exact population of the highlands themselves difficult to establish" (Janowski and Langub, 2011: 121).
The Bario region (population ~1000) lies in a valley 1,200 meters (3280 ft) above sea level in the Kelabit Highlands, in the south-eastern enclave of Miri Division in northeastern Sarawak, near the border that separates Malaysia from the Indonesian province of East Kalimantan. The longhouses in the Kelabit Highlands sit at the headwaters of the river Baram adjacent to the border. The highest peak adjoining the area is Mount Murud at 2422m (7946 ft) (Jiwan et al., 2006: 2).

The region forms part of a larger tableland area, with numerous running streams. Embankment of these water resources at strategic locations, with proper drainage and irrigation facilities, has helped to conserve water for past, present and future developments, including use in Bario and its satellite longhouses.¹

The Bario region is physically isolated by the surrounding mountain ranges. The most common means of transportation into Bario, for both people and goods, is by air, provided by a rural air service using a 19-seater twin otter plane. Until tourism was introduced in recent years, the main economic activity in Bario was rice cultivation. For generations, the local community has been cultivating rice for subsistence needs. The community grows a high quality rice variety, Padi Adan, popularly known as "Bario rice". Bario Rice has now been registered with the Malaysian Intellectual Property Organization (WIPO, 2008) as a product with Geographical Indication (GI). Janowski (1991: 103) noted that "Pade adan and pade dari are not produced for 'home consumption'. If they are not sold, they are used to feed visitors. Their association with provision for visitors, which is prestigious, makes the decision to grow them a prestigious one."

¹ For the purposes of this paper, the author will refer to these satellite settlements as longhouses, though in the interior of Sarawak, the terms "village" and "longhouse" are used interchangeably.
Physical Setting and Climate:

The soil types in the Bario area are mainly in the Merit, Bareo/Dln and Bareo/Umor series, overlying Palaeogene sedimentary rocks. This soil series consists almost entirely of flat peaty land. The Umor series soil area, and much of the area of Bareo series soils, had been converted, with considerable labour, into wet fields by the 1980s (Eiler and Loi 1982: 77), and since then Bario has been the site of the largest area of wet rice cultivation in the Kelabit Highlands (Janowski 2005: 257).

Figure 2. Mean Annual Rainfall and Evaporation Period at the Bario Station for the Period 1962-2003


Climatic and rainfall data was sourced from Department of Irrigation and Drainage (DID) Hydrological Yearbook (1962-2003), compiled from Bario Station (DID Station No. 3754007). The mean annual rainfall at Bario Station for the period 1962-2003 was approximately 2,241 mm. The mean annual evaporation for the period 1971-2003 was approximately 2,040 mm.
Between 1962 and 2003 August was typically the driest month, with mean monthly rainfall of about 161 mm. The month with the most recorded rainfall was May, with 228 mm.

The Bario region has a tropical equatorial climate, and is typically hot, wet and humid throughout the year. The climate is affected by the seasonal movements of the Inter-Tropical Convergence Zone (ITCZ) and the associated movements of the warm air with the monsoons. Overall the Kelabit Highlands have a mild climate, with daily temperatures ranging from 14-26°C. The an average annual rainfall is just over 2000 mm, low by comparison with the rest of Sarawak, and there is normally little or no dry season (DID, 1993).

The Indigenous Kelabit Community


Records on the methods of rice cultivation practised in the Kelabit Highlands include reports from R.S Douglas, Resident of the Baram District in the very early part of the century (Douglas 1909); E. Banks, curator of the Sarawak Museum in the 1930s (Banks, 1937b); W.F. Schneeberger, a geologist who carried out surveys for the Royal Dutch/Shell Oil Company in 1939 (Schneeberger, 1945, 1979) and Tom Harrisson, parachuted into the Kelabit Highlands by the British in the Second World War to organize resistance against the Japanese, and later curator of the Sarawak Museum (Harrisson, op. cit.). Yayha Talla, himself a Kelabit, gathered detailed
information from other Kelabit in Bario about agriculture practices in the past (Talla, 1979a, 1979b).


“The Kelabit see themselves as rice-growers first and foremost. They cannot envisage eating any other staple food than rice. They say they quickly become hungry if they eat a different type of starch, such as bread, roots or sago. These foods cannot, they say, satisfy as rice does. This attitude to rice as the ideal staple is usual among agriculturalist tribal groups in Borneo. However, not all groups are able to grow enough rice to eat only rice as their staple starch (although they would like to if they could), and the Kelabit are proud of their ability to achieve this. Not only do they want to produce enough; they want to produce more than enough, always more and more. When asked why this is so, informants say they want to be able to feed guests and to send rice to relatives in town. The reason for the Kelabit commitment to rice growing is arguably the association between rice and both adulthood and status, which are essentially the same thing.”

The Kelabit, like many indigenous Orang Ulu communities in Borneo, live or lived in longhouses. Villagers would dismantle and relocate their longhouses (a few miles after three or four seasons) (Ewart, 2012) to areas where they could practice swidden-farming. Each year a new area would be cleared, burned and planted with hill rice and vegetables, leaving the forest to regrow.
Ten longhouses are scattered throughout the Kelabit Highlands: 7 within Bario (Padang Pasir, Bario Asal, Pa' Ramapuh Atas, Pa' Ramapuh Bawah, Ulung Palang Atas, Ulung Palang Bawah and Arur Dalan) and 3 outlying areas (Pa' Lungan, Pa' Ukat and Pa' Umor) (Figure 4).
Kelabit longhouses are typically divided into family units (Ewart, 2012: 73). Each household lives in a home area called a *bilik*. A community “normally consists of one or two longhouses with about 10 to 15 family groups, which she terms "hearth-groups" because each family group has its own hearth and group activity is focused on the hearth itself” (Janowski, 1993: 653). The seven longhouses in Bario, now the major population centre in the Kelabit Highlands, are an exception to this, with from 10 to 29 families per longhouse.

Traditionally another *bilik* would be added to the longhouse every time someone in the community started a new family. Ewart (2011) explains that the expansion of longhouses serves as a reminder of the change in Kelabit attitudes from portability to permanence. In theory, the more families you have living in the longhouse, the larger and longer the house would be, though
today villagers build a separate longhouse as needed next to the original. Farm plot sizes per household however, would be smaller as the available land is split up.

**Figure 5. Traditional Kelabit Longhouse in the 1940s**

Source: © Sarawak Museum; Ewart (2012)

By 1989, less than 50% of the highland population still lived in longhouse settlements (Lian-Saging and Bulan, 1989, 1992) and certainly a smaller proportion now lives in the highlands than in the late 1980s.

There are no official figures on the numbers of Kelabit. There were estimated to be 5059 Kelabit in 1987, with a population growth rate of 4% from 1970 to 1980 (Ko, 1987). Applying this growth rate to population growth after 1987 yields an estimated total of around 11,000 people in 2008 (Janowski and Langub, 2011). However, this may be an overestimation, even including the majority of Kelabit that probably now live in the coastal city of Miri. Interviewees contacted during the present study suggested that there are approximately 6000 Kelabit living worldwide.
Although Bario residents may live in close proximity and seem to form a homogenous community (and identify collectively as coming from Bario), each satellite longhouse has its own head and differentiated natural capital. Every weekend, villagers from the respective longhouses rotate in the use of the small local market area close to the airport, where most locals and tourists meet. Here they sell/barter/exchange their produce (cultivated and wild fruits and vegetables / hunted and raised animals) to other longhouse residents. Barter or exchange is common (as most Kelabit are related), and those that use money are feeding either tourists at their homes or visiting family members from town.

In the early 1990s "both men and women were migrating into the Kelabit Highlands from the Kerayan [Indonesia] and almost all migration is in the context of kin ties, as emigrants reside in the households of relatives if they are temporary migrants. Permanent migration too is initially into a related household, with separate household being established only later" (Janowski, 2005:257).

The population in the Bario region today is probably between 2000 and 3000. There are a number of reasons for this concentration. Following the formation of Malaysia in 1963, an undeclared war, dubbed the Konfrontasi (Confrontation) (1963-66), broke out in the border area between Indonesia and what is now East Malaysia. Bario as it exists today was essentially formed during the Confrontation (Janowski, 1988).

During the Confrontation the government resettled people from longhouses scattered around the Kelabit Highlands, especially those close to the Indonesian border, in the immediate Bario area (for protection). Starting in 1963, the first to be resettled formed Bario Asal, the original Bario longhouse. The inhabitants of the other six longhouses resettled within the area soon after. Some longhouses were physically relocated by British SAS helicopters (Amster,
The relocation concentrated the Kelabit population and created an uninhabited frontier region between the two nations. “Old settlements outside of the highlands were said to have been abandoned because of this move” (Janowski, 1988:10).

As a large number of Kelabit arrived from other villages, both near the Indonesian border and outside the highland area, Bario grew to become the Kelabit "capital" (Ewart, 2012). The British SAS set up a base of operations there (Amster, 2006) and recruited local Kelabit into the war effort.

After the Confrontation people who had been relocated remained, partly because of the provision of services, in Bario, including health clinics, schools and a government-run airstrip from 1962 onward (Janowski 2004). Modern construction materials brought in by military personnel, including corrugated tin sheets, wire rope, steel nails, sheets of plywood, saws, hammers and other metal tools, profoundly changed Kelabit engineering in the post-Confrontation period. "Unlike the preceding fifty years of external contact, the Kelabit were now confronted with these things in a direct and explicit way, one that demonstrated new potentials and that offered alternatives to the materials on which they had hitherto depended." Ewart (2012: 71).

Infrastructure in the Bario region today includes the airport, cement roads (completed in 2011), a market place, community hall and health clinic, a police station and immigration office, and a number of homestay facilities for visiting tourists. There is still no proper road access to nearby towns or cities.

In Bario only a limited number of buffalo are available for farm labour. Most of the village livestock consists of chickens, mostly flown in from nearby cities, used as a source of protein. Wild boar and deer are still hunted, though their numbers have diminished.
Ever since the Second World War, a number of status-creating factors have been fed into the Kelabit social system, including success in education (Talla, 1979) and having family members living in town areas and providing remittances (Janowski, 1988:13). The other factor responsible for concentrating people in the Kelabit Highlands was the desire to cultivate wet rice fields, understandable in the context of the striking growth of permanent wet rice cultivation in Bario and demand for Bario rice in nearby towns since the 1960s (Janowski, 1988.). As the population began to grow, there was also an increasing sense of permanency about wet fields from 1963 onward as rice growing became part of a cash economy.

Bario was introduced to modern infrastructure, including an airfield, as early as 1962. The airstrip presented the Kelabit with an opportunity to export their rice to the coast (Janowski, 2004), leading to an explosion in Bario rice exports. The air link allowed increasing access to imported tools (Talla, 1979: 33) provided through the government's Assistance to Padi Planters Scheme, which also supported drainage of the peat swamps. Building the airport also provided rural people with easy access to nearby towns and cities, especially benefiting those who lived close to the airstrip (within few hours walk). Partly as a result, rice fields began to be abandoned.

**The Role of Rice Cultivation in Bario Culture**

Paddy cultivation has an enormous social and cultural significance, and plays an integral part in the traditional religion of indigenous groups in Sarawak including the Kelabit. Rice has been central to Kelabit culture. Many cultural features, ceremonial practices, daily food, rituals and public holidays link to rice. There was much more wet rice cultivation in the past, in areas
now abandoned (Harrisson, 1949; 191). Even though traditional rice cultivation practices have been largely abandoned, the Kelabit continue to self-identify themselves as rice growers (Janowski, 2004). Bario rice carries great cultural values for the Kelabit community as a sign of status and prestige, as a part of community celebrations, and as a source of cash income (see, e.g., papers by Janowski, 1988-2004).

Rice-growing by the Kelabit has led to the making of 'marks' on the landscape associated with specific social and kin relations (Janowski and Langub 2011). As among all agricultural peoples in Borneo, a poor rice harvest could be a matter of great embarrassment (Janowski, 1988). Since the Kelabit were generally able to produce reliable good harvests, there was normally (always in the case of an aristocrat, or he would lose his prestige) plenty of rice for the year for eating, for making rice wine, for feeding chickens and to spare. The Kelabit traditionally placed enormous emphasis on hospitality and generosity, and to be an aristocrat meant being able and willing to provide boundless quantitates of food (i.e. rice) and drink (i.e. rice wine) at any time for visitors, and to set up occasions, known as *irau*, at which particularly large quantities of rice and rice wine would be consumed (Janowski, 2004).

The only ways to take rice out of the area are by air, or by land using logging roads. Air transport is limited to 2 flights a day and 10 metric tons per trip. Land transport can carry 20 tonnes per trip, but takes 3-4 days to reach the closest town, Marudi.

Before air service was made available, rice was produced almost entirely for subsistence. With a regular air link to the coast, it became possible to ship rice to towns such as Miri and Marudi. Local rice growers realized (Janowski 1988) that certain varieties of rice grown in the highland area, known as *Padi adan* and *Padi dari*, were very much liked in town and were highly saleable there, where they were known as Bario rice. Because the communities in the
Barrio area could export their rice via the airstrip to new markets, and because Barrio is very suitable for growing these varieties, which can only be grown in wet fields, Barrio rice presented an economic opportunity despite the fact that it has a longer growing season than lowland varieties such as Bajong. According to Janowski (2005; 257), export of rice for sale in town could have been a factor that encouraged the expansion of wet rice fields in the Kelabit Highlands, as well as migration from other nearby longhouses (i.e. Pa' Dalih, Pa' Lungan, Pa' Mada) to the Barrio area.

**Labour scarcity**

The old Barrio system of preparing wet paddy fields, called "late baa", did not require much investment of labour. Fields were used for about seven years, and were then fallowed for a number of years. Subsequently the land might not necessarily be used by the family that originally brought the land under cultivation, even though that family was considered to hold the usage rights to the land. Another family wishing to use the land had to ask permission (Janowski, 1988).

Because little labour was needed to make pre-war Barrio wet rice fields, cultivation routines did not vary radically from year to year (Janowski, 1988) whether new land was being used (e.g. when the community was shifting to another area of a valley) or growers were cultivating land they had used the year before.

While among other rice-growing ethnic groups in Sarawak (e.g. the Melanau, Kayan and Kenyah) "aristocrats appear to have done, in the past, no manual work, having slaves and corvee labour to provide them with rice by working their fields, it was the hallmark of a Kelabit aristocrat to be hardworking" Janowski (1988: 11). Although the Kelabit appear to have had
some slaves, who undoubtedly helped aristocrats to produce bountiful harvests, slaves were considered to be "working with rather than for their master" (Janowski, 1988: 11). When the harvest was bountiful, the aristocrat master would then be praised for his hard work, good organization and good judgement.

The system of organization of agricultural labour was and is a setting for prestige-creating displays of generosity and wealth. The everyday labour exchange group system, *baya'*, involves only cooking a simple accompaniment to rice (which is brought along to the fields by participating individual) and the provision, in the past, of rice wine at the midday meal as displays of hospitality by the host family for the day. There is scope for generosity in the quality of this accompaniment, with the most appreciated dish being meat (hunted or domestic chicken) or fish (Janowski, 1988 - 2007).

Janowski (1988: 12) recorded that in the 15 to 20 years before the 1970s agricultural labour in Bario was done collectively by the villagers, whereby "inhabitants of longhouses other than that of the host as well as people living in his own longhouse would be invited to participate in a day of agricultural labour. After working hard in the field, the host family would then offer rice wine and slaughter animals as "payment" to thank the participants. Only some could afford this, and therefore not all fields had help every year. Those that could afford it would have only one, or occasionally two, large harvests in a year.”

This system was replaced by a system called *kerjasama* (or 'work together'), introduced by the SIB (Borneo Evangelical Mission) Church in the 1970s. Domestic animals other than chickens were not slaughtered for subsistence, while pigs and buffaloes were slaughtered only during festivities (i.e. *irau*; see Janowski 2004). The host’s only expenditure was the donation of RM10 ($2.60) - during 1986 to 1988 - to the parish and food and drinks for the participants
As participants were not paid under the *kerjasama* system, many more people were able to get agricultural work done in their fields in a given year.

**Rice Cultivation and Land Tenure**

Between 1961 and 1963, at the time when wet rice fields expanded and acquired permanency, the Baro population began to be inflated by the resettling of a large number of Kelabit from other longhouses (see above). Once a village resettled in the immediate Baro area, Penghulu (headman) Lawai Bisara from the original Baro longhouse (Baro Asal) gave "2 acres of land per family (that had resettled in the Baro area), and the Baro people agreed to continue cultivating the land they were using that time on a permanent basis" (Janowski, 1988: 17). As soon as every available piece of flat land was divided up (with none to spare for rotation) these lands were then slowly transformed into permanent wet rice fields. This was done with the help of a great deal of paid or crop-sharing labour. Many Baro people during the time accumulated money through sale of rice in town as they gradually transformed their land into permanent wet rice fields.

At a public meeting in the 1960s the Kelabit from Baro Longhouse, led by Penghulu Lawai Bisara, declared which land was to be cultivated permanently (Janowski, 1988: 17). The average plot size under the old system of cultivating wet paddy was about 10 square feet (Janowski, 1988: 16), whereas plots under the new system (called *baa* or wet rice fields) "were level and the sections within it were made as large as possible - sometimes one to two acres."(Janowski, 1988: 17).

By the 1980s a number of families were not cultivating their fields themselves, but had either hired paid labour (Penan or Indonesians) or had turned them over to the Berian people to
cultivate on a 50% share-cropping basis (Janowksi, 1988). Cultivating wet rice fields is very labour intensive, and their new income allowed the Kelabit to hire foreign labour (mainly Indonesians from the Kerayan and Berian areas in Kalimantan) to work their farm (Janowski, 1988; Bala, 2002; Amster 2006). It is said that Indonesians that were hired were once related to the Kelabit, and that without them "our farms would be laid to waste" (Bala, 2002: 107-8). The permeable frontier between the Kelabit highlands and the Indonesian border makes Bario a place that both draws migrants across the border and sends Kelabit away to towns where they become migrants themselves (Amster, 2006: 219).

By late 1960s, most Kelabit that exited farming operated small shops around the airstrip and became traders, sending Bario rice to town. Some moved to the city for jobs. Many had no young family members resident in Bario. "The strength of the Malaysian economy and the Kelabit urban migrants' success in town allows them to help relatives remaining in the rural highlands to hire workers and attract wives, and thereby continue rice farming and maintain the family farm" (Amster, 2006). According to Janowski (2005: 257) "across the border there is much less access to possibilities for earning cash income outside the interior; the Indonesian Rupiah is worth little compared to the Malaysian Ringgit so that wages are higher in Sarawak, and it appears to be much more difficult to send out rice for sale, despite the fact that there are much larger areas of wet rice land there than in the Bario area."

This shift in lifestyle has influenced the position of Kelabit women in Bario. Few Kelabit, particularly women, remain in the highlands after schooling, lowering the number of potential wives available (Amster 2005a). Berian and Kerayan women who marry Kelabit men increasingly fill this void: "Marriages, like the labour hired from across the border to maintain Kelabit rice farms, are largely funded by Kelabit urban migrants living in town areas, who often
pay substantial bride prices (*purut*) to the families of these brides on the Indonesian side of the border" (Amster, 2006:219). It is not uncommon for local Kelabit to marry Indonesian labourers, making them part owners of the land. Their children would be Kelabit, likely to seek further education and job opportunities in urban areas.

