

CHAPTER I

1. INTRODUCTION

1.1. Background of the Study

Sustainability of livelihoods is currently a key consideration and a way of thinking about the objectives, scope and priorities for development. This arose because of past experiences where the people's situations were not the primary consideration for development thrusts. The concept of sustainable livelihoods shall be applied to put more emphasis on the agricultural livelihoods of the Indigenous People of the Cordillera, Philippines as it relates to the management of their watersheds.

The Philippines has a total land area of 29,817,000 hectares (FAO, 2001) with a population of 76 million as of year 2000 and at a rate of 2.32% increase, it is estimated that the population will reach 150 million by year 2025 (NSO, 2000). Out of the total population of Filipinos, there are 20 million living in the upland areas and 50% depend on the forest resources (Dalmacio, 2001). Among them are the indigenous communities in the Cordillera that constitute majority of the ethnic groups collectively called "Igorot". They live in the rugged mountainous areas within forests and watersheds and depend on these areas for their livelihoods. In their desire to produce food in the marginal environment, they were able to develop farming strategies and resource management systems out of their experiences. These practices have been passed-on by their ancestors.

The pressure exerted, on the resources brings changes in land use and living conditions as development progress. This could be gleaned from forest trends wherein in 1934, the Philippines had 42 million hectares of forest areas which dwindled to 16 million hectares in 1999 (Arboleda et al, 2002). The rapid loss of Philippine forest occurred in 1990 with 75,000 hectares lost every year (Earth Times, 2001). Only 5.5 million hectares of forest are left out of the estimated 15.8 million hectares (DENR, 1996). The Philippine forest is estimated at 17% that is below the required 60% forest cover to maintain ecological balance and to provide continuous water and food.

The degradation of forests in less developed countries, like the Philippines, is a symptom of inequality in the distribution of wealth and resources. Man's quest for survival brought about by poverty on one hand and man's extravagance brought about by affluence on the other hand, are causes of imbalances in our society. Both contribute to the overexploitation of our natural resources that harms our environment. Food production in less developed countries and excessive consumption in affluent countries put agriculture as the prime offender of our environmental degradation. This is attributed to the situation where on the global scale remarkable increases in food production have been achieved in part by cutting down forest, ploughing up grasslands and converting these natural areas to croplands or pastures.

Inequality of resource distribution in the Philippines has its historical perspective. Before the Spaniards colonized the Philippines, land was commonly held by village clusters known as "barangays" and land access was mainly based on user-rights, similar to systems as they still exist today among the several indigenous upland communities. However, much of the traditional systems were destroyed when the Spaniards placed all lands under the Crown and introduced the feudal system, where large tracts of productive lands were parceled out among the Spanish military and the clergy and the local Filipinos were systematically deprived of their lands (Baldwin, 1998). Currently, land titles are given to individuals but many are still without access to land. Communal land ownership is still practiced in many indigenous communities.

In order to reverse environmental deterioration through sustainable development, options ought to be provided to people who either have difficulty producing food or who because of their absolute poverty cannot provide for their food. If food requirement is not met, the goals of sustainable development will not be achieved.

In this context, the indigenous upland farming systems as a livelihood option can be assessed through the sustainable livelihoods approach since the forest and watershed areas they live in are vital resources and forms of natural capital. Watersheds hold multiple and interconnected natural resources like soil, water and vegetation as well as wildlife. Watersheds are physically defined subsets of rural society, and the management of watershed is a question of social relations and coordination between individuals and other stakeholders with common interest in the resource (White and

Runge, 1994). The pattern of dependence on watershed resources can adversely affect the capacity to maintain harmony of activities with its deterioration. This can have a profound effect on lowland areas such as flooding, soil erosion, and loss of human lives, wildlife as well as livelihoods.

In essence, harnessing the indigenous knowledge and practices can help develop efforts to support watershed conservation and management. The indigenous systems and practices can be an alternative land use management in watersheds because these are results of the need to find solutions to local problems by the people themselves who live in the upland watershed areas. User groups who live in natural resource-based areas, are seen to have a comparative advantage over government agents in monitoring resource use more efficiently, equitably and sustainable. With this arose optimism that communities or user groups may be able to manage the resource more effectively than government agencies: this forms the basis for many programmes that attempt to create or recreate local common property regimes (World Bank, 1996 as cited by Dick et al, 2001). This theory is important to the study of sustainability of indigenous upland farming systems in the Cordillera, Philippines, whether local people maintain their resources in a sustainable manner as it relates to the management of their watershed areas.

A close look, therefore, at the indigenous upland farming systems and associated livelihoods is in consonance with the Philippine Strategy for Improved Watershed Resource Management formulated by the Department of Environment and Natural Resources (DENR, 1998). The philosophy states, “there should be a demand-driven, multiple use and community-based approach to watershed management involving both national priorities and stakeholder concern”. The Community-Based Forest Management (CBFM) is the flagship programme of the DENR in the Philippines, which is a shift from the past, where resource management was strongly centrally determined, top-down and non-participatory. This started in the early 1980’s where the shift was not total devolution but towards co-management where the state and community together with other stakeholders share management responsibility of access, control and benefits on the use of these resources (Sajise et al, 1999). The local knowledge of people can be harnessed and incorporated as part of community-based watershed conservation and management. The premise is that the inclusion of

local indigenous communities in resource planning and management can both improve the effectiveness of conservation efforts and help ensure that indigenous communities benefit from conservation. Their systems can contribute to sustainable watershed management because the local people are often capable of collecting accurate information about their resources. Their perception of their situation is critical for planning action. Information on their access to assets as influenced by transforming processes is of great value and can be analysed to blend with modern systems for greater efficiency. Exploring in depth the sustainability of indigenous systems can provide quantification of its strengths and weaknesses for improvement or adoption. There has been little empirical research to examine sustainability of indigenous systems in the Philippines other than through observations on its existence. One reason for this is the non-recognition in the past of indigenous knowledge and systems as a legitimate form of land use and was branded altogether as inferior to watershed management. Besides, indigenous systems have high adoption potentials for smallholder farmers because of their traditional history of use. These factors explain why this research is justified.

1.2. Statement of the Problem

There has always been an interaction between man and the watershed or his environment. This interaction can be translated in terms of food, water, fuel and shelter benefits from watersheds. These important benefits are becoming scarcer and scarcer as man moves toward modernization. The watershed is under heavy stress because of increasing human activities for their livelihoods.

The people or the social systems are far more important to focus in development activities because it will lead to their understanding, not only of improving themselves, but also the watershed area and resource that they depend on. Although constructive resource management rules and norms have been embedded in many cultures and societies, it has been rare for the importance of such local groups and institutions to be recognized in recent agricultural and rural development (Pretty and Ward, 2000). Development assistance had paid too little attention to how social and human capital affect environmental outcomes.

In this cognisance, the watershed can be taken as a planning unit. When one sees the watershed, the immediate idea comes to mind that it is an empty space predominated with trees that are seen as having commercial value when harvested. In reality, the watershed is a dwelling place of a society of culture and wisdom. An example is the Indigenous People of the Cordillera Region in the Philippines. They live in upland watershed areas and depend on it for their needs. They possess indigenous knowledge and systems in managing their land. Together with government, non-government and private assistance, they are trying to live harmoniously with their environment. Whether, social groups progress towards maturity is likely to be related with availability of social capital locally and appropriate inputs from government and voluntary agencies (Pretty and Ward, 2000).

Interventions can help develop indigenous communities as partners in watershed management and their support provides greater confidence to conserve the watershed. In areas where support is lacking, people will continue to integrate, in their own ways, conservation and development practices according to their own systems. In this study, indigenous upland farming systems will be evaluated in terms of their sustainability as affected by intervention and non-intervention processes. Sustainability will be assessed using the sustainable livelihoods approach where assets coupled with transforming processes shall be determined and correlated with the strategies adopted.

1.3. Significance of the Study

The results of the study will become the basis for empirical judgement as to the worthiness of the system for watershed conservation and management. The strengths and weaknesses to be identified shall become the entry points for either improvement or integration with watershed land use strategies.

The use of the sustainable livelihoods framework in assessing the upland farming systems and related livelihoods puts people at the centre for understanding their strategies and practices. The approach will be tested to bridge the knowledge gap towards the people's use of watershed resources in relation to their assets.

Considering the sensitivity of interventions' negative or positive acceptability because of failure or success, there is a need to understand how interventions create an impact compared to areas with no interventions.

The results of this study can provide practical bases in formulating and implementing future strategies for watershed conservation and management.

1.4. Objectives of the Research

The study generally aims to compare the sustainability of indigenous upland farming systems and related livelihoods in a watershed area as influenced by interventions and non-intervention processes.

The specific objectives of the study are the following:

1. Assess the local people's perception on the importance of watershed and their dependence on it.
2. Determine the factors influencing the local upland farming strategies and associated livelihoods and the sustainability of the strategies in relation to economic productivity, ecological soundness and socio-cultural acceptability.
3. Compare areas with programme intervention to those without programme intervention in terms of their effectiveness in watershed resource use, conservation and management.

1.5. Research Questions

The overall purpose of the research study poses the question on what are the similarities and differences on the sustainability of indigenous upland farming systems and associated livelihoods in a watershed area as influenced by programme intervention and without programme intervention.

The specific questions addressed are the following:

1. What are the local values and attitudes regarding watershed and its role to local upland farming systems and the household?
2. What are the factors (assets) influencing the upland farming systems and associated livelihoods?
3. What are the indigenous upland farming systems practiced and how sustainable are these practices in terms of economic productivity, ecological soundness and socio-cultural acceptability?

4. What are the risks and problems encountered in upland farming systems and how do they cope with such risks and problems?
5. What are the relationships among the assets, strategies and sustainability of the upland farming systems?

1.6. Hypotheses of the Study

The hypotheses tested in the study based on the objectives are the following:

1. There is no significant difference among farmers in the different communities regarding the local values and attitudes on watershed resources and their role to the local upland farming systems.
2. There is no significant difference among farmers in the different communities concerning the factors influencing local upland farming systems and their associated livelihood strategies.
3. There is no significant difference among farmers in the different communities in their upland farming systems practices and their sustainability in relation to economic productivity, ecological soundness and socio-cultural acceptability.
4. There is no significant difference among farmers in the different communities concerning the risks and problems encountered and the means to cope with them.
5. There is no significant difference among farmers in the different communities regarding the relationships among assets, strategies and sustainability of the upland farming systems in a watershed area.
6. There is no significant difference between areas with programme intervention and areas without programme intervention.

1.7. Layout of the Study

Chapter **one** presents the introduction of the study that comprises the background of the study, statement of the research problem, significance, objectives, research questions and the hypotheses of the study.

Chapter **two** reviews the related literature on forests, watersheds and people; watershed management approaches, indigenous knowledge and resource practices; upland farming systems; sustainability concepts and some approaches. The chapter outlines the conceptual framework of the study and explains how sustainability of the strategies adopted was quantified.

Chapter **three** discusses the methodology used in the study.

Chapter **four** presents the setting of the study and the characterization of the study sites.

Chapter **five** discusses the research findings and analysis of data gathered.

Chapter **six** considers the quantitative analysis of factors determining the sustainability of upland farming systems, the strength of relationships of upland farming systems with the assets and compared the areas with program interventions and without program interventions.

Chapter **seven** presents the conclusions and recommendations based from the objectives of the study.

CHAPTER II

2. LITERATURE REVIEW

2.1. Introduction

This chapter deals with the review of related literature on the main topics of the research. It deals with the concept on the significance of watersheds and watershed management, the people therein and the livelihood activities; the uplands and the farming systems; the indigenous knowledge and practices; the transforming processes such as institutions and interventions; and sustainability. The literature review discusses the relationship among the topics.

This chapter is composed of 8 parts. These are the importance of forest, watersheds and the people; watershed management approaches; indigenous knowledge and resource practices; upland farming systems; social institutions; interventions; sustainability concepts and some approaches to sustainability.

The last part of this chapter focuses on the conceptual framework of the study that is used to explain the problem under investigation. The conceptual framework shows the relationships of the variables that are considered in the study. The conceptual framework also provides a guide in the analysis of the data collected.

