Land and water related opportunities and constraints to livelihood security for vegetable crop growers in La Union and Mountain provinces, Luzon, the Philippines

A dissertation submitted in partial fulfillment of the requirements for the degree of Master of Science (MSc) in Rural Resource Management of the University of Wales

By Chiaki Yamada
BSc Land Development (1996, Japan)

School of Agricultural and Forestry Sciences
University of Wales, Bangor
Gwynedd, LL57 2UW, UK
www.bangor.ac.uk
Submitted in September, 2004

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ABSTRACT

The agricultural sector in the Philippines contributes 20% of the GDP, and generates 40% of employment opportunities. Moreover, production of crops, such as rice, vegetables, and root crops contributes greatly by 16% to farmers' livelihoods and the rural economy. Moreover, the production of crops provides 16% of farmer's livelihoods. Rice is one staple of agriculture, but in many provinces it is the production of vegetables and root crops that is most important.

This research aimed to identify the constraints and opportunities of the land and water for crop production, in order to enhance the security of livelihood in La Union and mountain provinces of Luzon in the Philippines.

Qualitative data was collected by structured interviews and participatory assessments such as resource mapping, group meetings and cropping calendars. Secondary data was also gathered from a visit the national and local government.

Issues discussed were cost-effective ways that farmers might be able to cope with constraints, limiting crop productivity and cropping pattern and achieve soil and water management. The conclusion were more water would be needed, agricultural extension and training should be better tailored to farmers and needs realities and infrastructural improvement, the information network between farmers and the government and post-harvest should be focused on in the future.

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ACRONYMS

ADB	Asian Development Bank
AEW	Agricultural Educational Worker
ATI	Agricultural Training Institute
CAR	Cordillera Administrative Region
CHARM	Cordillera Highland Agriculture resource Management
CIS	Communal Irrigation System
DA	Department of Agriculture
GDP	Gross domestic product
IAWM	Institute for Agroforestry and Watershed Management
NIA	National Irrigation Administration
WUAs	Water user associations

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Chapter 1. INTRODUCTION

1.1. Study rationale

According to Country Reports on Economic Policy and Trade Practices, agriculture in the Philippines occupies only 20% of GDP, whilst generating 40% of employment opportunities (Dacanay, 2003). Production of crops, such as rice, vegetables, and root crops contributes greatly by 16% to farmers' livelihoods and the rural economy in the Philippines (National Statistics Office, 2003).

The high population growth in cities in the Philippines has brought a need for more food. Farmers have had to adopt more intensive agricultural practices and reduce fallow periods (Boserup, 1981). Over cultivation which does not have fallow periods has caused land degradation and socio-economic problems, such as decreasing plot size and insecure tenure reduces farmers' capacity to increase crop yields(Poudel *et al*, 1998)
It might be that the opportunities and constraints for vegetable cropping differ for different groups of farmers. Due to be differences because of access to the markets to sell their own products and credit in different villages. For example, the indigenous people have a tendency to persist with their own traditional ideas rather than adopting modern technologies that help farmers produce more crops and can be adapted by farmers. Appropriate extension services which help farmers in need or provide practical help should be discovered through this project.

1.2. Study objectives

The main aim of this research was to identify the constraints and opportunities associated with growing vegetables and root crops, focusing on water and land management strategies and the key socio-economic factors of inheritance.

In order to achieve this aim, it was necessary to investigate current practices and limitations. This was done by answering four broad research questions.

(1) What are the current production systems for vegetables and root crops in different localities?

1. Types of vegetables and root crops grown and cropping pattern
2. Storage and processing
3. Occurrence of pest and disease and their impacts
4. Inputs used
5. Income from vegetable and root crop production and other sources
6. Constraints and opportunities
7. Markets and marketing process

(2) What are the main land management techniques associated with vegetable and root crop production in different localities?

1. Methods to prevent land degradation – intercropping and multiple cropping
2. Impacts of growing vegetables and root crops on soil, downstream and upstream effects

(3) What are the main water management systems used for vegetable and root crop production in different localities?

1. Sources of water
2. Measures to get water to the farm
3. Frequency of use of irrigation
4. Existence and efficiency of water management groups

(4) What are the key socio-economic aspects affecting vegetables and roots crop production in different localities?

1. Credit and marketing
2. Farm to market linkages
3. World market conditions and GATT[1]

[1] The General Agreement on Tariffs and Trade

1.3. Study outline

In order to achieve these questions, four different locations in lowland and highland areas were examined: San Gabriel in Province of La Union and Buoko in Mountain Province (Figure 1 and 2). These represented a range of ecological, economic and environmental conditions, farming systems and ethnic groups. The study was conducted from June 8th to July 26th 2004. In total, 56 farmers answered questionnaires and Participatory Assessments exercises, such as resource mapping, seasonal calendars, and problem rankings were practiced.

Figure 1. Location of Province of La Union

Figure 2. Location of Mountain Province

1.4. Project background

This research was undertaken as a part of EU funded "Strengthening the Institute of Agroforestry and Watershed Management, Philippines." This project is currently being administered by The Centre for Arid Zone Studies at the University of Wales, Bangor The objective of the project is to strengthen and improve the effectiveness of teaching, training and extension activities of the Institute for Agroforestry and Watershed Management (IAWM) focusing on the training needs of those serving the surrounding areas and the extension requirements of farmers from indigenous and other groups. The main activities comprise of the development of curricula and teaching materials and trials with internet and distance education within the Philippines. It is hoped that these activities will enable the forest dwellers and local farmers to be involved in and improve sustainable livelihoods. This research contributed to identify constraints and opportunities for vegetable and root crop growers and then help them to solve these issues.

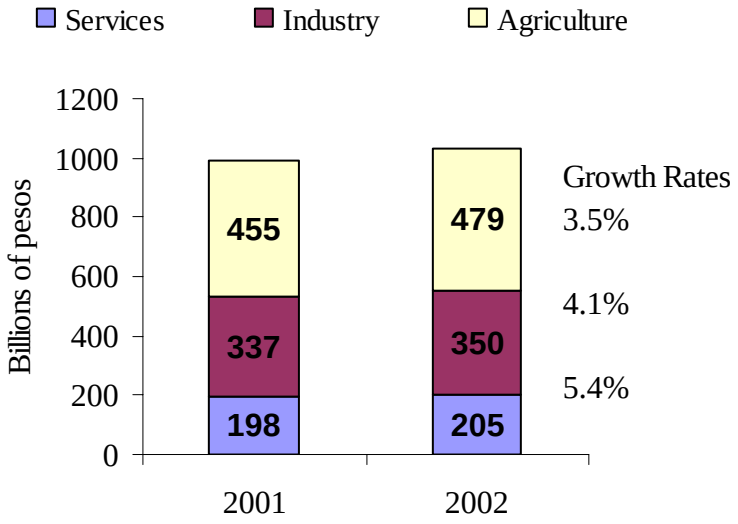
Chapter 2. LITERATURE REVIEW

2.1. The importance of vegetable production

2.1.1. Vegetables and other crops – the national picture

The vegetable industry in the Philippines is important both to the economy as well as the nutrition of ordinary people. Of the 73 million population in 1998, the agriculture sector employed more than 11 million people (FAO, 2003a). Also, Figure 2.1 shows that agriculture has contributed 16% of GDP in the Philippines in 2000 (Dacanay, 2003). The total area of planted crops was 11.6 million ha and of these, 5.5 million ha are devoted to rice and corn, and 6.1 million ha for vegetables and root crops (FAO, 2003a).

Figure 3. GDP of the Philippines in 2001 and 2002



Source: Dacanay (2003)

There are about 43 major kinds of vegetables grown in the Philippines (Bureau of Plant Industries, 2003a). According to the survey from Bureau of Agricultural Economics, the leading vegetables in both value and production are sweet potato, tomato, cabbage, beans, onion and garlic (Knott *et al*, 1967).

It is estimated that between 75 to 80% of the total area concerned with vegetable production is confined to the following provinces: Benguet, Mountain Province, Nueva Eciji, Pangasinan, Iloilo, Pampanga, Misamis Oriental and Bukidnon in the Philippines (Bureau of plant Industries, 2003a). In these particular provinces vegetables are planted throughout the year, and some produce is exported to different countries, such as Japan (Bureau of Plant Industries, 2003b).

Rice the staple food is grown in more than 80% of provinces in the Philippines more rice is produced than vegetables. In general, vegetables are grown mainly during the summer season after rice is harvested and planted as an intercrop with perennials such as coconut and fruit trees (DA, 2003a).

One of the problems in vegetable production is a lack of yield stability, mainly because of water related constraints, such as water rights and reliability of supply. In order to get guaranteed income from selling vegetables (Poudel *et al*, 1998). Investment by government on infrastructure, such as roads and bridges, is needed to transport fresh vegetables to distant urban areas (Poudel *et al*, 1998).

2.1.2. The importance of root crops

Root crops, such as cassava and sweet potatoes, have played an important role as a source of food for people after rice in the Philippines (DMMMSU, 1991). Sweet potato is a very important crop especially for low-income farmers in many parts of the Philippines and it is recognized as a staple food (Knott *et al*, 1967). It is also used as a livestock feed, and as a source of sugars and starches for industrial processing (Mackay *et al*, 1989). There are some Filipinos, especially those living in the mountains whose staple food is sweet potatoes. In these areas, such as Ifugap of Ifugao and Ikalahan of Nueva Vizcaya, it was observed that sweet potato grew with corn, taro and yam. Intercropping was recognized as a good way increasing canopy cover and showed that intercropping or relay cropping could be profitable with corn, sweet potato or legume (DMMMSU, 1991). Sweet potato is broadly recognized as a crop well suited for marginal lands and can be more profitable than rice in less fertile soils such as sandy coastal areas and on soils with acidic soils on hillsides. In the Philippines which is affected by droughts sweet potato can thrive (Tongonan, 2003). According to Mackay (1989), the sweet potato is is considered a drought-torelant species

and adapted to areas having 750 mm annual rainfall, with at least 500 mm is necessary during the growing season.

Cassava is also an important root crop in the Philippines. It grows easily even under poor conditions, such as lack of water and is a major crop component in mixed cropping systems in the uplands(DMMMSU, 2000).

2.1.3. The importance of green vegetables

The literature search did not reveal information about the importance of green vegetables in the Philippines.

2.1.4. The importance of vegetables and root crops to household income

The literature search did not reveal information about how vegetable and root crops affect on household income.

2.2. Current farming practices in the Philippines

Crop rotation, multi-storey cropping, sequential cropping, triple cropping and agroforestry are currently being applied by farmers in the Philippines (Bureau of Plant Industries, 2003b). The Department of agriculture (DA) (2003a) recommended farmers to use these practices in order to keep soil fertility and increase the crop productivity.

2.2.1. Crop rotation

According to Knott *et al (*1967), the most effective way of reducing the drastic effects of pest and disease in cropping system could be done through crop rotation. The choice of cropping patterns must ensure that soil erosion is minimized and the soil fertility is improved (DMMMSU, 2003).

2.2.2. Multi-storey cropping

Multi-storey cropping involves growing of some crops with different heights in the same land to optimize the use of available sunlight, wind protection, shade and moisture (DA,

2003a). In the Philippines there are commonly three layers of canopy. The upper storey often consists of multi-purpose tree or palm species (DMMMSU, 2003). In the central storey fruits or shrubs or small stature trees may be planted. The under storey comprises pulses, root crops and fodder legumes (DA, 2003a).

2.2.3. Sequential cropping

According to research by Poudel *et al* (1998), cropping sequences have been quite effective in minimizing soil erosion in the Philippines. Sequential cropping is considered as one facet of the major tools of soil conservation (DMMMSU, 2003)

Table 1, below shows the common combination in sequential cropping in different types of land in La Union. After harvesting rice, tobacco, vegetables or root crops are commonly planted.

Table 1. Type of sequential cropping through the year in Province of La Union

Name of Municipality	**Irrigated**	**Rainfed lowland**	**Rainfed upland**
San Gabriel	Rice - Rice Rice - Tobacco	Rice – Vegetables Rice – Sweet potato	Rice– Sweet potato
San Fernando	Rice – Tobacco Rice – Vegetables	Rice – Tobacco Rice – Vegetables Rice -Legume – Corn	Rice – peanuts

Source: La Union Technoguide (2003)

Department of Agriculture in Don Mariano Marcos Memorial State University (DMMMSU) recommends farmers sequential cropping rice-rice-beans, especially mung beans *(Phaseous).* This is because mung beans:

- Have low water consumption
- Are early maturing
- Require low levels of labour
- Are tolerated by environment
- Are good for live stock providing fodder, forage and green manure

- Are good for soil fertility because they fix nitrogen

2.2.4. Triple cropping

According to the research in the steepland, triple cropping, the planting and harvesting of three crops, such as cabbage-tomato-cabbage with a year off on the same fields showed the lowest soil loss (DMMMSU, 2003). It is because this combination will attribute to greater canopy cover than triple cropping tomato-cabbage-tomato in especially rainy season. It can maximize the amount of nitrogen or crop nutrient which can be applied into a piece of land (Poudel *et al*, 1998).

2.2.5. Agroforestry

Agroforestry is considered as a particularly appropriate and productive version of intercropping for the humid tropics (Agustin and Nortcliff, 1994)). There are many advantages claimed for agroforestry. Trees will be beneficial in the recycling of nutrients and will improve soil structure and may reduce or remove hardpans (Youdeowei *et al*, 1986) Kang determined that the best agroforestry practice is based on the fundamentals of alley cropping or hedgerow intercropping (Kang *et al*, 1990).