Labour arrangements allowed residents to retain title to their fields under the Native Customary Rights (NCR) system without having to perform farm labour themselves. Land in Bario lacks legal titles, and falls under the system of Native Customary Rights (NCR) (Laws of Sarawak (1999), c. 81; Bulan and Locklear, 2008). Native customary title originates in and emerges from the prior and historical occupation and possession of land in Sarawak by native communities, in accordance with their customs and traditions. Each native community's customs are relevant in defining the nature of interests in land subject to native title. Customs are recognized as part of the law of Malaysia under Art. 160(2) of the *Federal Constitution*. The Federal Court in Malaysia has held (Bulan and Locklear, *op. cit.*) that rights over land were recognized in accordance with the customary practice of clearing old jungle and not abandoning it. It was also acknowledged that the natives had a system of *Adat*, or Customary Law, at the time when James Brooke, the first Rajah, arrived in Sarawak.

Ownership of land is identified and acknowledged by the government only if the land is cultivated. If land is abandoned and reverts to secondary forest, it will be gazetted by the government and enlisted as forest reserve. Malaysian law today recognizes that natives have proprietary rights or interest over untitled land, which they have settled and farmed (referred to as *termuda* land in Sarawak). Rice cultivation may therefore be essential if landowners are to retain title to their fields; under the NCR regime, Kelabit communities, especially those that migrate (permanently) out of Bario, risk losing their ancestral land.
Under customary law land is not considered saleable, and the Kelabit do not consider that such customary law has altered. Only usage rights over pieces of land belong to an individual, through his own or his ancestors' investment of labour in it. Janowski (2005; 260) stated that:

"While Kelabit custom does not allow for actual ownership of land, it does allow for privileged access, which amount to de facto ownership, to land which has been altered and improved for agriculture on the part of those who have carried out alterations and improvements. This applies to wet rice land, particularly land brought under permanent cultivation, where a good deal of earth is moved. Thus, in practice the original inhabitants of the one longhouse in Bario, (Lam Baa) 'owned' most of the land in the area since at one time or another they had cultivated it, either under the new permanent system or under the previous less intensive system. They did cede land to incomers – they were indeed quite pleased to have them since it increased the status of the original inhabitants; in Kelabit custom, as is common in the Austronesian area (Bellwood, 1996), it is prestigious to be the first settlers of an area. However, they became less willing to cede more of their land as more immigrants arrived."

Ever since the 1970s, ownership of wet fields has become a major factor creating both wealth and prestige. However, "the whole arena of ownership of land is becoming a very topical one in Bario. The Kelabit of Pa' Dalih, where there is very little pressure on land, say that land cannot be owned, and indeed this appears to be theoretically the case in Bario. The Kelabit say that it is the investment of labour in land that is sold when land is sold, not the land itself. It seems that investment of labour, making the land usable for some human purpose such as rice
growing or the pasturing of buffalo, creates a lien on that land, and the greater the continuing effects of that labour the greater the lien. However, there is now (in 1990) effective ownership of wet rice land in Bario, although this is not recognized by Kelabit custom - or indeed by the government, since titles have not been issued for land in the Kelabit Highlands” (Janowski 1991: 91). Janowski added in a footnote that "The Sarawak Land Laws presently allow for claims, leading eventually to title being granted, to be made only on land which has been used by the applicant before 1958. Such use does not have to be for rice fields but is quite widely defined (see Hong 1987, Chapter 4). Nevertheless this date in practice means that much of the land presently treated as though it were privately owned in Bario could never be registered, since most of the inhabitants of Bario only came to live there in the 1960s" (Janowski, 1991:91).

According to information from the author’s field visit, the customary laws relating to land ownership remain unclear and inconsistent. Out of need, or even desperation, lands are sold to Kelabit that have the financial means to purchase them. Most of the time, the person who purchases the land only does so because they want to help the landowner. This is an unwritten rule. However, the land title is signed off by the longhouse chief and witnessed by council members. There is no clear line drawn to determine ownership, but land ownership can only change hands from one Kelabit to another. One has to be a Kelabit, or married to or adopted by a Kelabit, to be able to own a piece of land in Bario.

A cash economy in Bario is said to have existed before the Second World War, but at a very insignificant level. It was only after the start of large-scale export of rice (Padi Adan or Bario rice) to urban areas in the 1960s (Janowski, 2005; 257) that a cash economy became more prevalent (Janowski, 2003b: 105). Janowski (2004) estimated that in the late 1980s and 1990s the amount of rice exported from Bario could have been over 2,000 tonnes a year, based on the
approximately 10,000 ha of paddy fields under cultivation in 1982. When the Department of Agriculture commissioned a Soil Survey in the Kelabit Highlands in 1982, the area of rice fields under cultivation was 9,091 ha with a total production of 4,500 tonnes a year for the Bario area (Eilers and Loi, 1982:35). At least half of the total production of rice was exported and sold in town in the 1980s (Janowski, 2004).

Janowski commented (Janowski, 1991: 92) that “Very substantial quantities of money are now entering Bario via the sale of rice to town. Largely due to the inequitable distribution of land in Bario (which was carried out in a somewhat haphazard fashion with the first come often being the best served) some communities have more and better land than others. These have been able to sell their surplus to town by air. They have concentrated on growing pade adan and pade dari for sale. Not only are many people unable to sell rice to town, but it is said that there are cases of some not having enough rice to see them through the year. This is appalling to the Kelabit, who have normally always seen ample rice harvests, and to whom not having enough rice to see you through the year is the most unprestigious and embarrassing thing that could happen.”
<table>
<thead>
<tr>
<th>Significant Event</th>
<th>Year</th>
<th>Impacts/Recognitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Parachute troop</td>
<td>1944-1950</td>
<td>First contact with the outside world; change of belief from Animism to Christianity</td>
</tr>
<tr>
<td>Border confrontation between Indonesia and Sarawak, Malaysia; Airfield constructed in Bario</td>
<td>1960-1963</td>
<td>Government resettles longhouses nearby border area to Bario and its surrounding area. Sarawak achieves independence through Malaysia. End of British colonial rule. Expansion of permanent wet paddy fields; airfield allows sale of Bario rice to urban areas</td>
</tr>
<tr>
<td>Introduction of modern educational system</td>
<td>1962-1967</td>
<td>Primary 5 (8th grade) school established, with first batch of 30 pupils coming from other nearby primary schools. Secondary School introduced; receives the first 31 students from local Kelabit and other surrounding communities. Sale of rice sale expands; 50% crop sharing system established; cash economy introduced.</td>
</tr>
<tr>
<td>Agricultural station established</td>
<td>1968</td>
<td>Provides extension work and facilitates research and support activities. Henry Lian Aran from Long Lellang becomes the first Kelabit to graduate with a university degree (from the Ohio State University); others follow.</td>
</tr>
<tr>
<td>Christian revival</td>
<td>1973</td>
<td>Mass conversion of Kelabit people to Christianity by Borneo Evangelical Church/SIB. Children of school age move to town in larger numbers to further their high school education; more Kelabit become university graduates.</td>
</tr>
<tr>
<td>Rural health clinic</td>
<td>1974</td>
<td>Provides immediate health needs of local communities</td>
</tr>
<tr>
<td>Territorial army post</td>
<td>1980</td>
<td>Maintains security and patrols border</td>
</tr>
<tr>
<td>Police post</td>
<td>1985</td>
<td>Maintains public order and safety. After 20 years of relocation, young people now moving out consistently after the age of 14. Almost none move back after completing their education.</td>
</tr>
<tr>
<td>Tourism activity</td>
<td>1985</td>
<td>First local lodge/homestay set-up for foreign tourists coming to Bario</td>
</tr>
<tr>
<td>Commercial centre</td>
<td>1996</td>
<td>Mini-township provides shops for locals to trade and market farm produce. Working on an oil palm plantation becomes more profitable for foreign labourers by early 1990s; cost of foreign labour increases.</td>
</tr>
<tr>
<td>Introduction of community forestry</td>
<td>1998</td>
<td>Addressed fuel wood and timber problems; supplies over 19,000 seedlings (up to 2005) for issue to 190 participants from 15 longhouses. Bario rice becomes more expensive as supply decreases; now sold at ~RM7.50/kg</td>
</tr>
<tr>
<td>Irrigated wet rice farming (organic)</td>
<td>2002</td>
<td>Dept. of Agriculture wins Slow Food Presidia Foundation Award from Italy for Bario rice; uniqueness places it in same class as Basmati from Pakistan and Kwao Dwak Mali from Thailand</td>
</tr>
<tr>
<td>ITTO Project PD224/03 Trans-boundary Biodiversity Conservation Area: The Pulong Tau National Park</td>
<td>2005- 2006</td>
<td>Intended to conserve the natural ecosystems of the Kelabit Highlands, and to promote the sustainable development of local communities through implementing activities in biodiversity conservation and support for local socio-economic development initiatives. Population in Bario now consists primarily of very old and very young. Bario rice now sold for ~RM12/kg</td>
</tr>
<tr>
<td>Construction of concrete roads within Bario</td>
<td>2010 – 2011</td>
<td>Malaysian Government project initiated under the supervision of the Department of Public Works (JKR); aim is to improve and seal the existing earth roads (currently very dusty during the dry season and muddy during the raining season) within the Bario region (connecting the 7 longhouses, airport, clinic), replacing them with a concrete surface. Bario Rice supply low; price for Bario rice skyrockets to ~RM15-RM20/kg</td>
</tr>
<tr>
<td>Bario Rice Development Project (see chapter 5)</td>
<td>2011 – 2015</td>
<td>Memorandum of Understanding (MoU) signed between the Rurum Kelabit (Kelabit Association of Sarawak), State Farmers Organization and Ceria Group forming a joint venture company, Bario Ceria Sdn. Bhd, to implement the project. The project aim is to create a partnership among the three parties to modernize and mechanize rice farming in Bario Highlands. - The program involves three phases: 1. Improvement of the farm infrastructure including water management and field layout 2. Mechanization and modernization of the rice farming process including increasing the rice planting acreage and rejuvenating redundant fields 3. Rebranding of Bario Highlands rice through a Department of Agriculture rice certification process to ensure the quality and genuineness of Bario Rice.</td>
</tr>
</tbody>
</table>

Source: Jiwan et al., 2006: 3; Field Collection (this study, 2013)
Current Challenges in Bario

“The grouping of problems is basically classified into primary and secondary with respect to economic (transportation and manpower supply) and communication respectively. If transportation problem in term of cost reduction can be resolved, most of the other problems are secondary in nature. To most local residents, this issue could be settled by having access road by means of allowing logging to come in but this option is still to be disputed due to the unknown effect of logging on their quality of Bario rice, salt and pineapple production” (Jiwan, Chai, Teo and Jiwan, 2006: 4).

Although its main activities and economy revolve around rice cultivation and it was previously a self-sufficient rice-producing village, Bario, like the rest of Malaysia, now faces a decline in self-sufficiency. Today, those that still reside in Bario rely heavily on imported rice.

Malaysia has been experiencing rapid urbanization since independence, and internal migration has been one of its significant determinants. Although the state of Sarawak, where Bario is located, has a rapidly growing economy, the benefits of growth have been focused largely in urban centres such as Kuching, Miri and Sibu. According to the Department of Statistics (2010) 56% of the 2.5 million people in Sarawak live in urban areas. The majority of the rural population in Sarawak practice farming as their dominant activity. Poverty, although on the decline, prevails, and, increasingly, young people area seeking wage employment in urban areas.

People in their twenties and thirties show the highest propensity to migrate, and internal migration involves more men than women (Jali et al. 2006). Factors influencing farmers’ decisions to abandon paddy fields in Malaysia have included shortage of labour, low productivity
of paddy land, high off-paddy farm income, shortage of water supply and multiple land ownership (Thiran 1981). These indicators are similar to those experienced in Bario.

Today many villages in Sarawak are left abandoned, while in others the young leave, increasing the proportion of the aging population left behind. This results in an inability to farm. More and more abandoned farms and villages with aging populations are seen today in the rural areas of Sarawak. An increasing number of abandoned paddy fields is not unique to Bario.

Bario’s first primary school was opened in 1946 (Janowski 2003b: 105). There were once two primary schools and one secondary school in the Highlands. The secondary school still operates, offering education up to Secondary 3. Further education is only available in urban areas. Most rural school leavers can only expect to find unskilled employment, mainly in the service, manufacturing and construction industries. Remoteness severely restricts access to employment opportunities.

As a result, most students move to towns or cities, particularly Miri, for further education. Urban migration, mainly to Miri, is said to have begun in the 1960s, when the airstrip was built and formal education was introduced in Bario. It gathered speed in the 1970s, 1980s and 1990s (Janowski, 2003b, 2005). It is difficult to estimate with any precision how many Kelabit actually live in cities, as they tend to come and go depending on the availability of work (Janowski, 2005). Although most migration out of Bario has been temporary, it has involved a very large proportion of the total Kelabit population: probably around half are at any one time resident in town (Janowski, 2003b: 105).

Working-age adults migrate to seek better-paying jobs, leaving older adults to attend to farming. Like the Kelabit, the Iban and Bidayuh, the largest indigenous communities in Sarawak, began to migrate out of their villages in significant numbers in the 1960s when the
lumber and oil industries were experiencing rapid growth (Sultlive, 1992; Kedit, 1993 and Morrison, 1993). As has happened among these communities (Windle and Cramb, 1997), most of the Kelabit have moved to urban areas because living in the highlands limits the flow of information on employment opportunities and the mobility of people wanting to make practical use of such information. Those from the immediate Bario areas are said (Janowski, 2005: 247), to have included “more skilled and professional-level people, which benefited from the particular support of Tom Harrisson,” who left mainly to pursue further education and urban jobs (Janowski, 2005; Jiwan, 2006). Janowski (2005) found that education was one of the determinants of marriage, in addition to inherited status.

Women are mainly affected by the lack of better alternatives, although until quite recently women in the community did not plant and harvest paddy extensively but kept little plots as a way of keeping the local traditions alive.

The resident population of Bario today consists of the elderly, or schoolchildren aged 5 to 14 (Primary 1 to Form 3). During the author’s field visits there was no one in their 20s or 30s in the village. The family in Sarawak is a very strong unit, however, and it is common for absent family members working in the urban areas to send money, in the form of remittances, back to their longhouses (Windle and Chambers, 1997).

The labour force in the rice fields consists of Penan and Indonesian labourers, but their hire no longer makes economic sense. Now that money is used more regularly than barter exchange, and goods are getting increasingly expensive, labourers prefer cash to a 50% crop sharing deal with landowners. In recent years the available workforce from Indonesia has been lured away by the increasing demand, and better returns available, for workers on oil palm plantations in Indonesia or at construction sites in either Malaysia or Indonesia. Between 1990
and 2010 labour shortages affected Bario rice production, significantly reducing the supply available for the market. As foreign labourers grow too expensive or uneconomical for emigrant Kelabit living in town to support the family farm, more and more rice fields are being left abandoned. The resulting labour shortage is one of the reasons for implementing a mechanization scheme in the area.

**Summary:** This chapter has discussed the study area in depth in order to provide a greater understanding of the region, its history and its culture. It has explained the traditional social values of the Kelabit community, particularly as centred on rice cultivation, and their transformation as the community was relocated and settled in the Bario area in the 1960s. This relocation, as well as improved contact with the outside world, has led to urban migration and the underlying labour scarcity issues the community has faced and that has led to the current challenges faced in Bario. The chapter has also explained how the motivation for rice cultivation by the Kelabit has been affected by the desire to retain land ownership under the legal system applicable to traditional land tenure in Sarawak. The next chapter will describe the research methodology used for data collection.
Chapter 4

Research Methodology

“The information generated by an assessment is only as good as the process of generating it.”

(Frankenberger et al. 2001:81)

This chapter describes the field research methodology used in this study. It explains how the author applied the methodologies, approaches and specific data-gathering techniques used in the application of the sustainable livelihood framework to the current study, details of the author’s field work during two visits to Bario in 2013, and the sources of the data, collected during these visits, that will be presented in the next chapters. Justification for the use of the data analysis tools selected is based on previous studies that focused on the impact of mechanization on productivity, sustainability and food security in the country.

During the time of the author’s field surveys in 2013 the Bario Rice Development Project was not 100% completed, and the full impact of the introduction could, therefore, not be determined. The project is now completed, and the discussion of impacts in this paper takes into account information about its implementation during 2013 and 2014.

Sustainable livelihood framework - method:

The sustainable livelihood framework requires a 'hybrid' methodological approach that combines conventional survey tools with appropriate qualitative methodologies (Scoones, 1998). A mixed method of quantitative and qualitative data collection was therefore adopted to provide a comprehensive analysis (Blaikie, 2000). Qualitative data analysis was needed for open-ended questions that captured interviewee's responses in their own words (translated when necessary).
Qualitative data were collected using direct observation, structured questionnaires and semi-structured interviews with key informants. The questionnaire was developed to allow interviewees to discuss their perceptions of the different processes and the changes (from traditional to modernized farming; migration; future) involved in these processes. Quantitative data on their asset indices were also collected. The sustainable livelihood approach was applied to examine the extent to which access to various sources of capital influences a household's livelihood transition from farming to non-farming activities (also called "farm exit"; Bhandari, 2013) leading to the abandonment of rice fields in Bario.

**Interview Techniques**

Because the author grew up in Sarawak, he did not have to adapt to the culture and climate. Being Kelabit himself provided vital connections needed to perform his research by gaining the locals' confidence. The author was already familiar with the area, and was able to live with relatives while carrying out his field studies. Being local, however, may have altered both his own perceptions and the way people responded to him.

In order to analyze people's perceptions, the author conducted surveys and three types of interviews using questionnaires:

- Household interviews with residents of the Bario region
- Expat interviews with Kelabit that had migrated to urban areas
- Key informant interviews with officials from government and Ceria Bario, community leaders, and an academician from the local university (open ended interview questions using a guide available in Appendix 3)
As the Kelabit are close-knit (most are related to one another), the author was able to connect with Kelabit both in the village and in cities through the host of his homestay in Bario and through family members in Miri.

Prior to the commencement of his field study, the author conducted several key informant interviews with officials from the private company (Ceria Group) responsible for project implementation, the President of the Kelabit Association (Rurum Kelabit), a Kelabit university lecturer from the University Malaysia Sarawak (UNIMAS) that had conducted social studies in Bario, and with a number of Kelabit living in urban areas.

By conducting his key informant interviews first, the author was able to discuss the situation, to obtain help in exploring and understanding the concepts behind the project and its goals and direction, to get connected with managers from Bario Ceria and the relevant government ministries, and to obtain additional information including maps and insights into social issues. The author met with Kelabit living in the cities of Kuching and Miri to collect opinions and suggestions, and to get a better understanding of the current environmental and political situation. He was also able to test and modify his questionnaire before going into the field.

Field study phase for data collection

All interviews conducted were semi-structured. A written questionnaire was used but the author filled in the answers for interviewees; the goal was to have more flexibility than with structured interviews, although this approach meant that answers were not always consistent among interviews. In semi-structured interviews, the researcher uses a set of predetermined questions to guide the interviewing process, as opposed to an open interview process in which no
schedule is used (Kvale, 1996). Using this technique, the author was able to have "one on one" private interviews with informants, either face to face or through various communications media such as telephone and emails. This enabled informants to share private information or frank opinions with the author, and allowed for in-depth discussions including sensitive topics that informants may not have found comfortable sharing in the presence of other people. Many local residents are related to each other and to the community leaders, and to 'give face' to their elders most would choose to remain silent in public when they disagree with them. A farmer or a younger member of the community will usually not speak up about his objections to the views of the community leaders, as it is considered rude to do so.

The author was better able to build rapport with the informants by approaching them personally, and therefore was able to understand their motivations or fears with regard to the impact of modern technologies on their community. Interviews were a flexible component of the research, and helped in discovering the way people express their own ideas, sentiments, emotions and realities. Maps of the location of the project and the irrigation scheme were provided to aid the conversation and provide a visualization tool for the informants.