2.2. Forest, Watershed and People

The interest in conserving watersheds, which are often situated in forest areas, has been increasing over the last decades. Government, Non-Government Organizations and target beneficiaries are involved in the management and development of watersheds. This is a new approach caused by ineffective strategies in the past.

The need to conserve watersheds is founded on the concept that watersheds are hydro-ecologically significant areas primarily as source of freshwater and other natural resources (Veracion, 1995). Despite the significance of watersheds, many are now in a poor state because of the removal of forest cover. Excessive logging activities or timber harvesting, shifting cultivation and conversion of forest areas to other land uses were a common practice in watersheds. These have triggered the widespread degradation of watersheds that brought about environmental problems such as rapid

surface run-off, accelerated soil erosion, rivers, lakes and other bodies of water filled with silts and sediments. There are multiple benefits derived from the watershed like source of water, socio-economic needs of people dependent on it, maintaining ecological balance and habitat for wildlife species.

The output of a well-managed watershed is the production of freshwater that is used by human beings, plants and animal life. Although water is our most abundant resource covering 71% of the earth's surface, 97% of the earth's volume of water is found in the ocean and the remaining 3% is freshwater (Guzman and Guzman, 2000). They further stated that freshwater comes from surface water and groundwater through the process of hydrological cycle. The porous water-saturated layers of the soil that can yield an economically significant amount of water are called aquifers. Most aquifers are replenished naturally by precipitation that percolates in the soil. It is freshwater that is found on the earth's surface, streams, lakes and reservoirs. The area where water fills the available pores in the soil is the zone of saturation and is called groundwater. The groundwater moves in the aquifers and out to a discharge area such as wells, springs, lakes, streams and oceans. The conservation of watersheds is therefore vital to man. The groundwater is one of the critical resources to be managed in watersheds (Kumar et al, 1999).

Many countries face scarcity of water for irrigation, industrial use, as well as for drinking. Water quality as well as quantity is being affected through unsustainable use of forest and watershed resources. Problems on water contamination and the lack of water are a real crisis faced by many nations. The World Bank and WWF (2003) reported that one person in six lives without regular access to safe drinking water, and 2.4 billion people lack access to adequate sanitation. Water related diseases kill a child every 8 seconds. Water is a renewable resource and in the past, water was free, but nowadays, water is sold as mineral bottled water at a price. In many arid countries, the urgent need for water is critical while in Asian countries, the greatest requirement for freshwater resource is for crop irrigation, particularly in places where farming takes place and in great rice paddy fields.

The problem of water scarcity can be traced to overexploitation of groundwater resources that is exacerbated by wanton destruction of forest resources that result in

the lowering or falling of water tables. Salinity near coastal areas is also causing problems where salt-water intrusions occur. These problems make it even more urgent to manage our watersheds in a sustainable manner. Managing wisely our watersheds and forest resources also imply social, economic and ecological imperatives. Water catchments in the upstream or the upland areas give benefits to people living in the far downstream or the lowland areas. It is true that people downstream benefit from conservation done in the upstream but this raises the issue of whether and how they should pay for the conservation efforts upstream. User pays principle or concepts such as “payment for environmental services” could be incorporated as an incentive for conservation measures. A well-managed natural resource provides benefits but links to the upstream-downstream equitability should come to focus.

The forest resource, including the watersheds, has always been seen as an inexhaustible resource where many interest groups lay their claim. Different stakeholders like timber companies, development projects and local rural people seek access to these resources. Who then are the rightful owners of the forest? As Sahlin (1972) pointed out that there has always been a love-hate relationship between man and nature. Man lived-off nature’s bounty, evolving social systems, technology and customs that allowed man to live in a sort of balance with his environment. With various stakeholders claiming the forest resources, there also arose deep-seated differences between governments and rural people on who should control these lands and how they should be managed. In the Philippines, tribal or indigenous groups, upland and indigenous farming communities as well as settlers from the lowlands compete for forestlands (Poffenberger, 1991). He observed that forest agency, forest inhabitants, politicians and administrators in government as well as private agencies often struggle to have forestlands transferred to their control. Apart from this, he also pointed out that social scientists bring another perspective to the debate where their concern is often for the people living near or in the forest. The social scientists argue for the rights of the indigenous tribal and farming communities.

Population pressure also plays an indirect role as one of the driving forces of environmental degradation. Population creates increasing demand for food, energy, shelter and other services. The world’s absolute population is growing especially in

the less developed countries where the age structure is skewed towards the young, which makes for population growth (Palo, 1991).

In the Philippines, the competing needs from forest resources can also be traced to economic necessities. Burch (1990) expressed his sentiments on how he remembers the traditional pattern of order and balance between people's needs and sustainability of their resources. He stated that authority and accountability were close to the source of need and nature. Then came the period of disorder and destruction, as resources were redefined to meet centralized commercial goods of distant accountability and whimsical market forces.

2.3. Watershed Management Approaches

Today, natural resource management has a focus on the relationship of people and the forest. Current thinking tends to use social forestry principles to seek active involvement of people in planning, executing and management to meet their needs. In Nepal, Forest User Groups (FUG) has been established as permanent grassroots local institutions that are responsible for the planning, decision-making and implementation function of their forest management (Dev et al, 2003). Likewise FAO's (2001) report on the state of the world's forest pointed to the involvement of the communities in forest and watershed management that is now a significant feature of national forest policies and programmes throughout the world. Furthermore, governments are faced with inadequate financial and human resources that they are increasingly turning to local communities for assistance in protecting and managing state-owned forest.

A participatory approach to micro-watershed rehabilitation is being adopted in India. Participatory management is a process whereby those with legitimate interest in the project both influence decisions that affect them and receive a proportion of any benefits that may accrue (Oda, 1996). It is now widely accepted that to enhance and to sustain productivity of natural resources, those engaged in and affected by managing the resources, at the most basic level such as the users, must participate in planning their rehabilitation and management. Institutional and ecological sustainability are generated through participatory management.

In the Philippines, Community-Based Resource Management is a key factor in reversing the process of environmental degradation within the context of increasing human population exerting more pressure on dwindling resources (Sajise et al, 1999). They further stressed that Community-Based Forest Management (CBFM) is a process by which the people themselves are given the opportunity and responsibility to manage their own resources, define their needs, goals and aspirations, and to make decisions affecting their well-being. CBFM is inherently evolutionary, participatory and locale-specific and considers the technical, socio-cultural, economic, political and environmental factors impinging upon a given community. Community-Based Natural Resource Management in Africa is different from the “user-centred-model” applied in Asia since it supports the “custodial” interest of the community (FAO, 2001). The assumption is that forest-adjacent communities have a custodial interest in ensuring that the forest or woodland does not become degraded. The intention is to make local communities stakeholders of the forest, not simply users of its product. The community-based stakeholders must address forest management goals such as forest protection, production and poverty alleviation.

Current approaches to sustainable forest management are practiced on the ground like ecosystems and landscape management that recognise the dynamism of ecological and social systems, adaptive management and collaborative decision-making (FAO, 2001). Another approach reported is integrated forest conservation with biological diversity, including management of both inside and outside protected forest areas.

There is a growing confidence that watershed development can contribute immensely towards the sustainable enhancement of rural livelihoods. Kumar et al (1999) warned that there are, however, a number of challenges and implementing difficulties that will need to be addressed in the coming decades if the objectives of sustainable development are to be realised. In the context of Javier’s (2000) requirement for a good watershed management that is to identify, develop and disseminate improved technologies and land management practices that are productive and effective, indigenous practices could be seriously considered for evaluation. In essence, indigenous people developed their systems out of their needs and most of them live inside watershed areas.

2.4. Indigenous Knowledge and Resource Practices

Scientific and new technologies are associated with modernisation to make life better. Associated with these technologies are additional costs or inputs. Yap (2003) gives an example wherein the International Rice Research Institute (IRRI) in the Philippines introduced high yielding varieties of rice to farmer's fields that consequently increased the use of chemicals for pests and fertilisers to make it productive. He also claimed that the green revolution programme in the 1960s required new forms of social organization that valued western expertise and rejected traditional ways and knowledge.

There are many indigenous systems that are worth documenting and evaluating that are neglected because of lack of understanding about them. Indigenous simply means something that is originating locally and performed by a community or society in a specific area. It emerged as people's perceptions and experiences in an environment at a given time (Seeland, 1997). This implies that a distinct set of knowledge emerged from the local communities without outside interventions. This knowledge refers to the body of mental inferences and conclusions that people build on a basis of different elements of information that allows them to take action in a given context (Leeuwis and Ban, 2003).

Summing up the meaning of indigenous knowledge, Grenier (1998) defines indigenous knowledge as the unique traditional and local knowledge existing within and developed around specific conditions of women and men indigenous to a particular geographic area. Indigenous knowledge is, therefore, the traditional information-base for a local community that is continuously influenced by internal creativity and experimentation that was developed through trial and error.

Previous development planners had neglected indigenous knowledge as plans were developed in a "top-down" approach. National development plans disregarded local traditional practices in exchange for modern technological advances. According to Mc Neely and Pit (1985) environmental planning and conservation should therefore pay much closer attention to the cultural context in both popular ideas and grassroots action. They claimed that many ideas and values held by ordinary people in the

different cultures around the world often have a long history coming from time and places where humans lived in close harmony with their local environment. This perspective is what they call conservation from below, which is an attempt to build on indigenous and traditional knowledge and practices to ensure maximum amount of local direction in environmental conservation of resources.

There are rich diversities of local conditions especially in the uplands. AMARU (1980) reported that wilderness continues to support population of traditional ecosystems with people who maintain their culture, linguistic and ecological distinctness from the lowland agricultural system. While the area of wilderness was reduced, it was still extensive and protected from human influences by cultural factors such as taboos preventing overexploitation, tribal warfare between groups and ownership by ancestors rather than individuals. The indigenous communities of the Mountain Province, Philippines have their customary laws on use, ownership and conflict resolutions. They have council of elders who are composed of community leaders/elders who are instrumental in the management, preservation and conflict resolutions through the “dap-ay”, which is considered the governing body of the community (Pogeyed, 1999). However, this indigenous system is weakening due to death of elders and transfer of some administrative functions of the “dap-ay” to barangay officials. Culture then is playing a vital role in resource management and conservation. The 15th session of the general assembly of the International Union for Conservation of Nature (IUCN, 1980) recognised the importance of the cultural heritage of mankind in conservation and the wider process of development. A meeting was again convened in Morges (IUCN, 1993), by the Commission on Environmental Planning, as a follow up to this assembly that held a major focus on the relationship between culture and conservation. It was recognised that cultural data on behaviour and motivation on nature are rarely used. It was therefore proposed to gather general information in the way in which behaviour, motivation and cultural patterns function and are transmitted in human societies to analyse how they relate to nature.

The Rio Summit during the UNCED meeting (UNCED, 1992) recognises and strengthens the role of Indigenous People and their communities in Chapter 26 of Agenda 21. It calls for: (a) recognition of the values of traditional knowledge and resource management practices with a view to promote environmentally sound and

sustainable development and (b) the establishment of arrangements to strengthen the active participation of Indigenous People and their communities in the national formulation of policies, laws and programmes relating to resource management and other development processes that may affect them and their initiation for such policies and programmes.

Indigenous resource practices are being done in many communities worldwide. Pogeyed (1999) reported that indigenous communities within the Cordillera, Philippines were able to develop appropriate management schemes to sustain their resources in a rugged mountainous terrain. Each ethnic group in the Cordillera developed their unique resource management based on their problems and needs.

Literature points out those indigenous practices have been documented in relation to resource conservation. Garcia (2003) relates that farmers in Tago, Philippines before the 1970s used traditional farming systems that were based on ecologically sound agriculture manifested in their soil fertilisation techniques and diverse cropping patterns. These practices provided food security, food quality, low reliance on external inputs and stable production. The people's daily subsistence depended entirely on mixed cropping and integrated farming. Before the green revolution programme in the Philippines in the 1960s Yap (2003) recalled that traditional rice farm practices allowed rice straws to remain in the field to allow soil fertility and moisture. It was also used for fodder for farm animals. Animals served multiple functions in peasant agriculture and provided valuable manure that helped maintain fertility and productivity of rice paddies. New technologies, however, were introduced neglecting the wealth of indigenous knowledge and practices in rice farming.