2.3. Land management

2.3.1. Land degradation in the steeplands

Soil erosion is an ecological, environmental and economic problem, loss of organic matter content and soil fertility, and the destruction of the structure of the soil (Hudson, 1971). It is one of the worst forms of soil degradation, along with soil compaction, low organic matter, loss of soil structure, poor internal drainage, salinisation, and soil acidity problems (Lapar and Pandey, 1999). It is generally stated that it causes the removal of valuable topsoil. Good topsoil is generally enriched with organic matter and has a crumb structure that provides larger soil pores, lower soil density, and enhanced water infiltration and aeration. The loss of natural nutrients and applied fertilizers with the soil will affect crop emergence, growth and yield directly (Wall *et al*, 1987). Furthermore, the loss of soil will lead to deterioration of soil physical properties, such as soil quality, structure, texture and stability

(Wall *et al*, 1987). The alternation of texture will reduce the water-holding capacity of the soil, and make soils susceptible to drought. The problem of soil erosion in the Philippines has been recognized as a serious problem. More than half of the total land area is severely eroded and degraded (Lapar and Pandy, 1999). According to Pewsbitero *et al* (1995), annual soil loss was estimated to be nearly 74.5 million t in 1992 in the Philippines. Upland development projects organized by the Philippine government have been implemented during the last two decades, some of which have promoted the conservation of farming systems, such as alley farming and constructing bench terraces and contour hedge rows (Cramb *et al*, 2000)

2.3.2. Off-site impact of upland soil erosion

Off-site damage from soil erosion is not always as obvious as the on-site effects (Wall *et al*, 1987). Some off-site impacts of upland soil erosion in tropical and subtropical watersheds, include siltation, water pollution and water flow irregularities, reduction of irrigation and agrochemical run-off (Hudson, 1971). The major off-site effect is sedimentation of rivers in the Philippines (Wall *et al*, 1987). Sediment caused by soil erosion can be deposited down stream and can contribute to road damage. The sediment will reach streams or watercourses and then accelerate erosion, clog drainage ditches and stream channels, silt reservoirs, cover fish spawning grounds and reduce downstream water quality. It is reported that pesticides and fertilizers that are frequently transported along with the eroding soil can contaminate or pollute downstream water sources and recreational areas (Wall *et al*, 1987). Ostberg (1991) found that it is important to identify the fundamental causes of soil erosion and understand comprehensively the physical, economic, political, institutional and social dimensions in order to manifest effectively the complex issues in soil erosion.

2.3.3. Land tenure

Land is one of the most important of farmers' assets (Youdeowei *et al*, 1986) and landless agricultural labourers are the poorest (Sinha, 1984). Land tenure is the rule which governs the rights to communal land, corporate land and individually owned land. This system is being related to social customs, political interest and economic considerations (Llanto and

Bellesteros, 2003). Security of tenure is a decisive variable determining farmers' incentives to protect land quality. If property rights of land are defined well, farmers will have incentives to conserve soil as benefits in the future from soil conservation, and it will lead to the farmers to make the investment (Youdeowei *et al*, 1986). Whether farmers have possession of the legal title to land or not is not so important to ensure the security of land tenure (Sinha, 1884). Projects of land conservation and its progress of projects will taken seriously, if there is no security of land or farmers do not have long-term rights to use lands. In order to progress projects successfully, the individual title of land should be important (Kummer, 1992).

According to Bureau of Plant Industries (2003b), approximately 75% of households own only 1 ha of land or less, and 40% of the land is cultivated by leaseholders in the Philippines. It also assumes that the inadequate size of landholdings and issues of landlessness are caused by institutional factors, such as the traditional inheritance system; where property inheritance in each family is among siblings and the Philippine civil code. Besides, Sinha (1984) stated that the law of inheritance may lead to farmers having insufficient land because the inherited land is divided equally among all the children after their father is dead. This has been initially instituted for egalitarian reasons, but under conditions of land shortage it may lead to the unfavorable consequences of fragmentation (Sinha, 1984). Small pieces of land holdings without modern techniques may not yield sufficient returns for a family's subsistence needs (DMMMSU, 2003). Furthermore, the land administration infrastructure, such as the land information system, in the Philippines is insufficient. Land ownership, boundaries and land uses are provided by the national government, therefore the integration of information is obscure for farmers (Llanto and Ballesteros, 2003).

2.3.4. Pests and pathogens

According to Hossain (2000), vegetable production is greatly affected by damage from pest and disease. It is estimated that about 24 % of the total rice crop was lost due to insects whereas 14 % was lost because of disease. Also, he described that the total quantity of vegetable was lost 26 % due to insects and 36.5% was lost because of disease (Hossain,

2000).

2.3.5. Cultivation in the slopelands

There are almost 2,609,900 ha, that have a slope of more than 50°C in the Philippines with 6,293,362 ha having a slope of 30-50 °C (Bureau of Plant Industries, 2003b). Upland is defined as land with a slope of 18% or more by Philippine government definitions (National Statistics Office, 2003). With the marked increase in population and limited flatlands to accommodate them, it is inevitable that sloping lands should be cultivated for agricultural crops (Bureau of Plant Industries, 2003b)

2.4. Water

2.4.1. Farmers' perception of irrigation management transfer

According to Vermillion (1997), the management of irrigation systems in more than 25 countries has been shifting from government agencies to farmers, communities and non-governmental organizations. The right to control water and the irrigation structure is being transferred from government to local water user associations (WUAs) (Vermillion, 1997). Following this transfer of management, farmers take responsibility for the irrigation network, operating and maintaining the infrastructure, and gain 'a sense of ownership' of the system (Jones, 2002).

2.4.2. Watershortage caused by drought

Drought is defined as a period without significant rainfall and moisture (FAO, 2003b). It may cause plant water stress and growth may be affected becoming slow. Even short drought stress can reduce the crop yield and growth. A lack of water reduces the uptake of nutrients by a crop. This is mainly because nutrients move to the roots through water films within the soils. Moreover, the watershortage leads to a decrease in nutrient availability by reduction of microbial activity, which is responsible for the release of nitrogen, phosphorus and sulphur from soil organic matter (FAO, 2003b).

2.5. Socio-economic factors around crop and vegetable production

Extensive land use as a means of enhancing sustainable agriculture is not an appropriate option for highly populated areas in Asia. As soil conservation is intensified to produce the amount of crop productivity, the structure of property rights, access to capital markets and technology and information should be considered more (Lapar and Pandey, 1999).

2.5.1. Marketing and infrastructure

Generally speaking, road shortage is a common problem, especially in the highlands, and transportation is usually undeveloped in the Philippines. This makes it difficult for farmers to get produce to market and does not allow for technical and extension officers to visit and assist farmers (Bureau of Plant and Industry, 2003b). The marketing system is inadequate in some rural areas to transfer surplus value, such as vegetables and fruits, from the rural sector to the more powerful national and international markets in most developing countries (Spedding, 1979). O'Hare *et al* (2001) suggested that the expansion of the road network enables access to markets and improves telecommunication. This will provide farmers with more incentives to promote increasing crop productivity.

The Department of Agriculture mentioned that marketing enterprise and infrastructure should be developed to get more income to generate more income selling crops (Bureau of Plant Industries 2003b). Saying that supporting a provision of facilities for post-harvest is needed immediately and roads should be upgraded for better access to markets.

Transport of produce from the field to the market is difficult because rural roads and some main roads are in poor condition. Postharvest losses of vegetables were identified in the range of 20 to 40% and also cabbage losses were amongst the highest, at 20 to 30% due to trimming and transportation losses (Bureau of Plant Industries, 2003b). Furthermore, literature discussing the situation in China (O'Hare *et al*,2001) shows that the post-harvest was a serious problem and its losses is high with a percentage of more than 35%. For example, the quality of much of the productivity falls after harvesting because of poor post harvest handling, although the production of fruits and vegetables is quite large in China. Also, from the agricultural fields to markets the total losses can amount to more than 15-30% owing to the poor transportation (O'Hare *et al*, 2001).

2.5.2. Market vegetables demand for the Philippines

Table 2 shows that in terms of the region Filipinos are not large consumer of vegetables. Per capita consumption is only about 39 kg per year in the Philippines. The Philippines lag behind other Asian countries in consumption of vegetables, failing to reach 69 kg per capita annually that the DA recommends. The potential market for vegetables is therefore potentially high and there should not be any national problems with over production (Bureau of Plant and Industry, 2003a).As shown in Table 3, consumption of other vegetables, such as total consumption. garlic, ginger, dry peas, cauliflower and pepper, accounts for more than half of the total yearly consumption. There are mainly imported from China, New Zealand, Australia and United States through legal trade (Bureau of Plant Industries, 2003a)

Table 2. Per Capita consumption and availability of vegetables in selected Asian countries

Country	Per Capita (kg/year) vegetable consumption[1]
Philippines	39
Thailand	60
Taiwan	122
Japan	137

Source: Industry Situational Review (2003)

[1] Excluding root crops

Table 3. Average per capita (kg/year) consumption of vegetables, the Philippines

Type of vegetables	Philippines	Metro Manila	Rural Areas
Roots / Tubers	8	8	9
Beans and nuts	4	5	3
Green leafy and yellow vegetables	10	7	12
Other vegetables	26	24	26
Total	48	44	50

Source: Industry Situational Review (2003)

2.6. Livelihoods in the Philippines

According to Preston (1997), people's capacity has to be generated and maintained as a means of making a living for a livelihood to be sustainable. He defined livelihood as the assets, knowledge, entitlement, the activities, capabilities and the access to social network and infrastructure and information especially land required for a means of living.

2.6.1. Increased household income

Agricultural commercialization will lead to rising incomes, will improve food security, nutritional state, and welfare (Braun, 1995). Moreover, it permits reduced workloads and improved household sanitation, water availability and quality and housing environments will be enhanced (Preston, 1997). However, the status of people who have higher household income like enough food consumption are not necessarily needed. Also, the structure and level of employment can be affected directly by commercialization and diversification of agriculture (Braun, 1995).

Chapter 3. DESCRIPTION OF RESEARCH SITES

3.1. Introduction

The Philippines is divided hierarchically into regions, provinces, municipalities, barangays and sitios. A sitio equates to a village. This research was conducted in four sitios: Bantuagui, Pactil, Boga and Sengyew (Table 4).

Table 4. Summary of the indicators for the four sitios in which research was conducted

	Community 1	**Community 2**		
	Sitio 1	**Sitio 2**	**Sitio 3**	**Sitio 4**
Name of Sitio	Bantuagui	Pactil	Boga	Sengyew
Province	La Union	Mountain Province	Mountain Province	Mountain Province
Municipality	San Gabriel	Bauko	Bauko	Bauko
Barangay	Lakong	Monamon Sur	Monamon sur	Monamon Sur
Altitude	Highland	Highland	Highland	Highland
Research areas within sitios or barangay	High land and low land	High land	Middle land	Low land
Water resources	Rainfall Springs River	Rainfall Creeks	Rainfall Creeks	Rainfall Creeks

Source: Based on interview with farmers and questionnaires

3.2. Sitio Bantuagui: Lakong: San Gariel: La Union

3.2.1. Location

The municipality of San Gabriel (Figure4) has 17 barangay. Bantuagui is located 25 km from Bacnotan which is the nearest town (Plate1). This area has land with rough and flat terrain. The soil type over the area in is silt loam and sandy clay loam. Sitio Bantuagui is divided into higher lands and lower lands. There are approximately 35 households in sitio Bantuagui and nearly half of households live in the upper sitio and the rest of them live in the lower sitioFigure 5. Resource map of sitio Bantuagui (Figure5) shows that more than 80 % of households in lower Bantuagui connect hoses for watering agricultural lands during the dry season. With two springs and a river they can obtain water for agricultural lands constantly over the rainy season. All three springs are dry during the summer season. 70 % of households in sitio Bantuagui live in the upper Barangay and they can only get water for household consumption.

Figure 4. Location of San Gabriel and sitio Bantuagui

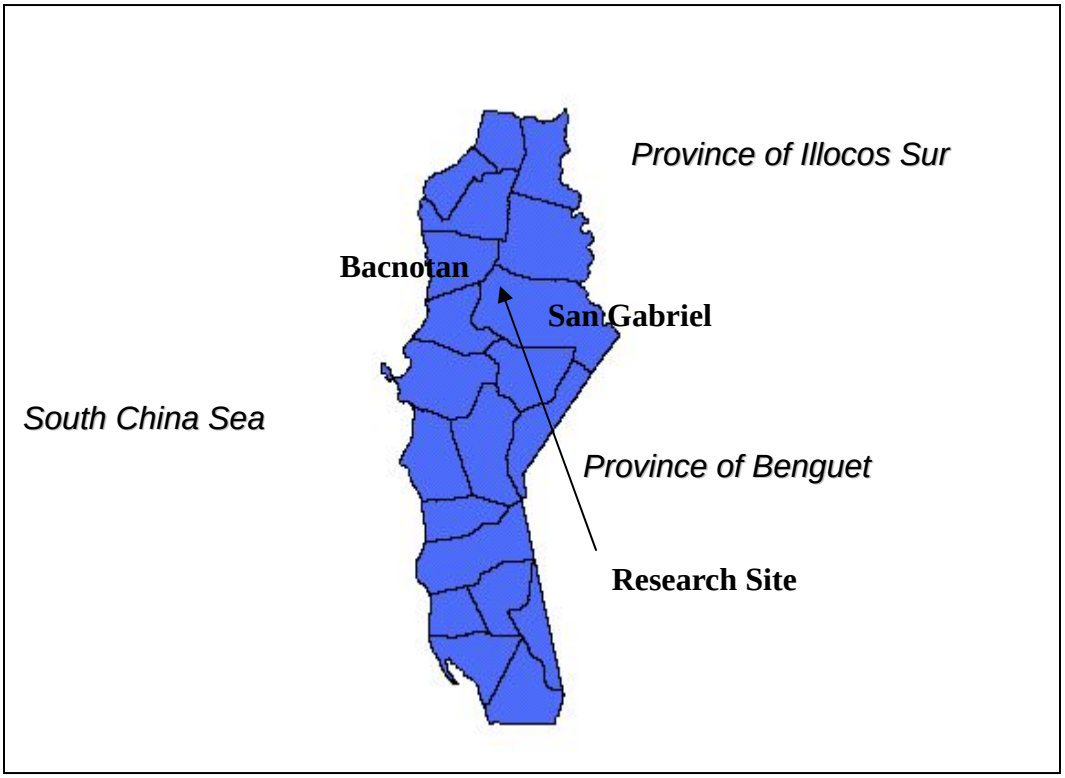
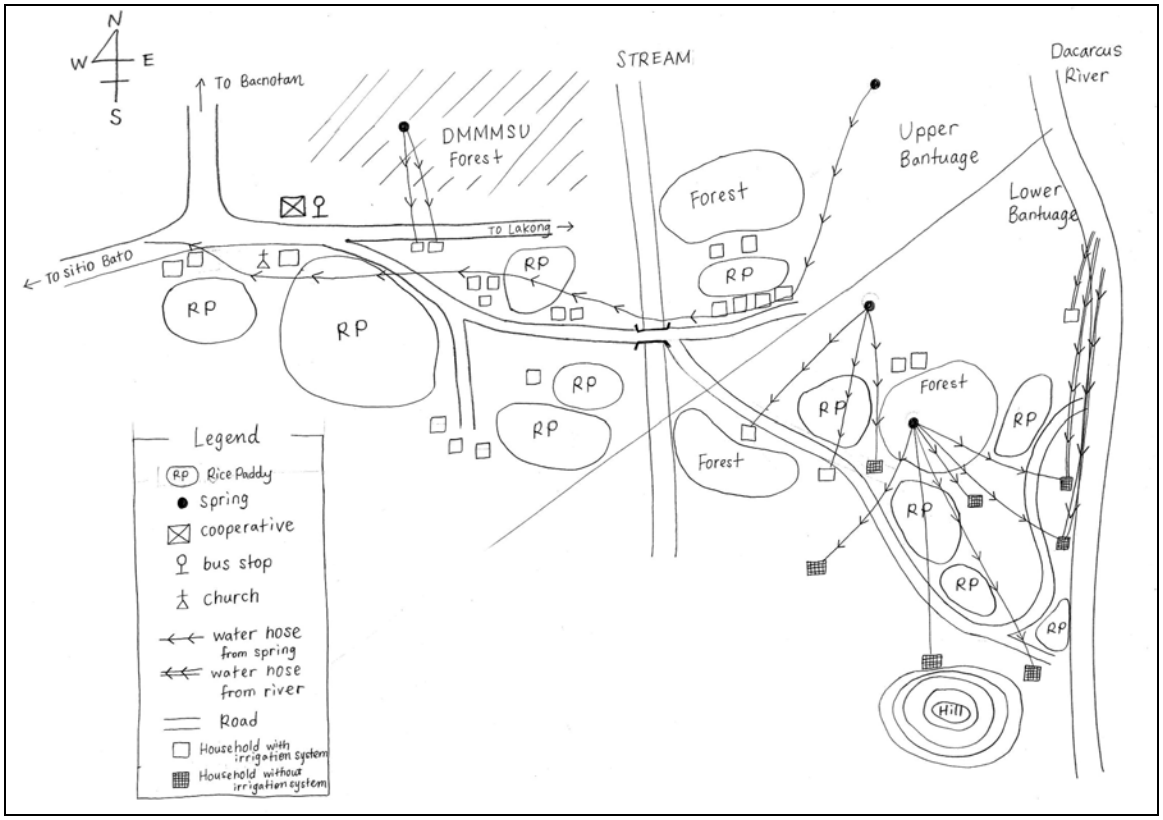