Questionnaires were administered and made available in both English and Malay (Bahasa Malaysia). The author designed three forms of questionnaire: for rural households, for urban households and for officials. Each completed questionnaire was checked and read on the night of the interview, and any inconsistencies identified were followed up with the households concerned (since the author was still in the area). Most of the household surveys were completed by heads of households where they were available, and where not, by a household member familiar with the welfare of the household (mostly managed by women in the longhouse). A field notebook was kept with notes taken during the interviews. Interviews were conducted mainly in
English, but there were times when Malay (Bahasa Malaysia) was used by the interviewee to convey a message. A translator was not needed for these interviews as the author speaks Malay.

**Household Interviews**

**Table 2. Interviews Carried Out in 7 Longhouses in Bario Within The Project Area**

<table>
<thead>
<tr>
<th>Villages</th>
<th># of households</th>
<th>Total population</th>
<th># of households interviewed</th>
<th>% of households interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulung Palang Atas</td>
<td>23</td>
<td>197</td>
<td>5</td>
<td>21.7%</td>
</tr>
<tr>
<td>Ulung Palang Bawah</td>
<td>19</td>
<td>153</td>
<td>5</td>
<td>26.3%</td>
</tr>
<tr>
<td>Bario Asal</td>
<td>29</td>
<td>200</td>
<td>5</td>
<td>17.2%</td>
</tr>
<tr>
<td>Pa'Ramapuh Atas</td>
<td>15</td>
<td>109</td>
<td>5</td>
<td>33.3%</td>
</tr>
<tr>
<td>Pa'Ramapuh Bawah</td>
<td>10</td>
<td>67</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Arur Dalan</td>
<td>26</td>
<td>107</td>
<td>5</td>
<td>19.2%</td>
</tr>
<tr>
<td>Padang Pasir</td>
<td>23</td>
<td>136</td>
<td>5</td>
<td>21.7%</td>
</tr>
</tbody>
</table>

Source: Field Collection (2013)

Total: 145 families (969 people) = 100%

School-age children represented:

SK Bario (Bario Primary School) : 129 students

SMK Bario (Bario Secondary School): 160 students

Total: 289 students.

The study draws mainly on qualitative data, and to a lesser extent on quantitative data.

The author conducted a socio-economic household survey using a semi-structured questionnaire on two separate trips to Bario (June and October 2013). The author managed to interview participants from the seven longhouses participating in the Bario Rice Development Project, namely, Ulung Palang Atas, Ulung Palang Bawah, Bario Asal, Pa'Ramapuh Atas, Pa'Ramapuh Bawah, Arur Dalan and Padang Pasir.
Earlier discussions with key informants (including Ceria Bario and government officials) and community members now living in urban areas clarified the situation in the study area. Interviewees in Bario were asked to meet at various meeting locations, as well as in every other household starting from the longhouse located closest to the airport (Map).

In seeking out participants the author had to adapt to conditions on the ground and take into account the weather and the availability of flights into Bario village. It was necessary to ensure that the household surveys were done at the right season and at the right time of day. It is difficult to conduct interviews during the rainy season, when travel between longhouses is difficult and can be dangerous after dark, and during holiday seasons, when most villagers travel to the cities to be with their children and grandchildren, often for weeks at a time. The author chose to conduct his second month of field study after the harvest season to avoid bias in participant selection.

An attempt was made to survey each of the longhouses in a stratified manner. After following a recruitment strategy (stratified random sampling) designed to avoid bias in participant selection, the author found that some households were empty, and potential interviewees in many others were either busy or simply agreed with comments of other interviewees (on most occasions, participants would say that they had the same thoughts as those living next door). Participants would also ask what the previous participant had said, and just copy the response made by other participants. The author avoided entering this data by not revealing who the previous participants were or what they had said. The author decided to treat the first set of interviews as a test using a pilot questionnaire, and where needed he reorganized the order in which he asked his questions after he realized the difficulties on the ground (i.e.
participants availability, weather and time constraint). Due to these limiting factors, the sample size (n) was lower than the author had intended.

In order to accomplish this study in a timely and efficient manner, taking into account financial and time constraints, the author administered surveys using qualitative methods. Creswell (1994) suggests that the inductive process of qualitative methods permits a more in-depth comprehension of social human problems, as well as building a complex picture with words that provide rich detail and insights into participants’ experiences. Random purposeful sampling (Bogdan and Biklen, 1998) of the residents of Bario was utilized to select interviewees for this study from all seven longhouses. The data collected was analyzed qualitatively by “working with data, organizing them, breaking them into manageable units, synthesizing them, searching for patterns, discovering what is important and what is to be leaned, and deciding what you will tell others” (Bogdan and Biklen, 1998:157).

Not all residents of Bario own land or have a stake in the Bario Rice Development Project. Therefore, respondents were chosen from landowners participating the Bario Rice Development Project with knowledge of wet rice cultivation in the region. Although there are limitations to the purposive sampling method that raise concerns, including concerns that opinions of the selected target population would overweigh those of subgroups in the population that are more readily available, this method can be used to better understand phenomena about which little is yet known.

A total of 35 household interviews (or 5 interviews per longhouse) were collected. For each of the 35 households selected for this study, the author interviewed either the head of the household or, if he were unavailable, his wife. Of interviewees 46% were women (usually interviewed if the male head of household did not wish to answer questions) and 54% were men.
Additionally the author surveyed one household representative from each of two neighbouring longhouses, Pa' Umor with 22 families (120 people and Pa' Ukat with 26 families (117 people). Table 2 provides the names of the longhouses, total number of households in each longhouse, the number of households surveyed and the percentage of households per longhouse that the survey sample represents.

The purpose of the structured household interviews was to get general information on the individuals in each household, including age, occupation, main livelihood activity, sources of income, professions engaged in different seasons.

The rural household questionnaire (Appendix 1) covered the following ground:

1. Family unit and respondent profile (e.g. Age, occupation, education, place of birth, family tree)
2. Asset index (physical capital, natural capital, financial capital, human capital and social capital)
3. Longhouse profile
4. Family background (including reasons why absent family members were not in the longhouse)
5. Farm characteristics and land tenure
6. Annual harvest
7. Expenditure ranking for 2012
8. Perception of the Bario Rice Development Project
9. Gender roles
10. Possessions
11. Perception of traditional practices versus mechanization
12. Perception of consumers of Bario Rice (price of Bario Rice)
Expat Interviews

Figure 6. Rural-Urban Migrant Profile

By including a family tree or genealogy table in both household and expat questionnaires, the author was able to collect information on family members of participants (farmers) in Bario who had emigrated from Bario and were now living in the city. The author also collected information from members of his own family living in Miri. In addition, he was able to connect with other Kelabit from the local urban church attended by family members. To get a better idea of migration patterns, the author used this information to contact and interview 37 Kelabit between the ages of 35 to 73, originally from Bario, who had migrated out of the region between the 1950s and 1999 and now lived in urban areas (Miri, Bintulu, Kuching, Kuala Lumpur, Netherlands, UK). Most of these only returned to visit their parents who continued to stay in the longhouses.
According to the author’s interviews, 48% of expatriate interviewees left Bario in the 1970s. More than 80% obtained Form 5 (Grade11). 59% of urban interviewees were female and 41% were male. Males had obtained higher education than their female counterparts.

Key Informant Interviews

The author conducted eleven semi-structured key informant interviews between June and August 2013: three with government representatives (Department of Agriculture, former Minister of Modernization of Agriculture), two with community leaders (Rurum Kelabit), one with a Kelabit lecturer from the University Sarawak (UNIMAS), four with private company officials (Ceria Bario) and one with a civil engineer in charge of the irrigation project. Key informants selected were those who were knowledgeable about what was going on in the community, who were involved in the project or who were being affected by the project.

The purpose of the key informant interviews was to gain a better understanding of the Bario Rice Development Project, and to understand the factors that were responsible for the transformation from traditional rice cultivation to modernized rice-farming practices. The interviews were geared towards documenting the officials’ perceptions of the Bario Rice Development Project and their views on relevant management and development issues.

The author also interviewed the Bario school principal, a Kelabit from a neighbouring longhouse (Pa' Umor). She left Bario in 1973 for further studies and work, and returned to Bario in 2006 to serve as principal in the local school. She reported that when she arrived in 2006 the fields were mainly secondary forest covered with bushes. The area of fields reverting to second growth was growing as more and more fields were abandoned between 2006 and 2010. She said that parents of her students encouraged their children to study hard and work in the city.
Students in the school did not help actively in the field during harvest season. Only those who did not attend school helped out in the fields, and most of these are Penan rather than Kelabit.

**Other Field Techniques**

**Participant observation:**

Participant observation involves watching and recording behaviours within a clearly defined area. The researcher plays the role of passive observer and is, therefore, outside the actions being observed and recorded (Spradley, 1980).

During the introduction of the mechanization project and construction of the new rice mill, the author attended and observed workshops and meetings among the stakeholders involved. These included a seminar by Ceria Bario on the use of mechanization in June 2013, and a seminar by the Department of Agriculture at the Bario community hall in August 2013 on managing paddy diseases. Most of these workshops and meetings took place at various locations in the study area, including in the rice fields themselves. Data derived from attendance at these meetings and workshops assisted in better understanding local history, community dynamics, and involvement in, awareness of and participation in the project.

Together with a group of farmers and the local manager of Ceria, the author participated in transect walks for landowners in June and October 2013. These walks were conducted by the Department of Agriculture in order to educate the landowners about pest and rice disease management. By participating in these walks the author was able to get an overview of the area and make general observations.

During the walks the author was able to observe the use of machines and equipment provided for some beneficiaries of the mechanization programme in Bario. He was also able to
see evidence of irrigation concerns (e.g. dry, cracking rice fields) while witnessing the construction of the seven irrigation dams intended to resolve these issues. The author managed to talk to some household heads in the area and to labourers on the project to discuss any social issues. The key participants for this project were the Ceria Bario officers and longhouse heads who were to be used as enumerators helped in identifying issues relating to land use, cultivated crops, cultivation patterns and the mechanization program in the area.

**Summary:** The research methodology used for data collection in this study was structured around the sustainable livelihood framework in order to gather information on the various types of livelihood capitals that could be analyzed following this model. The author has described his techniques for conducting household interviews, expat interviews, key-informant interviews, map-work, transect walks and participant observation, and has explained how these were adapted to the particular circumstances and limitations in Bario at the time of his visits. The next chapter presents the details of the mechanization project itself.

Map-work and Transect Walk:

**Figure 7. Transect Walk with Villagers, Private Company And Government Personnel Discussing Rice Disease Management**
Chapter 5

The Bario Rice Project

This chapter introduces the Bario Rice Project, the mechanization scheme whose impact on the local community is the subject of this study, based on information gathered by the author in the course of his field research. It describes the history and operation of the project in detail, highlighting the historical makeup of rice cultivation activities in Bario and the project’s background structure and implementation. In addition, the chapter explains how the role of influential decision makers in a position to direct the application of federal funding to the Bario area, led to the project formulation, despite the fact that the variety of rice grown in Bario is a local specialty that contributes little to the overall goal of increasing rice self-sufficiency within the country as a whole. At the end of the chapter, the author presents further observations made during his field visit in the project area.

Figure 8. Rice Fields in Bario, Kelabit Highlands in 1947 and 1962

Source: Janowski (2004)
Figure 9. Paddy Fields In Bario In June 2013 (Before the Bunds were Removed for the Mechanization Project)

Source: Field Collection (2013). Note: Most of the rice plots size were kept to the same size as in 1962 (around 1 acre per plot)

Figure 10. Paddy Fields In Bario In October 2013 (Bunds Removed to Form Plots of at Least 1 Hectare)

Source: Field Collection (2013). Note: After getting the villagers to agree on the land division and how it was going to be fragmented. The rice fields were at least 1 hectare per plot.
The Bario Rice Development Project, which introduced mechanization into the highlands, was funded by the Malaysian Federal government at a cost of RM17 million (approx. CDN$5.66 million) as part of its overall national policy aimed at alleviating rural poverty and increasing the nation’s rice self-sufficiency level (SSL). The government’s intended goals were national, rather than being aimed at either Bario society in particular or the fact that Bario rice was regarded as a specialty crop sold at a higher price than that charged for other rice varieties. This project shows both the good and bad sides of management of funds and policy by the government: although funding for this project was intended to revive the economy of Bario, it
was ultimately available because people of influence at the government level were able to convince the federal government to provide it.

After he took office in 2003, former Prime Minister Tun Haji Abdullah bin Haji Ahmad Badawi set aside a large sum for agricultural development. Sarawak’s former Deputy Chief Minister Tan Sri Dr George Chan, who was also Minister of Modernization of Agriculture, was able to secure a substantial portion of this funding for development in the state. Between 2004 and 2006, the funding was used to purchase combine harvesters in order to introduce mechanization into selected lowland rice-growing areas. The machines, however, were not well maintained. They belonged to the Sarawak Farmer’s Association, but no one was willing to pay for necessary repairs and all the original funding had already been used up to make the initial purchase. By 2010, most of the machines were no longer in use.

The crisis in 2008, however, stimulated further interest in investing in rice production as prices rose. Dato’ Sri Idris Jala, a Kelabit minister in the Federal Cabinet, convinced the federal government to invest in Bario though most of new money went to irrigation rather than to mechanization. In 2011, Ceria Sdn Bhd, an agriculture service provider, was formed as a private company in Sarawak. It took over all the machines and offered to repair and maintain them. Along with the repairs, part of its business plan was to train farmers to use these machines, with the aim of charging the farmers for their use.

Because there was an opportunity for the harvesters to be brought to Bario to cultivate a premium grade rice for which there was a high demand, Ceria was approached by the Rurum Kelabit to implement the use of the previously purchased harvesters in Bario. The Bario region had faced similar challenges to those elsewhere in Malaysia: scarcity of labour, costs of producing / cultivating paddy fields that exceeded the revenue from the yield, and low
productivity and quality (broken grains) of the Bario rice produced. Bario paddy planting was on a downward slide, with more and more fields being deserted year after year. In the ten years before the mechanization project started, fewer than 60 hectares remained in cultivation.

In 2011, after the establishment of the Malaysian government’s National Agro-Food Based Policy (2011-2020), the Sarawak state government allocated RM17 million (approximately CDN$6 million) under the National Key Result Areas (NKRA) programme for a 5-year (2011-2015) Bario Rice Development Project in Bario (Government Transformation Programme, 2012), intended to revive idle or abandoned paddy fields. To implement the project, CERIA signed a joint venture with local community associations to work on existing farms. Shares in the joint venture were allocated to the Rurum Kelabit (44%), Ceria Alliance Sdn. Bhd. (51%) and the Sarawak Farmers Organization (5%).

In addition, the government introduced subsidy programmes through the National Agro-Food Based Policy to cover the costs of mechanization, including a Guaranteed Minimum Price (GMP) for rice. This complemented existing subsidies to the area covering costs of propane gas (for cooking), diesel (for vehicles and generators), rice seed (seeds are provided for free) and fertilizer (also provided free).

The goal of the Bario Rice Development Project, launched on 17 January 2012, was to introduce mechanized agriculture to 200 hectares of rice fields in the area, increasing the total paddy growing area by 200% and the yield from 1 to 3 metric tons per hectare. The joint venture brought combine harvesters to Bario. Mechanization was intended to reduce production costs and increase efficiency, as well as increasing the income level of the individual paddy farmers.
Seven longhouses were involved in the mechanization and modernization project: Padang Pasir, Bario Asal, Pa’ Ramapuh Atas, Pa’Ramapuh Bawah, Ulung Palang Atas, Ulung Palang Bawah.

**Figure 12. Wet Rice Fields In Bario under the Mechanization Project**

Source: Ceria Agriculture Services Sdn. Bhd. (Project Proponent)

Paddy fields in the project area (the 7 colours represent the paddy fields belonging to the 7 longhouses)

1. Blue: Ulung Palang Atas – 10 lots / 17.49ha
2. Pink: Ulung Palang Bawah – 19 lots / 28.60ha
3. Orange: Bario Asal – 21 lots / 33.87ha
4. Purple: Paramapuh Atas – 13 lots/ 25.09ha
5. Brown: Paramapuh Bawah – 13 lots/42.26ha
6. Green: Padang Pasir – 20 lots/ 30.04ha

7. Red: Arur Dalan – 18 lots/ 31.73 ha

The project design required that existing plots be combined to produce larger areas that could be harvested on a commercial basis. Eventually this involved 114 lots in total, averaging 1.83 ha/lot, making up 209.05 ha of wet paddy fields that were to be converted for mechanization. According to public information from Bario Ceria, as of June 2013 there were 148 participants in the project area.

Bario rice fields traditionally shared their water by letting it flow from one field to another (plot sharing) until it reached an earth drain that allowed the excess to flow to a larger river. As landowners were required to share water from the same source, the owners of farms located further away from the river were at a disadvantage. The additional acreage developed by the project was to be serviced by seven new irrigation dams, each built on a different small river. A commercial rice mill and an information centre were to be constructed as part of the project development.

Bario Ceria was to provide mechanization services as a contractor, adopt paddy areas where landowners were not planting, and share the proceeds of harvested paddy with landowners at a 70:30 ratio. For farmers not entering into this contractual arrangement, Ceria was to offer the opportunity to sell their harvest to its rice mill in Bario at a competitive rate. Ceria was also to assist all paddy farmers in Bario to apply, co-ordinate and receive all rightful assistance available to them, and, ultimately, to transfer all the management and know-how back to the Kelabit.
Irrigation work map:

**Figure 13. NKEA Bario Rice Industry Development Project, Bario, Kelabit Highlands, Miri Division: Overall Area Layout and Irrigation Plan**


Bario Ceria offered three ways for landowners to participate in the mechanization project:

1. Rent the machines from Bario Ceria and prepare their own fields

2. Subscribe and pay for certain activities (e.g. weeding, transplanting, harvesting) in the field

3. Allow Ceria to work the plots, sharing their proceed of harvest at 70:30 ratio, with Bario Ceria accepting 70% of the yield as payment for the land use. Of the 70% that went to Ceria, 49% would be directed to the Rurum Kelabit.
During the author’s visit in October 2013, 54 of the participant landowners agreed to contract their land to Ceria on a 70:30 basis. These included landowners living in urban areas, most (as the author learned during his interviews in Miri) agreeing to allow their relatives to decide and sign the 70:30 agreement for them. Some landholders chose to keep and dispose of their 30% themselves (for self consumption, sale outside or gifts). Others choose to sell their 30% to Ceria at RM3.60 (~ 900kg x RM3.60 = RM3,240). Some even chose to buy paddy from Bario Ceria at RM3.60 (as there is a local demand for Bario Rice within the community). Landowners had the full discretion on how they wished to handle their paddy.

Of the remaining landholders in 2013, 32 utilized the machinery on a pay-per-service basis, paying Bario Ceria the cost of the mechanization services and keeping 100% of the yield produced. The remaining 57 participants, mainly people from Padang Pasir, Pa' Ramapuh and Arur Dalan, had not decided which option to choose because most of their lands were still under conversion/development.

The project is currently (2015) entering its 5th year. Mechanization has been introduced to all of the designated areas, and dam construction has been completed. In January 2015, Ceria Bario Sdn Bhd reported that all of the longhouses had agreed to sign on to the 70:30 contractual basis agreements, possibly because it was more convenient. This included the 32 landowners that initially opted for the pay-per-service basis. Others had not signed on before because the project had not yet arrived at their fields, and they were uncertain about what to expect.

Originally the intent was to produce two crops per year, but the attempt to perform double cropping failed. According to Janowski (1988), it had been suggested, originally by Douglas in 1912 (p.20), that the Kelabit in the early part of this century, and thus under the old Bario system, produced two crops of rice a year. However, Janowski (1988) was told that this
was inaccurate, and that a double-cropping experiment was carried out in the 1970s in Bario but failed due to rat and bird attacks. Apparently no double cropping was ever attempted under the old system.