In South Africa, numerous indigenous practices were documented relating to soil and water conservation. This implies that traditional soil and water conservation techniques can have a significant role in watershed management. Water harvesting in Northern Sudan makes use of earth embankment built across "wadi" beds (El Samni and Ahmed Dabloub, 1996). This practice succeeds in spreading water outward from the gully and on to the fields beyond. Each embankment is different which is constructed to fit in to the shape of the gully and the intensity of water running through it. Another indigenous practice in Sudan is "trus" cultivation, a practice of

water conservation. Mohamed (1999) described the practice where water run-off is harvested by constructing low earth bunds called “trus”. Farmers living in the increasingly arid area, where the only water source that could be used with some degree of certainty was harvesting run off water, practice this.

Kassogue et al (1997) documented the range of traditional techniques. They observed that Dogon farmers often combine several techniques such as stonewalls, stone lines and bunds, micro-basin, mounding trash lines, grass barriers and creating fields. These indigenous technologies evolved because of shortage of land and fertile soil.

It can be argued that indigenous systems and practices abound and were developed for different purposes and needs and they came from people who try to use their resources in accordance with their knowledge, traditions and customs. Customs and traditions significantly affect the practices of local communities. In Southern Philippines, farming communities do not view incentives for conservation only in terms of material benefits. Other value incentives include the symbolic importance of the crop, opportunities for strengthening social networks, and the power and authority that is associated with leading conservation efforts (SFM, 2003). Furthermore, production systems are dictated by local knowledge that is an essential resource for identifying, utilising and maintaining different crop cultivars for different livelihood purposes. SFM (2003) reported that local knowledge on sweet potato in the Philippines has evolved out of farmer’s need to learn about the crop and its relevant scientific knowledge. These serve as major impetus for local farming households to conserve sweet potato diversity for local food consumption patterns, preferences, adaptability to local growing conditions and traditional beliefs and practices.

The discussion on traditional knowledge and practices has evolved out of needs of farmers that mean that they were developed out of experiences with their environment. Understanding the practices better can lead to their role to provide an avenue for adaptation of principles to similar site conditions. Their effectiveness shall become a basis for developing improved technologies. Howes (1980) summarised an extended role that indigenous knowledge can play in resource management as: (a) indigenous knowledge such as knowledge on soil, rocks, vegetation, etc. can be used to determine the effective resource-base of an area; (b) it can serve as basis for

environmental monitoring and early warning system. Indigenous observers can be used to bring attention of scientists quickly so improving the chances for remedial actions; and (c) indigenous observers can be involved as “eyes and ears” of science. Hagmann and Murwira (1996) concluded that a synthesis of traditional techniques and new methods could be adapted to specific sites, situations and farmer needs.

2.5. Upland Farming Systems

In the Philippines, the definition of uplands varies across sectors. The Department of Environment and Natural resources (DENR) which has jurisdiction over most upland areas in the country defines uplands as hilly to mountainous landscapes greater than 18% slope, including the table lands and plateaus lying at higher elevations which are not normally suited to wet rice cultivation unless some forms of terracing and groundwater exist. These are classified as public or state-owned lands.

According to Macandog (2003), more than 90% of Southeast Asia is upland areas. Before, these areas were sites of undisturbed natural forests, but rapid population growth resulted in upland migration and upland migrants now have no choice but to cultivate the land for a living, thus transforming natural forests to agricultural lands. This transformation has led to problems such as soil acidity and erosion. Being predominantly sloping, uplands are subject to soil erosion especially when the topsoil has no protective cover from wind and heavy rainfall and when it is disturbed by cultivation. This problem, in effect washes away the fertile topsoil, leaving the infertile subsoil, not helpful for plant growth. This condition poses the question of conservation practices in slope land farming since there is a question of whether the welfare of the environment comes before the welfare of the people for food, since they have no flat areas to cultivate so they have no other option but to till the slope lands.

It has been estimated that there are at least 250 million Indigenous Peoples in 70 countries (Roy, 1988). Although they live in relatively resource-rich forest areas, they are often one of the most deprived groups in many countries that feel threatened. The distinguishing features of the Indigenous Peoples are their strong determination to

preserve, develop and pass on to future generations their continued existence as a people in accordance with their cultural patterns, social institutions and legal systems.

The Indigenous Peoples developed farming systems to provide food and often slash-and burn or swidden farming is the main traditional practice for many indigenous communities. In some cases, settled villagers make cyclical use of the same fields and some live in temporary villages that are abandoned as fields become exhausted after several cycles of cultivation. Many experts consider shifting cultivation as a primitive and marginal farming system since yield is always lower than irrigated fields.

Indigenous Peoples, however, adapt to changes as development and other factors affect their systems such as agricultural intensification. Brocklesby and Ambrose-Oji (1997) recognised the significance of shifting cultivation in their work in Cameroon, which was not even given emphasis in their earlier conceptualisation of the project, since they were focusing on forest management. In the course of their study, on the sustainable management strategies of resource users, they found that shifting cultivation was a major practice that is integrated into forest resource use system. Furthermore, agriculture is the main livelihood activity where the practice is a mix of short and long fallow rotation, but they claimed that forest farming and shifting cultivation remained poorly understood and little attention was paid to incorporate the ecological effect and socio-economic determinants into management proposals.

It is clear that in a forest and watershed area, people's activities and their livelihoods have a significant overall impact on forest management. Even government solutions to forest degradation are always towards the technical aspect of forest management like reforestation, and sometimes governments use forest laws as a legal basis to exclude forest occupants in their access to natural resources. Most forest policies have viewed people as the prime threat to the forest, and have attempted to exclude groups other than the government from decision-making. This approach does not only affect the sustainability of the livelihood strategies of local people, but also increases the vulnerability of the marginalized sector of the communities (Suler, 2002). This ultimately leads to unsustainable management of natural resources and forest depletion. Thus, in practice, forest resources were made inaccessible to the poor and marginalized whereas the influential along with the members of the timber mafia

consumed these resources at their will. This dichotomy created the feelings of lack of ownership among the marginalized sectors not only adding to their misery but also encouraging them to adopt unsustainable means to meet their fair requirements of forest resources.

Poor people in marginal and sub-marginal areas are most often exposed to environmental shocks such as natural disaster, stresses and environmental related conflicts, and are least capable of coping when they occur. Yet, forest policies tend to exclude them over influential people to obtain economic gains in the use of the forest resources.

In this regard, Chisholm (2003) in his counterview that the poor are environmental managers or activists cited Broad's (1994) discussion on the evolution of and condition for environmental activism of the poor in the Philippines, wherein all over the country, there is a collapse of tropical ecosystem with people becoming poorer and pushed to subsistence level by ecological collapse. Many of the poor, however, were concerned that environmental degradation would deprive their children of their means of livelihood, and many were transformed into environmental activists. Three conditions for environmental activism in the Philippines were: (a) the threat of environmental degradation to the natural resource base by which the poor live; (b) poor people have lived in the area for sometime or have some sense of permanence there; (c) civil society is politicised and organised. Chisholm (2003) succinctly and correctly added a fourth condition wherein those groups who became environmental activists were not the original environmental degraders. Degradation was taking place and affecting their livelihoods, but they were not the cause of it.

Clearly, logging concessionaires were given license by the Philippine government to harvest trees through the Timber License Agreement (TLA's) especially in the 1960s through 1990s. Large forest areas with merchantable or harvestable trees were cut down and processed into lumber and eventually exported to other countries. These logging companies, which were mostly multinational companies, have all the logistical resources to extract large volumes of trees for profit. Marketing the trees to distant lands provided money for the government but at what price to the local users and the environment? Harvestable trees take years to grow and then for the

companies, only second to fell these trees. However the government blames the “kaingineros” or shifting cultivators who only use small patches of logged-over areas to grow crops for their food needs. While the poor saw their natural wealth lost through government’s approval to companies to extract timber, they became aware and understood that they were being exploited systematically, hence they became environmental activists. Their activism was targeted to “others”; people or organisations from outside who had disturbed the previous relatively stable balance that they had with their environment (Chisholm, 2003).

This argument presents a vital consideration for this study since it would be useful in understanding the values and attitudes of upland watershed dwellers in the Cordillera, Philippines where logging activities by companies had been made in the past. How do the upland dwellers look at the watershed and its conservation in relation to their livelihoods? This issue is addressed through answering the hypothesis of this study that there is no significant difference in the values and attitudes of the local people on the watershed resources.

Asian indigenous strategies for agricultural intensification are evident, such as terrace development. In India, there was a long history of terracing as a result of independent local initiatives (Roy, 1988). The indigenous communities in the Philippines with varying degrees and forms also practice terracing. The Ifugaos in the Cordillera have established rice terracing techniques, considered as the 8th wonder of the ancient world, with a preserved family-owned forest located at ravines that is managed to support rice terraces adjacent to the area (Pogeyed, 1999). These forests are locally termed “muyung” which is a source of wood requirement for owners and support the watershed for irrigation system and buffer zones to agricultural lands as well. Vegetable cultivation in slope and terraced fields is another avenue for intensification process to reduce dependence on shifting cultivation practices. As a pathway to look for alternatives to shifting cultivation, the International Council for Research in Agroforestry (ICRAF, now the World Agroforestry Council) is working towards mitigating tropical deforestation, land depletion and rural poverty through improved agroforestry systems. On hill slope farmlands, contour hedgerow systems and grass strips along embankments are introduced as a means to build agroforestry-based conservation farming systems (Garrity, 1994).

Agroforestry is a sustainable land management system that increases overall production that combines agricultural crops, tree crops and forest plants and/or animals simultaneously or sequentially and applies management practices that are compatible with the cultural patterns of the local population (Bene et al, 1979). Initial activity regarding agroforestry in the Philippines was the development of the Sloping Agricultural Land Technology (SALT) by the Mindanao Baptist Rural Life Centre in 1970, a Non-Government Organisation. The system is a packaged technology of soil conservation measures and production that integrates these in just one setting (Laquihon et al, 1995). Basically, Sloping Agriculture Land technology is a method of growing field and permanent crops in bands, 4 to 5 meters wide between contoured rows of nitrogen-fixing trees and shrubs. This technology fits well in sloping lands as it minimises soil erosion through trees planted as hedges along the contour of mountain slopes. When the hedges are 1.5 to 2 meters tall, it is cut back to a height of 50 centimetres and cuttings are placed in the strips (also called alleys) between the hedgerows to serve as organic fertilisers.

Agroforestry system is one of the technologies that are incorporated as a strategy in the Community-Based Forest Management programme in the Philippines (Arboleda et al, 2002). In other areas of Asia, the growth of agroforestry has been significant. This is a socially desirable development, as agroforestry is typically more sustainable and profitable than shifting cultivation where increasing population pressure exists on a limited land resource (Otsuka and Place, 2001). They compared labour use and residual profit between shifting cultivation and agroforestry and found that estimated residual profit is much higher in agroforestry compared to upland rice in Sumatra and the net revenue during the production year is higher in agroforestry. Furthermore, they concluded that agroforestry is sustainable because beginning with the fourth year (in case of cocoa) and the eighth year (in case of rubber) tree crops yield positive returns for well over 20 years.

2.6. Social Institutions

Social institutions, either formal or informal, are driving forces to meet household and community objectives. Through local institutional arrangements, communities can effectively manage their livelihoods and natural resource-base. Access and control

over land and natural resources are regulated through many different systems and arrangements. Whether these systems are formal or informal, statutory or customary, restrictive or open, they all play a major role in rural livelihood security. History, values and beliefs are reflected in the way societies organise their systems of agricultural production and natural resource management. They determine the extent to which farmers and other rural community members have the right and power to secure the resources they need to ensure food security and income. Social institutions also have an important influence on the political climate in which resources are managed and regulated.

According to Sen (1999) institutions are the rules, organisations and social norms that facilitate coordination of human action. Institutions provide opportunities, incentives and constraints for human choices and reduce complexity and uncertainty of the world by governing individual or organisational decisions (Edeling, 1998). Institutions are the rules that people develop to specify the activities that should be done or not done related to a particular situation (Ostrom, 2002). Institutions are the rules while organisations are groups of individuals bound together by some common purpose to achieve objectives (Leach et al, 1999). They claimed that institutions are regularised patterns of behaviours that emerged from underlying structures or sets of rules in use. Regularised practices performed over time eventually constitute institutions. Social structures and institutions, like traditional authority and ritual, were seen as maintaining functional adaptation of community members.