Plate 1. Landscapes in sitio Bantuagui

Figure 5. Resource map of sitio Bantuagui



Source: Resource mapping exercise

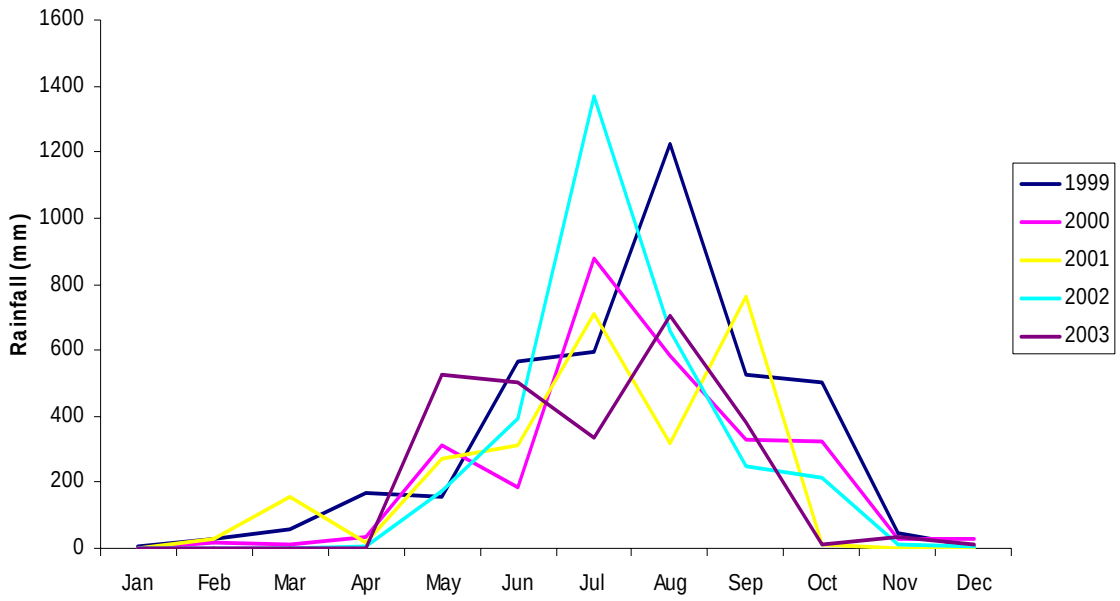
3.2.2. Climate

Metrological data were obtained from Agromet Station in DMMMSU, which is nearly 15 km away from sitio Bantuagui and is the nearest weather station. Figure 6 shows that from November to February, called the summer season, the total monthly rainfall is less than 50 mm. Monthly rainfall in rainy season from May to October makes up more than 90% of total yearly rainfall which is concentrated during this season. Typhoons occur often over the rainy season. As shown in Figure 7, the total mean annual rainfall from 1999 to 2003 was approximately 3000 mm since 1999 and the lowest amount rainfall was recorded in 2003, which is nearly 2500 mm. The mean temperature was 24.8 °C for the same period.

3.2.3. Water resources

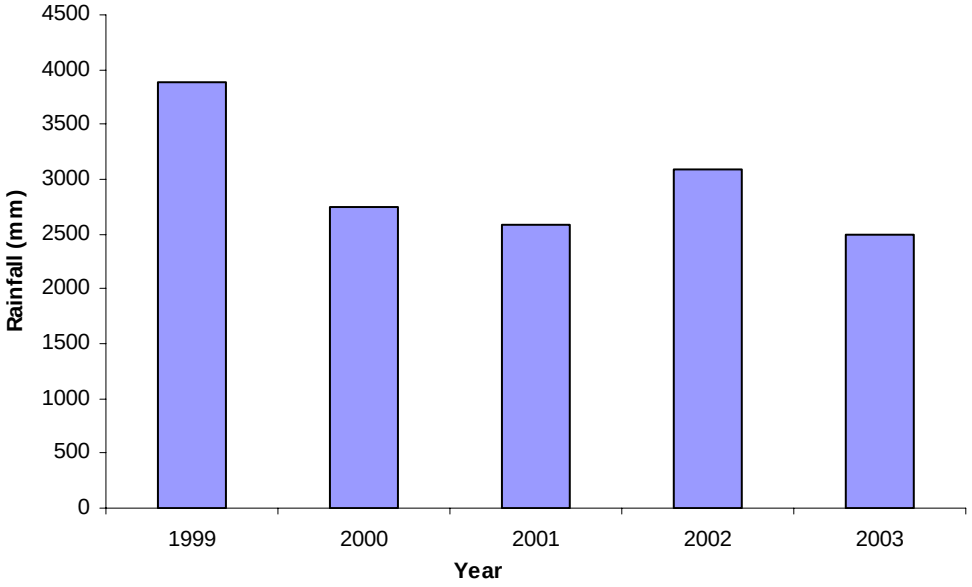
In sitio Bantuagui, crop productivity depends on water from three springs and a river called Dacercus which flows from the North to the South of the sitio. These sources also provide domestic water for four households as well as irrigating land. Some agricultural land in the highlands is irrigated by hoses in the only rainy season because water in the springs and river are scarce in summer season. Table 5 gives details of the three springs in sitio Bantuagui. The first spring has the greatest volume of water of the three so water from this spring goes to the agricultural land in rainy season. There are only 10 households using water from this spring because there are only 10 households around this spring. The second spring is located in a higher part of the barangay and provides water for only 84 households. Water from this spring cannot be used for crop production because there is in sufficient water.

Figure 6. Monthly rainfall in Bacnotan, La Union from 1999 to 2003



Source: Agromet Station in DMMMSU

Figure 7. Annual rainfall in Bacnotan, La Union from 1999 to 2003



Source: Agromet Station in DMMMSU

The second spring was developed with the helped of Lorma foundation, a non-government association. They donated a fund for the construction of the water tank and they also gave 1,300 of pipes. The project was completed on April 1997. The municipal government also provided some hoses. Farmers who use water from the second spring pay 10 pesos monthly for maintenance of water hoses. The households get water with a maximum time of 30 minutes in day and also get water with an average of 1 drum during summer (April – 1st week of May).

When there is water shortage in the second spring, some of people use water from the third spring. The third spring can be used all year around. In the third spring, farmers used a diesel pump with an interval of 5 days. Each farmer consumes 5 liters of gasoline every time they pump. These springs practically dry up in summer season and cannot provide water to any agricultural land. The Water Sewerage Association [1] has regular meetings twice a year before rainy season and just after rainy season and they conduct clearing and repairing hoses twice a year. More than 70% of farmers in the lowland have irrigation systems which are quite simple. Water is fed by gravity through pipes from creeks in higher ground. Neither pumps nor sprinklers are available in all lands. Since Lorma foundation installed pipes they have been maintained by individual farmer on the farmers' land, but there has been no cooperation to maintain pipes higher up. The irrigation system will not work in the summer season because rainfall in not available during this period.

[1] Water Sewerage Association is the group composed by farmers in sitio Bantuagui and dealing with water problems and colleting money from farmers

Table 5. Water resources in sitio Bantuagui

	Spring 1	Spring 2	Spring 3
Location	Eastern part of lower Bantuagui	Upper part of Bantuagui	Western part of the top of mountain
Distance	___[1]	4 km away from sitio Bantuagui	___
Number of users	10 households	84 households	2 households
Uses	Irrigation Household consumption	Household consumption	Irrigation Household consumption
Condition in rainy season	Enough water	Enough water	Enough water
Condition in summer season	Dry	Dry	Dry
Responsibility for maintenance	Local farmers	Water Sewerage Association	Local farmers

Source: Based on interview with staff [2]in Water Sewerage Association

3.2.4. Livelihoods and agriculture

Most of the residents in this area are engaged in agriculture. Most of their household income comes from selling rice, fruits, vegetables, root crops and livestock**.** Farmers have practiced mixed-cropping and sequential cropping through the year. Livelihood diversification is important and five farmers (19%) have fishponds in which they also grow Taro within the ponds during the summer (Plate2). Tilapia is the main species kept in the ponds and it is used for household consumption.

[1] This information was not collected through the interview.
[2] Staff in Water Sewerage Association is chosen from farmers in sitio Bantuagui and they are voluntary staff.

Plate 2. Taro growing in the fishponds

3.2.5. Transport and access to market

It takes nearly 40 minutes from this barangay to market in Bacnotan by jeepney (Plate 3), so whilst the town is accessible the number of jeepneys running and the cost of travel have a significant impact on the accessibility of local markets. The movement of produce from farm to jeepney is often done using sleighs towed by oxen or people (Plate 4).

Plate 3. A typical jeepney

Plate 4. Agricultural sleigh

3.2.6. Land tenure

There are four land tenure types in La Union: tax declaration, private titled land, ancestral land and government land (Table 6). Most farmers have tax declaration land and they have to pay 50,000 pesos per year to the government. Although farmers who have land with tax declaration have a chance to buy land with title, the long and complicated process often discourages farmers from applying.

Table 6. Definition of land types

Land type	Definition	Advantages	Disadvantages
Tax declaration	Land for which documents exist showing the regular tax to be paid.	Less expenses in applying for tax declaration No right or privilege to leave your land	If you do not pay your tax for several years, there is a possibility that your land will be confiscated and it will again declared as a property of the government.
Private titled Land	Land which is owned by the farmer, land to which the farmer holds title	1.You can borrow money with the land as security 2. Even you failed to pay your tax for several years, you still own that land	1.The application process to obtain title to the land can take 5 months. 2. And is expensive
Ancestral land	No data	No data	No data
Government land	No data	No data	No data

Source: Based on the interview with staff in DMMSSU

3.3. Sitio Pactil, Boga and Sengyew: Monamon Sur: Mountain province

Plate 5. Landscape in sitio Sengyew

3.3.1. Location

Mountain Province is located between 120°45’ to 121°35’ E longitude and between 16°45’ to 17°48’ N latitude (DA, 2003b). Monamon Sur is one of the 22 barangays in the municipality of Bauko (Figure8), which is located at the Northern part of Mountain province (Plate5). It is nearly 90 km away from market in the town of La Trinidad where farmers sell their products to traders. Sitio Pactil is located in upper Monamon Sur and sitio Boga is the center of Monamon Sur and sitio Sengyew is situated in the lowest land in this barangay. Land use of the barangay is divided into agricultural lands which occupying area with 759 ha, forest which has 382 ha and residential areas has 142 ha (Figure9).