Unlike other rice varieties available in Malaysia (e.g. Bajong rice) that can produce double or triple crops annually, Bario rice requires 6 months from planting to harvesting. Rice specialists from the Department of Agriculture in Sarawak have suggested that this is due to the genetic makeup of Bario rice varieties (Tan et al., 2008). There is a link between photosensitivity of the identified Bario rice varieties (i.e. Adan Halus, Adan Sederhana and Padi Tuan) and their growing period that only allow a planting window of 3 months. Such photoperiod sensitivity exists in most traditional varieties in tropical and subtropical Asia (Viraktamath 2013).

The project therefore planned to take advantage of single cropping by allowing the fields to lie fallow for 6 months before the next cropping cycle, thereby reducing the use of chemical fertilizers (as opposed to natural fertilizers such as buffalo manure, which is also used to make the bunds, or walls, between paddy plots (Janowski, 1988)).

**Summary:** Chapter 5 has explained how the Bario Rice Project was initiated and why, and has followed the development of the project from inception to its implementation in the Bario region. It has explored the ways in which the project has involved the owners of rice fields in the Bario community, and the relationships that developed on the ground while implementation was in progress, and the changes, particularly to the organization of rice-growing areas, that had to be made within the community as the project developed. The next chapter will present the livelihood results collected from the field study.
Chapter 6

Results

This chapter presents qualitative and quantitative results of the author’s fieldwork. It provides data on the Bario population and its age structure, household demographic data, and household livelihood data as collected and explained using asset indices, including observations on the social aspects of involvement in Village Security and Development Committees (JKKK) and participation in rice cultivation. It also presents an agricultural and economic comparison between yield produced traditionally and that produced, or expected to be produced, under the mechanization project.

Household Interviews – Quantitative and Qualitative Results

Population and age structure

According to the author’s observations, the population residing in Bario is largely composed of aging parents (senior citizens). The children of these seniors live in Miri and other cities, while children still attending primary and secondary education in Bario live with their grandparents. Interview results confirmed his field observation that, except for foreign workers in the local schools brought in by Ceria Bario and Indonesian labourers, there was no sign of teenagers or young adults (age 15-35 years old) during his visit to Bario. The absence of working age Kelabit is an issue in Bario, where the older population is increasing while the younger age groups (both male and female) continue to move out after age 15, like their parents before them, to attain further education.
According to the Marudi District Office (2013), the seven longhouses have a total registered population of 969 in 145 households. The Miri District Office website (2013) states there are 134 households and 948 people living in Bario. In 2014 there were allegedly 948 people registered as living in Bario. However when the author asked Kelabit living in Miri who maintained registered addresses in Bario, he was told that most of those who use Bario for their registered home (as listed on their Malaysian Identity Cards) but actually live elsewhere do so for political purposes (e.g. to be able to vote in and for the region). Key informants interviewed in October 2013 told the author that in fact there were less than 700 people residing permanently in the these longhouses.

The total number of households, and the population in each longhouse, varies depending on the season. Those living in Bario often travel to cities and nearby longhouses, sometimes for long periods. Those that visit Miri tend stay away from Bario longer then a week; some are away for months. Outside of festival periods, such as during the author’s field visit, about 20 to 30
percent of the *bilik* in the longhouses (7 longhouses) are left empty for weeks to months. The residents move to the city to visit their children and grandchildren, and only return when they have to do some chores (i.e. repair work, weeding, gardening and harvesting) around their homes.

In addition, the average number of people in these longhouses differs depending whether any festivities are taking place, such as a name changing ceremony (*Irau*), wedding, or a funeral, and also on whether festive seasons were in progress, especially Gawai (harvest season at the beginning of June), Pesta Nukenen (Bario Food festival, held in mid July) and Christmas. Most family members living outside the area return to Bario during these times to visit their parents and relatives. These are also occasions when more flights are chartered (privately) to accommodate these festivals.

Children, including students at the local school, account for 289 of the Bario residents. During school holidays, most school children go back to the city to visit their parents. None of the school employees except the principal is from the Kelabit Highlands (i.e. Pa' Umor). Most of the staff and teachers in Bario are from West Malaysia. When asked about the students' caregivers, the author was told that most of the children attending the local school were either boarding at the school or living with their grandparents while their parents worked in the city.

During the author’s visits (May and October 2013) there appeared to be significantly fewer then 700 people in Bario, even allowing for school children.

**Household Survey Results: Demographic data**

The analysis herein incorporated stratified random sampling to allow the population in Bario to be divided into sub-populations representing the respective longhouses. However, for
analytical purposes the results from all seven longhouses are combined here unless otherwise specified.

**Figure 14. Demographic Data in Bario**

The sex ratio of respondents interviewed was 54% male and 46% female. Respondent age range was from 48 to 81, with the average age of respondents being 63.

**Household Survey Results: Livelihood data**

**Asset Index (Physical Capital, Natural Capital, Financial Capital, Human Capital and Social Capital)**

All households in the 7 longhouses live in similar situations, and are generally similar in their asset indices except for land holdings.

**Physical Capital:**

In Bario, the physical capital includes the range of consumer durables that households acquired (e.g. source of power, water and fuel for cooking), as well as their housing (identified as the land, and the physical structures that stand on it).
Housing is the most important component of physical capital. Traditionally the Kelabit community lived in wooden longhouses elevated on stilts, typically divided into family units with each section delimited by its floorboards. Today, most of the houses or longhouses in Bario are not built predominately of wood. Most longhouses have concrete floors. Although their walls and floors are still built of wood, windows are equipped with glass panels and metal railings, while a zinc roof is not uncommon. Extensions, especially toilets and kitchen areas, are layered with cement flooring to make them longer-lasting and to avoid the need to change.

Overall, the physical capital of all households interviewed was the same. All households had roofs made of zinc, with floors (kitchen and toilet are cemented) and walls of wood, flushing toilets, and gravity feed pipelines supplying water from the closest stream. The only difference was their source of electricity.

With respect to consumer durables, most households own a television, radio, washing machine, bicycle, motorcycle, computer and cellphones. Those that do not own a washing machine or a television normally share with their relatives.

Table 4. Source of Electricity

<table>
<thead>
<tr>
<th>Source of Electricity</th>
<th>Number of Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Operated Generator and Solar</td>
<td>4</td>
</tr>
<tr>
<td>Diesel Operated Generator</td>
<td>26</td>
</tr>
<tr>
<td>Hydropower</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

Note: All households own a diesel-operated generator. Those that both own a diesel-operated generator and have access to solar and hydropower may have better physical capital than households who only own a generator.
There are differences in physical capital when it comes to each longhouse’s source of electricity (Table 4). Only Bario Asal has full-time electricity, drawn from the largely failed dam project installed in 2002 (Figure 24), while the rest still rely on generator sets.

Locals and visitors often joke about the cost of living in Bario, and that the currency is charged in USD (United States Dollars) rather than the local RM (Ringgit Malaysia). This is because everything costs significantly more than in Miri (the US dollar is approximately three times the value of the ringgit). Jiwan et al. (2006: 4) found that cost of living is high in Bario due to the cost of transporting goods from Miri by air or on timber roads. In 2006 "a fixed-wing chartered cargo plane with capacity 1 ton cost at least RM5,500 per trip from Miri to Bario. A refill of 14kg cooking gas cost RM220 per cylinder (town price RM22) and a liter of fuel (diesel, petrol & kerosene) cost RM9.00 (only RM1.30/lit. of diesel in town)” (Jiwan et al., 2006: 4). Today costs have increased further, and most of the villagers do not stay in Bario as long as they used to. Instead, they travel to the city to live with their children.

**Natural Capital:**

All longhouses have their own water source:

**Table 5. Rivers in Bario**

<table>
<thead>
<tr>
<th>Name of longhouse</th>
<th>River name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bario Asal</td>
<td>Pa’ Marariew</td>
</tr>
<tr>
<td>Arur Dalan</td>
<td>Arur Dalan</td>
</tr>
<tr>
<td>Ulung Palang Bawah</td>
<td>Arur Laab</td>
</tr>
<tr>
<td>Pa’ Ramapuh Atas</td>
<td>Pa’Ramapuh</td>
</tr>
<tr>
<td>Pa’ Ramapuh Bawah</td>
<td>Arur Tentumuh</td>
</tr>
<tr>
<td>Padang Pasir</td>
<td>Arur Lutut</td>
</tr>
<tr>
<td>Ulung Palang Atas</td>
<td>Arur Telal</td>
</tr>
</tbody>
</table>
Total size of parcels owned by each household:

**Table 6. Land Size for Rice Cultivation in Bario**

<table>
<thead>
<tr>
<th>Descriptive Statistics Data</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Size in Acres</td>
<td>35</td>
<td>.35</td>
<td>3.83</td>
<td>46.90</td>
<td>1.34</td>
<td>.72</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The land size per household owned by the 35 interviewees range from 0.35 acres to 3.83 acres or (0.14ha to 1.55ha). In total, the 35 interviewees owned 46.9 acres (19 hectares) of land out of the 200 hectares under the project, representing only 9.5% (19/200 x 100) of the project area.

**Longhouses and Land Size**

In total, interviewees owned 46.90 acres of paddy field in Bario. Though some family members owned larger fields, the acreage owned by individual households was generally similar, with a mean of 1.34 acres per household (range: 0.35 - 3.83 acres).

According to the author’s household interviews, the size of land holdings does not influence the participants' financial capital or even their past ability to send their children to school. Therefore the ability to send children to school does not depend on land size. This result may reflect specific conditions in Bario, including free access to the educational system (with children's board reportedly paid in rice) and the initial distribution of 2 acres of land to immigrants in the 1960s, which may have levelled out differences in land holdings among households.
Financial Capital

Figure 15. Number of Children Working and Attending School Within Interviewees Households

Of participants interviewed, 23% had children attending school (from age 6 – 14) living with them, while the other 77% did not. Of the participants living in the longhouses, 74% had working children living out of the longhouses while 26% had either school-age children or no children.

Labour Security:

Historically, labour was supplied either by family members or by the community as a whole under the gotong royong system (see p. 106). Urban migration removed most of this labour force from the community. For landowners who continued to work their fields, hired labour provided a substitute for the labour force originally supplied by family and community members. Among the interviewees, 46% used hired labour, with from two to four hired labourers managing their paddy fields. Among the remaining interviewees, 40% of the total
reported that their fields were abandoned while 14%, representing landowners with very small plots, continued to work their fields themselves.

At the time of the author’s visit, all of the hired labourers were seasonal transient workers either from the Penan tribe or Indonesians from across the border. Interviewees reported that the cost of hired labour ranged from RM1827 – RM2744 ($609–914 CDN) per acre per annum. As none of the interviewees were deriving income from the rice they produced, payment for hired labour was not dependent on yield. Instead, it depended on remittance money from landowners’ children living in urban areas. With the arrival of the mechanization project further workers were brought into the area (see p. 122), but these were hired separately by Ceria Bario rather than being drawn from the relatively small pool of hired labourers already working seasonally in Bario.

No livestock was owned by 51% of the participants; the remainder owned chickens, buffaloes or both.

**Figure 16. Percentage of Labour Hired by Interviewees**
Of the 35 interviewees, 15 (43%) received money from their working children (remittances); 11 (31%) of these also collected a pension (upon retiring from the civil service). 1 (3%) received a pension only, and 8 (23%) did not receive any money from external sources.
During his data collection process, the author utilized the asset index method to measure the financial capital of the household in Bario. Although recording incomes directly would be more precise, the reliability of the data would be questionable. Money is a very sensitive topic, and it is not common for people to discuss how much they receive from their family or from work in the village setting. People were not keen to reveal their true income, and any values recorded here are only broad estimates. Also, as money may have only been received intermittently, average amounts were difficult to assess (Windle and Chambers, 1997). Therefore, to avoid touching on sensitive topics that would make participants uncomfortable, the asset index was used to measure financial capital for the community in Bario in order to better understand current or potential income streams.

Local Expenditure:

Table 7. Ranking of Interviewees' Expenditures

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure on food</td>
<td>1</td>
<td>1</td>
<td>1.00</td>
<td>.000</td>
</tr>
<tr>
<td>Expenditure on school</td>
<td>7</td>
<td>9</td>
<td>7.97</td>
<td>.891</td>
</tr>
<tr>
<td>Expenditure on utilities</td>
<td>2</td>
<td>2</td>
<td>2.00</td>
<td>.000</td>
</tr>
<tr>
<td>Expenditure on medical</td>
<td>5</td>
<td>5</td>
<td>5.00</td>
<td>.000</td>
</tr>
<tr>
<td>Expenditure on non-food</td>
<td>4</td>
<td>6</td>
<td>5.20</td>
<td>.994</td>
</tr>
<tr>
<td>Expenditure on transport</td>
<td>3</td>
<td>4</td>
<td>3.23</td>
<td>.426</td>
</tr>
<tr>
<td>Expenditure on loan</td>
<td>8</td>
<td>9</td>
<td>8.63</td>
<td>.490</td>
</tr>
<tr>
<td>Expenditure on gifts</td>
<td>7</td>
<td>8</td>
<td>7.40</td>
<td>.497</td>
</tr>
<tr>
<td>Expenditure on farm tools</td>
<td>3</td>
<td>6</td>
<td>4.57</td>
<td>1.243</td>
</tr>
<tr>
<td>Valid N (list wise)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Interviewees were asked to rank their total expenditure for 2012. They were given a list of nine items to rank as their main expenditure by priority - listed as first choice, second choice and so on. The list included expenditure on daily food for the family, utilities (e.g. diesel, cooking gas and water), school fees for their children, medical fees (medication purchases), non-food expenditure (e.g. clothing and toiletries), transport (e.g. diesel/petrol and air fare), loans (e.g. mortgage), gifts and farming costs (e.g. fertilizers, pesticides. etc.). Table 7 indicates the expenditure behaviour for each interviewee, ranked according to their immediate needs. For each expenditure behaviour, the table provides minimum and maximum ranking, mean ranking, standard deviation and total responses (N).

The most important number on Figure 19 is the mean, indicating the average ranking each item received. The lower the mean, the higher the ranking. Expenditure on food was ranked as the highest priority, followed by expenditure on utilities, transport, farm tools, medical, non-food, gifts, school and loans.

Figure 19. Interviewees’ Expenditure Ranking
Human Capital:

Of housewives interviewed, 8 (24%) indicated that they received money from their children, while 6% received money from their husbands or by selling local forest products, of the business/contractors interviewed, 4 (12%) received money from their children. None of the labourers had working children, but they acknowledged that they received money from relatives both in the city and living in the village.

Ulung Palang Atas had more retired respondents than Arur Dalan, while Arur Dalan had the most respondents who are still working. Bario Asal had the most statistically significant difference when compared to Ulung Palang Atas, Pa' Ramapuh Bawah and Padang Pasir, because no retirees were interviewed from Bario Asal. Respondents from Bario Asal were either housewives, business owners or labourers. The author concludes that occupational choice could influence the human capital in each longhouses, giving unique characteristics to each. However overall there were no statistical differences found between occupational choice and land size.

Figure 20. Occupations of Persons Interviewed
Education:

Figure 21. Education Level Obtained by Interviewees

The school in Bario offers education only up to Form 3 (Grade 9). All students move to the city for further education.

Among the interviewees, 40% had obtained education up to Primary 6 (equivalent to Canadian Grade 6) while 31% had obtained Form 5 education (equivalent to Canadian Grade 11) (Figure 21). From the author’s urban-migration interviews with Kelabit living in urban areas, the author learned that most moved out of the region upon completion of Form 3, the highest level of formal education available in Bario, in order to take up further studies.
The cross-tabulation in Table 8 between highest level of education achieved and occupation shows that most of those who had obtained the highest level of education are now retired. They had left Bario for education and careers, and had only returned to the region to retire. Males tend to have an advantage in being able to further their education, while females remain in the area to help out in the fields after completing their Primary 6 level education (Figure 22). This trend has changed over the years (in the 1970s) as the number of females that have obtained further education has increased (see chapter on expat interviews, below).

**Figure 22. Interviewees’ Education Level by Sex**
**Social Capital**

All households were similar in that the heads of households were men, though decision-making in rice-related issues was handled by women.

All of the interviewees identified themselves as Christian, were active in their individual churches, and carried out responsibilities as church members. Church involvement has been very prevalent in the Bario community since 1944–1950 (Jiwan, Chai, Teo and Jiwan, 2006: 3), the period after first contact with the outside world, during which there was a change of belief from animism to Christianity. Lian-Saging and Bulan (1989: 102) reported that villagers believe that rice is only able to grow with human help, and much attention is lavished on it. In the past, the Kelabit relied on the pre-Christian deity Deraya to have a successful rice crop, and believed that success of the crop depended on the spiritual state of those who planted it (Janowski, 2005: 654).

**Figure 23. Percentage of Interviewees Involved in Development and Security Committees**
Besides having an individual Head of Village/Longhouse, or Ketua Kampung, in each longhouse, some longhouse residents served on Village Security and Development Committees (JKKK). The JKKKs are village consultative committees, each chaired by the Longhouse Chief, that were instituted in 2008 by the Malaysian government to encourage active participation of villagers in the rural planning and implementation process. The members of JKKK are paid a very minimal nominal fee for their service - a monthly allowance of RM800 for the JKKK chairman, RM200 for the secretary and RM50 for each committee member (Chiam, 2015).

Among the functions and responsibilities of the JKKKs (Ministry of Rural and Regional Development, 2013) are:

(i) Planning projects for the benefit of the longhouse community, to be funded by the state government

(ii) Developing and carrying out projects that foster cooperation between government departments and non-governmental organizations (NGOs)

(iii) Acting as intermediary between the longhouse community and government departments and NGOs

(iv) Carrying out specific methods to select secretaries and other members of the subcommittee

(v) Ensuring the security and safety of the longhouse; making sure the longhouse is free from negative elements such as drug, illegal immigrants, subversives and so forth.
Observations on Involvement in JKKK and Rice Cultivation – (June 2013 – October 2013)

Of the interviewees, 20 (57%), mostly women, said that they were actively involved and served on a committee in their respective JKKK. Only two of the 16 women interviewed were not involved in a JKKK. Out of the 19 men interviewed only 6 were a member of a JKKK committee. However, all 6 played a leadership role in their committees, either as chair or as head of one of the various subcommittees (e.g. education, agriculture, tourism and industry, infrastructure and public utilities, youth, culture and sports and safety).

Out of the 43% (15 persons) that were not involved in a JKKK, 2 were women and 13 were men. All 15 of these non-members said that they volunteered time to the JKKK and helped out in church activities. All of the interviewees, however, played a part in church activities.

During one of his field visit, the author had the opportunity to join in a women's JKKK discussion. It was interesting to see that women from different longhouses met at the communal market place. Although each longhouse has their own JKKK, the women’s group would usually meet collectively to discuss current issues. During the discussion, the women discussed distribution of government subsidies, household issues, and upcoming events (festivals or workshops), and updated each other on daily issues. Not much was said about the transition in the rice cultivation process. Most of these women were once rice cultivators, but were too old to farm anymore. Some still plant their own patch of rice and perform very minimal farming activities. They had no concern that mechanization was going to take over the fields or their work. When asked, all of them were receptive to and welcomed the idea that a machine would revive their abandoned fields and the surrounding fields. They were optimistic about the project and hoped to see the fields look as good as they had in the past. Some even hoped to see more Kelabit youth returning to the longhouses as visitors to enjoy the beauty of their surroundings.
Involvement in Rice Cultivation

The author asked his interviewees whether they or any of their family members were still involved in rice cultivation, and if so who made most of the decisions relating to rice farming, who was involved in the day-to-day activity relating to rice farming, and whether the family had employed local workers to help in rice farming and at what stage.

All of the interviewees agreed that women played an active role when it came to rice farming (i.e. weeding, soaking rice seeds, sowing sprouted rice seed, transplanting rice and harvesting), while the men were mainly responsible for making and repairing bunds and fences and moving harvested rice. All of the interviewees admitted that they did employ workers at some stage to help farm their plots.