Ingerval et al (2003) believed that security of access to resource use is essential to sustained agricultural production. There are many different ways in which access to land and other resources can be organised such as freehold, leasehold, sharecropping and rental arrangements. There are also systems of usufruct by which the owner, whether a clan, traditional leader or landlord, grants rights to use the resource for a limited period of time. Access arrangements depend on many factors and are influenced by local conditions such as population density, the availability of land, fertility, socio-political context and history of the community concerned.

Informal institutions also exist in local communities. Informal institutions are endogenously enforced and upheld by mutual agreements among social individuals or

groups such as customary laws. An example is the notion underlying indigenous forest management practices, where a number of customary rules and regulations for trees and forests can be distinguished. They also apply to the control or monitoring structures such as indigenous tree tenure (Wiersum, 1997). In most customary systems, land cannot be bought and sold freely. Despite this restriction, customary practices do not seem to have hindered investment in the small-farm sector. There are, however, drawbacks to the customary system. These include the powerful groups that may use their position to access key resources, rights of socially marginal groups like women and certain caste are poorly guaranteed and, many governments do not recognise the legal power of customary authorities to regulate and administer land (LEISA, 2003).

These customary practices in local organisation apparently evolved as the best means for them to manage their resources in relation to their set-up or structure. This local knowledge, being unrecognised, creates indifference by local people towards development activities particularly imposed by outsiders.

A customary practice of the Apayao indigenous upland farmers in the Cordillera, Philippines are called “lapat” system. “Lapat” is a traditional practice of a bereaved “isneg” (indigenous people of Apayao) family where material resources like cultivated swidden fields, a portion of a mountain or a river are declared off-limits to people to show their respect and value for a dead family member (Maata, 2003). The most valuable function and output of the “lapat” customary system is its tremendous contribution to resource conservation and socio-economic upliftment of the family.

Related to social institutions, Katz (2000) espoused the notion of social capital that can provide the foundation for use rules, monitoring and enforcement mechanisms which helps preserve the natural resource base. She describes social capital as the networks of social relationships that can be drawn upon to improve individual and collective well-being. Social capital is defined by its functions and values of those aspects of social structure as resources that can be used to realise their interest. Social capital may have its foundation in shared history, ethnicity, religion or other group membership that is manifested in collective knowledge, respect for group rules and norms and the creation and maintenance of self-governing institutions. A general

principle designed by Ostrom (1990) as cited by Agrawal (2001) for sustaining institutions in Common Property rights is that users are more likely to manage their common resource sustainably when their rights to devise institutions are not challenged by external government authorities. However, it could be argued that institutions must comply with national rules on resource management to prevent overexploitation and degradation of resources. Without government control, the rule of law may be abused and local institutions become a tool to legitimise their actions for unsustainable resource use.

In the Philippines, common property resources are those resources in which groups of people have co-equal use rights and co-ownership. It has cultural, social, political and historical bases. Designating a resource as common property resource mainly depends on the existence of a group of people who are residents or indigenous to the area, bound by tradition, formal and informal structures and norms through which they control, own, manage, protect and preserve these resources (ATIK, 1992). However, degradation of common property resources as manifested by the shrinkage in area and decline in productivity has resulted in making the poor people who depend on the resource even poorer. Although efforts by government, private groups and communities to restore manage and protect common property resources have been started in some areas of the country, the crisis is still real. One factor that contributes to the degradation is that people who manage common property resources are not clear about their roles and rights to the resources. The water user's association and irrigation systems in India depict a successful example of cooperation. Factors that influenced collective actions are the size of organisation, closeness of community to market, sites with religious centres and potential leadership of influential persons (Meinzen-Dick et al, 2000). These factors tend to show that the existence of social capital creates an atmosphere of cooperation among the people where they can help each other for their common welfare.

A case in point for successful local organisation that forms a basis for collective action in promoting sustainable resource use for Common Property Resource Management in Tigray, Ethiopia are the “rist” system, “baito” system and water user groups (Chisholm, 2003). The “rist” system is a land tenure system that is an institutional form linking descent groups to specific areas of land. The “baito” is a

system of people's councils that was developed from a mobilisation and civic defence structure. These are useful for Common Property Resources Management, while the water user's group were established for sustainable management and water resource sharing. Chisholm argued that the role of social capital influences the extent through which an effective community-based management regime can be established and maintained. Furthermore, he claimed that the trust created and mechanisms established can lower discount rates of poorer households in Ethiopia.

For the success of managing resources particularly shared by common people, cooperation is strongly needed for members of the communities. This entails working together in using their resources wisely so that the benefits will be equitably felt by everybody to negate the theory of the "tragedy of the commons". This theory refers to the overexploitation of a potentially renewable resource. The crisis scenario of rapid population growth and resource depletion prompted Garret Hardin to write the "tragedy of the commons" theory. His idea is simple and critical. If each individual who has a right to access and use a common resource continues to increase his yield to improve his standard of living, relative to the others, the stock will eventually become depleted. All those that depend on it, including that individual, will suffer as a result. He concluded that the use of resources must be governed by some authority, whether scientific, political or other means. In this instance, there is an analogy with watershed management: to manage it properly. All stakeholders, including those who directly benefit but are not staying within the watershed area, must contribute by paying a price for its conservation. The "tragedy of the commons" in reality applies to "open access" and thus to "unmanaged" commons (Lane and Moorehead, 1994).

From the above literature, it is apparent that social institution becomes a transforming mechanism to attain collective actions to meet objectives.

2.7. Interventions

Strong partnerships and people's participation are the keys to effective intervention but the timing of the interventions are vital to a smooth transition to development. A timely and correct intervention can bridge the gap when it is needed most and can ensure long-term effectiveness.

While governments have provided various forms of interventions and assistance to indigenous farming communities, they are influenced by the idea that Indigenous Peoples must be raised from their current “inferior” intellectual and technological levels to the advanced levels of the dominant society. Many Indigenous Peoples tend not to have a voice in the political process in many countries and they are vulnerable and have sometimes, negative perceptions to government interventions especially when they perceive a threat to their traditional rights over land and forests (Roy, 1988). One threat is the hostile attitude towards the traditional shifting cultivation practice that is seen to be susceptible to ecological constraints. The limitations of shifting cultivation practice have led many governments to push for a more environment friendly technology. Roy (1988) claimed that this “top-down” intervention approach has not been adopted wisely since it is imposed on the people rather than initiated by them. This non-adoption also happens when development projects that deal with agriculture and natural resource management do not pay attention to assessing or understanding the issues of rights and tenure before starting project activities. It is often assumed that development interventions will automatically benefit the community at large (Ingeval, 2003). This is the general concept of some development planners that what is good for us is good for them.

It is a common notion that Non-Government Organisations (NGO's) seem to be gaining ground in intervention activities with many successful programmes and projects they undertake. This is attributed to the thinking that the Non-Government Organisations are more concerned with the social aspect in development. As an example, Cooperative Assistance and Relief Everywhere (CARE) International have used the livelihoods framework in stages of its project work in less developed countries.

Westley (2001) pointed out that using the livelihoods framework, it was found that in many instances poor governance, counterproductive state interventions, corruption, repression of minorities and even civil war are among the causes of livelihoods disruptions. For instance, in the highlands of Guatemala, people suffered secular discrimination, impoverishment and oppression of their culture but through community-based savings and credit organisation and market cooperatives introduced

by a project intervention, it provided Indigenous Peoples with a political space in which to negotiate respect for their rights.

In Africa, success stories of sustainable agricultural intensification appear in those cases where necessary investments or where market proximity and satisfactory infrastructure have enabled markets to function reasonably well. Where state and the Non-Government interventions have resolved structural weaknesses in product markets or have established an agrarian capital base, farmers enjoy incentives and have often pursued sustainable agricultural intensification (Reardon et al, 2001).

Another Non-Government assisted project in India on the construction and rejuvenation of traditional earthen dam called “johads” resulted in the active participation of villagers in the planning, design, monitoring and implementation of water resources that led to strong feelings of community ownership. The improved availability of water in this drought-prone area has greatly improved the quality of life of those living in the area (Kishore, 2003).

In terms of rights over common property resources, Agrawal (2001) concluded that it is better that state interventions, markets or privatisation of property rights over resource use will not be resorted to. He said that attention should instead be focused more on underlying rights and powers of access, use, management, exclusions and transferability that are conferred through rules governing resources. Furthermore forest policies of many governments tend to pursue initiatives that espouse devolution to local users of resources but there is a need to consider the stability and functionality of local institutions in place to make devolution work. Since devolution is the transfer of control over the use of resources from central government to local government units or user groups, the capability of local government and user groups should be considered. Communities and local user groups have the right to implement institutional arrangements but unspecified rights and settlement of major disputes often cannot be addressed without the intervention of the state (Rangan, 1977 as cited by Agrawal, 2001).

A case of state intervention in India is the ordering of Coca-Cola plant to stop drawing water from the community water sources by the court after it found it was mining the environment. Protest from farmers in Plachimada claimed more than 50

sacks of rice and 1,500 coconuts a year were produced but when Coca-Cola built the bottling plant, their harvest yielded barely 5 sacks of rice and 200 coconuts. Government's intervention ruled that extraction of groundwater in the area was illegal. The court found that groundwater was a national resource that belongs to the entire society and every landowner can draw a reasonable amount of groundwater necessary for its domestic and agricultural requirement. In this case, 51,000 litres (11,000 gallons) of water was being extracted per day, converted to coke products and transported, thus breaking the natural water cycle (Brown, 2003). The underground water belongs to the state or the public and the state intervened and acted as trustees for its protection. This therefore implies that even with the recognition of local institutions to form their own rules for collective action to meet their objectives, there are factors outside of the local institutions that tend to disrupt the collective efforts and undermine their welfare. In this respect, the intervention of the state for these local groups is still necessary. It also proves that state intervention can be a potent solution to conflicts that the local groups encounter against bigger private companies that undermine their welfare. Likewise, government policies need to formally recognise the forest use rights of rural households, in a manner similar to the recognition of farmlands. This might facilitate the development of village-level institutional norms that would challenge destructive forest uses. The idea of Zewdie (2003) is that sustainable forest management demands that rights to use forest resources are accompanied by corresponding farmer obligations in forest conservation. The forest laws should, therefore, be re-oriented to support local organisational development and forest management, rather than a blanket policy on forest protection through the use of forest guards. At the same time, it is also important to address the inequalities in direct forest access through local level consultation processes.

Pinstrup-Andersen (2001) proposes policy actions to achieve sustainable food security for all, where policies and institutions are needed to facilitate access by poor rural families to inputs and appropriate technologies as well as non-farm rural employment, improved markets, infrastructure, improved natural resource management, good governance and sound national and international trade and macroeconomic policies. These are all geared towards the government's provision of interventions in terms of social services that must be available to achieve sustainable food security.

Interventions, therefore, are vital to assist the local poor household especially in marginal economies to level the playing fields and uplift their standards of living. They may have access to natural capital and have good social institutions but they should be provided with basic social services so as to complement whatever assets they possess for their livelihoods.

2.8. Sustainability Concepts and Some Approaches

Sustainability is a complex concept that varies in interpretation among different people. It is a broad concept that entails a holistic approach of all sectors concerned. Sustainability in its simplest term means to maintain, which is often associated with other human-centred activities such as agriculture, natural resource management and others. Sustainability is often used synonymously with sustainable development (Belle and Morse, 2003). They cited the World Commission on Environment and Development's (WCED, 1987) definition of sustainable development as a development that meets the needs of the current generation without compromising the ability of future generations to meet their needs and aspirations. Development is therefore inherent to sustainability. Development could be understood as the improvement of the entire community. It is a set of complex concepts and perceptions that covers the spectrum of ideologies. UNCED (1992) presented four goals to be met as a requirement to sustainable development. These are: (a) meeting the needs of tomorrow's generation through today's decisions; (b) balancing social, economic and environmental objectives which requires the application of people-centred approaches including local knowledge, ideas and values; (c) managing natural systems within their limits; and (d) focusing on development, not growth.