Figure 8. Location of municipality of Buoko and barangay Monamon Sur

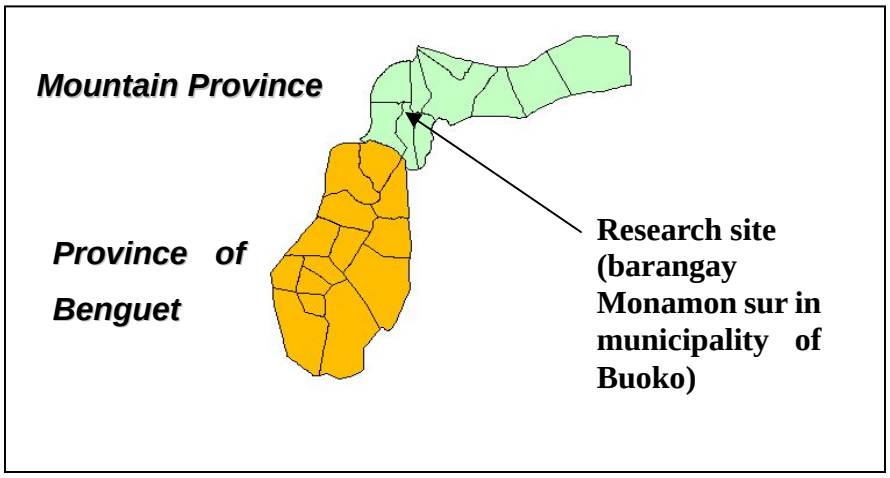
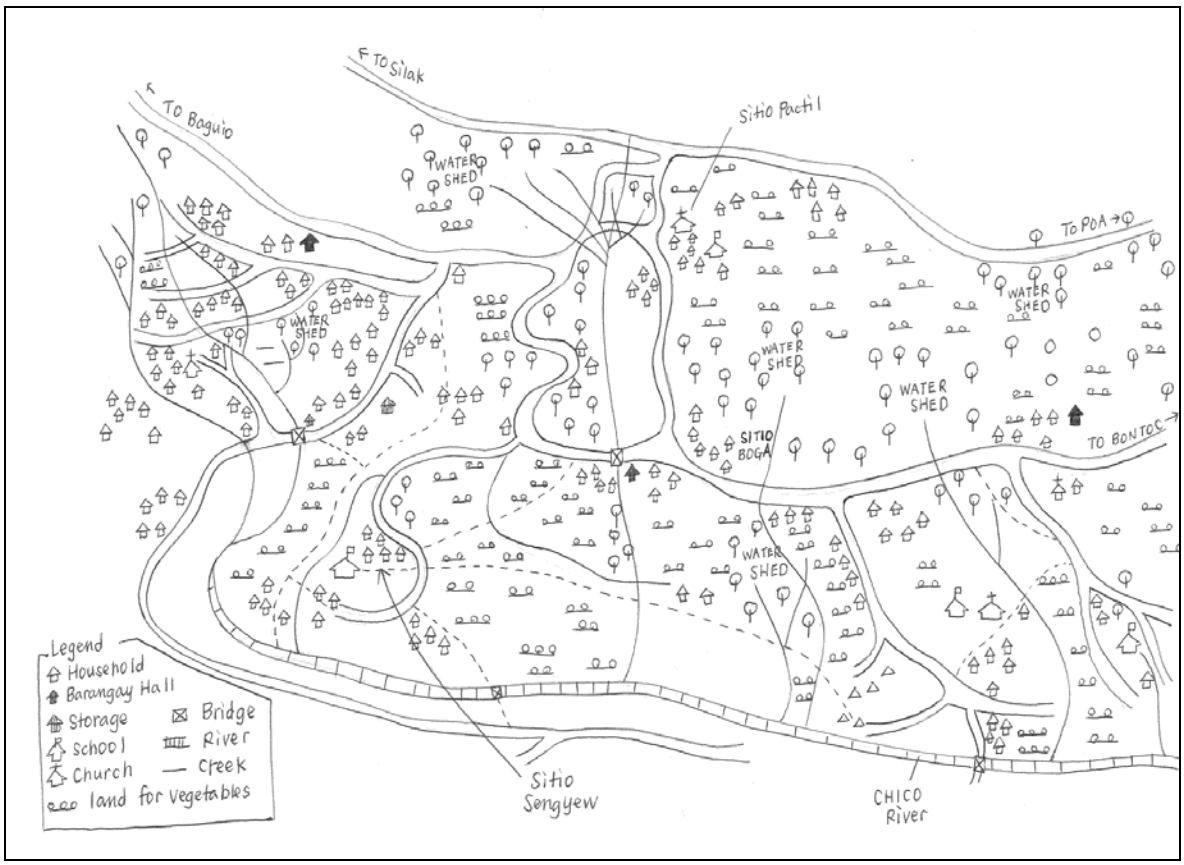


Figure 9. Resource map of barangay Monamon Sur



Source: Resource mapping exercise

3.3.2. Climate

Figure 10 shows the mean monthly rainfall recorded at Philippine Atomospheric Geophysical and Astronomical Services Administration (PAGASA)[1] in Baguio the nearest weather station to sitio Pactil, Boga and Sengyew from 2000 to 2003. Figure 11 shows that total annual rainfall for the same four years. The distribution of rain over the year is similar to sitio Bantuagui, with the most of the rainfall between May and October. However, the annual rainfall is approximately 1000 mm higher in Baguio, than Bacnotan.

[1] PAGASA is the part of the Filipinos government and keep the record of rainfall, humidity, temperature and typhoons.

Figure 10. Average monthly rainfall in Baguio, Benguet from 2000 to 2003

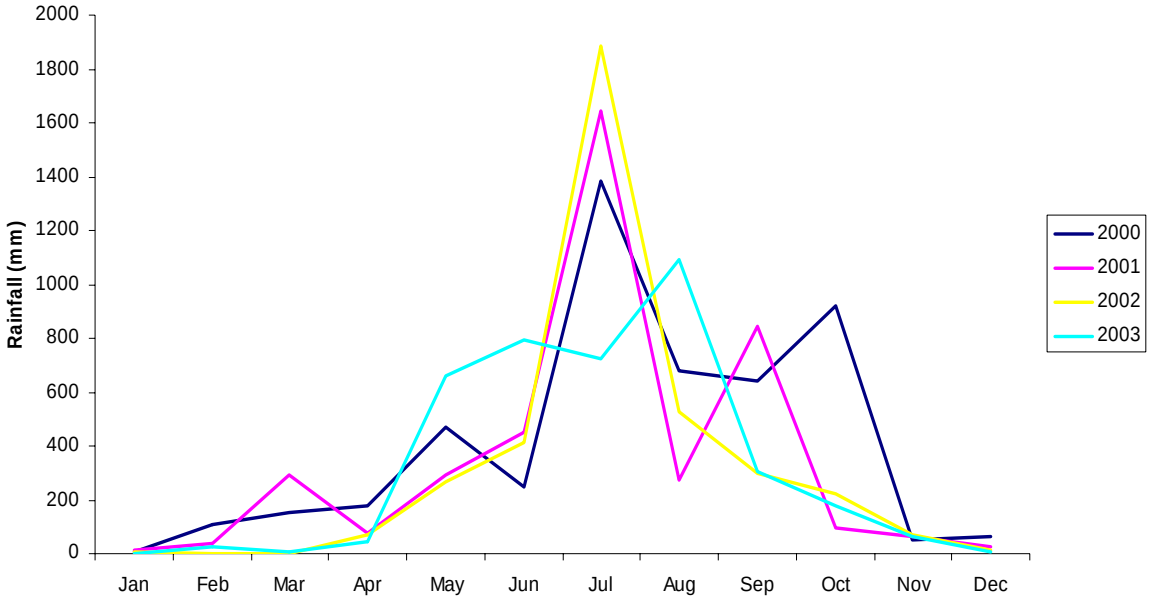
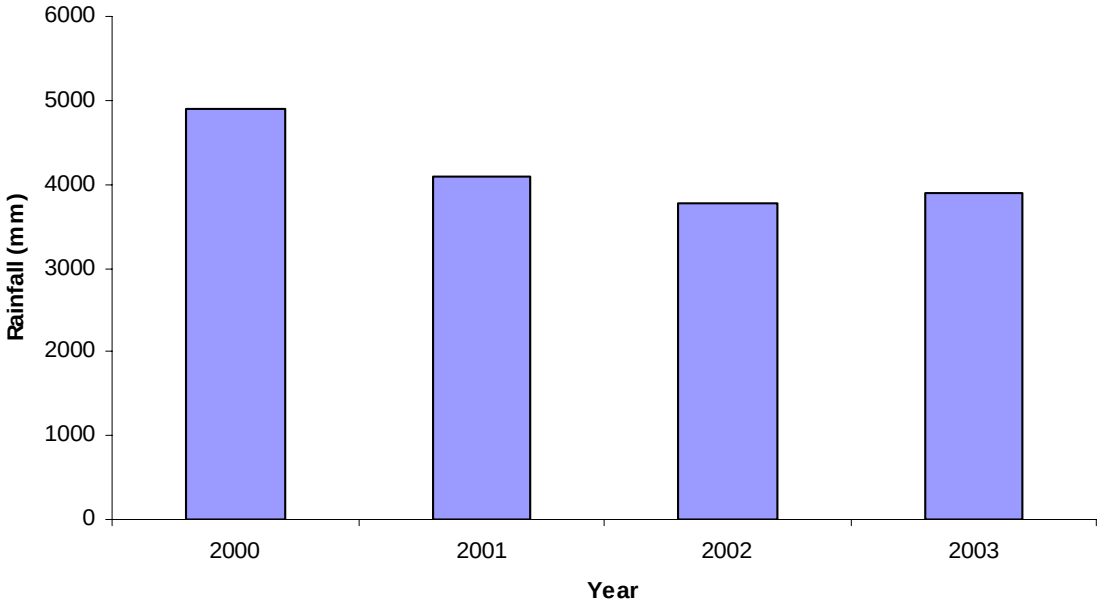


Figure 11. Annual rainfall in Baguio, Benguet from 2000 to 2003



Source: PAGASA in Baguio

3.3.3. Water resources

A majority of the households in sitio Pactil, Boga and Srengyew rely on water from a few springs and several creeks (Figure9). Five of the creeks flow from the forests which watershed managements were done. Currently, there are only 282 ha of forest which are maintained and protected by local people for irrigation and domestic water supply sources. In the summer season when there is only a little rainfall, the streams run dry but in the rainy season these is plenty of water for vegetable production for vegetable production and household consumption.

In the rainy season typhoons damage the pipe lines in sitios. Several pipes in highland areas have leaks because of terrible winds during the typhoon season. This leakage reduces the amount of water available for household consumption and agricultural fields. The forests also serve as sources of firewood and lumber.

Unirrigated areas, 483 ha, are found mostly at the upper part of the barangay, such as in Pactil and farmers in these areas have to wait for the rainy season in order to be able to cultivate crops. Farmers in this barangay do not produce and maize at all (Table 7).

Table 7. Farming practices and main crops

System type	Crops grown (ha)		
	Rice	**Vegetables**	**Maize**
Irrigated	__[1]	276	__[2]
Un-irrigated& Rainfed	__	483	__

Source: Based on the interview with barangay captain and data from Barangay Report 2003

3.3.4. Land tenure

90% of farmers interviewed are land owners with title in these sitios and this gives farmers

[1] No farmers grow rice in barangay Monamon Sur
[2] No farmers grow maize in barangay MonamonSur

the ability to borrow money from banks although there is a limit to how much banks are willing to lend.

3.3.5. Livelihoods

There are three main sources of income in this barangay; commercial vegetable farming[1], non-farming activities[2], off farm activities[3]. The number of farmers called commercial vegetable farming is 985 household and this is the biggest majority. Non-farming activities are practiced by 187 households and off-farm activities have 103 households.

3.3.6. Agriculture

Monamon Sur is a commercial vegetable production area. The vegetable produced at most in this barangay is potato and 750 t of potatoes are grown from 266ha of cropland. The other major product is cabbage and 1,110 tons cabbage is produced from 252 ha of land (Table8). Bell pepper and green peas are mainly grown in the middle and lower barangay. Nearly 90% of products from this barangay are sold in trading-post in La Trinidad.

Table 8. Crop production in Monamon Sur in 2003

Type of crop	Area planted (ha)	Type of crop	Area planted (ha)
Potatoes	266	Bell pepper	30
Cabbage	252	Green peas	22
Chinese cabbage	153.5	Lettuce	5
Carrots	30	Sweet potatoes	0.5

Source: Barangay Report 2003

There are four agricultural support facilities in this barangay, run by the National Irrigation Administration (NIA) and the Department of Agriculture (DA). These are Communal

[1] Farmers who produce vegetables, such as potatoes, cabbage and only work in own agricultural land
[2] Farmers get income from working in another person's farm that would provides a daily wage at a minimum of P100/ day
[3] Farmers whose income deprives from business establishment, such as shops

Irrigation System (CIS), Solar Dryer / Mulch Purposes Drying Pavement, Seed Potato Storage and Loading Platform. The CIS, which has a length of 19.2 km, is sited in parts of three sitios and conveys water to agricultural fields of 373 households. However, recent typhoons damaged pipes which have led to the development of leaks. The Seed Potato Storage building was constructed at sitio Pactil and some other sitios by the Highland Agricultural Development Project (HADP). The storage in sitio Pactil is used and maintained by 30 households. If other households want to share the storage, they are allowed to if there is space and they can afford to pay the fee.

Table 9 shows the most common pests and diseases and the insecticides and fungicides applied. Farmers generally mixed insecticides and fungicides when they spray on the specific dosage in practice called 'cocktailing'.

Table 9. Agricultural chemical applied in barangay Maonamon Sur

Name of pests	Name of insecticides	Name of fungicides	Name of disease
Trips	Selecron	Manzate	Late bright
Diamond Back Moth	Magnum	Cyrzate	Black leg
Cutworm	Mesurol	Dithane	Leaf spot
White flies	Karate	Manager	Powdery mildew
Liklik	Murell	Rover	Club cut
Leaf minor			

Source: Barangay Report 2003

3.3.7. Market

There are two markets where farmers sell their produce. One of them is located in La Trinidad and farmers sell their crops to dealers. This place is called to trading-post and the other is in Baguio city which is adjacent to La Trinidad. The market in La Trinidad is the biggest in Cordillera Administrative Region (CAR). There are sold per kilo of through a contract system depending on the agreement between the farmer and the dealer. Small

quantities of vegetables are sold at Abatan, Mabaay and Bontoc[1] at a retail prices.

3.3.8. Transport and access to market

This barangay is accessible to any type of transportation either buses or jeepney daily to going to Baguio, La Trinidad and Bontoc where have a market from 8:00 am to 6:00 pm. Some private vehicles owned by farmers are available for farmers to carry vegetables. Fares to use the National High Way to La Trinidad are very high.

3.3.9. Credit

There were three (10 %) respondents in sitio Pactil, Boga and Sengye who had borrowed money from Quedan core[1] attached to the land bank. Farmers who have land demonstrated only by tax declarations usually cannot borrow money from the bank because they do not have land title. However, for those people who have no land title it is possible to borrow money from Quedan core. Table 10 shows credit facilities available for farmers in barangay Monsmon Sur.