In the paddy fields, the author saw only women doing the work (clearing and weeding in June 2013). The men were more interested in contract work (repairing roads, building/renovating the house, hunting etc). Interviewees agreed that women were more intimately involved with rice growing then were men, and hence few women pursued further education. Gender distributions among different rice-growing tasks, according to the household interview responses, are listed in Table 9. These results are similar to the findings of Janowski (1991), indicating that little has changed in over two decades. Janowski’s (1991:63) observation that women carry out "activities which involved 'hands-on' with the rice itself, while men carry out activities which are heavy labour" still applies today.
Table 9. Gender Distributions Among Different Rice-Growing Tasks

<table>
<thead>
<tr>
<th>Activity</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearing of grass and weeding</td>
<td>Men and women</td>
</tr>
<tr>
<td>Making and repairing bunds</td>
<td>Men</td>
</tr>
<tr>
<td>Making rice nursery beds</td>
<td>Men and women</td>
</tr>
<tr>
<td>Soaking rice seeds</td>
<td>Women</td>
</tr>
<tr>
<td>Sowing sprouted rice seed in nursery</td>
<td>Women</td>
</tr>
<tr>
<td>Transplanting rice</td>
<td>Men and women</td>
</tr>
<tr>
<td>Weeding</td>
<td>Women</td>
</tr>
<tr>
<td>Guarding rice (Pest control)</td>
<td>Men and women</td>
</tr>
<tr>
<td>Harvesting rice</td>
<td>Men and women</td>
</tr>
<tr>
<td>Moving harvested rice</td>
<td>Men</td>
</tr>
</tbody>
</table>

Source: Janowski (1991); Field Collection (2013)

Seasonal timetable for Bario Traditional Rice Cultivation:

Traditionally, wet rice cultivation in Bario was a church affair. Farmers/villagers would attend church to find out when they should soak their seeds. A key informant told the author (confirmed by other key informants in Bario) that rice cultivation in Bario began in June, when seed and nursery preparation are done. The following Table 10 is derived from information provided by interviewees.

Table 10. Traditional Wet Rice Cultivation Tasks in Bario

<table>
<thead>
<tr>
<th>Month</th>
<th>Activity</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of June</td>
<td>seed preparation nursery preparation (normally ¼ of the paddy field)</td>
<td>In late June or early July, seeds are soaked in a gunnysack. The sprouting seeds are separated, allowing for other seeds to sprout.</td>
</tr>
<tr>
<td>July-August</td>
<td>transfer of sprouting seeds in to the nursery (before flooding the field)</td>
<td>Once the grain begins to sprout (in 2-3 days), the seeds are then transplanted to a small plot on the paddy field (normally less then ¼ of a full plot) – the &quot;nursery&quot;. The seeds are left for about a month.</td>
</tr>
<tr>
<td>October</td>
<td>transplanting the rice seedlings onto the field, flooding the field</td>
<td>Transplanting takes 1 month and requires 3 – 4 persons per acre (1 plot). After transplanting is done, the fields are flooded and irrigation is controlled/monitored closely throughout the course of the growth period before harvesting.</td>
</tr>
</tbody>
</table>
November - December: Rainy season, pest control, controlled irrigation, tourist visits. Villagers stay back to monitor the growth of their rice fields. Precautions are taken against diseases and pests. At this time, tourists would visit the longhouse to see the lush green fields/plots.

January - February: Harvesting. January-February is said to be the optimum time to harvest the paddy. Any later than this, and most of the grain would have fallen out of its husk.

March - May: Break/Holiday, Sale of rice. Farmers/villagers normally take (3-4 months) break and visit friends and families in the cities. Some use this time to sell their rice in the town.

Source: Field Collection (2013)

Interviewees reported that the yield from traditional rice cultivation was about 300 kg, with an average of 8.57 kg harvested per household. Out of the 300 kg, 205 kg was reported to be used by the family and for gifts, while only 55 kg were harvested for sale.

When asked how much rice they had sold in the previous year, only 11% of household respondents replied that they had managed to sell at least 10 kg. Only 3% (1 household) of the participants sold 15 kg or more. Most of the remaining rice was kept for self-consumption and also as gifts (it is common in Kelabit culture to provide bags of rice to relatives). Some was stored for use in a future ceremony or festival (e.g. an Irau or name-changing ceremony).

Table 11. Yield Produced from Traditional Rice Cultivation

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Sum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Harvest (Kg/Season)</strong></td>
<td>35</td>
<td>0</td>
<td>60</td>
<td>300</td>
<td>8.57</td>
<td>11.939</td>
</tr>
<tr>
<td><strong>Total Harvest For Family/Gifts (Kg/Season)</strong></td>
<td>35</td>
<td>0</td>
<td>20</td>
<td>205</td>
<td>5.86</td>
<td>6.165</td>
</tr>
<tr>
<td><strong>Total Harvest For Sale (Kg/Season)</strong></td>
<td>35</td>
<td>0</td>
<td>15</td>
<td>55</td>
<td>1.57</td>
<td>3.980</td>
</tr>
</tbody>
</table>

Note: Size of land held by each household varies, however, the yield per acre is an average of yield produced by N=35.
Bario rice (or *Padi Adan*) has always been considered as a luxury grain, and is sold in town at high prices. During the author’s interviews, participants told him that Bario rice sold for RM4 - RM5/kg in the 1990s and RM7 - RM8/kg in the 2000s. Today, Bario rice is not easily available, and could sell for from RM13 - RM20/kg.

In the past, according to Janowski (1991: 103), Bario rice represented the "major means, which the Kelabit of the highlands have to acquire money and such sale, and the consequent accumulation of cash, is prestigious." The latter is still true. However, from the author’s survey, most of the Kelabit community (living in Bario) do not now rely on the sales of rice as their main income. It is, instead, apparent that the chief motive for acquiring plots of paddy fields and maintaining agricultural practices has to do with prestige and maintaining land ownership (see Chapter 2). The Kelabit people believe that it is prestigious for them to own paddy fields. Having a full field during the harvest season is a sign that you can afford to maintain your fields, and lavish growth shows that you have the means to continue growing rice - basically showing that you are rich. Janowski (1988) explains that the ability to provide a rice meal for members of other “hearth-groups” is associated with dignity and pride.

**Attitudes towards the Mechanization Project**

At the time of the author’s interviews, all of the interviewees had agreed to sign with Ceria Bario (and, according to the company, all have now done so). When asked if they thought that there would be any negative consequences from the project, all of the interviewees raised similar issues.
Upside:

All interviewees agreed that there was a need for implementation of this project, mainly to address labour shortages, irrigation issues and land abandonment. Interviewees pointed out that with the introduction of mechanization, there was a need to eventually develop larger fields and introduce more technology for general transportation and for bringing the product to the marketplace.

Because labour is the main issue leading to land abandonment, interviewees believed that the introduction of this project could alleviate that concern. Machinery will replace the labour shortage, and cut down the time of planting, harvesting, milling and processing, provide individual water outlets to irrigate each individual field and also revive abandoned rice fields.

Interviewees also indicated that consumers would gain from this project. Because there was a shortage every year and the harvest has been decreasing each year, the price of Bario rice has skyrocketed. Most Kelabit, even in the city, cannot afford to eat Bario rice. Most local farmers the author interviewed would not buy or consume a lot of Bario rice (as they would have in the past). Instead they would sell the Bario rice or keep it for gift giving, and buy rice subsidized by the government from the city. The government subsidy, intended to help the rural poor, did not apply to Bario rice, which has always been seen as a product cultivated for prestige rather than for daily subsistence (Janowski, 1988)

Downside:

All of the interviewees voiced their concerns that the project would not be done properly, and that failure of implementation would mean that the benefits would be lost while more damage would have been caused to the natural environment than leaving the fields as they are
Respondents cited the hydroelectric project introduced in 2002 (New Straits Times, 2002) which failed as a result of the miscalculation of water flow into the hydro turbine, as an example. One interviewee noted that there are currently power lines around the village but there is no continuous supply of electricity. Today, the power line just sits there rotting while the hydroelectric project only generates enough power to supply 1 longhouse (Bario Asal).

At least half of the interviewees raised concerns over the need to use chemical fertilizers and pesticides. They were concerned that this could harm future sales and marketing of Bario rice, which has always been known (and sold at a very high price) because of the pristine and organic ways of cultivating it. As part of its "good agriculture practice" goals, the mechanization project aimed to reduce the use of pesticides by planting in the main season (in October). Locals believe that if all rice is planted in October, even in plots not in the project area, it will reduce the chance for pests to breed because each field will manage its own pests. As it enters its 5th year, more abandoned fields are being replanted and the use of pesticides has been reduced by spreading the losses due to pests over a larger planted area.

Other concerns, raised by those residing in neighbouring longhouses outside of the project area, covered issues such as maintenance of the machinery, including combine harvesters and machinery for milling rice and irrigation. Experts are needed at all times during the planting and harvest season in case of a mechanical breakdown or other problem. Because this project is
time-limited (and dependent on a grant provided by the government), there were concerns about future sources of funding to maintain the use of modern technology, including the costs of equipment maintenance and repair.

When asked if they would accept the 70:30 contractual agreement between Ceria Bario (of the three choices of arrangement offered), all participants interviewed for this study preferred this option. Because this arrangement is essentially a free service (from clearing, levelling to producing) and has proven to generate a better yield, interviewees felt that they could not afford to leave the project for fear of losing out; many are too old to deal with alternate arrangements (e.g. renting machines).

From his field study, the author found that farmers or landowners in general were more concerned about whether the project would reach their fields (thus removing them from the responsibility of having to look for labour and maintaining the field), and whether the project will be a success, than about the yield produced from mechanization.

**Expat and Key Informant Interview Results**

**Expat Interviews**

The author conducted 37 semi-structured interviews, using a "Rural Urban Migration Questionnaire" (Appendix 2), with Kelabit living outside of Bario who identified themselves with longhouses involved in the project. Twenty-nine face-to-face interviews were conducted in Miri. Most were done on the weekend, after church. The author attended the Borneo Evangelical Mission (BEM) church, which many Kelabit attend for worship. During the church service, the author identified Kelabit that belonged to the longhouses involved in the project, and approached them to ask for their time to answer a few questions. The interviews were conducted
over lunch, tea and dinner after church (n=16). As in Bario, the Kelabit were happy to discuss matters over meals. The interviews were conducted in groups (2-3 at a time) and with individuals. Other interviews in Miri were conducted as a family over dinner on weekdays (n=13).

Six interviews (n=6) were conducted via email/Facebook with Kelabit living overseas (London, United Kingdom; Perth, Australia; Netherlands and Kuala Lumpur), and (n=2) by phone with Kelabit living in other cities in Sarawak (Kuching and Bintulu).

Initially the author interviewed 45 participants. He had to remove 8 interviewees from the data because they insisted that their address was in Bario, and wanted to be interviewed as local farmers rather than as expatriates although they had houses in Miri and were not engaged in farming. These respondents were retired, and returned to Bario at least once a month.

The average age for these interviewees was 54 (oldest: 67; youngest: 37). 20 of the interviewees were female and 17 male. The average year interviewees left Bario was 1976 (earliest 1963; latest 1993). Most of the Kelabit living in urban areas only visited Bario once a year. All of the interviewees had received formal education, from as low as Form 3 to as high as an MBA and a Doctorate.

According to the author’s interviewees in Miri, most of the Kelabit community that resided in that city moved out of the village after their Secondary 3 education, and only returned to visit their parents who continued to stay in the village. Some left after obtaining their primary school (primary 6).
**Reason leaving Bario:**

All of the Kelabit interviewed stated that they had left Bario for further education and to look for a job. Of the 37 interviewed, only 4 women said that they had been fully involved in rice cultivation when they were younger, before they had decided to move out of the village for work. The other 33 did not plant or harvest the fields before they migrated out of the village. Most of those leaving behind their longhouses were focused heavily on education, and had been raised in the expectation that they would move out of the village for a better life. From these interviews, it can be concluded that many traditional rice farmers did not want their children to be farmers. Instead, they wanted their children to excel, and to seek professional jobs.

Most interviewees travelled to the longhouse at least once a year to visit their parents. This was more frequently than the number of times that their parents would fly to Miri to visit them. All of the interviewees claimed that they sent money back to Bario, and every time they visited the longhouses they would spend money to renovate their house, and now and then to expand and upgrade the rooms. Most of the upgrades (e.g. toilets, kitchen and storage space) were contributed by Kelabit living in the city, who would purchase a fridge or bring back motorcycles, grass cutters etc.

When asked if they would encourage their children to return, all of the interviewees said that they would bring their children back to experience the simple life in Bario and to experience their culture and heritage. Those Kelabit that could afford to hold traditional festivities (e.g. an irau or name-changing festival; cf. Janowski, 2004) would invite the entire village, and close friends and relatives from outside the area, to Bario. Two interviewees said that they would encourage their children to work in Bario, but only if there were job opportunities (e.g. business in rice sales, service and construction).
Only ten of the 37 expat interviewees were married to other Kelabit. Of the others, 7 had married members of other indigenous groups in Sarawak (Kadazan, Kayan, Lun Dayeh, Melanau, Bidayuh), 11 were married to spouses of Chinese extraction, 3 were married to members of other Asian peoples (Indian, Indonesian, Malay) and 5 were married to Europeans (British (including Scottish) and Dutch). One was unmarried.

In Malaysia, at birth, a child's race is recorded as being that of the father. Therefore, when the author asked the question "Do your children (if they are raised outside Bario) identify themselves well as Kelabit?" all of the Kelabit women who married outside the Kelabit community said no. Instead, he was told that all their children identify themselves as their father's race (i.e. Chinese, Indian, British). As for the men interviewed, all said yes, and women that marry another Kelabit will also say yes, with great confidence.

**Perception About Mechanization:**

None of the interviewees said they ran any business in Bario. When asked if they were supportive of the idea of the mechanization project in Bario, 90% (33 interviewees) responded that they were fully supportive as long as it would bring back the abandoned fields and not jeopardize the pristine nature of the land. The other 10% (4 interviewees) were not against the project but were uncertain about their decision. These 10% believed that with proper planning mechanization could be a good thing, but feared that the project would run out of funds and face abandonment. Because of labour scarcity they did not believe that the project could move forward without foreign workers, and expressed concern that this will be an issue in the long run. They did not believe that using foreign workers to manage and run their fields was a long-term solution.
When asked if their children's perception of Bario would change with the introduction of mechanization, all of the interviewees said yes. As noted above, only 2 interviewees said they would consider having their children moving back to tap into or try venturing into the Bario rice business, while the others said that they would not. One of the main reasons given for not encouraging their children to move back to Bario was that it was not profitable, and there were greater opportunities out of the highlands. Kelabit that live in the cities feel that their parents worked hard so they could move out to seek a better life, and that moving back would be a retrograde step. Their parents had laboured too much to get out of the highlands, and they did not want their children to face the same problems but to pursue their ambitions in an urban area.

When asked if mechanized rice farming would change the perceptions of tourists, all of the interviewees said that tourist perceptions would not change because of where Bario is located and the fact that the longhouses still exist. As long as it is still surrounded by dense rainforest and longhouses are still maintained, tourists can still enjoy a different experience in Bario. They were optimistic that the development that was taking place in Bario would bring in more tourists, as it contributed to awareness and provided facilities such as proper roads for visitors. While the project would provide extra income to landowners even in the city, interviewees said that it would not change their lifestyle, and that they would be very happy to receive more Bario rice, and to have it at a more affordable price, in future.

**Household Interviews - Additional Results and Field Observations**

**Respondent attitude and gender roles:**

In addition to the rural livelihood questionnaire used for this study, the author was able to ask additional questions to get an idea, from the respondents’ accounts, of the attitude of locals,
their perception, role and involvement in decision-making in the village, and their concerns regarding the mechanization project. He was also able to make field observations on gender roles in the village.

Role in society:

From the additional questions asked during the interviews, the author found that the villagers agreed that men made all the household decisions when it came to financial matters (making purchases and deciding on renovation), whereas women decided on daily needs (clothes, groceries and food). As a community, respondents work together in a gotong royong (mutual help) fashion to make decisions through a JKKK committee or through the headman. According to the standardized law provided by the federal government, each longhouse can have no more then 15 committee members sitting on its JKKK. On average, at the time of the author’s interviews, 10 of the committee members were men and 5 were women.

JKKK committee members were the ones responsible for making decisions in the longhouse and village. The women would normally head their own sub-committee dealing with church, household events and festivals, but the men handled financial and official matters including development decisions and meetings with government officials or non-government representatives. Additionally, the women were usually responsible for keeping the longhouse clean, organizing social events (food-wise), and planning gotong royong sessions to clean up the longhouse area or to plant rice and vegetable gardens.

During the time of the author’s interviews in June and October 2013 the mechanization scheme had just started its land-clearing stage, so there were no yields to compare to traditional harvests. Traditionally interviewees would reap 300kg per acre from a good harvest. The
project goal was to produce 3tonne/ha. During his stay the author had the opportunity to sit with
the villagers (mostly his respondents) during a casual meet, over coffee or dinner, for their
thoughts about the mechanization project.

Most interviewees raised the same concerns about issues that could hinder the project’s
success, from the increasingly aging population to labour shortages, insufficient machinery and
even vandalism. Vandalism was not raised often, but during his visit the author observed several
occasions in which blockades were set up on roads to delay the project, sand was poured into
machinery, and holes were stabbed into irrigation pipes.

The chief challenge that could delay or even derail the project, according to the author’s
respondents, was the lack of people manning the machinery due to the lack of local involvement.
From previous experience, relying on foreign labour had been seen to be unsustainable in the
long run. Lack of involvement could lead to loss of motivation by the contractors, and thus
cause opinion leaders to go against the project or cause problems between neighbouring villages.

On one occasion, residents of a neighbouring longhouse that was not in the project area
claimed that the mechanization project jeopardized their harvest. In the past, Bario rice was
planted without the use of pesticides, which gave them the right to call it organically grown rice.
As the mechanized farms planned to use pesticides and fertilizers on project plots, the villagers
claimed that this would increase the number of pests that would then infest their fields. As more
and more fields have been abandoned, there has been a need to apply pesticides because there
was a lack of "pest sharing" (in the past, when there were more rice fields and everyone planted
at the same time, the pests would not concentrate on a single plot, but would disperse).

Now, with very few rice fields left, the pests were concentrated on the remaining plots, and
those longhouses that were not within the project site (namely, Pa Umor and Pa'ukat) were
concerned that their fields would be affected. Some claimed that their harvest had already been affected during the introduction period.

Despite these concerns, the respondents were nonetheless optimistic about the project. They felt that the upgrades to infrastructure (roads and irrigation works) would make life easier and attract more people to come back, and that the use of machinery would counteract the effect of labour shortages resulting from population decline (however, only one interviewee placed any importance on people returning to the area). Interviewees did not know what to expect, were keen to know what the results of the harvest would be when their plots were fully mechanized, and were hopeful.

Although all of the author’s selected interviewees in the Bario region were involved in the Ceria Bario scheme, the author also talked to four landowners from neighbouring longhouses (Batu Patong, Pa'Dalih, Pa'Ukat and Pa'Umor respectively) that were not within the project boundary but also belonged to the Kelabit tribe and utilized the local clinic, schools, marketplace and airport. According to them, they were optimistic about the introduction of the project and hoped to see it succeed and reach their longhouses at a later stage. They were neither angry nor jealous that their longhouses were not able to be part of the project; instead they were happy to be able to see the outcome before introducing it into their longhouses. They were also pleased that the project was to involve the construction of a commercial milling facility, and that Bario Ceria had offered to buy their harvests at a fixed rate. They will now have a choice to either pay to mill their paddy rice in the facility or to sell their paddy to the company.
Role in rice cultivation:

During the interviews, the interviewees were asked to identify tasks involved in cultivating rice. Because most of them were no longer cultivating rice themselves, their accounts were based on what they could recall. The author adapted Janowski’s (1991) study, carried out in the 1980s, to prompt recollection of the activities that took place in the past. With that, the information in Table 9 was agreed upon by the interviewees. All of the interviewees that were still cultivating rice were women, and the only activity they were still involved in (with the help of hired labourers) was clearing of grass and weeds, soaking rice seeds, and sowing sprouted rice seeds.