The challenge to sustainable development is expounded further by Bass et al (1995) as: (a) environmental sustainability that entails ecosystem being able to support healthy organisms while maintaining its productivity, acceptability and capability for renewal; (b) social sustainability that reflects the relationship between development and social norms or does not stretch these beyond the communities' tolerance for change, and; (c) economic sustainability which requires that the values of the benefits to the society in question exceed the cost incurred, and that some form of equivalent capital is handed down from one generation to the next.

Essentially, sustainability recognises that the earth has a limited supply of resources for species and that all life depends on a healthy, well functioning ecosystem (Guzman and Guzman, 2000). Serageldin (1994) integrated the viewpoints of three disciplines in sustainable development. These are those of the economist, the ecologist and sociologist. It was stressed that the economist seeks to maximise human welfare within the constraints of existing capital stock and technologies. The ecologist's concern is the preservation of the integrity of the ecological subsystems viewed as critical to the overall stability of the natural life support system. The sociologist emphasised human beings as key actors whose patterns of social organisation are crucial for devising viable solutions to achieving sustainable development. "Putting people first" simply means recognising the centrality of the social actors and their institutions in sustaining development. Sustainability must be "socially constructed" where social, economic and ecological arrangements must be purposively and simultaneously made (Cernea, 1995).

The ecologist brings a systems view on sustainable development focusing on the dynamic nature of complex environmental problems with their multitude of links and indirect effects (Rees, 1994). He claims that these effects are manifested at distant locations (downstream) or in the future.

There are indications to put into operation sustainable development for natural resources. In India, the management of micro-watersheds is a more recent focus of policy and has both ecology and livelihood as its objectives (Farrington et al, 1999). Most countries are carrying out national forestry programmes involving iterative forest sector planning. The process is the development of a comprehensive forest policy framework that is consistent with a country's socio-economic, cultural, political and environmental conditions that is integrated into wider programmes for sustainable land use involving participation of stakeholders (FAO, 2001).

Sustainability is a complex issue wherein the tools to measure sustainability are continuously sought. Belle and Morse (2003) cited Liverman et al (1988) and Quannie and Gardener (1995) that perhaps the most popular approach to gauge sustainable development has been the employment of indicators. Indicators are signs

and signals that could be monitored in order to predict a good future. There are, however, many definitions of indicators. The consensus is that an indicator is an operational representation of an attribute such as quality, characteristics, property and other features of a system while data are actual measurements of observations of the value of indicators (Gallopín, 1997 as cited by Belle and Morse, 2003). Furthermore, they claimed that the economic aspect of development was focused in the past since it is easiest to measure what is transacted in the market place than what is not. What and where to measure are more intuitive and the common unit of account enabling aggregation is straightforward money. However, these calculations are not available for sustainable development which includes social and environmental concerns. As Steer and Lutz (1994) pointed out aggregation requires a common unit of measurement of social as well as environmental benefits.

There are critics who argue that such aggregations are inevitably arbitrary and misleading, while supporters contend that even if the indices are arbitrary, the purpose is to force non-monetary elements to be valued in development policy. As a basis for the evaluation of sustainability, Belle and Morse (2003) presented an example of a checklist for an indicator of sustainable development as: (a) specific that must relate to outcome; (b) measurable which implies that it must be a quantitative indicator; (c) usable or practical; (d) sensitive which must readily change as circumstances change; (e) available or relatively straightforward to collect the necessary data. One method in assessing sustainability is the Systemic Sustainability analysis (SSA). This is founded on the Soft Systems Methodology (SSM) that is a process by which it can help develop indicators in a participative mode. Another tool used in Participatory Forest Management is the Economic Stakeholders Analysis (ESA). This tool is helpful in assessing the economic incentives of local forest users in the context of multipurpose forestry. It is a methodological approach that seeks to improve the understanding of the economic incentives faced by primary stakeholders in Participatory Forest Management situations (Richards et al, 2003).

From the different approaches in measuring sustainable development, it is clear that the social assets/social capital or the people are central to sustainable development. This study also aims to use the Sustainable Livelihoods framework developed by the Department for International Development (DFID). The Sustainable Livelihoods

Framework is a way of putting people at the centre of development, thereby increasing effectiveness of development assistance. The sustainable livelihoods framework focuses on household assets, recognising also the importance of physical well-being, education and the state of natural environment for poor people in the achievement of sustainable livelihoods. The DFID (1999) expounded the framework's aims to increase sustainability of poor people's livelihoods through the following objectives: (a) improved access to education, information, technologies, training and better nutrition and health; (b) a more supportive and cohesive social environment; (c) more secure access to and better management of natural resources; (d) better access to basic and facilitating structures; (e) more secure access to financial resources and; (f) a policy and institutional environment that supports multiple livelihood strategies and promotes equitable access to competitive markets for all.

2.9. Conceptual Framework

The conceptual framework of the study (figure 1) shows the process by which sustainability of the indigenous upland farming systems and associated livelihoods in the watersheds of the Cordillera Administrative Region, Philippines can be ascertained. The conceptual framework is adapted with slight modification from the Sustainable Livelihoods Framework for micro policy analysis of the Department for International Development (DFID, 1999). The framework is a way of putting people at the centre of development to help understand and analyse the livelihoods of the poor and is also useful in assessing the effectiveness of existing efforts to reduce poverty. The sustainable livelihoods approach starts with the analysis of people's livelihoods with their full involvement and respecting their views. It also focuses on the impact of different policies and institutional arrangements upon people or households. The livelihoods framework helps to organise the various factors that constrain or provide opportunities and to show how these relate to each other. It then attempts to gain a realistic understanding of what shapes people's livelihoods and how the various influencing factors can be adjusted so that, taken together, they produce more sustainable outcomes.

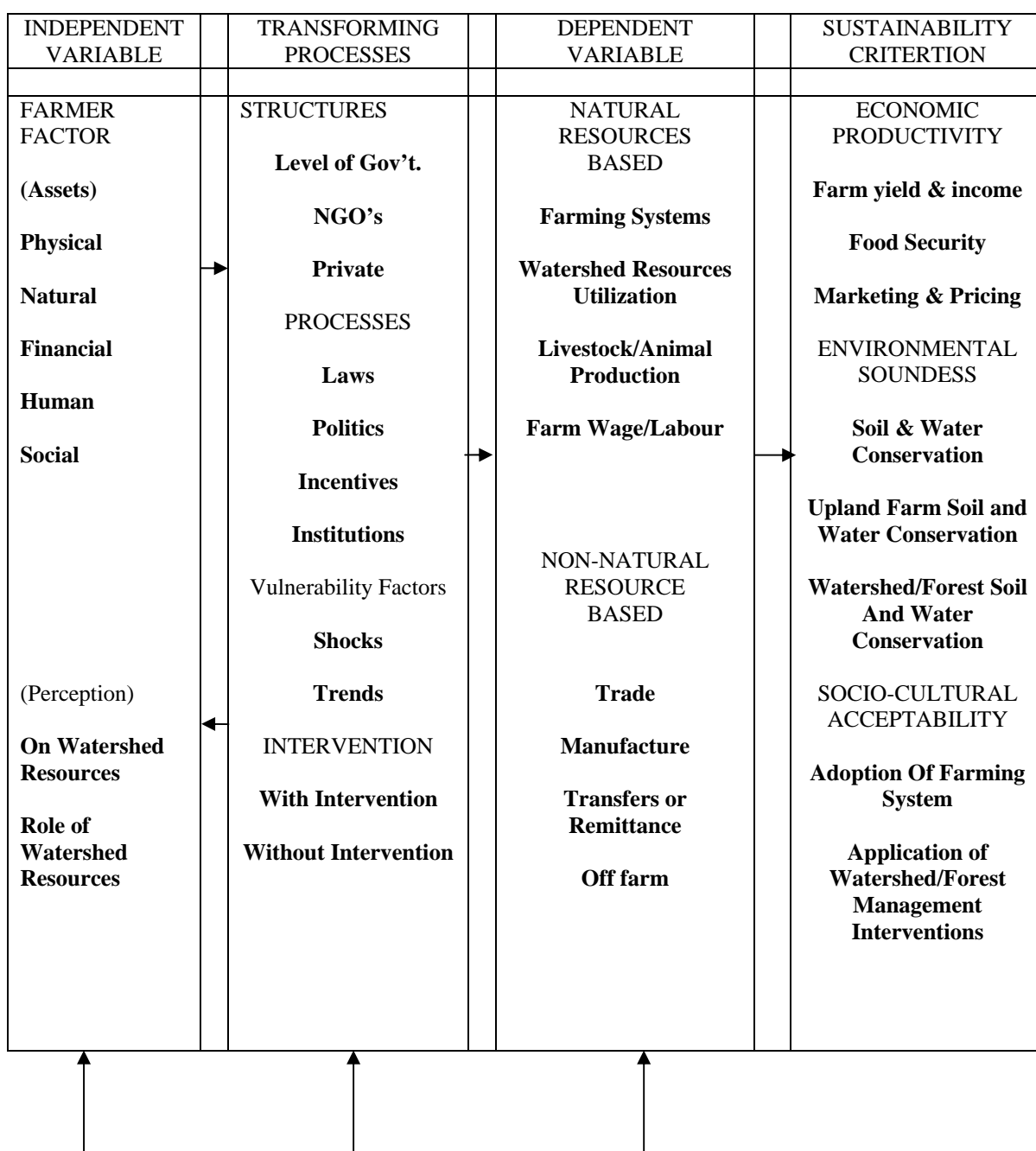


Figure 1. Conceptual Framework (Adapted with modification from DFID)

Starting from the Department for International Development's approach, the framework for this study focuses on the household as the main social unit according to assets it possesses and has access to. These are influenced by outside factors such as interventions or transforming processes as well as unforeseen circumstances or vulnerability factors. The relationships between assets and transforming processes determine the strategies that will be adopted. The result could either be the improvement of the well being of the households with the conservation of natural resources or unsustainable strategies of the households.

There are four major elements that are considered in the framework of this study. The first element, are the household factors such as assets owned and accessed to, and their perception towards the watershed as the natural resource. The assets are basic to production, marketing and the interaction by the households within their environment. The assets include financial, natural, human, physical and social assets. These are the capital resources that the households own. The natural assets are the natural resource-base such as land, water, trees and others that yield products for use. The physical assets include materials and improvements that contribute to production of goods and services. The human assets include the level of education and health status. The financial assets pertain to the cash to purchase production and consumption goods and services, and access to credit. The social assets pertain to the household's social networks and associations in which they participate in group collective actions and derive support especially in times of shocks.

The perception of households on the natural capital, specifically the watershed resources, that they have access to is also vital as it relates to how practices and strategies are implemented that contribute either to conservation or degradation of the watershed resources. These practices are influenced by their perception and attitude in the manner in which they value the resources in the watershed area.

The second element of the framework that act as the intervening variables, are the transforming processes and vulnerability factors. These elements are outside factors that influence the household factors in relation to the decisions for strategies to be adopted such as upland farming systems and associated livelihood options open to them. The transforming processes are the structures such as interventions from the

government, non-government or private sectors. The transforming processes also include laws, policies and institutions, either formal or informal that influence assets and attitudes of households as well. The social institutions or organisations, in turn, affect management strategies and practices. The effects on livelihood strategies of external shocks and trends are also recognised by the framework. Vulnerability to shocks and trends affect decisions on the strategies used, including various coping mechanisms.

The framework depicts interventions through the study areas with programme intervention either by the government, non-government or private organisations. In this study areas with programme interventions will be compared with the areas without programme interventions. The study hypothesised that upland areas with programme interventions do not differ significantly from areas without programme interventions.

The third element in the framework is the strategy adopted, represented by the dependent variables that are the result of the interaction of assets and transforming processes. Strategies could be natural resource-based such as local upland farming systems and practices, livestock/animal production or watershed resource utilisation. The strategies could also be non-natural resource-based that includes trade, manufacture, transfers, remittances and other services resorted to by the households.

The fourth element of the framework, which is represented by the sustainability criteria, is the impact of the asset-transforming processes-strategies interaction. The impact could either result in sustainable or non-sustainable upland farming system and associated outcomes in terms of economic productivity, ecological soundness and socio-cultural acceptability.