Table 10. Credit facilities in barangay Monamon Sur

Source of credit	Use of credit	Interest rate
Private capitalist	Agriculture	5 - 10%
Land bank of the Philippines	Business and medicines Agriculture	2 - 5%
Philippine National bank	Business and medicine	2 - 5%
St. Paul Cooperation	Business and medicine	2 - 5%

Source: Based on interviews with mixed group of farmers and data from Barangay Report 2003

3.3.10. Language constraints

There are more than 70 dialects in the Philippines and nearly 6 of these are spoken only in

[1] Abatan , Mabaay and Bontoc are the name of places in Mountain Province

[1] The part of the land bank which is attached the Pilipino government

the Mountain province. Table 11 shows that in each barangay several dialects are spoken. Farmers in these 3 sitios speak mainly Kankanaey. Kankanaey is used by nearly 92% of total population. Few people speak Tagalog, which middlemen from Manila usually speak when negotiating the price of vegetables with farmers. When no common language exists between farmers and dealers, other dealer who do speak both Kankanaey and tagalong will act as translation in negotiation. As a result, farmers have to pay a little money for dealers in La Trinidad.

Table 11. Population of sitio Pactil, Boga and Sengyew by Mother Tongue

Sitio	**Dialect**						**Total**
	Kankanaey	**Ibaloi**	**Kalanguya**	**Ilocano**	**Tagalog**	**Itneg**	
Pactil	764	12	8	28	12	6	830
Boga	213	0	0	7	2	0	222
Sengyew	199	0	1	1	0	0	201
Total of 3 sitio	1176	12	9	36	14	6	1253
In baragay	2764	87	50	65	16	9	2991
Percentage of barangay	92.4%	2.9%	1.7%	2.2%	0.5%	0.3%	

Source: Based on Barangay Report in 2003

3.4. Summary of key indicators

Table 12 shows the summery of the indicators for four sitios. Sitio Pactil, Bogam Sengyew is quite similar environmental situation, farming systems and socio-economic aspects.

Table 12. Summary of the indicators for the four sitios in which research was done

Name of Sitio	Bantuagui	Pactil	Boga	Sengyew
Number of households	Approximately 35	101	37	35
Transport issues	Local roads	Local roads High cost and restricted availability of hire vehicles	Local roads High cost and restricted availability of hire vehicles	Local roads High cost and restricted availability of hire vehicles
Production system	Low input	High input	High input	High input
Destination of produce	Markets Cooperative Neighbours Household consumption	Trading-post Household consumption	Trading-post Household consumption	Trading-post Household consumption
Main crops ranking	Rice Fruits Sweet potatoes Black beans French beans String beans Cassava Pigeon peas Taro Aubergine	Cabbages Potatoes Carrots Sweet peas Chinese cabbages	Potatoes Cabbages Carrots Bell peppers Sweet peas	Cabbages Potatoes Bell peppers Carrots Sweet peas
Cooperatives	One cooperative	None	None	None

Source: Based on interview with mixed group of farmers and questionnaires

Chapter 4. METHODOLOGY

4.1. Sampling Strategy: the people

4.1.1. Selection of farmers for questionnaires and interviews

In order to get as clear information as possible from farmers which are representative of the upland areas, farmers have to be divided into appropriate grouping rather than choosing farmers at random (Ambrose-Oji, 2003). She described that different kinds of farmers have different cropping systems at different position in the watershed, and would therefore face different constraints and benefits to their land and water management strategies. Thirteen respondents are in higher Bantuagui and another thirteen farmers are living in upper Bantuagui. It was assumed that sitio Pactil, Boga and Sengyew have different livelihood constraints and opportunities due to physical aspects, such as location, altitude and water sources. Using the resource maps generated as part of the qualitative information (Figure 5 and 9), key informants divided the map into different altitude zones. Equal numbers of households were identified within these zones on the map by the key information. Questions asked by the researcher were translated from English to the local languages. Occasionally, the researcher asked some simple questions to farmers directly. In order to get accurate and full information from farmers, they were given more than 1 minute to answer questions.

4.1.2. The people: selection of farmers for Participatory Assessments exercises

In both June and July when the author have been in four sitio, farmers were quite busy because of planting rice in sitio Bantuagui, planting cabbages and harvesting carrots and potatoes in sitio Pactil, Boga and Sengyew. Resource mapping was carried out during meetings with the barangay captain, farmers leaders and farmers all present Both barangay captain and farmer leaders informed farmers of the data and place of group meeting. Interview about seasonal calendars were included in questionnaires and problem ranking was carried out after questionnaires. Interviews were conducted with those farmers who were available and willing. The characteristics of the resultant sample are shown in Table 13.

Table 13. Summary of the sample characteristics

Name of Sitio	Bantuagui	Pactil	Boga	Sengyew
Total of farmers interviewed	26	10	10	10
Sex of interviewees	Male 21 Female 5	Male 5 Female 5	Male 8 Female 2	Male 3 Female 7
Average age or respondents	~19 0 20~30 9 40~59 12 60~ 5	~19 0 20~30 7 40~59 3 60~ 0	~19 1 20~30 5 40~59 4 60~ 0	~19 0 20~30 7 40~59 3 60~ 0
Mean net income of farmers questioned	No data	148,990 ± 29,225	199,889 ± 52,503	98,534 ± 19,455
Degree of wealth	Low	High	High	High
Average total landholding / household	1.1 ha	0.95 ha [1]	1.02 ha [1]	0.55 ha [1]
Average land used for agriculture	0.37ha	0.95 ha	1.02 ha	0.55 ha
Income sources	Vegetables, Shops Remittance from family	Vegetables Labour	Vegetables Labour	Vegetables Labour
Solely on agriculture from income	83%	80%	80%	80%
Residence mode	More than 10 years	Since born	Since born	Since born
Years as farmer (mode)	5-10 years	10 years	10 years	10 years

Source: Based on fieldwork interviews and questionnaires with mixed group of farmers and Barangay Report 2003

[1] No farmers have rice fields
[1] No farmers have rice fields
[1] No farmers have rice fields

4.2. Data Collection Techniques

The sitio study was divided into 3 parts: group meetings, structured interviews and unstructured interviews (see Appendix I).

4.2.1. Quantitative data collection: Structured interview with questionnaires

Quantitative data was all collected through the interviews and questionnaires to know general information, such as how many years farmers are involved in agricultural activities and how many farmers are using fertilizer and pesticides.

The objective of the individual interviews was to estimate individual perceptions and eagerness of growing crops, such as vegetables and root crops and individual participation in social community groups. The questionnaire was mixed, semi-structured (See Appendix I) which included pre-coded questions with an open-ended format during a structured interview. All the interviews took place in the individual farmers' house at a time when interviewees were available. Direct and leading questions were avoided and farmers were quite encouraged to expand on their comments, rather than agree or disagree with the suggestions. Some answers with farmers' opinions and views the researcher did not expect were written on the different sheet of papers as literally as possible by the interpreter.

Questions about the following sections were included in the interviews and questionnaires:

- General information: 1. Social aspects such as age, sex, name of sitio and educational level; 2. Socio-economic aspects such as the existence of cooperative and income
- Farming system: 1. Types of crops and varieties grown; 2. Cultivation technique and land conservation technique; 3. Inputs; 4. Pest and disease
- Market: 1. Distance from farms to markets; 2. Types of market and sellers; 3. Type of crops dealt with; 4. Type of people decide the price.
- Physical information such as climate, soils was from secondary data collection

4.2.2. Qualitative data collection: Participatory Assessments

4.2.2.1. Group meetings with resource mapping

The original plan was to have a group meeting in each sitio, however, time constraints did allow to carry out a group meeting in each community. Whereas these meeting should be organized at least one week in advance, because of poor communication amongst farmers, the arrangement for group meetings was determined only three days beforehand. One of the main reasons for the meeting was to produce a resource map. At the beginning of meetings, the idea of a resource map and what should be included was demonstrated to the participants by the researcher and/or the translator. It made maps easier to draw. This was a good opportunity to ask the group question about the sitio in general and so provide important context and background data. Respondents were asked to draw the main roads and important natural resources such as water courses, forest and agricultural land (Plate 6). This allowed villagers to draw the boundaries of their village and indicate the distribution of natural resources (McCracken *et al*, 1988). Through resource mapping, the farmers' perception and interests about natural resources might be found.

Plate 6. Resource mapping in sitio Bantuagui

Source: Authors own record of fieldwork

4.2.2.2. Seasonal calendar and labour demand

This methods to indicate which time of the year farmers were more occupied, needed more labour on the farm, when food or money was most abundant. Agricultural activities were divided into two categories by villagers; planting seeds or tuber and harvesting. The level of agricultural labour demand for each month was also showed. The labour demand results came from interviews in which farmers were asked to point out which was the busiest month. It was an important exercise to demonstrate seasonal patterns of rainfall, crop rotation, labour requirements and occurrence of disease (McCracken *et al*, 1988). Cropping seasons can be clear through ploughing, sowing seeds, weeding and harvesting. Also, it will be easy to identify the greatest difficulty and vulnerability which influences lives of local people (Theis and Grady, 1991).

4.2.2.3. Ranking

This method was used to quickly find the main constraints afflicting farmers and the degree of these. The different priorities of individual people can also be easily compared. Farmers were asked to choose which was the most serious agricultural problem out of 7 or 8 problems. Various problems and each item can be compared through the ranking and the most serious constraint can be determined thorough this methods.

4.2.3. Secondary data collection

Secondary data, such as annual crop productivity in La Union and the average rainfall in two provinces were taken from the files of the Department of Agriculture and PAGASA in San Fernando, La Union and Baguio, Benguet. Also, general information in the Philippines about crop production was from the government, department of agriculture in centre office in Manila, provincial office and regional office.

4.2.4. Immersion in local culture

In order to understand the local culture and people, the author stayed in each community[1] for nearly a week and quite often talked to local people (Bernard, 1995).

4.2.5. Limitation to the method

4.2.5.1. Validity

The internal validity of these results from the interviews and questionnaires were likely to be high because the author had one translator who supported and farmers, too. Most of farmers had a positive attitude during the interview and questionnaires as well. The number of samples collected was 56. It is hard to say that all sitios in this Barangay, and the Philippines have the constraints and opportunities found through this research in sitios.

4.2.5.2. Bias

Nearly 50% of farmers interviewed were male and the number of respondents had an equal distribution as a whole. However, there were only 20% of female respondents in sitio Bantuagui and 80% of farmers interviewed in sitio Boga were male as well. It was not random on sex of interviewees. Moreover, 50% of farmers interviewed were from 20 to 30 years old and there were no respondents who were over 60 years old.

[1] Community1 – Sitio bantuagui
Community 2 – Sitio Pactil, Boga and Sengyew

4.3. Analysis techniques

4.3.1. Quantitative data from structured interviewed

Quantitative data from questionnaire was put into EXCEL 2003 and SPSS version 12 computer programmes. This data was analyzed either as total number of respondents or as a percentage of the whole sample. The data which have significant differences between sitios or communities were represented as tables or graphs. Furthermore, data was analyzed using one-way ANOVA and Turkey test to determine if there was a significant difference between sitios in the amount produced and inputs used.

4.3.2. Classification of sitios in the results

Sitio Pactil, Boga and Sengyew were quite similar in type of crops grown and farming systems, and so in the results section they were compared sitio Bantuagui.

4.3.3. Botanical name

It is important to note that the English and local names for crops, insects and disease have been used in this report. The scientific names have not been used because no voucher specimens of the plants and other organisms mentioned here taken, and there was often doubt concerning the exact species farmers were discussing. The genus has been mentioned where there was less doubt as to the group, but again these have not been scientifically determined.

Chapter 5. RESULTS

5.1. Vegetable Production Systems

5.1.1. Crop cultivated

Crops are planted in both flat land and land with slopes of up to 45% or even more in sitio Bantuagui. Mixed-cropping can be seen on sloped land with a combination of beans and sweet potatoes, followed by rice and maize is practiced. Several different species of fruits trees consumed by the household are planted around agricultural fields, mainly papaya, avocado, mango, citrus and jackfruit are the fruits. They do not use trees for fuel consumption or as a timber. During a year, sequence cropping such as rice-rice-beans and rice-beans-vegetables is frequently used system. The average holding of each household is 1.1ha of agricultural land, of which nearly 60 % is used for growing rice. The remaining 40% is used for vegetables and fruit trees. More than 10 types of crop [1]are grown over the year and farmers have specific reason to grow certain vegetables. For instance, nearly 80% of farmers interviewed grew sweet potatoes because these were popular crops and important for household consumption. All farmers planted rice and the income from selling the rice provided more than 60% of their total income. None the less rice is usually consumed in the household and selling it in the markets is quite rare. Farmers in barangay Monamon Sur produce cash crop vegetables such as cabbage, potatoes, carrots, sweet potatoes and chayote *(Securbita sp)* for household consumption. Most of the vegetables produced are marketed at La Trinidad Trading Post and Baguio Hanger Market. Vegetables, rather than rice, are grown throughout each year and farmers utilize large quantities of farm inputs such as fertilizers, insecticides and fungicide to ensure marketable quality and higher volumes of their crops. The higher crop productivity may be due to the inputs, but may also be partly due to the cropping system, such as inter-cropping and relay-cropping which farmers practice through the year. Less than 10% of farmers here grow rice because farmers think it is not an appropriate crop for this area because of the low temperatures.

The main reason for producing the crops was overwhelmingly for household

[1] Rice, Sweet potatoes, String beans, Black beans, French beans, Cassava, Taro, Peanuts, Pepper, Mushroom, Aubergines

consumption, however, crops were also produced due to high demand and high value.

Table 14 shows the mean total landholding and land used for vegetable production in each sitio. Vegetables are planted in all lands of sitio Pactil, Boga and Sengyew although Sitio Bantuagui has approximately 0.4 ha in mean total land used for vegetables. The rest of the land (0.73h) is used for rice production.