All of the interviewees agreed that there was definitely a huge difference between mechanization and traditional rice cultivation techniques. The main difference was the time required for a field to be cleared, planted and harvested. The second significant difference was the number of people required to tend the field. Normally it would take 3-4 people a month to finish planting an acre of paddy. With mechanization this can all be done with 1 – 2 persons, and it takes only a couple of hours to complete 1 hectare. According to both landowners and company representatives interviewed for this study, there are multiple obvious ways in which mechanization has changed the landscape of traditional rice cultivation in areas such as harvesting, yield etc. (see Discussion).

Interviewees noted that, due to the lack of local youth able to participate in the project, the Ceria company had hired mostly foreign workers to work the machinery. Interviewees were not certain what the situation would be after the completion of the pilot project. This could be an issue in the long run, because foreign workers are not permitted to work in the region for too
long. It is not sustainable for the entire project to rely on foreign labour, as this could potentially encourage illegal migration into Malaysia.

Overall, all interviewees agreed and accepted that Bario needed mechanization if it was not to face abandonment of more rice fields, leading to the loss of its famous Bario rice. On the other hand, some interviewees also voiced their concerns about the issue of crossbreeding between rice strains.

Some interviewees reported that because traditional rice fields are cultivated in small plots, some traditional rice farmers (the 60% that were still cultivating before the project was implemented) plant different rice species (e.g. red rice) on the same plot. It is easier to manage smaller fields in order to control these crops and keep them from spreading to the next plot. The interviewees feared that by expanding the rice fields to 1 ha per plot as required by the project, there would either be a risk of crossbreeding or a halt to red rice production in the future.

**Field Observation**

**Gender Involvement**

During the author’s visit in October 2013, the villagers attended a workshop organized by paddy pest and disease experts from the Department of Agriculture, Sarawak. The experts were there to explain and to educate the villagers on ways to identify and control pests, as well as on the management of pests and diseases of paddy in Bario. At the time, Bario rice was faced with Blast disease (DOA, 2013), in which a causal fungus, *Pyricularia /Magnoporthe oryzae*, attacks the rice plants at all stages of growth, producing spindle-shaped lesions on the leaves and causing rot at the panicle neck. The experts set up a presentation in Bario's town hall.
The author’s observed that more women than men were present at the presentation and interested to learn about disease management issues and ways to mitigate them. At first the women sat at the back row of the room, but were persuaded to move forward to fill up the front row. This indicates that, although the women were interested, they left space at the front row for those who were more vocal and would ask questions, or even criticize the experts’ findings or methods.

Male interviewees were outnumbered, but present. The men would sit at the front row of the presentation, representing the community. When the experts opened the floor for questions none of the women spoke up, but the men raised issues concerning the way paddy diseases and pest were handled in the past although the women had most of knowledge (as women play an active role in the field). The men would ask the women to confirm if what they had said was true.

The experts brought the attendees to the field to show them how paddy disease and pest management should be done. The women spoke among themselves on the technicalities of how rice should be planted. The author could hear them chattering in the distance about the infected paddy and insect pests that needed removing and also which weeds were harmful for the plants. But, although the expert was a woman herself, the local women would stand back and allow the men to talk to her. This could have been a cultural issue, as Kelabit women are reputed in general to have a gentle nature.

At one point the men were translating the experts' comments, given in Malay, into Kelabit for the women to understand. The women just smiled and nodded. The author could hear that at the back, some laughed and said "we understand Malay, I don't know what is the point of the translation." But the women just played along and listened.
After the workshop the author had a casual chat with the women, and found that most of them already knew the problem existed and had their own way of dealing with the disease. One of them joked that they are the ones looking after the paddy fields more than the men ever did. They said they internalized the information given to them and would ask the men if they needed to know more about the problem. They also mentioned that the men would advise them after the workshop and provide an informal 'replay' of the workshop after the experts had left. The men did agree with what the women had to say, and acknowledged the fact that women in Bario played a major role in rice cultivation and had a better understanding of what was going on with their plants. The men would ask the women to confirm certain things, such as "Have you seen this bug eating up the grains?"

After the workshop was over, there was a debriefing period with talks about land fragmentation and how the land is divided in the community to limit the spread of diseases and pests. Most that attended the debriefing meeting were men. Of all the women that participated in the presentation and field visit, only one attended. The author noticed that when it comes to decision-making about land and government-implemented exercises the women were not present, even if the decisions were related to rice cultivation. He asked where they had gone, and was told that most of them had gone home to prepare meals, pick up their grandchildren or attend to their farms. When asked why they were not interested in attending the debriefing period they just said, let the men handle the negotiation and tell us what's happening later on.

Ceria Bario acknowledged the fact that the women in the community played an important role in rice cultivation. On one night during the author’s visit in June 2013, they organized a workshop/focus group to explain to the women how the project works and what is involved.
They gave them an opportunity to ask questions. During the time the author took the opportunity to ask these women questions about gender roles in rice cultivation and in the community.

It was interesting to witness the gap between our assumptions and the way the villagers resident in Bario actually live. The author had assumed that the project idea would excite or even overwhelm them. However, when the contractor showcased the combine harvesters, showing how they could harvest and separate the grains from the tiller at the same time, one of the older ladies in the group said she had seen better and bigger machines during her holiday trip with her family overseas. It was quite amusing to see them discuss among one another and compare these contraptions to what they've see in Sabah or West Malaysia. One even compared them to what they had seen in the Netherlands.

**Summary:** In this chapter the author has reported the results of his field research, presenting data on demography and livelihood assets in the Bario community, local attitudes towards the mechanization project, backgrounds and attitudes of expatriate Kelabit, and information from key informant interviews. The chapter presents the attitudes of interviewees towards the mechanization project (both its ‘upside’ and its ‘downside’). Interview data from expatriates provided data on their reasons for leaving Bario, while key informant interviews provided detailed information about the mechanization project and its application. Field observations and interviews provided additional data on gender roles and gender involvement in rice cultivation, and in particular on the role of women in the Bario community.
Chapter 7

Synthesis

Livelihoods in the Bario Community

This chapter provides an analysis of the author’s results using the sustainable livelihood framework, addressing the community’s livelihood through collected asset indices. The chapter also provides the author’s assessment of the livelihood situation within the community, based on the synthesis of his data, and compares his results to those of a similar study carried out a decade earlier. The chapter concludes by summarizing the community’s attitude towards the Bario Rice Project.

The author was able, using the sustainable livelihood approach, to understand the "actual" livelihoods of the Kelabit community in Bario. Participants from the 7 longhouses in Bario were, not surprisingly, very similar in their asset indexes (i.e. physical, natural, financial, social and human capital).

**Physical Capital:** Except for sources of electricity, identified items of physical capital were the same in all longhouses. Although all households have access to electricity, their means of access differ. Bario Asal is the only longhouse that has access to free hydro power, providing a twenty-four hour energy supply that saves the cost of diesel needed to run generators. The other longhouses still rely on solar power and diesel-fed generators. From the author’s observations, electricity is mainly used to start up refrigerators (keeping food chilled for the next day), run washing machines and light homes, especially in the kitchen area where the family spends most of its time. Other uses would be to charge mobile phones and laptop computers. Once in a while they switch on their television (most of the time it would just be playing at the background).
Natural Capital: All seven longhouses identified their own rivers, and all family members own a share of land or rice field (abandoned or cultivated). The only difference among the seven was the size of the field plots, ranging from 0.35 ha to 3.85 ha per household. Smaller landholdings may represent a division among their children of the 2 acres originally belonging to each household. Other reasons for the difference could be sales of land from one family to other. One of the author’s urban interviewees, for example, bought land from a family member to help the family to pay their debts. The exchange, although not recognized by the government (because NCR land cannot be sold), was signed and witnessed by elders and community leaders.

Jiwan et al (2006) found that the rice fields of each household range from 1.3 to 2.2 ha, with a yield ranging from 3 to 4 tons. Abdullah (1998) noted that there were about 440 ha of cultivated rice fields in Bario and its satellite longhouses. It is unclear, however, if these longhouses extended beyond those in the current study area. In 2013, the author was told that the yield was only 300 kg per ha.

Plot size influences future income, as a larger field will yield greater returns in the future. Those who own larger plots may be able to do so for several reasons:

1. They belong to the Bario Asal longhouse, which has no limit to land holding size
2. They are well-off urbanites able to purchase land from family members (in this case, the remittances for the landowner would be higher compared to the others)
3. They do not have a large family and have not had to subdivide their original 2 acres.

Financial Capital: Households in Bario may be classified into two main livelihood strategy groups (i.e. personal business and receiving external funds) on the basis of the relative amounts of income derived from doing business, receiving pensions, and receiving money from children living in cities. Although, according to Skeldon (2005), out-migration from rural areas
should impoverish rural communities, this has not been the case in Bario. Since urban migration of youth began in earnest in the 1970s, it has been the availability of remittances from children that has enabled the residents of Bario to maintain their longhouses, and even to maintain their cultivated land using paid labour.

Remittances from children who have left the area, in fact, can be seen as the "backbone" of the Bario rural economy. The most frequent livelihood strategy was dependence on external income from children (43%), followed by dependence on children providing money in combination with a pension fund (31%) and owning a business (23%). Only 3% relied completely on pension funds.

By contrast, in Negeri Sembilan, a state in Peninsular Malaysia where the local Malay residents have no comparable attachment to the land other than as a source of income, rice fields began to face abandonment in the 1970s due to the high price of rubber. Instead of younger people migrating on their own and sending remittances home, whole families simply abandoned their fields or converted them to other crops. According to Kato (1994:146), "As recently as 1970, 87 percent of the total gazetted sawah (paddy fields) in Negeri Sembilan were actually planted with rice in the main-season; but the figure dropped to 51 percent in 1975 and to 16 percent in 1980. The figure registered a modest recovery to 21 percent in 1985, but the rate of sawah cultivation plunged to a mere 7 percent, or 1,005 hectares, in 1990". Kato concluded that the younger generation of Negeri Sembilan Malays were not interested in agriculture. The Department of Agriculture has since (2014) reported that the total planted area in Negeri Sembilan was 1,986 hectares in 2013. Although this is an increase of about 980 hectares, it is still a depressed figure compared to that from the 1970s (12,818 hectares).
In Bario, the migration of the younger generation also began in the 1970s. However, fields were still maintained by foreign or landless labourers under sharecropping agreements or through payment. The ability to pay for labour through remittances, as well as sophisticated cross-border marriage arrangements between locals and Indonesians, allowed for at least 60% of the rice fields being cultivated in 2011. Future studies should examine the amount of remittances flowing into the Bario local economy and the contribution of cross-border marriages.

The livelihood concept takes an open-ended view of the combination of assets and activities that constitute a viable livelihood strategy for a rural family. Remittances and transfers are always important, as are wages and salaries in activities that have little or nothing to do with agricultural linkages. Empirical research suggests that farming activities, on average, tend to correspond to only 40-60% of the livelihood 'package' put together by rural households in South Asia and sub-Saharan Africa (Reardon, 1997). Rural growth linkages do not explain the patterns of activity and income sources that correspond to the non-farm components of rural livelihood (Ellis and Biggs 2001).

No household in Bario had a livelihood based primarily on cropping. There were no statistical differences between households that depended on receiving income from children, a pension fund, or from children and a pension fund combined with their own business. Interviewees from different households had equal opportunities to make purchases and shared similar financial capital. As the physical capital of the people in Bario seemed to be the same, there was no apparent group that was poorer or more marginalized than any other.

Comparing the relative assets from different livelihood activities does not reveal much about the resilience of these strategies (e.g., a household whose members are wholly dependent on pension funds and children providing them with money may be well off by local standards,
but its lack of diversification across sectors makes it vulnerable to sudden changes in their children's employment status.)

Employment in Bario is currently not an issue, because most of the current population is retired. Residents depend on external income from remittances from their children and pension funds (barter is still used for some goods), and no household in any of the 7 longhouses derived a great proportion of their income from rice farming or livestock.

None of the author’s interviewees knew anyone in Bario who actually cultivated Bario rice for a living, although he was told that those living in more distant longhouses (e.g. Pa' Lungan and Pa' Dalih) sell rice seeds to the community living in Bario. Only 23% (n=8) of respondents received no money from external sources. These respondents derived their income from running local businesses (i.e. a coffee shop or a grocery store), contract work (i.e. building roads and bridges), or running a homestay (converting rooms in their houses to accommodate tourists). Selling agricultural products such as rice becomes a hobby, and almost a luxury.

**Human Capital (knowledge, skills and health):** The level of human capital differed little among the 7 longhouses. The population in Bario was primarily composed of seniors (71% of household interviewees were above age 60). The only key differences in human capital were in the proportion of retirees (deriving an income from pensions), adults (i.e. housewives, or labourers and business owners) and children present and absent, including school-age (23%) and working children/expat (74%) – 3% of households had no children – and the mean levels of education per household. Households with school-age children experience a temporary reduction in financial/human capital. From a livelihood perspective, there are negative and positive implications of a large household. According to Ellis (1998), large households mean a greater household labour pool, increasing the scope for diversifying livelihood activities. However,
larger household sizes mean a greater number of dependents, with limited income having to be shared by a greater number of unemployed adults and children. Occupation and education also plays a major role in determining the human capital of the individual household. In Bario retirees have the most education, followed by business owners/ contractors, housewives and labourers.

**Social Capital:** The author’s interviews revealed that social capital in Bario is associated with participation and membership in social organizations such the Development and Security Committee (JKKK) or Rurum Kelabit (Kelabit Association), or being involved in church affairs. Working together, and associating oneself with a formal association or organization such as a committee, boosts social capital in the community. Social status strengthens social capital in "traditional" social practices that involve familial values. For example, being a son or daughter of a headman, or belonging within his extended family network, enhances social capital and allows one to be able to speak up in church, at festivals or during meals, and to make more community decisions. Although it is an advantage to be part of, or related to, a family that has or once had leadership ties, the largest amount of social capital in Bario today is exhibited by Christian church groups. Status and prestige remain important in Bario, despite efforts to reduce their importance when Christianity was first established in the region (Janowski, 2005).

Jiwan et al. (2006) conducted a study on the same 7 longhouses, with comparable results to those found in the present study. The population residing in Bario was observed to comprise aging parents (senior citizens) without grown-up children and young parents with children still attending primary and secondary school. There were very few people in productive age groups (18 – 40 years old) due to limited attractive economic activities in Bario. The three most common occupations of households were farmers (55 %), pensioners (21 %) and government
servants (7%). Farmers earned below RM500, pensioners between RM501-RM600 and government servants between RM601-RM1000 per month. Jiwan's study showed that most farming in the area was subsistence in nature, as RM500 a month is considered below the poverty line in Sarawak.

Table 12. Comparing Bario Demographics Between Studies in 2006 and 2013

<table>
<thead>
<tr>
<th></th>
<th>Jiwan et al. (2006)</th>
<th>Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number interviewed</td>
<td>29</td>
<td>35 (+2 from outlier longhouses)</td>
</tr>
<tr>
<td>Percentage of households interviewed</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Sex ratio of respondents (m/f)</td>
<td>69/31</td>
<td>54-46</td>
</tr>
<tr>
<td>Age range of respondents</td>
<td>23-80</td>
<td>48-81</td>
</tr>
<tr>
<td>Average age of respondents</td>
<td>54</td>
<td>63</td>
</tr>
</tbody>
</table>

Source: Jiwan et al. (2006) and this study

Perhaps it is the "informal income" from remittances that truly supports rural development in Bario. Researchers and planners should pay more attention to the flow of remittances into local rural economies, and its influence on rural development.

Community Attitudes Towards the Bario Rice Project

Contrary to expectations, the Kelabit in Bario are not poverty-stricken and do not rely on rice as their major source of income. To that extent, they are not typical of many of the rural communities for whom the introduction of mechanization has had a serious economic and cultural impact. Most farmers or landowners in the Bario region are retired "hobby planters" or leisure farmers, very much involved in community development and church activities, and living life in a simple manner. They mainly rely on external income (pensions, or remittances from children who work in the cities).
Because of this, the impacts of the project on local lifestyles have been indirect (though this may also be because, at the time of the author’s visit, the project was still in its introductory phase). It seemed to the author that residents are just happy that things are being upgraded.

The problem is that the lifestyle in Bario is not sustainable in the long run, and the project may do little to change that. With its aim of promoting sustainable development, the Malaysian government hoped to jump-start the Bario Rice Development Project by introducing Ceria Bario to run it during the 5-year pilot phase, and later passing the ownership of the project to the Kelabit. The company, though, has found it challenging to persuade local Kelabit to look after their own fields after the project ends, even with the heavy workload being taken over by the mechanization process.

The main challenge faced by the company in moving the project forward has been, according to the author’s interview with Ceria director Patrick Song, to "try to convince the local young people in Bario to be more participative in the Bario rice industry." It was intended that, with proper training during this 5-year period, the younger generation could learn and take over. Ceria Bario did hire four Kelabit youth, offering them mentorship and guidance with the aim of teaching them to run the project from a managerial position. The youth did not show much interest, probably because the project was still at the implementation stage and groundwork was not done, and, according to the project contractor, withdrew prematurely from the project.

Bario Ceria's original objective was to provide mechanization services only, with day-to-day farm maintenance such as weeding, adding water (just turning a tap) or letting water out to be done by the farmers. Even these basic jobs have now been relegated to Bario Ceria as part of the contractual arrangement with owners, but it is a strain on the company's resources to bring in workers from the lowlands, and foreign workers, to look after the fields. To date, there have been
between 5-10 Penan, 7 Cambodians and 5 Indonesians working with the company. Only 3 – 6 Kelabit have been occasionally involved in one way or another in the mechanized harvesting. Today, as the project comes to its end, instead of persuading more farmers to sign up the company is encouraging farmers who have the ability to look after their own farms to exit the program and to use the machinery on a rental or per-service basis.

During the author’s visit in 2013, when the project was still in the initial stages of implementation, his interviewees seemed sceptical about its success but remained optimistic. For the most part, when asked about their thoughts about how their life would change with mechanization put in place, their response was that they were not sure. A major motive for the Kelabit in reviving their fields and selling padi adan, even before the commencement of the mechanization project, has not necessarily been to increase income, but rather to maintain prestige and ownership of the land (Janowski, 1988). Similarly, the Iban, the largest indigenous group in Sarawak, has been active in recent years in seeking rights for land used for purposes other than rice-growing (see Cramb 2007). So far, there is no indication that anyone has chosen to exit the mechanization project (by refusing to convert their fields for combine harvester use). Although they do want the project to proceed on their land, Bario residents' interest in the rice project appears to be connected more to a desire to increase their social capital rather than to increase their income or financial capital. Evidence for this conclusion comes from the fact that even before the adoption of mechanization, landowners in Bario able to do so used remittance money from their children to hire labourers to work their rice fields despite the fact that the fields themselves were not producing income. The goal was to continue to cultivate rice for social reasons and to maintain land tenure, not to make a profit from cultivation. Mechanization may replace these workers but provide the same social function, especially as control of lands passes
from aging residents able to supervise their workers to their urban children, who may prefer acting as absentee landholders to returning to the region to take an active part in cultivation.