The Department for International Development's criteria for sustainability shall be used where economic sustainability is achieved when a given level of expenditure is maintained over time. To be more specific, economic sustainability is achieved if people have income above the baseline level of well being, usually above the poverty line. The ecological soundness is achieved when the productivity of life-supporting natural resources is enhanced or conserved for future generations. Specifically,

ecological soundness is achieved when soil and water conservation as well as watershed protection measures are practiced. Socio-cultural acceptability of the strategies used is achieved when social exclusion is minimised and social equity maximised.

The impact or outcome becomes the basis for a feedback mechanism to improve on the assets-transforming processes-strategies interaction of the whole system.

CHAPTER III

3. METHODOLOGY

3.1. Introduction

This chapter presents the procedure used in the conduct of the study. It presents the steps followed in the implementation of this research that consists of four sections. The first section deals with the identification of the research objectives followed by the criteria for selecting the site or location of the research study, sampling frame and unit of analysis. The sampling frame includes the selection of respondents for the study. The third section is concerned with the data collection procedures such as construction of questionnaires for household interview schedule and the checklists for focus group interviews. The method of gathering information from the respondents is also discussed in the third section. The last section pertains to the data management and analysis. It deals with the statistical procedure used in analysing qualitative as well as quantitative data sets.

3.2. Identification of Research Objectives

The research objectives were identified based on the literature review. The main research question was as follows:

“What are the similarities and differences on the sustainability of indigenous upland farming systems and associated livelihood in the watershed area of the Cordillera as influenced by programme intervention and without programme intervention”?

The general research objective was to compare the sustainability of indigenous upland farming systems and related livelihood in a watershed area as influenced by intervention and non-intervention processes.

Specifically the objectives of the study are: (a) assess the local people’s perception on the importance of watersheds and their dependence on it; (b) determine the factors influencing the local upland farming strategies and their sustainability in relation to economic productivity, ecological soundness and socio-cultural acceptability and; (c) compare areas with programme intervention to those without programme intervention

in terms of their effectiveness in watershed resource use, conservation and management.

3.3. Site Selection

The study was conducted at the Cordillera Administrative Region, Northern Luzon, Philippines. The specific study sites were communities situated in a watershed area. For purpose of comparison, one site was selected with a Community Based Forest Management programme intervention implemented by the Government through the Department of Environment and Natural Resources (DENR). Another site was selected within the same locality with no programme intervention. One study site was selected at the Benguet Province and another at the Mountain Province in the Cordillera Administrative Region in the Philippines. The Regional Office of the Department of Environment and Natural Resources assisted in the identification of areas with the Community Based Forest Management Program in the Cordillera. All the sites were visited for the selection of communities for the study.

3.4. Sampling Frame and Unit of Analysis

One municipality from Benguet Province and another from the Mountain Province, Cordillera Administrative Region, Philippines served as the sampling frame of the study. In each municipality, communities were selected based on presence of Community Based Forest Management Program of the DENR and another community was chosen without program intervention that is near to the community with program intervention.

A total sample size of 160 respondents, broken down into 80 respondents for each Province was chosen randomly from the sampling frame. There were 40 respondents each for communities with CBFM program intervention and 40 respondents for communities without program intervention. This served as the unit for analysis for the household survey. Focus groups were stratified according to gender. The members of the focus groups were selected through random sampling.

For the study sites with programme intervention, the list of names of participants were obtained from the programme implementers and random sampling was done to select the respondents. For areas without programme interventions, a list of households were

taken from the Barangay Captain (elected government officer in the community) and then randomly selected as the respondents.

3.5. Distribution of Respondents

Table 1. Distribution of respondents in the study sites

LOCATION	DISTRIBUTION OF RESPONDENTS	PROGRAM INTERVENTION
Lesseb, Mountain Province	40	None
Capinitan, Mountain Province	40	CBFM*
Boyacaoan, Benguet	40	CBFM*
Lengaoan, Benguet	40	None
Total	160	

*CBFM= Community-Based Forest Management Program

There are a total of 160 respondents for the study that are broken down into 40 respondents for each community. Two communities are located at the Mountain Province while the other two communities are located at the Benguet Province of the Cordillera Administrative Region. Capinitan from the Mountain Province and Boyacaoan from Benguet have program interventions, specifically the Community-Based Forest Management Program of the Department of Environment and Natural Resources.

In the study, 50% of respondents were women. The research selection of the respondents included the husband or the wife. In cases where the husband was not available, the wife was interviewed since both were engaged in the farming activities and helped each other in farm operations. Individual households who were members of the CBFM programme have both husband and wife as registered members. This means that both the husband and wife have knowledge in the farming and CBFM operations in their locality.

3.6. Data Collection, Methods and Sources

Before the actual fieldwork, the Regional Office of the DENR was visited and the Regional Technical Director was informed of the study and interviewed for assistance in the identification of communities with Community Based Forest Management

program. A point person was contacted who is familiar with the sites to accompany the researchers. The Municipal Mayor and Governor of the Province were also visited and informed about the purpose of the study in their jurisdiction. This facilitated data gathering and access to any secondary information. The secondary data were obtained by looking into programme documents, annuals, progress reports and case reports especially for areas with programme interventions. These data were taken from government agencies and Non-Government Organisations who are involved in the communities. Historical events, background information about the study site and other pertinent information were likewise obtained.

For the primary data collection, the combination of semi-structured interview, focus group interviews and participant-observation were used in the study. A questionnaire with open-ended questions was devised for the household interview schedules (See Appendix A). The questionnaire included demographic information, household factors like assets and perceptions of households to watershed resources, social institutional arrangements, strategies and practices adopted as well as risks and problems encountered and their coping mechanisms. The prepared questionnaire was pre-tested before final use so that ambiguities or unclear questions were identified and corrected. Likewise, informal interviews were conducted to further explain unclear ideas and to gather information used in the local dialect to describe their systems and practices.

Discussions through focus group interviews were used to gather in-depth information on aspects such as gender roles, customs and traditions and other concerns not covered by the household survey. The focus groups were divided according to gender and separately asked information concerning land tenure, social aspects, and upland farming systems and their problems and concerns. Observation around the community and their farms was done to further understand the farming systems and the overall condition of the community. This provided clearer insight on the way of life of the people and a means to cross check data gathered.

3.7. Data Management and Analysis

A coding scheme was devised for tallying results of the interviews. The qualitative and quantitative data were analysed using a computer-based Statistical Package for Social Science (SPSS) programme. The data were analysed using descriptive statistics such as mean, frequency and ranking. The Analysis of Variance (ANOVA) test was used to determine significant differences among the communities based on the parameters measured. The Bonferroni's multiple comparison of means was further used whenever a significant result existed in the Analysis of Variance to identify specific mean differences. Multiple linear regression analysis was used to determine relationships among the sustainability indicators of the upland farming systems used such as the assets, yield, soil and water conservation techniques adopted, social support system and perceptions on effectiveness. The vegetable upland farming systems adopted by the farmers were related to sustainability criteria such as economic productivity, ecological soundness and socio-cultural acceptability. The areas with Community Based Forest Management Program (CBFM) were also compared to the areas with no CBFM program.

CHAPTER IV

4. THE SETTING OF THE STUDY

4.1. Introduction

The study area is presented in this chapter. The chapter introduces the location of the study at the Cordillera Administrative Region, Philippines and the specific barangays or communities.

4.2 The Setting

4.2.1 The Cordillera Administrative Region

The Cordillera Administrative Region (CAR) is one of the newest regions among the 14 regions in the Philippines. It is located at the mountain ranges in the central part of Northern Luzon. The Cordillera Administrative Region was formerly known as the Mountain Province that was created as a special province of the Philippines in 1907. It was then composed of the sub-province of Bontoc, Lepanto, Amburayan, Apayao, Benguet, Ifugao and Kalinga. Later, Amburayan and Lepanto were incorporated into the sub-provinces of Benguet and Bontoc respectively.

In 1987, a new Philippine Constitution was drafted and approved paving the way for the establishment of autonomous regions for Muslim Mindanao and the Cordilleras. The President of the Philippines then, Corazon C. Aquino, issued Executive Order No. 220 on July 15, 1987 creating the Cordillera Administrative Region. The region is composed of the provinces of Benguet, Ifugao, Mountain Province, Kalinga, Apayao and Abra including the chartered city of Baguio (Figure 3). The CAR has a total land area of 1,829,370 hectares or 6% of the country's total land area.

The topography of the Cordillera is mountainous with very steep to nearly level slopes and deep ravines. The terrain is rugged with towering peaks and sharp ridges abound in the area. Valleys and plains are located at the lower elevations. Elevation ranges from 500 masl to 2710 masl. The people of the Cordillera are referred to as the Indigenous Peoples collectively called "Igorots". The homogeneity of cultures and traditions in the Cordillera is the common ground that binds its people and land. The region's rich and varied cultural heritage distinctly identifies the Cordilleran from the mainstream of society in so far as cultural ramifications and norms are concerned.

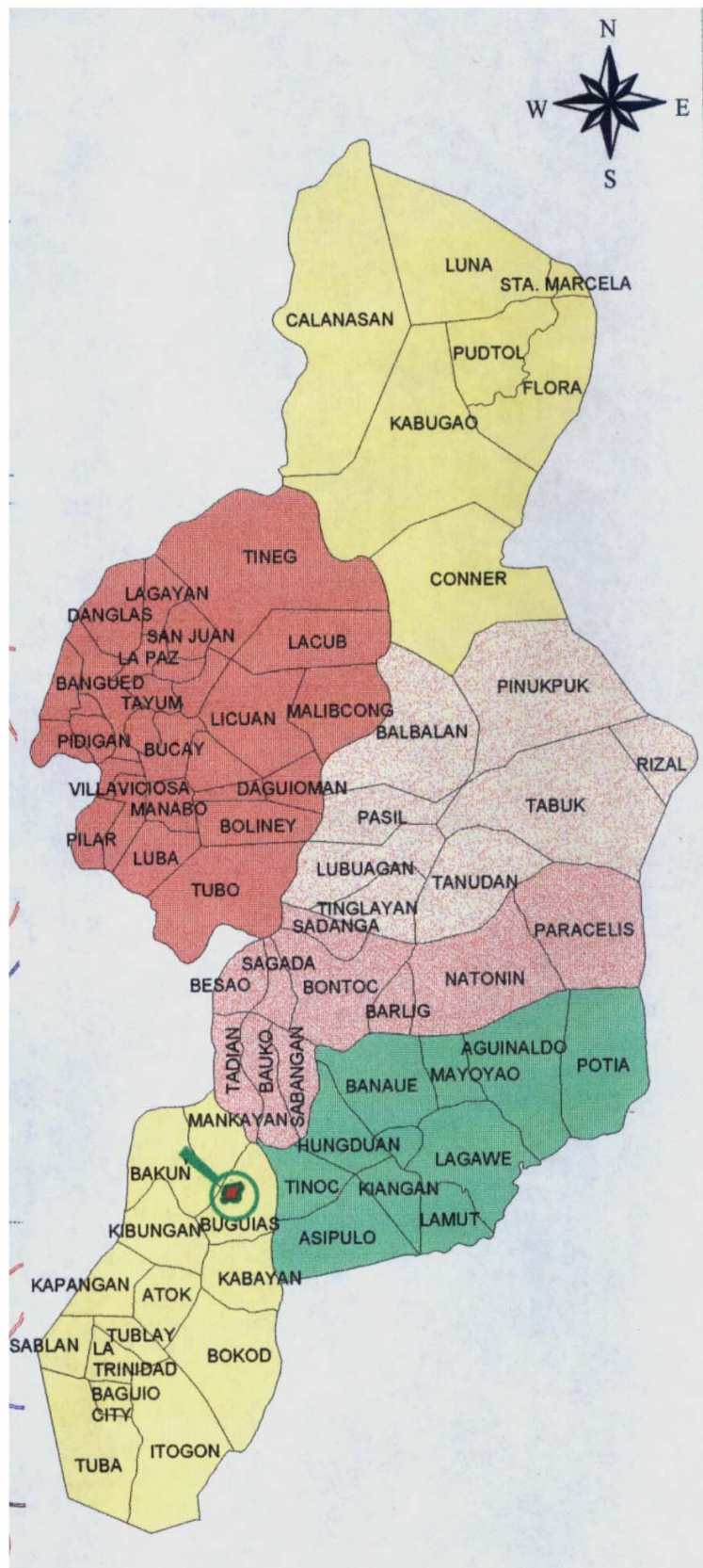


Figure 3. Map of the Cordillera Administrative Region

Currently, however, migrant groups from the lowland areas can be found in parts of the Cordillera Administrative Region particularly in the City of Baguio and La Trinidad, Benguet Province. This is brought about by economic interaction such as employment opportunities, trade as well as intermarriages.