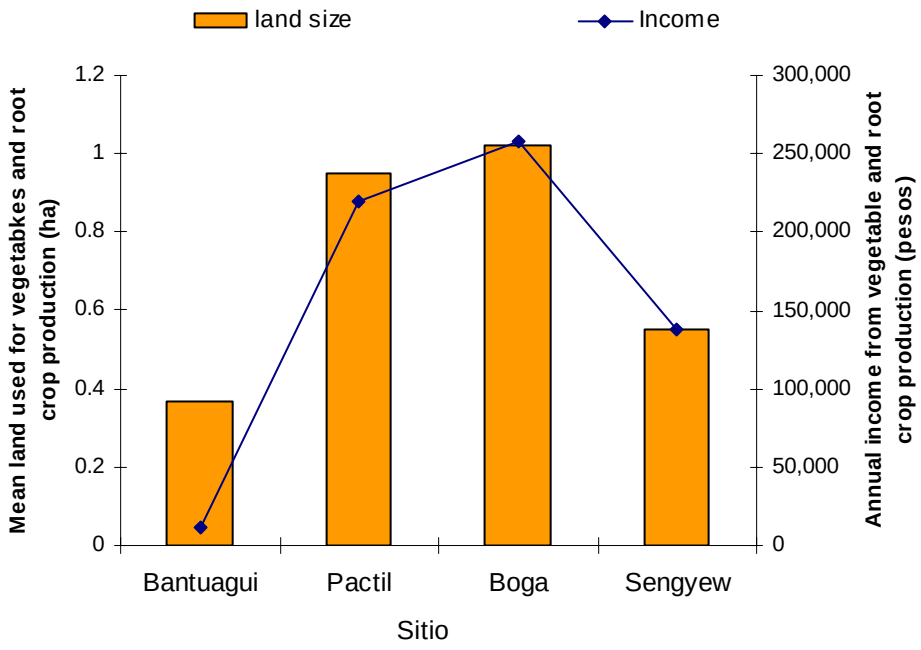
Table 14. Landholdings in each sitio

Livelihood indicators	**Bantuagui**	**Pactil**	**Boga**	**Sengyew**
Mean total landholding	1.1 ha	0.95 ha	1.02 ha	0.55 ha
Mean Land are used for vegetables	0.37 ha	0.95 ha	1.02 ha	0.55 ha

Source: Based on fieldwork questionnaires with mixed group of farmer

Figure 12 shows a comparison between size of land for vegetables and root crops and income from vegetables and root crops. Sitio which has the large land for vegetables and root crops has the highest income from vegetable and root crop production.

Figure 12. A comparison between size of land for vegetables and root crops and income from vegetables and root crops



Source: Based on fieldwork interviews and questionnaires with mixed group of farmers

Table 15 shows the main vegetables and root crops grown by farmers in the different sitios. Farmers in sitio Pactil, Boga and Sengyew tend to grow similar crops. The main difference between Bantuagui and the other three sitios is that all respondents grow rice in sitio Bantuagui where as none do in the other three sitios. Crop types and varieties vary between the different sitios. Farmers in sitio Pactil, Boga and Sengyew concentrate on growing cabbage and potatoes, which are more suitable to the climate and high altitude. They also grow bell peppers *(Capsicum sp)* and sweet peas *(Lathyrus sp).* Respondents noted that sweet potatoes *(Ipomea sp)* and beans are quite tolerant to drought and heavy rain. Also, twenty respondents mentioned that beans usually were sold for high prices in the markets, and plants which fix nitrogen were good to maintain soil fertility.

Table 15. Crops in each sitio

Name of sitio	Type of crops	Number of responses	Percentage of responses	Reasons for producing these kinds of crops
Bantuagui	Rice	26	100	Staple food for farmers
	Fruit trees	26	100	High value crop
	Sweet potatoes	21	81	Household consumption High demand
	Black beans	18	69	Household consumption
	French beans	11	42	Household consumption
	String beans	8	30	High value crop
	Peanuts	4	15	Household consumption
	Cassava	2	7	Household consumption Animal feed Drought tolerant food
	Pigeon peas	2	7	High value crop
	Taro	2	7	High demand
	Pepper	1	4	No inputs need
	Ginger	1	4	No inputs need
	Mushroom	1	4	No need intensive care
	Aubergines	1	4	High demand
Pactil Boga Sengyew	Cabbage	27	90	Tolerant to strong winds to low temperature to heavy rain
	Potatoes	27	90	High demand Easy to grow without much intensive care
	Bell pepper	10	33	High value crop Fast growing
	Carrots	8	27	Minimum use of pesticide
	Sweet peas	7	23	Easy to grow and harvest Low labour demand
	Chinese cabbage	3	10	No specific reason
	Lettuces	1	3	High demand

Source: Based on fieldwork interviews and questionnaires with mixed group of farmers

Plate 7. Interview with farmers in sitio Sengyew

Figure 13 shows that production of vegetables and root crops in each sitio, based on questionnaires. Although the total vegetable and root crop production are more that 15t in sitio Pactil, Boga and sengywe, sitio Bantuagui has only nearly 1t in vegetable and root crop production.

As shown in figure 14, total mean production of cabbage and root crops was the highest in sitio Pactil and which was more than 20t. cabbage and potatoes contributed more than 80% of total yields of crops in sitio Pactil, Boga and Sengyew. On the other hand, farmers in sitio Bantuagui do not produce cabbage and the total mean of root crops is only 0.5t. Only farmers in sitio Pactil and Bantuagui produce other types of vegetables such as Chinese cabbage *(Brassica sp)* in comparison to sitios Boga and Sengyew.

As shown in Figure 15, more than 2 t of bell pepper and sweet peas, which are high value crops, are grown in each sitio Boga and Sengyew. Farmers in sitio Sengyew produce onlybell pepper, sweet peas, cabbage and root crops. More than 90% of products in sitio Pactil are potatoes and root crops.

Figure 13. Production of vegetables and root crops in each sitio

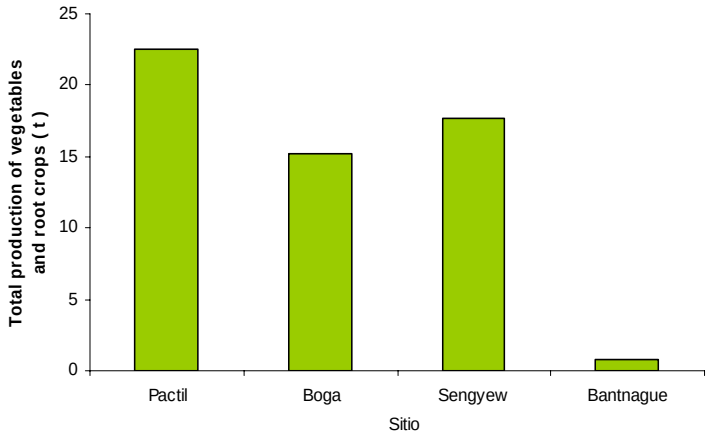
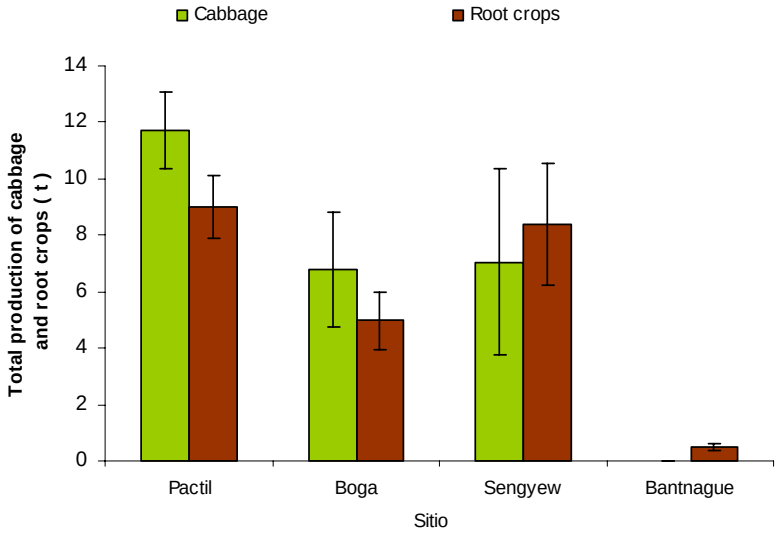
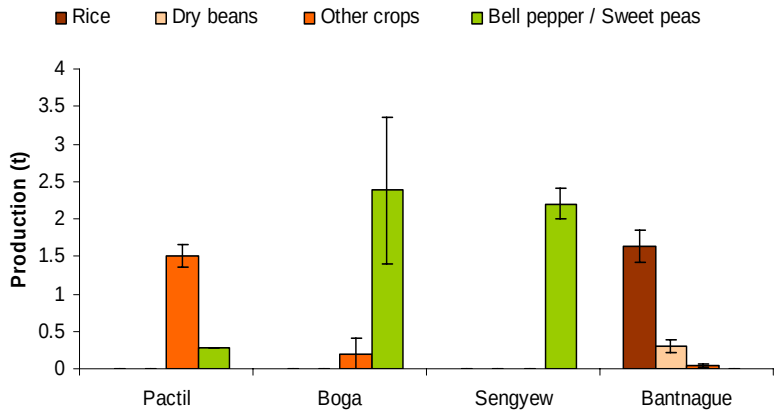


Figure 14. Total mean productivity of cabbage and root crops in each sitio



*1 Root crops (Potato, Cassava, Carrots, Sweet potato)

Figure 15. Total mean productivity of rice, bean and other crops in each sitio



Beans (French beans/Mung beans/Peanuts) Other crops (Chinese cabbage/ Black pepper / Aubergines)

Source: All figures based on fieldwork interviews and questionnaires with mixed group of farmer

Six (23 %) respondents in sitio Bantuagui said that they were eager to produce more rice and to attempt growing hybrid rice in the future (Table16). However, they had had no experience of planting them and they were not sure how hybrid rice would work on their land. Whilst the Department of Agriculture (DA) did give five seminars on hybrid rice propagation in the provincial office in 2003, nobody from sitio Bantuagui attended because the information about the seminars did not reach there. Of interviewees who grow celery (*Apium sp)*, one respondent had not grown celery before. He did not know the reasons why celery had not have grown. This farmer adapted a positive attitude to produce celery again after he finds the reason of the failure.

Table 16. Type of crops farmers want to produce in the future

Name of sitio	Type of crops
Bantuagui	Hybrid-rice
Pactil, Boga and Sengyew	Celery, Tomatoes, Aubergines

Source: Based on fieldwork questionnaires with mixed group of farmers

When discussing the benefits of producing cabbage with farmers, several reasons were given. More than half of the farmers mentioned that the demand for cabbages was high altitude and that they were suitable vegetables to be grown on high altitude land. Table 17 was from the interview with a specialist in the DA whose staff interviewed farmers in market of La Trinidad. The average yield of cabbage is higher than that of any other vegetables and the average unit production cost per kg is low.

Table 17. Average yields

Commodity	Average yield (mt / ha)
White potatoes	19.0
Cabbage	21.0
Carrot	19.0
Lettuce	9.0
Celery	14.0

Source: Based on interview with DA staff in La Trinidad

5.1.2. Cropping system

Of the four farmers using multiple cropping, mixing rice and vegetables in the same field, three respondents were satisfied with their choice because the price of beans does not fluctuate and they can usually sell them at 15 to 20 pesos / kg. Table 18 shows that more than half of farmers interviewed, nearly 65%, produce the combination of rice, sweet potatoes and beans, such as black beans *(Castanospermum sp) and* French beans *(Phaseous sp)*. These two beans are sold in the markets of Bacnotan and San Fernando but all the sweet potatoes are consumed within the household. Most respondents interviewed said that they preferred sequence cropping mixing rice with vegetables, planting some different type of fruits trees at the side of their field for household consumption.

Table 18. Description of sequential cropping in sitio Bantuagui

Type of combination	Number of responses	Percentage of responses
Sweet potatoes and beans after rice	17	65
Some other combination	4	15
Beans after rice	3	12
Sweet potatoes only, after rice	2	8

Source: Based on field work questionnaires with mixed group of farmers

Mixed-cropping can be seen in sitio Bantuagui and the following combinations are mainly practised:

1. Maize – Black beans (Plate 8)or Pigeon peas
2. Rice - Maize – Pigeon pea *(Cajanus sp)* – Cassava *(Manihot sp)*
3. Tiger grass *(Thysanolaena sp)* – Banana - Maize
4. Black beans – Pigeon peas – Banana
5. Banana – Taro *(Colocasia sp)* – Tiger grass – Papaya *(Carica sp)*
6. Rice – Banana
7. Rice – Beans – Maize(Plate 9)
8. Peanuts *(Arachis sp)* – Banana

The combination tiger grass with banana or rice was found on land with gentle slopes.

Tiger glass is used to make brooms. As tiger grass is tough, the brooms can be used for a long time.

Plate 8. Mixed-cropping beans with maize

Plate 9. Mixed- cropping rice, maize and beans in sitio Bantuagui

5.1.3. Soil conservation methods

There is a government service which provides facilities to analyse soil type and fertility free to farmers in the provincial office, in La Trinidad. They accept three soil samples from different place of the same farm. After soil analysis, farmers can get advice from soil technicians on how to improve soils or what crops to plant.

All farmers interviewed in sitio Pactil, Boga and Bantuagui (Plate10) practiced terraces in their fields. Only one farmer had an agroforestry area, which was 0.1ha. Bananas and rice were planted in that area. Although some agroforestry areas can be seen in sitio Bantuagui, farmers interviewed were not engaged in the agroforestry. There were no respondents who fixed terraces even if terraces were damaged

Plate 10. Terraces in sitio Bantuagui

Bolo and sickle are the preferred tools of all farmers interviewed for harvesting crops in all sitios. The bolo is used to prepare land before sowing time in sitio Pactil, Boga and Sengyew. Some farmers own Asian water buffalo, which are a type of buffaloes, and are used to cultivate lands instead of hand tractors. Preparing land can be done faster with Asian water buffalo than with hoes. They eat mainly weeds and pasture grasses no the cost of inputs for them is lower than for hand tractors. Usually, farmers pay 500

pesos a day to hire a hand tractor from neighbours.

Table 19 show tools used in four sitio. Most farmers in all four sitios used carabao *(Asian Water Buffalo)* and some farmers used hand tractors in sitio Pactil, Boga and Sengyew in land preparation.