A few interviewees raised concerns about land rights, and to whom the land belonged after the company opened up the bunds and began cultivating (because they were not the ones cultivating it). Some locals planted (before the project) banana trees and pineapple, or even let their water buffalos graze the field, purely to maintain ownership of the land. Others planted trees on the edge of their land as "markers" or "pegs" and even, in some instances, fenced their portion of the land to establish their "claims". The rest, though, were optimistic that their community/political leaders, or their own children, would have looked over the project terms and would have warned them if the outcome was likely to be bad.

Although the ownership issue still remains unclear and inconsistent, for peace of mind and to make it easier for the production and distribution of the harvest the landowners came with a mutual agreement to "officially" measure their land and write their names and acreage on the project map. A group leader was identified or volunteered, and he/she was responsible for the map of the longhouse fields and name the plot according to landowner. Although this has no legislative status, there was a Memorandum of Understanding (MoU) signed whereby the private company and the locals try to mutually commit to the Bario rice development project.

The migratory pattern post-introduction has not been encouraging. Few people are likely to move back after settling outside of the village. The younger generation is exiting the region to pursue further education, and it is apparent from the rural-urban migration interviews that those who left in the 1970s for further education and job opportunities subsequently settled in the city, only returning to Bario for festive seasons and to bring their children to experience the longhouse. Since the inception of the project, only 4 to 5 people, all retirees, seem to be moving
back into the village – not to be farmers, but to build their retirement homes. It is the modern facilities and infrastructure now available in Bario, rather than the project, that local interviewees believe is encouraging retirees to move back.

**Summary:** The synthesis of the collected data in terms of asset indices presented in this chapter suggests that the Bario community is not typical of poor rural communities elsewhere. Landowners in the community (almost entirely the elderly) are relatively well off, depend mostly on remittances from their migrant children for income, and appear more concerned about the social status and land rights rice cultivation provides than on the income it generates. Because of this, their attitudes towards the mechanization project are based less on economic considerations but on the impact that the project could have on their social status, including their interest in retaining title to traditional lands. In the final chapter the author presents his conclusions, and provides recommendations for future action.
Chapter 8

Conclusions and Recommendations

The Sustainable Livelihood Framework and this Study

Rural development was the core focus of Malaysian government policy from Independence through the 1990s, with a lesser emphasis in the present century. Its rural development policies have focused on external technologies and national goals. Although changes in global production networks and increased urbanization (contributing to rural-urban migration) have changed the character of rural areas, Malaysia continues to focus on poverty reduction strategies whose success is measured in terms of economic impact, despite recent studies that have shown that social and environmental impacts are equally if not more important for local government or policy makers. In the case of Bario, the economic impact of the mechanization project may be secondary, in the eyes of local participants, to social and status concerns, although economic impacts may be important in any strategy designed to reduce urban migration and restore vitality to the community.

There is therefore a need to identify the poverty level, current economic standing and way of life of a rural community before any new agricultural policy is introduced. If a village is poor due to accessibility issues, the government should address these issues first rather than depending on a cookie cutter strategy to rectify/revive abandoned fields in hopes that the economy of the village will flourish as a result. Planners, developers and decision-makers must understand the everyday realities that people face. In the absence of an understanding of these realities, interventions have a high probability of being unsuccessful or even damaging (Chambers, 1983; Anderson and Grove, 1987; Chambers, 1987; Goodwin et al., 1998; Shepherd, 1998; World Bank, 2002).
Though the Kelabit community in Bario has made progress, both in level of education and the acquisition of professional jobs in urban areas, it still faces struggles in preserving its identity, culture, land and resources. Although there isn't much local economy in the region, investment funds for rural development keep coming in (e.g. green energy projects, road improvement, Bario rice development). The chief reasons for this may be political, through familial linkages with authoritative figures that can influence investment decisions and link them to government policy initiatives.

FAO (2005: Foreword) warns that "efforts focused on technology often ignore rural realities including the heterogeneity of rural households, their diverse livelihood strategies which change over time in response to new opportunities, as well as the demands and constraints of different phases of their life cycles." Although the Malaysian government made concrete efforts to assist the development of Bario rice and to improve the livelihood of the Kelabit community in Bario, offering assistance to promote rice farming in terms of government subsidies (especially the free fertilizer subsidy), lack of capital and labour remains part of the reason that the neglect of rice lands has accelerated.

The introduction of mechanization in Bario has nonetheless not only revived the abandoned fields, it has produced more known positive than negative (local) economic impacts. Capital injected into the village through the Bario Rice Development Project not only provided machinery to tackle the labour issue affecting rice production, but also brought in the construction of an improved internal road system, irrigation work, and possibly an improved electricity supply (by utilizing the irrigation dams to generate energy using a micro hydroelectric generator).
The socio-economic status of landowners should increase through the reutilization or revival of their abandoned fields. According to the project director, the Bario Ceria key performance index is to produce 3 tonnes per hectare, with an expected minimum gross earnings of \((RM3.60 \times 3000kg) = RM10,800\) annually per hectare of land owned. Under the 70:30 share arrangement, if a landowner owns 1ha of land, he or she will get 30% (900kg) of the harvest, in addition to other means of getting money (i.e. remittances, pension, hunting etc). Currently (2014), as confirmed by the Department of Agriculture and PEMANDU, the official productivity figure of grain produced in a year, supplied by Ceria and confirmed by the Department of Agriculture, is 3.01 tonnes per hectare, as compared to traditional production of 0.8 tonnes per hectare.

An increase in annual production of Bario rice will make it more available in the market and more affordable for both commercial and local consumption. The introduction process has encouraged families that had migrated out of the village to visit and, in some cases, to consider returning to the area, at least after retirement. There is a lack of local job opportunities in Bario that would attract members of the younger generation to move back to the region. Greater access to local employment opportunities may increase and sustain the local population in Bario in the long run. However, most of those who have moved out have married into different cultural or ethnic groups, and may not move back even if economic opportunities in the region improved. Access (road and air) to Bario is limited, and therefore reaching the market is too expensive for entrepreneurs to start anything.

Ecotourism is on the rise, stimulated in part by increased harvest activities (visitors often plan trips to the area around harvest time), increasing awareness of this isolated village, and advertising accompanying the sales of Bario rice in supermarkets both domestically and
internationally (i.e. in Singapore and Australia). Jiwan et al. (2006: 1) had already suggested that eco-tourism would be well received in Bario. The type of development given the highest ranking by his interviewees was related to conservation (60%), followed by eco-tourism, agriculture and research. This would also explain why the local community preferred development of eco-tourism to agriculture. With proper planning, Bario could create a retreat resort for tourists and use that as an external income to boost their financial capital and contribute towards the local economy, potentially attracting more youth back into the village (either for visits or to work in the industry).

Livelihood diversity is critical to longer-term security of livelihoods (Scoones, 1998; Ellis, 2000b). Income for all 7 longhouses did not seem to be diversified, as villagers rely heavily on remittances and pension funds. With modernized farming, their fields could provide extra income through agriculture by reducing the cost of hiring labour.

The Future

As modernization is introduced into rural community farming practices world-wide, what role are rural communities going to play in its adoption in the future? In this study, the impact of mechanization on the livelihood of the local community was not very significant. Most of the villagers still maintain their way of life and enjoy the benefits provided by the government, their pension and remittances from their children. Most of their income and subsistence (economic drivers) are acquired from non-farming activities, and there is no incentive for them to continue or pursue laborious rice farming activities. Planning is still required to achieve selective mechanization and popularization of machinery among the farmers. Involvement and training
workshops for the farmers is important so that the farmers could learn to use the machinery in the most effective manner.

Rural developers must address the historical context of a community, especially on issues such as land ownership and plot size, when promoting adoption of mechanization/modernization of a traditional practice. The following lessons can be learned from the experience in Bario:

1. Although the project ran on schedule, some problems could have been avoided with proper training for the entire community, both those within the project boundary and around, rather than for participants only. Although this would have been costly, it would have allowed for better cooperation within the community. Concerns such as fears about a land grab, about commercialization degrading the quality of Bario rice, or simply not knowing what was going on, could have been addressed a workshop for both men and women before the project was implemented.

2. There should have been an initial study on the socio-economics of the population to understand its needs, and also to understand issues around land ownership.

3. A baseline report should have been prepared that could be used for potential expansion; the present study could be used as a baseline for future study of how the community population and livelihood (asset index) change in the future.

4. The interest of farmers or landowners (or even youth) in existing paddy schemes could have been enhanced by providing them with a share in the whole process of rice production. One way to do this in future would be to help farmers/landowners (both living in Bario or even those living in towns) to be self sufficient in the industry - by setting up a corporation (a small/medium enterprise that manages sizeable fields)
or by handing over the existing company "Bario Ceria" (entire operations) to the members of the community.

The implementers of the Bario Rice Development Project should also have acknowledged the crucial importance of understanding the Kelabit's actual needs. This could be achieved through the inclusion of "local institutions such as farmers' organizations, cooperatives, chambers of agriculture and political parties, through which rural people bring their needs to attention of decision-makers, through dialogue or lobbying" (FAO, 2005: Foreword). Although there were efforts to include community organizations - the Rurum Kelabit, for example, was a signatory to the memorandum of understanding with Ceria Bario - the real decision-makers were mainly exclusive members of society living in urban areas.

Bario has favourable natural conditions, with fertile soils and sufficient irrigation supply for cultivating rice. Further sustainable development of the rice industry in Bario potentially offers vast opportunities, from agriculture, transportation, and construction to tourism, the development of cooperatives or the creation of local entrepreneurs (by encouraging the local community to gain ownership in Ceria Bario Company), farmer-linked businesses and market development. The locals (and especially their children if most of them are retired) should work together with Ceria Bario, and learn from it.

The aim should be to reverse migration out of the region by prioritizing employment creation, in order as to reduce the vulnerability resulting from a skewed dependence on welfare (government projects and subsidies) and external income (from pension funds and working children).
Hence, a future plan to create jobs and improve access routes to the region is important to sustain the livelihood of the local population in Bario and the longhouses surrounding it. Although introducing mechanized farming in Bario may appear a backward method of increasing the local population, as it reduces the number of workers needed, doing so may attract younger professionals to the idea of starting up a business in Bario.

**Final Thoughts**

The author came back into Bario thinking that he would find a poverty-stricken area divided by disputes among the locals about the introduction of commercial farming practices. Instead, the region, like many other abandoned longhouses or towns, faces a different sort of issue: not the shortage of rice, as the author initially expected, but insufficient opportunities and lack of the planning needed to retain a viable population (especially among the younger generation).

The Bario Rice Development Project is transforming the rural sector from a traditional farming community to a commercial-oriented one through improvement of infrastructure, enlargement of paddy field parcels, reorganization of the size and shape of communal lots, subsidies, and the creation of rice estate. This requires a lot of societal cooperation and acceptance to allow it to continue to work. Adams (2002) suggests that in the past studies and policies regarded the rural economies of developing countries as being synonymous with agriculture, and neglected non-agricultural work and other socio-economic activities that often extended beyond the longhouse boundary. While policy makers (Mosse et al., 2002) have tried in vain to restrain rural-to-urban migration by promoting rural development, Bounthong et al., (2004) suggests that the growing market economy has brought about the delocalization of livelihoods, especially in rural areas.
The Bario Rice development project is in line with national plans to stimulate the economy in rural areas as a means to stop youths from migrating to cities. As more youth leave the rural areas, elders are left behind to tend large plantations (rubber and oil palm), including labour intensive paddy fields. The average age of the population in Bario is 70.

Although at the initial stage (in 1997) rural communities tended to be isolated in their longhouses, by 2007 foreign workers (from Indonesia) dominated the agriculture industry (especially in the booming oil palm industry). Hiring foreign workers allows rural communities to focus their attention on entrepreneurship (selling produce or setting up a 'homestay' in their longhouses). Therefore, although there may be a general trend of rural decline, some rural areas are more successful and dynamic than others.

A project such as the Bario Rice Development Project can provide an opportunity for young entrepreneurs to generate income from the village while improving the ability of landholders to retain traditional title to their lands. With its rich natural resources and cultural values, the Kelabibit community should strive to re-develop its fields (whether through traditional practices or not) so that the region will remain habitable, and title under the NCR land system will be retained, for generations to come.
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Appendices

Appendix 1. Rural Livelihood Questionnaire

**Questionnaire –
Livelihoods of Rural Households in Bario, Sarawak, Malaysia
Interview via questionnaire**

Attention: Please be informed that all information collected via this questionnaire will be kept confidential and will only be used for the purpose of my thesis ONLY. Participants are given the choice NOT to answer all the questions.

<table>
<thead>
<tr>
<th>Family Unit &amp; Respondent Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respondent Profile</strong></td>
</tr>
<tr>
<td>Respondent name:</td>
</tr>
<tr>
<td>Occupation:</td>
</tr>
<tr>
<td>Education:</td>
</tr>
<tr>
<td>Name of Head of family unit: ___</td>
</tr>
</tbody>
</table>

1. List family members by drawing a genealogical diagram:

2. Include all family members’ info at the back of this questionnaire*:

   (i) Name: 
   (ii) Age 
   (iii) Marital status 
   (iv) Working/Schooling 
   (v) Live in village or city: 
   (vi) Reason of leaving village and when: 
   (vii) Level of education: 
   (viii) Why and when did each of them (if any) leave the village? 
   (ix) Do they send back money, food or consumer goods to the family on a regular basis? Please elaborate and estimate amount.

Form of participation in the Ceria Bario Scheme: (circle one)

   a. 70:30
   b. Pay for full mechanization services
   c. Pay for use of certain machinery
<table>
<thead>
<tr>
<th>Capital type</th>
<th>Asset index categories</th>
<th>Index components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical capital</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>Roof material:</td>
<td>Walls material:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Floor materials:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Source of electric:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toilet types:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kitchen type:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water source:</td>
</tr>
<tr>
<td></td>
<td>Consumer durables</td>
<td>Television:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radio:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Washing Machine:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bicycle:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motorcycle:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Handphones:</td>
</tr>
<tr>
<td><strong>Natural capital</strong></td>
<td>Land</td>
<td>Land acreage:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location of land:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cultivated or Uncultivated:</td>
</tr>
<tr>
<td></td>
<td>Cultivated land</td>
<td>Type of crops:</td>
</tr>
<tr>
<td></td>
<td>Livestock farm land</td>
<td>Livestock:</td>
</tr>
<tr>
<td><strong>Financial/Productive capital</strong></td>
<td></td>
<td>Type of employment:</td>
</tr>
<tr>
<td></td>
<td>Labour security</td>
<td>Schooling children:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working children:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hired labourers:</td>
</tr>
<tr>
<td></td>
<td>Productive durables</td>
<td>Home types (e.g. homestay):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Own businesses:</td>
</tr>
<tr>
<td></td>
<td>Transfer/rental income</td>
<td>Rental incomes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Land under Ceria’s 70:30 Scheme:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remittances (from pension/children):</td>
</tr>
<tr>
<td><strong>Human capital</strong></td>
<td>Education</td>
<td>Level of education:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Literacy:</td>
</tr>
<tr>
<td><strong>Social capital</strong></td>
<td>Household</td>
<td>Head of household:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision making (task distribution):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Hidden” female-headed households:</td>
</tr>
<tr>
<td></td>
<td>Community</td>
<td>Part of the Development and Security Committee (JKKK):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very Much</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Somewhat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AVERAGE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not Involved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Part of the Rurum Kelabit:</td>
</tr>
</tbody>
</table>
Note: ** Moser and Felton, 2007 & Moser, 2006

<table>
<thead>
<tr>
<th>Involvement in church:</th>
<th>Very Much</th>
<th>Somewhat</th>
<th>Average</th>
<th>Not Involved</th>
</tr>
</thead>
</table>

Longhouse Profile

Name of Headman: ______________________
Population of the longhouse/village: __________
No. of people living full time in the longhouse: ______
No. of men: ___ No. of actively earning/working men: ______
No. of women: ___ No. of actively earning/working women: ______
No. of children (0-17 years old): _______
No. of children attending school: _______
Number of people who regularly/yearly come back to longhouse/village: ______
Number of people who hardly ever come back to the longhouse/village: _______

Family Background

Why and when did each of them (if any) leave the village? Do you buy rice for the family consumption? If yes, how often and how many kgs each time?

Farm Characteristics and Land Tenure

1) If you are a land owner,
   a) How much land do you own? ______ acres
   b) How many of plots of land do you own? ______
   c) What is the average size of each plot? ______
   d) How did you acquire most of the land? Inherited/ bought/ Other, please specify
   e) Specify
   f) Where is the land located? (Please mark on the project map)
      i. Land size within the project boundary (with map to aid): ______
      ii. Land size outside of the Ceria Barlo project boundary: ______
      iii. Land used for wet paddy: ______
iv. Land used for other purposes: 

v. Paddy field that adopted/received mechanization*: 

vi. Paddy field that still practices traditional rice cultivation: (State year, since )

f) What is the percent (%) or acreage of your land used for rice cultivation? % or acres.
   i. How much of your land is farmed by yourself/family members? : acres.
   ii. How much of your land is farmed by paid labour? : acres.

g) What is the percent (%) or acreage of your land used for other farming activities? % or acres.
   i. How much of your land is farmed by yourself/family members? : acres.
   ii. How much of your land is farmed by paid labour? : acres.

h) What is the percent (%) or acreage of your land used for rearing livestock? % or acres.
   i. How much of your livestock is managed by yourself/family members? : acres.
   ii. How much of livestock is managed by paid labour? : acres.

j) How much of your land is tenanted to other farmers? % or acres

k) How much of the land is farmed using mechanization by Ceria? % or acres

l) How much of the land is farmed using traditional methods? % or acres

**If you DON’T OWN LAND and you do farming,**

a) Who owns this land? 

b) Under what arrangement do you use this land? leased/borrowed/other, please specify 

c) How long have you farmed on this land? 

d) What is the average size of each plot? 

e) Where is the land located? (Please mark on the project map)
   i. Land size within the project boundary (with map to aid): 
   ii. Land size outside of the Ceria Bario project boundary: 
   iii. Use land for wet paddy: 
   iv. Use land for other use: 
   v. Paddy field that adopted/receive mechanization*: 
   vi. Paddy field that is still practices traditional rice cultivation: (State year, since )
### Expenditure for 2012

<table>
<thead>
<tr>
<th>What are your main cash needs?</th>
<th>Rank importance (1 - 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please specify estimated amount RM per month for each item.</td>
<td></td>
</tr>
</tbody>
</table>

| Daily food for the family |  |  |
| Utilities e.g electricity, water |  |  |
| School fees |  |  |
| Medical bills |  |  |
| Non-food e.g. clothing, toiletries, household goods |  |  |
| Transport e.g. petrol, airfare |  |  |
| Loan repayment |  |  |
| Gifts, donations |  |  |
| Farming equipment (including seeds, fertilizers and pesticides purchase) |  |  |
| Other, please specify: __________ |  |  |

### Annual Harvest

<table>
<thead>
<tr>
<th>Rice cultivation through Traditional Practice</th>
<th>Rice cultivation through Ceria Bario Mechanization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total kg rice harvested per acre of land: ___kg</td>
<td>Total kg rice harvested per acre of land: ___kg</td>
</tr>
<tr>
<td>Total kg rice harvested per season: ___ kg</td>
<td>Total kg rice harvested per season: ___ kg</td>
</tr>
<tr>
<td>Total kg rice harvested for the family: ___ kg</td>
<td>Total kg rice harvested for the family: ___ kg</td>
</tr>
<tr>
<td>Total kg rice harvested for relatives: ___ kg</td>
<td>Total kg rice harvested for relatives: ___ kg</td>
</tr>
<tr>
<td>Total kg rice harvested for sale? ___ kg</td>
<td>Total kg rice harvested for sale? ___ kg</td>
</tr>
</tbody>
</table>

### Additional Questions (1) …

1. Are you a member of any community development committee? If Yes, please specify your position
   ________________________________________________________________

2. How many of your family members are still involved in rice cultivation?
   i. Who in your family makes most of the decisions relating to rice farming?
      ________________________________________________________________
   
   ii. Who in your family is actively involved in the day-to-day activity relating to rice farming?
      ______________________

   iii. Has your family ever employed local workers to help in the rice farming? If Yes, at which stage of the farming cycle?
      ________________________________________________________________

3. Is your farm participating in the Ceria scheme?
If Yes,

i. Since what year? ___________________.

ii. How did you first hear about the Ceria scheme? ___________________________________________

iii. What are the criteria that qualify you to participate? ________________________________________

iv. What are your expectations from your participation in the scheme in the first 2 years? 5 years? Beyond? ____________________________________________________________

v. Will you encourage other members of the community to participate in the scheme? ________________

vi. Have you ever been discouraged by anybody from participating in the scheme? (Yes/No) 

vii. If Yes, what were the reasons given to you? ______________________________________________

viii. If you have to name one factor/reason that will hinder the success of the scheme, what do you think that one factor would be? ____________________________________________

ix. If you have to name one factor/reason that will contribute significantly to the success and sustainability of the scheme, what do you think that factor/reason would be? _________________________________________

tax. Since participating in the Ceria/mechanization scheme, have the yields from your rice field/plot of land has increased or decreased when compared to the yields when traditional farming method was used? If yields have increased or decreased, by how much per acre? ____________________________

xi. What do you think is the biggest challenge faced by the Ceria/mechanization scheme? ______________

4. If you are not involved in the Ceria Bario Scheme,

i. Please specify your reasons for not participating. ____________________________________________

ii. Will your family consider participating in future? 