4.2.2. Poverty Situation

Result of a study by the government on the Minimum Basic Needs Survey conducted in 1996 showed that in the Mountain Province there is a poverty incidence of 67.97%. This means that 67.97% or 15,531 households of the total number of households are poor and unable to meet the minimum basic needs of a family. The municipality of Sabangan, where barangay Capinitan is located, has 56.19% poverty incidence while the municipality of Bauko, where barangay Lesseb is located, has 49.41% poverty incidence. Basically, all the Provinces of the Cordillera Administrative Region belongs to the “Club 20” or the poorest provinces of the Philippines targeted under the social reform agenda of 1996, although some improvements had been accomplished in these areas.

Based on the final result of the Family Income and Expenditure Survey (FIES, 2000), the average family income in the Cordillera Administrative region increased by 7.51% annually between 1997 and 2000 at current prices or by 0.82% annually at constant 1994 prices. Table 2 shows the average family income of rural and urban areas of the Cordillera Administrative Region from 1991-2000.

Table 2. Average Family Income (Rural-Urban), CAR: 1991-2000 in Pesos at 1994 Price.

	1991	1994	1997	2000
CAR	75,045	74,669	92,554	94,846
Urban	124,901	112,226	159,334	148, 329
Rural	52,841	57,760	62,778	64,969

Source: NEDA, CAR Regional Poverty Situation

The NEDA reported that since 1991, average family incomes in real terms have improved despite a slowdown between 1997 and 2000 and a slight drop between 1991 and 1994. The industry sector suffered a 7% decline in gross output due to a severe energy crisis that hit the nation affecting the production output in industry and as such the drop of income during this period was felt more in urban areas where industries are located while rural income still managed to flow. Incomes in the rural areas are in fact improving contrary to the perception that the income situation is worsening. Between 1997 and 2000, average income in real terms in the rural areas grew by 1.15% annually compared to the 2.6% annual drop in the urban areas. Across provinces in the Cordillera, Baguio City, as expected has the highest average income followed by Benguet.

The Regional Development Report from the Cordillera (NEDA, 2003) showed that the disparity between families in extreme poverty and those belonging to the richest group has worsened over the period 1988 to 2000. In 1988, the average income of families belonging to the richest group was 17 times that of those belonging to the poorest group. This disparity increased to 20 times by year 2000. Even when the average incomes of the poorest groups are combined and is compared to that of the richest group, the disparity remains glaring. That is almost twofold in 1988 and almost threefold by 2000. The urban-rural disparity in average family incomes has neither improved with urban incomes remaining more than twofold that of rural incomes in the Cordillera for the past 12 years.

Within urban areas, the disparity between the richest and the poorest families also remains wide even while the gap was reduced in the last 12 years. That is, the mean income of families belonging to the richest group was 19 times that of families belonging to the poorest group in 1988. By 2000, the gap was reduced to 13 times. If the urban-rural income distribution is bad, the situation within rural areas in the Cordillera is even worse.

4.3. The Study Sites

The study was conducted at Barangays Lesseb and Capinitan in the Mountain Province and Barangays Lengaoan and Boyacaoan at Benguet Province.

4.3.1. Barangay Capinitan, Sabangan, Mountain Province

Location

Capinitan is one of the 12 barangays of the municipality of Sabangan, Mountain Province. It is situated 120 degrees 50' 58" longitude and 16 degrees 55' 61" latitude. Barangay Camatagan bound Capinitan on the north, Barangay Busa on the south, Lagawa and Bauko on the west and Chico River on the east (Figure 4).

The area is accessible through the Halsema highway from Baguio City. It is 12 kilometers away from the municipal hall of Sabangan, Mountain Province.

Characteristics

Capinitan is mountainous with steep slopes and some flat terraced areas. It has an elevation ranging from 1,160 masl to 1,840 masl. The upper ridges of the mountain are public forest being protected by community members. The adjacent forest area of the community was formerly a logging concession of a private lumber company with a Timber License Agreement granted by the government. However, at present the logging company ceased operation and the logging area was given to barangay Capinitan whose jurisdiction falls within the area to protect and manage as their watershed.

Houses are clustered near the highway while gardens are located at the upper and lower slopes. Gardens are mostly terraced and planted with highland vegetables. The area has been occupied and possessed since time immemorial and is part of the ancestral domain of the indigenous community. With the tax-mapping program of the government, individual lot claims were issued tax declarations.

Concrete foot trails from the road going up the garden slopes were constructed by the community members using the Congressional fund provided for the municipality. The concrete footpath forms a network utilized as routes going to the house settlements. Electricity is provided to the community through the Mountain Province Electric Cooperative. Communication system is through hand-held radios and mobile phones while postal and telegraphic services are available at the municipal hall of Sabangan.

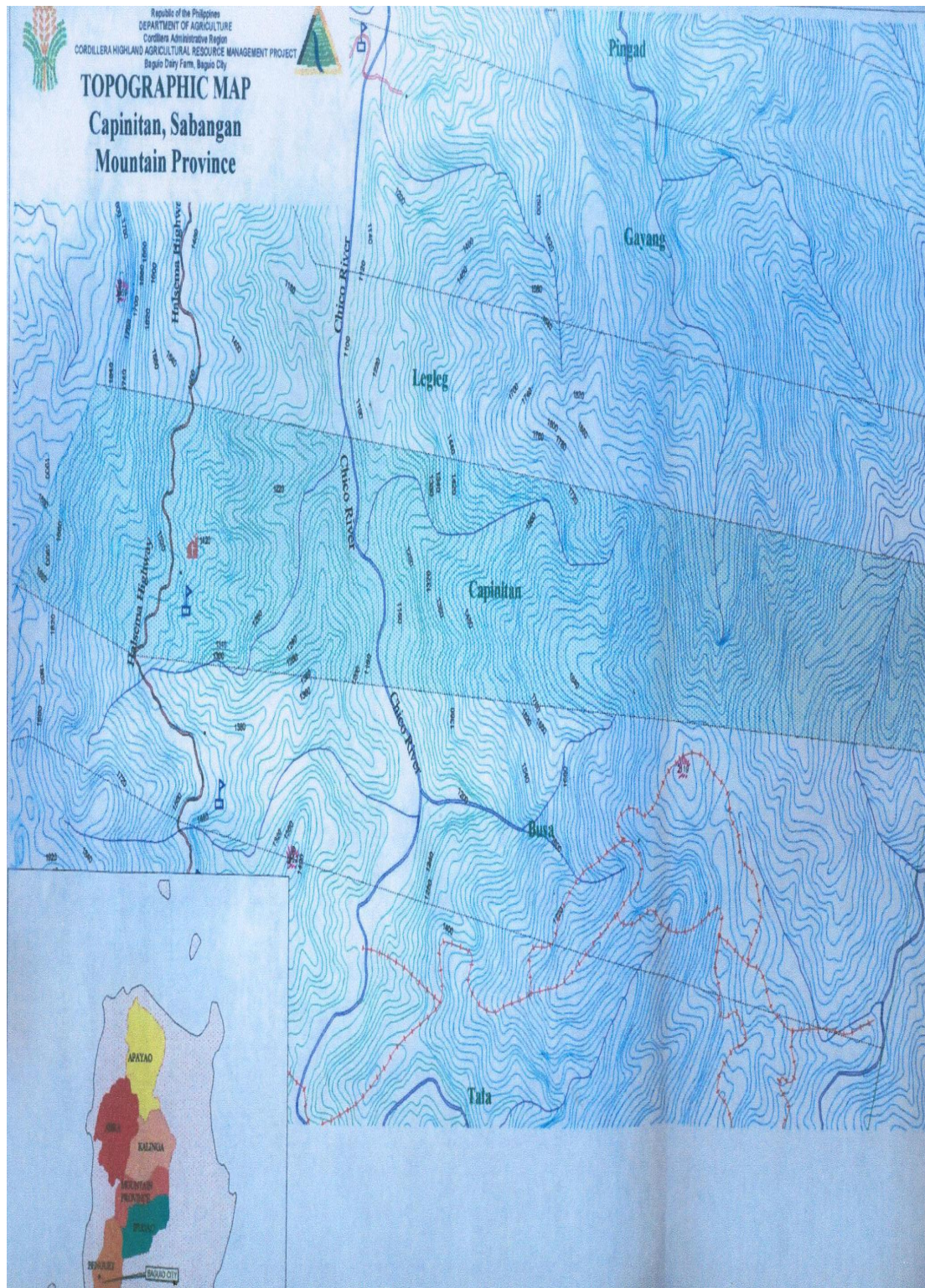


Figure 4. Map of Capinitan, Sabangan, Mountain Province

In terms of health services, a barangay health clinic is present rendering services such as immunization, home baby deliveries, first aid and periodic consultation. One regular midwife is present in the clinic while assistance from the municipal health personnel is provided during scheduled visits.

An elementary school is present in the community which has grade 1 up to grade 6 headed by a classroom teacher per grade level. After elementary education, students enroll in nearby barangay high school. There are also three religious groups in the community where Catholics are the predominant group, followed by the Born-Again Christians and the Jehovah's Witnesses.

The community is a recipient of government programs specifically the Integrated Social Forestry Program (ISFP) in 1989 by the DENR. In 1993, the area was identified as the Center for People Empowerment. As such the members of the ISFP were organized into the Capinitan CARP-ISF Association (CACIFA), a People's Organization dependent on upland farming for their livelihood. Eventually in 2001, the PO's became recipients of the Community-Based Forest Management Program (CBFM) of the DENR as partners in development.

4.3.2. Barangay Lesseb, Bauko, Mountain Province

Location

Lesseb is one of the barangays of the municipality of Bauko, Mountain Province. Barangay Tapapan bounds Lesseb on the north, on the west by Pandayan, on the south by Mabaay and the east by the Halsema highway (Figure 5). It is 11 km away from the municipal hall, 4 km from the national highway and 8 km away to the nearest local market. The area is accessible going down an unpaved road from the national highway.

Characteristics

Lesseb has a total land area of 640.60 hectares with steep mountainous areas. Its elevation ranges from 1,040 masl to 2,000 masl. Lesseb resembles a valley where house settlements are found in clusters at the lower portion and along the slopes. Terraced gardens are found at the slopes while pine forests are located at the upper ridges. From the lofty and extensive plateaus of Mount Data flows water going to the



Figure 5. Map of Lesseb, Bauko, Mountain Province

creeks of Lesseb. It flows all year round, visible at great distance as waterfalls. Bordering the immense precipice that forms this cascade, the trail descends to the community below from the mountains. The people depend on upland vegetable farming where water is abundant from the natural spring.

The agricultural lands constitute 100.89 hectares while forestlands consist of 206.60 hectares of Benguet pine trees that are naturally growing. There are 160 hectares of grasslands that are suitable for grazing area. The built-up areas comprise 64.60 hectares devoted to residential, institutional and recreational lands.