Table 19.Tools used in fotr sitios

Name of sitio	**Bantuagui**	**Pactil**	**Boga**	**Sengyew**
Tools used in harvesting	Bolo	Sickle	Sickle	Sickle
	Knife	Tractor	Tractor	Tractor
	Stick			
Tools used for land preparation	Grab hoe	Hand tractor	Hand tractor	Hand tractor
	Spading fork	Bolo	Bolo	Bolo
	Shovel	Shovel	Shovel	Shovel
	Bolo	Plow	Plow	Plow
	Carabao	Carabao	Carabao	Carabao

Sources: Based on field work questionnaires with mixed group of farmers

5.2. Constraints agricultural Vegetable Production

5.2.1. Cost of inputs and incidence of pest and disease

The main insect pests and disease identified by farmers in sitio Pactil, Boga and Sengyew are shown in Table 20. The only method farmers use to reduce damage by pest and disease is employment of pesticides, insecticides and fungicide; they do not practice late planting, timely sowing, optimum plant density or other non-chemical means to avoid pest breeding.

Table 20. Impacts of insects pest and disease on vegetables and root crops in sitio Pactil, Boga and Sengyew

	Name of insect pest	Name of disease
	Cut worm	**Blight of potatoes**
Insect pest	**Leaf minor**	Curling of bell pepper leaves
	Diamond back moth [1]	Bacterial wilt
	Tarzan	
	Black legue	

Source: Based on interview with mixed group farmers

Insect pests, such as cut worm *(Spodoptera sp)*, leaf minor *(Parthenocissus sp)* and diamond back moth *(Plutella sp)* are responsible for the most damage. Although pesticide and insecticides are used in sitio Pactil, Boga and Sengyew, plants are still damaged by both disease and insects especially the flowers of bell peppers. The main diseases identified by farmers are blight *(Xanthomonas sp)* which affect potatoes and pepper leaves. The only method used to avoid pest and disease is the application of pesticides and fungicides in sitio Pactil, Boga and Sengyew. On the other hand, there is no practical experience in the use of pest control or fertilisers in sitio Bantuagui. Five respondents in sitio Sengyew said that bell pepper is quite intolerant to disease compared to the other vegetables they are producing. They mentioned that one disease, which farmers do not know the name of effect on both leaves (Plate 11) and fruits (Plate 12) of bell pepper are a quite serious problem.

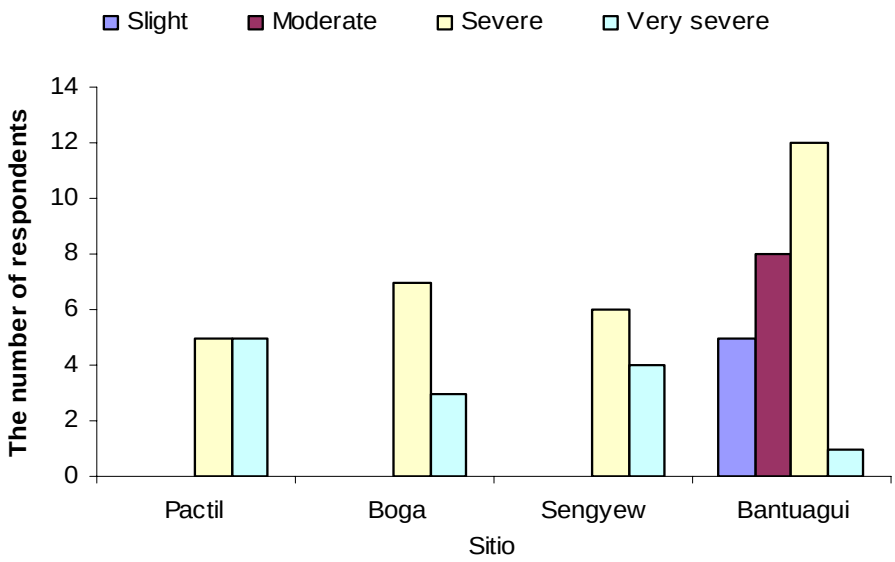
[1] Name with bold are quite serious insect pest and disease

Plate 11. A leaf damaged by unidentified disease in sitio Boga

Plate 12. Fruits damaged by unidentified disease in sitio Pactil

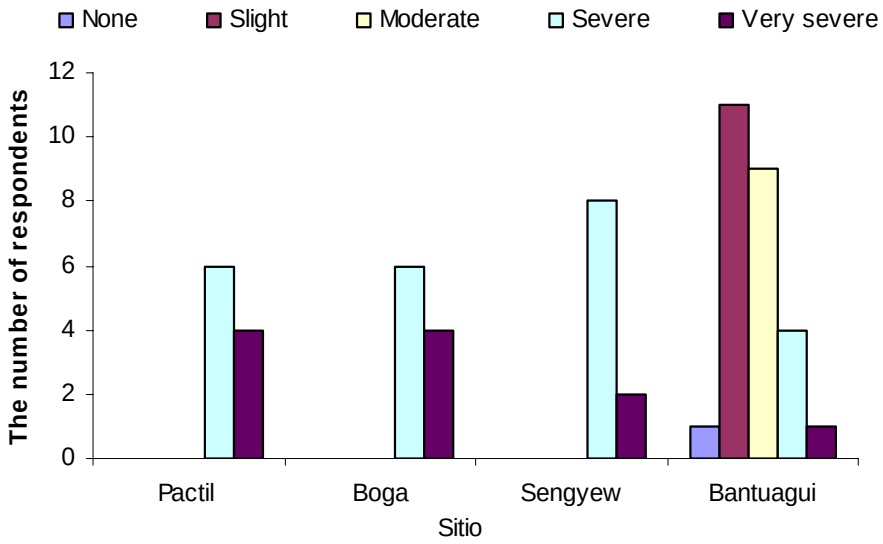
From figure 16 and 17 indicate clearly that most of the farmers in sitio Pactil, Boga and Sengyew think that their crops had serious pest and disease problems by. Although they have high inputs for pesticides and insecticides, their vegetables are still damaged by disease and insects. Through interviews, some farmers in sitio Sengyew mentioned that they thought they gave the wrong amount of insecticides and pesticide because they were still struggling disease and insect pests. In order to decrease the effect on them, they would like to use the appropriate quantity and times of them. The price of good quality vegetables is high in trading-post. Therefore the price of vegetables damaged by pest and disease will be lower or not be sold. It is reported by farmers in sitio Bantuagui that the damage of crops is not so serious. After they classify crops, they can sell the good quality vegetables in the markets and the rest is consumed in the household.

Figure 16. Degree of impacts by insects



Source: Based on field work questionnaires with mixed group of farmers

Figure 17. Degree of impacts by disease



Source: Based on field work questionnaires with mixed group of farmers

Moderate - vegetables can be sold

Severe - only some vegetables can be sold in the markets

Very severe - vegetables are not suitable for sale

Each sitio has a significantly difference in input cost (Table 21). Although farmers in sitio Pactil have a higher input cost than sitio Boga and Sengyew, total income from vegetables are lower than these two sitios.

Table 21. Description of inputs cost in each sitio and standard error

Livelihood indicators	Bantuagui	Pactil	Boga	Sengyew
Degree of input	Low	High	High	High
Mean input cost (pesos)	1,522 ± 102 [1]	77,737 ± 20,195	57,623 ± 11,685	37,205 ± 11,344

Source: Based on field work questionnaires with mixed group of farmers

All farmers interviewed in sitio Pactil, Boga and Sengyew said that they used two types of fertiliser and crop giants (Table 22)[1]. Crop giant helps plants during flowering and bearing fruits and pods, however, its name and effects are not familiar to farmers. Complete fertiliser and urea fertiliser are only used for rice and sweet potatoes, rice and beans respectively. Farmers do not have any inputs and care for Taro, corns and cassava at all. All thirty respondents use chicken manure every cropping. Of the farmers who use complete fertiliser and urea fertiliser, all respondents said there were no specific reasons why they use fertiliser. All farmers mentioned that they did not intend to change their fertilizer use.

[1] ± = Standard error

[1] No specific information

Table 22. Type of inputs in all sitios

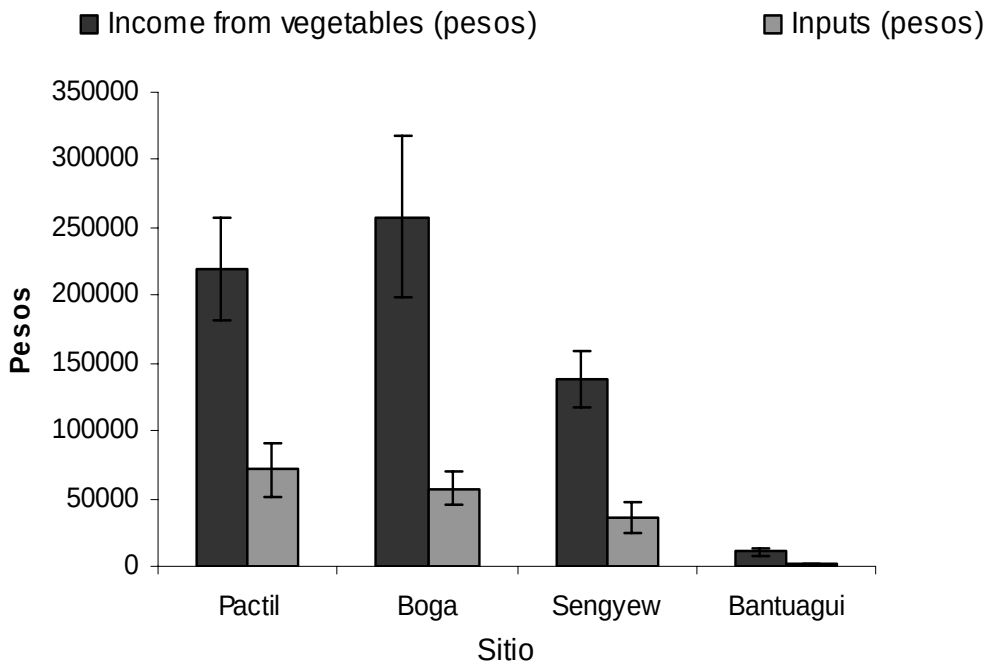
Sitio		Bantuagui		Pactil, Boga and Sengyew	
Input	**Name of input**	**Number of respondents**	**Percentage of respondents**	**Number of respondents**	**Percentage of respondents**
Fertilizer	1.Complete fertilizer N-P-K=14-14-14 [2]	26	100	30	100
	2. Urea fertilizer N-P-K= 45-0-0	26	100	2	100
	3. Crop giant	0	0	2	7
Manure	Manure	26	100	0	0
	Chicken manure	0	0	30	100
Pesticide/ Insecticide [3]	1. Sumicidin	0	0	14	47
	2. Biga	0	0	9	30
	3. Selecron	0	0	8	27
	4. Magnum	0	0	4	13
	5. Karate	0	0	3	10
Fungicide	1. Detame	0	0	15	50
	2. Manzate	0	0	9	30
	3. Cursate	0	0	2	7
Herbicide	1. Afalon	0	0	8	27
	2. Gramoyone	0	0	6	20
	3. Round-up	0	0	4	13

Source: Based on field work questionnaires with mixed group of farmers

[2] Complete fertiliser is applied for only Rice production
[3] Farmers apply for 19 kinds of pesticide and insecticide in total

Sitio Boga had the highest income from vegetable production and which is nearly 200, 000 pesos and income between Bantuagui was significantly lower (Figure18).

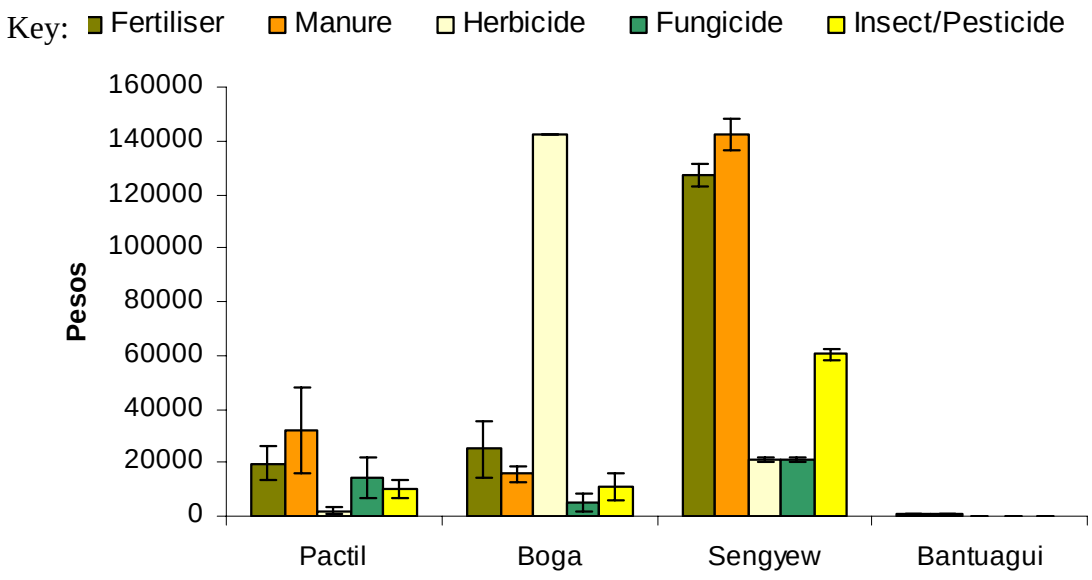
Figure 18. A comparison income from vegetable production and inputs of pesticides, insecticides, fungicides, herbicides and fertiliser and standard error between each sitios



Source: Based on Field work questionnaires with mixed group of farmers

Sitio Pactil, Boga and Sengyew are significantly different from sitio Bantuagui in respect of inputs used. (p = 0.000) A few farmers interviewed in Sitio Sengyew spent a lot on manure and fertilizer and the both average of costs are more than 120,000 pesos for them (Figure 19). Nearly 40 % of money spent on inputs goes on herbicides in sitio Boga. Five respondents mentioned that they still have a problem with weeds despite this high spend on herbicide