   If Yes, what would be the reason(s)? ________________________________________________________

   If No, what would be the reason(s)? ________________________________________________________

5. If you have stopped cultivating rice fields, please specify the year and reason. __________________

6. Will you consider returning to the area or planting rice again in the near future? 

   If not, why?

Additional questions (2) … Gender Roles
1. In your opinion, do men or women usually make decisions for the family? ________________

2. In your opinion, do men or women usually make decisions for the village?
   ______________________

3. In the JKKK/Village Development and Security Committee, how many of the committee members are women and how many are men? (Women: _____ and Men: _____)

4. In your opinion, what active committee roles are usually carried out by the women in your village?
   ______________________

5. In your opinion, what active committee roles are carried out by men in your village?
   ______________________

**Additional Questions (3) … Possessions**

Indicate whether the household possesses the following items and if so, how many.

<table>
<thead>
<tr>
<th>Car</th>
<th>Cellphone</th>
<th>Gas Stove</th>
<th>“Tetel”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorcycle</td>
<td>Generator set</td>
<td>Plough</td>
<td>Traditional Beads</td>
</tr>
<tr>
<td>Bicycle</td>
<td>Flushing toilets</td>
<td>Bank Savings</td>
<td>Others, specify;</td>
</tr>
<tr>
<td>Television</td>
<td>Direct water supply</td>
<td>Refrigerator</td>
<td></td>
</tr>
</tbody>
</table>

Are you sometimes forced to sell possessions because you need the cash? (Yes/No)

**Additional Questions (4) … traditional vs mechanization practice**

1. When rice is cultivated using traditional practices, what are the farming tasks done mainly by the men and those done mainly by the women?
   ______________________

2. Has mechanization changed the different stages in rice cultivation when compared to cultivating rice the traditional way? If yes, what are the most obvious differences?
   ______________________

3. After mechanization, what are the farming tasks that men and women still have to do?
   ______________________
4. After mechanization, has the role of the women changed significantly? If yes, in what ways?
   _______________________________________________________
   ____

5. Does Ceria employ more local or more outside workers to do the mechanized tasks?
   _______________________________________________________
   ____

6. What is your overall reaction to the mechanization of rice cultivation in Bario?
   _______________________________________________________
   ____

7. Has mechanization changed the lifestyle of the local community? If yes, in what ways?
   _______________________________________________________
   ____

8. Has it improved the quality of livelihood in Bario? If yes, in what ways?
   _______________________________________________________
   ____

9. Who stands to benefit the most from the Ceria scheme and in what ways?
   _______________________________________________________
   ____

10. Who stands to lose the most from the Ceria scheme and in what ways?
    _______________________________________________________
    ____

11. What is your advice for the way forward?
    _______________________________________________________
    ____

<table>
<thead>
<tr>
<th>Additional Questions (5) … Consumer of Bario Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For how many years have you been buying Bario rice for your own consumption?</td>
</tr>
</tbody>
</table>
|   _______________________________________________________
|   ____ |
| 2. How much did you pay per kg in the past for Bario rice? Year ___ and RM __ per kg |
|   _______________________________________________________
|   ____ |
| 3. How much do you now pay per kg for Bario rice? Year 2013 and RM____per kg |
4. Do you think there is a difference in quality between Bario rice planted using the traditional method and Bario rice planted the mechanized way?

__________________________________________________________

5. If you are now told that the Bario rice is cultivated using machinery, fertilizer and pesticides, will you still buy it? If YES, will you pay the same price per kg as you have paid in the past?

__________________________________________________________

6. What is your overall reaction to the mechanization of rice cultivation in Bario?

__________________________________________________________
Appendix 2. Rural Urban Migration Questionnaire

Resident Profile

<table>
<thead>
<tr>
<th>Respondent Profile</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent name:</td>
<td>Age:</td>
</tr>
<tr>
<td>Occupation:</td>
<td>Gender: M / F</td>
</tr>
<tr>
<td>Education:</td>
<td>Village name:</td>
</tr>
<tr>
<td>Age:</td>
<td>Permanent address:</td>
</tr>
</tbody>
</table>

Name of Head of family unit: _________________ No. of people in the family unit: ___

List family members by drawing a genealogical diagram:

Include all family members’ at the back of this questionnaire*:

(x) Name:
(xi) Age:
(xii) Marital status:
(xiii) Working/Schooling:
(xiv) Live in village or city:
(xv) Reason of leaving village and when:
(xvi) Level of education:
(xvii) Why and when did each of them (if any) leave the village?
(xviii) Do they send back money, food or consumer goods to the family on a regular basis? Please elaborate and estimate amount.

1. Original Village/Place of birth:

2. Why did you leave the highlands?:

3. How old were you when you left?:

4. Current village(s) that you go back to:

5. When was the last time you went back to your village? How frequently do you go back?

6. What are your reasons for going back? (eg holiday/visit relatives/wedding, funeral etc/business/other):

Education Profile

1. Did you start school in Bario?:

2. If so, when/at what grade level did you transfer to an urban school?
3. Year you started school:

4. If you started school in Bario, year/grade level you transferred to an urban school:

5. Highest educational level achieved:

6. Name and location of school(s):

7. School timeline:

8. How many other Kelabit did you know at your first village school and first urban school?

9. How many were there in your first class (end of school)?

10. How many completed class with you?

11. Do you know where they are now/what they are doing etc/if they still go back to the village?

12. Who were the first Kelabit and who were the oldest Kelabit you know to have attended school?

13. Who in your family/village had gone to school before you?

14. What were the occupations of your parents/guardians?

15. If you moved to an urban school, did your parents/guardians moved with you?

16. If so, what did they do for a living after migrating?

17. If not, have they migrated to the urban town too? When? What did they do when the first migrated?
18. What are your parents/guardian doing now?

19. How many siblings do you have?

20. How many went to school?

21. How many went to an urban school?

22. Did they start school in Bario? If so at what age/grade level?

23. What is the highest educational level they achieved?

24. What do/did they do for a living?

25. If any siblings did not go to school, what were the reasons?

26. What did/do your unschooled siblings do for a living?

27. **IF** you were to compare between siblings (or relatives) of yours who have been to school and those who didn’t, who do you perceive to have a better life (e.g. more comfortable with themselves) now that they are retired?

<table>
<thead>
<tr>
<th>Have not been to school:</th>
<th>Very Happy</th>
<th>Somewhat Happy</th>
<th>Neutral</th>
<th>Not Very Happy</th>
<th>Not at All Happy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have been to school:</td>
<td>Very Happy</td>
<td>Somewhat Happy</td>
<td>Neutral</td>
<td>Not Very Happy</td>
<td>Not at All Happy</td>
</tr>
</tbody>
</table>

28. How did your parents/guardians pay for your schooling?

29. Did you work during school/university to pay for your education? **If so,** what did you do then and for what amount of money relative to what you need in school?
Livelihood

1. What was your first job? When did you start?

2. What is your current job? How long have you been doing this?

3. When did you get married?

4. How old were you then?

5. Is your husband/wife Kelabit?

6. Did you meet your husband/wife in Bario or after migrating to urban town?

7. How many children or grandchildren do you have now?

8. Did you frequently take your children to Bario with you when you went back?

<table>
<thead>
<tr>
<th>Very Often</th>
<th>Often</th>
<th>Not Very Often</th>
<th>Never</th>
</tr>
</thead>
</table>

9. Do your children visit Bario on their own now? How frequently?

10. Do your children (if they are raised outside Bario) identify themselves well as Kelabit?

Involvement in Bario and Rice Cultivation

1. Do you own paddy field(s) in Bario?

2. If yes, did you inherit the paddy field(s)?

3. If yes, from whom did you inherit these paddy field(s)?

4. If you bought the paddy field(s), when?
   a. From whom?
   b. At what price?
   c. Why did they sell?
5. What is the size of your field?

6. Do you own property in Bario other than paddy fields?

7. Do you own or operate a business in Bario?

8. Does any aspect of your work involve Bario?

9. Did you plant/harvest the field before migrating?

10. If yes, when and for how long? How often?

<table>
<thead>
<tr>
<th>Very Often</th>
<th>Often</th>
<th>Not Very Often</th>
<th>Never</th>
</tr>
</thead>
</table>

11. How has cultivation changed since you first grew paddy? Explain.

<table>
<thead>
<tr>
<th>Very Much</th>
<th>Somewhat</th>
<th>Same</th>
</tr>
</thead>
</table>

12. How was the paddy field managed when you left? (e.g. older siblings, parents, grandparents, labourers?)

13. What do you think about the changes in paddy cultivation that have taken place since you left? Explain.

<table>
<thead>
<tr>
<th>Poor</th>
<th>Fair</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
</table>

14. What are you thoughts about mechanization?

15. Do you think it is a good idea? Why yes/why no?

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

16. Is mechanization necessary? Why (or why not)?

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

17. What do you think are the main social/economic/agricultural issues faced by the introduction of mechanization to Bario rice cultivation?

18. How would you resolve these issue(s)?

19. If you had a *magic wand*, what would you do to change Bario rice cultivation?

20. Are you confident that the mechanization program will be successful?

<table>
<thead>
<tr>
<th>Very Confident</th>
<th>Confident</th>
<th>Average</th>
<th>Not Confident</th>
</tr>
</thead>
</table>

a. If yes, please explain?

b. If no, please explain?
21. What do you hope to see once the introduction of mechanization for rice cultivation is fully in place in Bario?

22. As you look back now (2013), how do you feel about your life:
   a. Before school?
      - Very Happy
      - Somewhat Happy
      - Neutral
      - Not Very Happy
      - Not at All Happy
   b. Before leaving Bario?
      - Very Happy
      - Somewhat Happy
      - Neutral
      - Not Very Happy
      - Not at All Happy
   c. While attending urban school?
      - Very Happy
      - Somewhat Happy
      - Neutral
      - Not Very Happy
      - Not at All Happy
   d. While attending post school education/university?
      - Very Happy
      - Somewhat Happy
      - Neutral
      - Not Very Happy
      - Not at All Happy
   e. Afterwards?
      - Very Happy
      - Somewhat Happy
      - Neutral
      - Not Very Happy
      - Not at All Happy
   f. Now?
      - Very Happy
      - Somewhat Happy
      - Neutral
      - Not Very Happy
      - Not at All Happy

23. Are you glad you left the highlands?
   - Very Happy
   - Somewhat Happy
   - Neutral
   - Not Very Happy
   - Not at All Happy

24. Would you have preferred to have migrated at a younger or older age? Please explain.

25. Would you encourage your children or grandchildren to go back and plant paddy?
   a. If yes, why?
   b. If no, why?

26. Would you encourage them to invest in paddy cultivation?
   a. If yes, why?
   b. If no, why?

27. Has the introduction of mechanization of rice cultivation in Bario
   a. Changed your ideas on what your children or grandchildren should do?
      - Very Much
      - Somewhat
      - Same
   b. Changed your perception of Bario? If yes, in what ways?
      - Very Much
      - Somewhat
      - Same
   c. Changed the lifestyle of people in Bario? If yes, in what most obvious ways?
<table>
<thead>
<tr>
<th>Very Much</th>
<th>Somewhat</th>
<th>Same</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. Changed your lifestyle/people who live in urban areas but are landowners (i.e. participating in the Ceria scheme)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Much</td>
<td>Somewhat</td>
<td>Same</td>
</tr>
<tr>
<td>e. Changed tourists’ perception of Bario?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Much</td>
<td>Somewhat</td>
<td>Same</td>
</tr>
<tr>
<td>f. Others. Explain.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3.

KEY INFORMANT QUESTION GUIDE:

1. What is the Dept of Agriculture policy on rice cultivation in Sarawak? Is Sarawak trying to strive for full self-sufficiency, or if not, what percent of full self-sufficiency?

2. Please share with me your views on what Ceria is doing. Do you consider their approach to be sustainable? Are Ceria’s activities in line with, and supportive of, supporting the policies and plans of the Department of Agriculture?

3. What do you perceive will happen when the government funding directed to Ceria runs out?

4. How relevant do you think Ceria's role is in Bario? Is Ceria's presence in Bario helping to boost the economy of rice farming in Bario, or is it having a negative effect?

5. How do you think Ceria has changed rice cultivation in Bario, particularly in terms of quality, branding, and public perception of the product (assuming that the public has considered Bario rice as being very special)?

6. From what you know of Ceria’s activities in Bau and in Bario, what else could Ceria do to make their role in the development of Bario rice cultivation even more relevant? More sustainable? What should their next step be? (Currently they are working in irrigation system in the village - constructing 7 mini hydro dams and a

7. I would like to understand the impacts of the transfer to modern technology on traditional farming in general, and on the communities that used to practice traditional farming methods. What would you consider to be the most positive impacts and the most destructive impacts, and why do you think so? What mitigation methods could be put in place to minimize destructive impacts?

8. What would you consider to be a pristine and organic method for rice cultivation? Does such a thing currently exist in practice?

9. Would you consider traditional rice cultivation methods as practiced by the Kelabit community in Bario as fitting your definition of “organic”?

10. In Bario specifically, do you see any potential success or benefit of the introduction of mechanization? Do you see any potential problems or negative impacts?

11. There seems to be increasing demand for Bario rice despite its rising price. As an
expert in rice, do you believe that the production of Bario rice should be increased to meet this demand, as we have done with other rice varieties in Sarawak (padi bajong = padi Adan)?

12. Would the quality of Bario rice be compromised if mechanisation is used to achieve this (for example, if double cropping is introduced to produce two harvests a year instead of one, as has been the traditional practice?)

13. As an expert in rice, do you believe that mechanisation implies the mandatory use of pesticides and fertilizers? If so, what impact is increased use of these products likely to have on the quality of Bario rice?

14. If pesticides and fertilizers are used, would you foresee a change in consumer demand for Bario rice? Would consumers still be willing to pay a premium price if the product could no longer be considered organic, or if it was perceived as having changed in some way?

15. From your many years of research and experience, could you share with me some stories of success (and failure) of rice cultivation as a result of introduced changes?

16. To help me better understand this topic, i.e. the mechanisation of rice cultivation, whom would you advise that I should meet to request more information? Are there any farms that I should visit?

17. If you had a magic wand, what would you do to make rice cultivation a career option for the younger generation?

For the project proponent:

Using the Combine Harvesters: Some similarities and differences observed in Bau and Bario

Some general comments on the background information:
Physical, Social-economic and Environment observed in Bau and Bario – i.e. how similar and how different are these two sites as far as rice farming is concerned before and after the introduction of the combine harvester.

1 Traditional farming method using only human labor

Manpower requirement: in man-days per acre etc
   local farming community versus employed (foreign) workers

Rice varieties
how many varieties
what are some of these varieties
which varieties are preferred by the local community
which varieties are sold for cash

Farming season – Planting method
single or double cropping
what are the major farming tasks
how long does it take for each crop (seed to rice)

Rice fields
Average size
Individually owned or community owned or leased

Use of fertilizers
If used, approximate quantity/cost per acre etc

Use of pesticides
If used, approximate quantity/cost per acre etc

Mixed farming
what other crops e.g. subsistence and cash crop

2 Integrating the Combine Harvester into the Padi Farming

Manpower requirement: in man-days etc
local farming community versus employed (foreign) workers

Rice varieties
how many varieties
what are some of these varieties
which varieties are preferred by the local community
which varieties are sold for cash

Farming season – Planting method
single or double cropping
what are the major farming tasks
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Use of pesticides
   If used, approximate quantity/cost per acre etc

Mixed farming
   what other crops e.g. subsistence and cash crop

Some questions on the Combine Harvesters
   • What is the investment cost for each harvester?
   • What is the working life-span e.g. years, tons of produce?
   • Cost & Benefit Analysis – cost of operation & maintenance, estimated cost per ton harvest, etc?
   • Is the same machine used for wet and dry padi?
   • In a place like Bario, which is inaccessible as far as heavy machinery such as the harvester is concerned, what is the contingency plan if the machine breaks down during the peak of harvest season? What would be the down time e.g. days? Weeks?
   • Is it envisioned that the local community will one day own and operate their own harvester? Or will it be more cost effective for the local community to outsource the tasks to a private company?
   • Has the cost of production increased with the use of the combine harvester?
   • Has the price per kg of Bario rice increased?
   • Is there a difference in price between Bario rice harvested by the combine harvester and those harvested by the traditional method i.e. by human labour?
   • Is there a difference or perceived different between rice harvested by the combine harvester and rice harvested purely by human labour?

Miscellaneous Questions
   • Are there any land use, land rights issues being raised?
   • Are there any possible effect of fertilizers used etc on the quality of Bario rice i.e. padi adan?
   • Who owns the IP of Bario rice?
   • Does Bau rice has an IP issue too?
   • Who does the marketing, sales etc?
   • Do you observe any change in the lifestyle of the local farmers after they let the combine harvester harvest their rice fields? if so, what are the most obvious changes?
   • What is the optimum land size for it is to be economical to use the combine harvester?
   • What is the downside, if any, for using the combine harvester? on the land? on the harvest? on the community? on the consumer?
   • What is the long term plan/visions of Ceria in Bario, in Bau?
   • Where is the next site to introduce the combine harvester?
Material Requests
Land use maps
Crops identification maps
Some financial reports/figures

Follow-up questions in 2015:

1. These questions are focused on the 200ha that has already been completed:

2. How many harvest since inception? Still "No" to double cropping?

3. Could I get the harvest data (tons per ha) from the first inception to date? (i.e. 2011, 2012, 2013, 2014)

4. Has the socio-economic status of the households (landowners) increased? (I mean obviously it should, since many of their plots were abandoned to begin with) if so, how much are they selling or gaining from (1ha of land)?

5. Do the landowners sell 30% of their paddy to Ceria or do they sell it on their own? If they sell it to Ceria, how much would they make from that 30%?

6. How much does it take for the locals to dry their rice at the mill and what is the going rate of Bario rice today?

7. How many remain/exit the in the 70:30 contract?

8. Are there any locals working / handling the harvester machine/ mill?

9. Are there any social issues? (e.g. Opinion leaders opposing)

10. What remains the challenge faced by Ceria Bario?

11. What would you say the number of people in Bario (project area) to be? Do you see more people moving into the village or exiting?