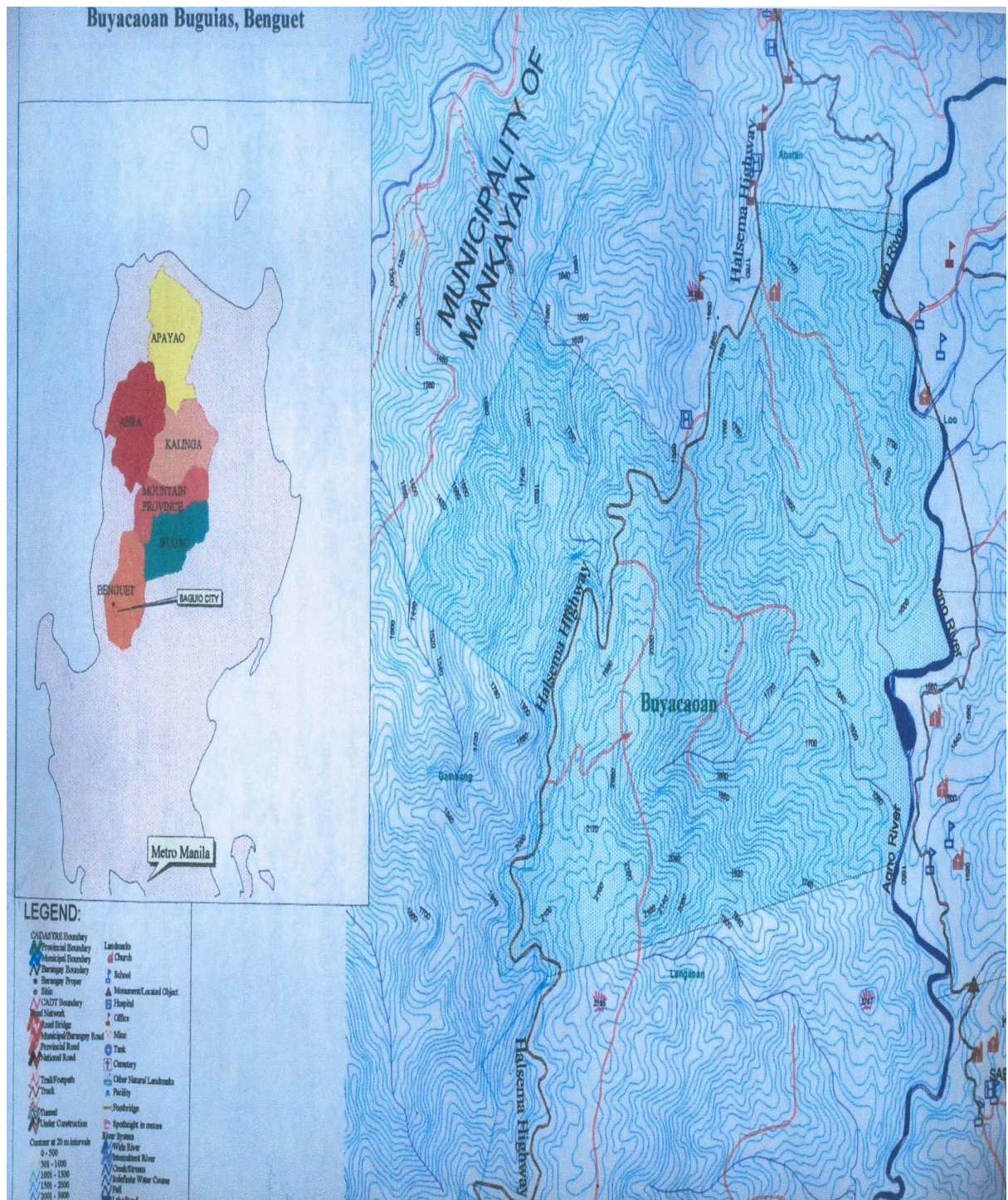
There are no communication facilities in the community. Newspapers are the only sources of information. Although Lesseb is energized, there are no radio and television relay stations received. There are also no passenger vehicles allowed by the Land Transportation Franchise Regulatory Board for this route. The people commute through private jeep, vans and truckers passing by.

4.3.3. Barangay Boyacaoan, Buguias, Benguet Province

Location

Boyacaoan is one of the 14 barangays of the municipality of Buguias, Benguet Province. The municipality of Buguias is located in the northernmost part of the province of Benguet with a total land area of 21,279 hectares. Out of the total land area 1,015.25 hectares were classified as alienable and disposable lands by the national government. This means that the remaining land areas of the municipality are classified as public lands that are either declared as national parks, watershed reservations or forest reservations.

Barangay Boyacaoan is the CBFM site of the DENR that is situated within the catchments of the Agno River. The community lies between latitude 16 degrees 46' 00" and 16 degrees 47' 00" with longitude 120 degrees 48' 00" and 120 degrees 49' 00" (Figure 6). It is accessible by land transport routes via the Baguio-Bontoc-Banaue road or the Halsema highway. This is the main road access for transport of farm products. Barangay Loo bound Boyacaoan on the north, on the west by the Halsema highway, on the east by the Agno River and on the south by Barangay Lengaoan.



Brief Background

In the early days, the municipality of Buguias, where Boyacaoan is located, was a virgin forest covered with pine trees and oak trees. Amidst this forest were wild fruits, animals and honey in abundance, so it was not surprising for the inhabitants to live on hunting and swidden farming to supplement the wild plants they picked from the forest.

In the 17th century, the Spanish colonizers reached Buguias, Benguet. The Spaniards frequently visited the place to recruit workers at the mines of nearby Lepanto. It was a forced labor to work at the foot and horse trails and consequently some people moved out from the municipality. The Spaniards appointed those who remained as “Cabeza de Barangay” or Barangay Head to recruit more laborers and collect taxes for the Spanish rulers. With the construction of more trails, it paved the growth of the community.

In January 1900, the Americans took over the Spaniards and discovered nearby Lepanto as a potential mining area. During this regime, Buguias was created as a township through Act No. 48 of the local civil government on November 22, 1900. In 1933 to 1934, the Americans recruited residents to work in road construction at the mines in Suyoc and Lepanto areas. More mines in other areas were opened and a logging concession was established. At this juncture, the Americans taught the people democratic way of living through social services. The Americans taught the people to improve their swidden and terraced farms, animal rearing and vegetable gardening. As people were progressing, World War II broke out disrupting all activities. The Japanese Imperial Army ruled Buguias like the other areas. In 1944, most of the people evacuated until the American soldiers came back to the Philippines and defeated the Japanese until they surrendered in 1945. After the war, all disrupted activities such as road construction, bridges and schools reopened including agriculture and logging.

The entry of the Chinese farmers in Buguias and its barangays, including Boyacaoan and Lengaoan in 1950, has gradually changed the farming systems. The Chinese businessmen introduced the commercial vegetable farming that shifted from the

traditional “kintoman” rice production. From then on, modern farming technologies have expanded not only on the relatively flat lands but also invaded hilly open areas. This is a threat to environmental security considering that even protected mossy forest and critical water sources are invaded by the farming industry.

The municipality of Buguias, a once thickly forested area is now a progressive vegetable farming community.

Characteristics

The topography of Boyacaoan, Buguias, Benguet is mountainous characterized by steep slopes with a few flat areas at the lower elevations. The elevation of the area is 1,700 masl to 2,000 masl. Vegetable gardens dominate the more flat areas and terraced slopes. The uncultivated portions are dominated with pine forest. The area is a watershed catchments area considered as the “headwaters” of the declared Upper Agno Watershed supporting the two major hydroelectric plants of Ambuclao and Binga dams located at Bokod and Itogon, respectively.

Just like Barangay Capinitan, Boyacaoan was formerly a site for the Integrated Social Forestry Program and the Boyacaoan Agroforestry Association Incorporated (BAFAI) was created as a Peoples Organization. In 1992, the DENR awarded a project on Environmental and Natural Resource Sectoral Adjustment Loan Program. This is a reforestation project to rehabilitate denuded forest areas in the community. In 1999, the Peoples Organization was awarded with the CBFM program.

4.3.4. Barangay Lengaoan, Buguias, Benguet

Location

Barangay Lengaoan is adjacent to Barangay Boyacaoan. Both are adjoining areas at the municipality of Buguias, Benguet. Boyacaoan bound Lengaoan on the north, on the south by Amgaleyguey, on the west by the municipality of Bakun and the east by Baculungan Sur (Figure 6a). It is accessible through the Halsema highway.

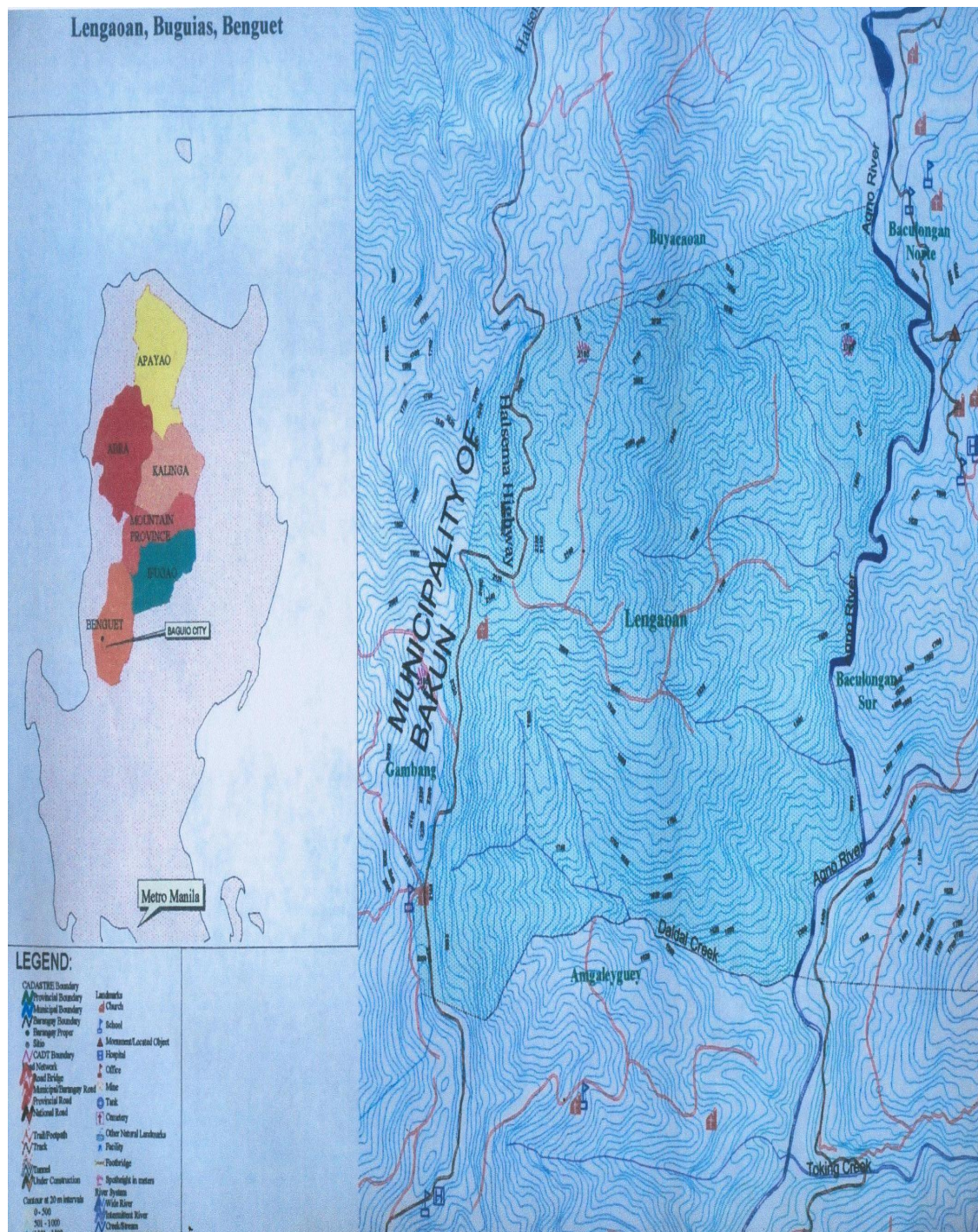


Figure 7. Lengaoan, Buguias, Benguet

Characteristics

Lengaoan is the smallest barangay of the municipality of Buguias, Benguet Province. It has a total land area of 780 hectares or 3.47% of the total land area of Buguias (21,279 hectares). Lengaoan is a mountainous area with steep slopes but rather flat at the upper portions that were leveled for vegetable gardens. The elevation of the area ranges from 1,350 masl to 2180 masl. The landscape is predominantly gardens at the flat areas on top of the mountains to terraced gardens at the slopes. There are very few forest areas as trees were cut for vegetable gardens. Water is very scarce and the gardens are situated higher than the water source that is located inside Barangay Boyacaoan.