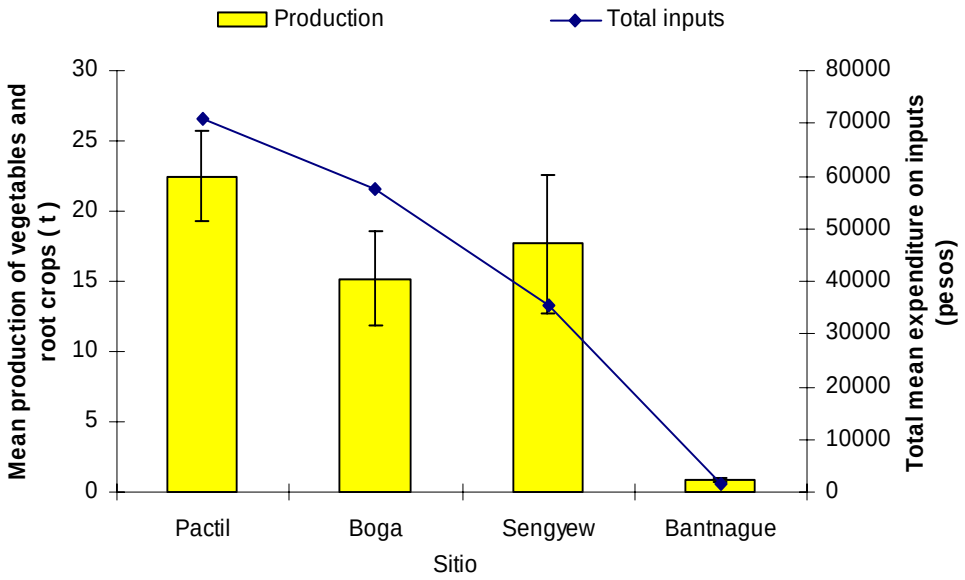
Figure 19.Mean and standard error of total costs of fertiliser, manure, herbicide, fungicide, insecticide and pesticide per year



Source: Based on field work questionnaires with mixed group of farmers

Looking at the relationship between mean vegetable and root crop production and cash expenditure on inputs, is hard to interpret. In those places where production high expenditure is also high, although sitio Sengyew has nearly 17t in mean yields of vegetables and root crops and which is 2t higher than sitio Boga, however, sitio Boga has higher inputs than that of sitio Sengyew, which is a difference of nearly between them. Sitio Bantuagui has only 0.8t in total mean yields of all vegetables and root crops. If the productivity of rice is included, the total mean productivity will increase up to 2.4t (Figure20).

Figure 20. Mean production of vegetables and inputs of fertiliser, pesticides, fungicides, herbicides and standard error in each sitiomanure, insecticides



Source: Based on fieldwork interviews and questionnaires with mixed group of farmers

Of the farmers who use more fertiliser than manure, six (23%) complained about the increase of the price of fertiliser. Figure 21 shows that the price of complete fertiliser (NPK) has increased since January in 2003. Furthermore, although there has not been a big increase in the price of urea fertiliser, the price is higher than complete fertiliser. Due to the high price of urea fertiliser (Figure22), farmers use more chicken manure as this fluctuated less.

Figure 21. Complete fertiliser: Average Retail price from 2002 to 2004

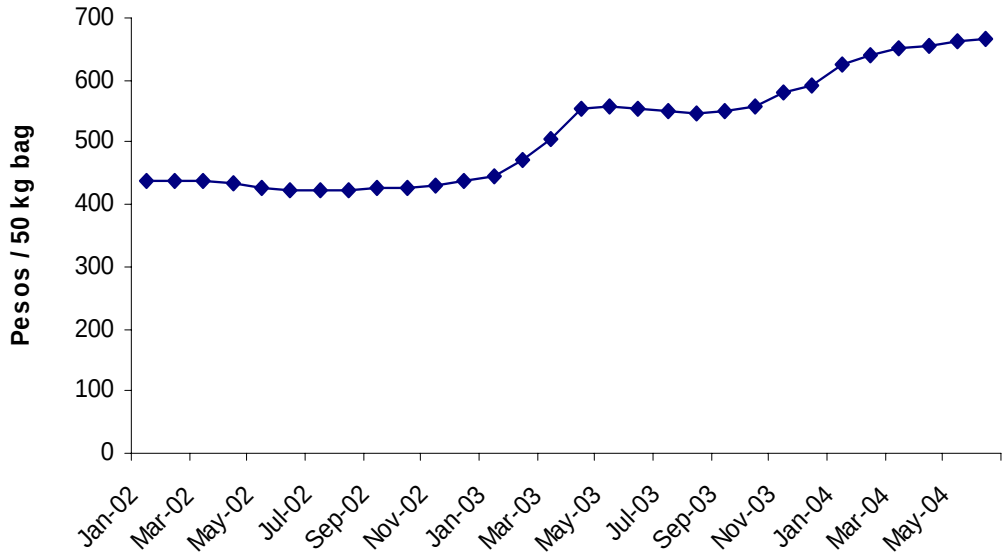
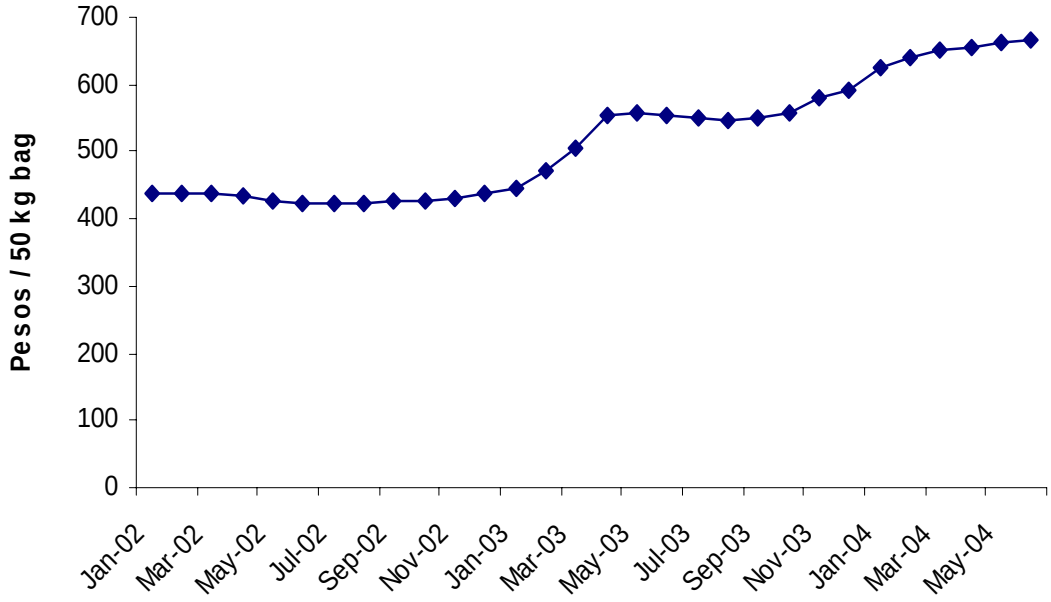


Figure 22. Urea fertiliser: Average Retail price from 2002 to 2004



Source: All figures based on Weekly Price Monitoring (Cereals& Fertilizer) produced by staff in Bureau of Agricultural Statistics

5.2.2. Labour demand

All farmers interviewed plant rice during June or July because during this time there is high rainfall in sitio Bantuagui (Figure 23). Rice must be planted before August which has the highest amount of rainfall. If there are typhoons in June, planting rice will be carried out in June because farmers think growing rice will be needed a plenty of water. Few farmers plant second crop of rice after the first harvesting of rice but most farmers plant different crops such as beans and sweet potatoes because the rainfall is quite a little.

Figure 23. Seasonal calendar in sitio Bantuagui

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rice 1											* 1	
Rice 2												
Rice 3												
String beans 1												
String beans 2												
Black beans			2 nd		1 st				1 st		2 nd	
French beans		2 nd				1 st		1 st		2 nd		
Sweet potatoes 1												
Sweet potatoes 2												
Cassava			2 nd			1 st			1 st		2 nd	
Taro												
Peanuts												
Pepper												
Mushroom			*2									
Aubergines												
Rainy season												
Summer season												

Notes : Some rice are planted in the nursery and then transplanted into the big fields

The mushroom production can be possible from March to June and it usually takes 15 days to harvest

Key
- Planting
- Harvesting

Source: Based on field work questionnaires with mixed group of farmers

Figure 24 shows that from June to July farmers are involved in planting cabbages and Chinese cabbages in sitio Pactil, Boga and Sengyew. After harvesting cabbages, some farmers plant sweet peas and the others lay their land fallow. Early in February, carrots potatoes and bell pepper are planted.

Figure 24. Seasonal calendar in sitio Pactil, Boga and Sengyew

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cabbage												
Carrots												
Potato												
Bell Pepper												
Sweet peas												
Sweet potato												
Chinese cabbage												
Red pepper												

Planting
Harvesting

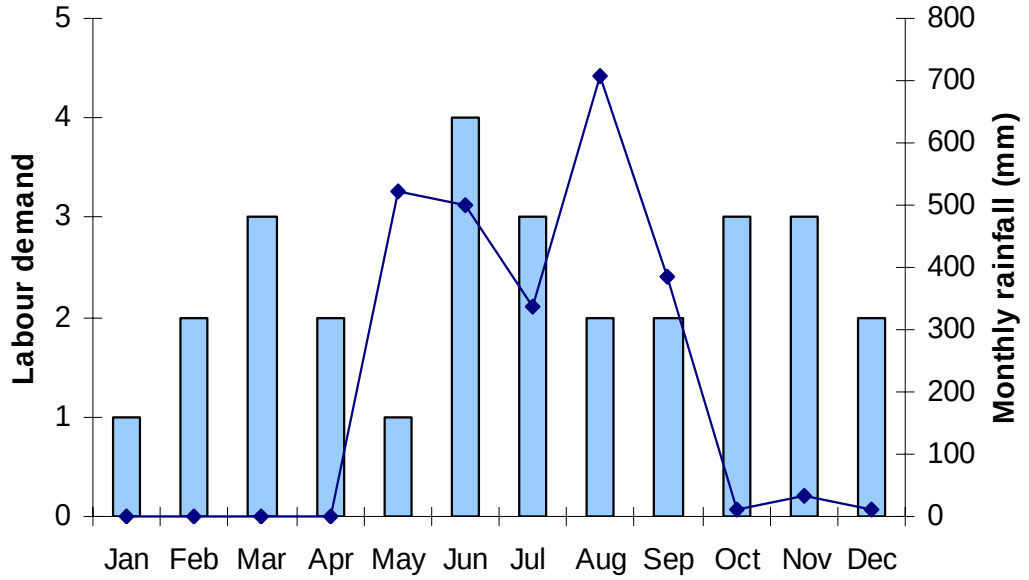
Source: Based on field work questionnaires with mixed group of farmers

Plate 13. Farmers harvesting potatoes in July

Labour utilisation level between men and women are same because agricultural practices such as sowing, weeding and harvesting are carried out by both men and women in all four sitios. Plate 13 shows men and women harvesting potatoes. The peak of the labour demand in sitio Bantuagui is from June to July (Figure25) shows that because rice is planted and then transplanted. Farmers plant rice by hand taking a long time. Sweet potatoes and beans are sown in the same season. Planting of beans is carried out between October and November. Farmers usually in sitio Bantuagui start planting rice in June. They do not use tractors to plant rice thus the demand for labour is the high at this time.

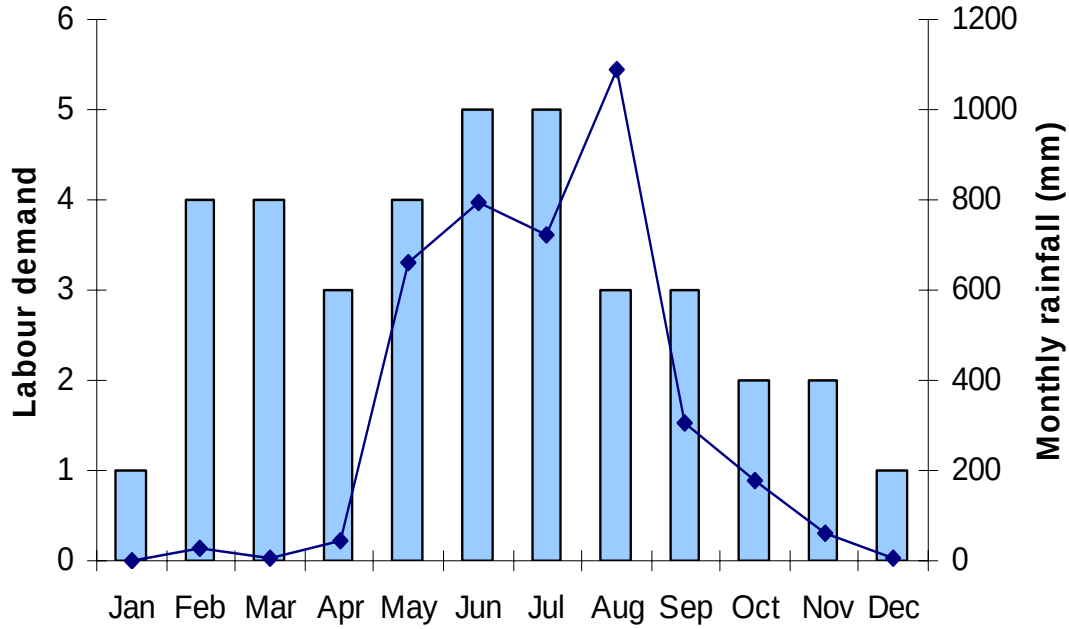
Sitio Pactil, Boga and Sengyew, the highest labour demand is in both June and July because farmers harvest carrots and potatoes and transplant cabbages from the nurseries to the fields (Figure26). Also, farmers are busy in February and March because of planting carrots and potatoes, especially as it takes a long time to plant potato tubers. From October to January, farmers are not busy because most vegetables are already harvested. Some male farmers mentioned that they could leave the agricultural work to their wives during October and January and would like to work in different places to get cash income when labour demand is low. Agricultural work is practiced by both men and women in these sitios and only women can harvest sweet peas if their husbands are working outside the fields.

Figure 25. Labour demand in sitio Bantuagui and total monthly rainfall in Bacnotan



Data of rainfall and temperature in 2002 from Agromat station in DMMMSU

Figure 26. Labour demand in sitio Pactil, Boga and Sengyew and total monthly rainfall in Baguio, Benguet

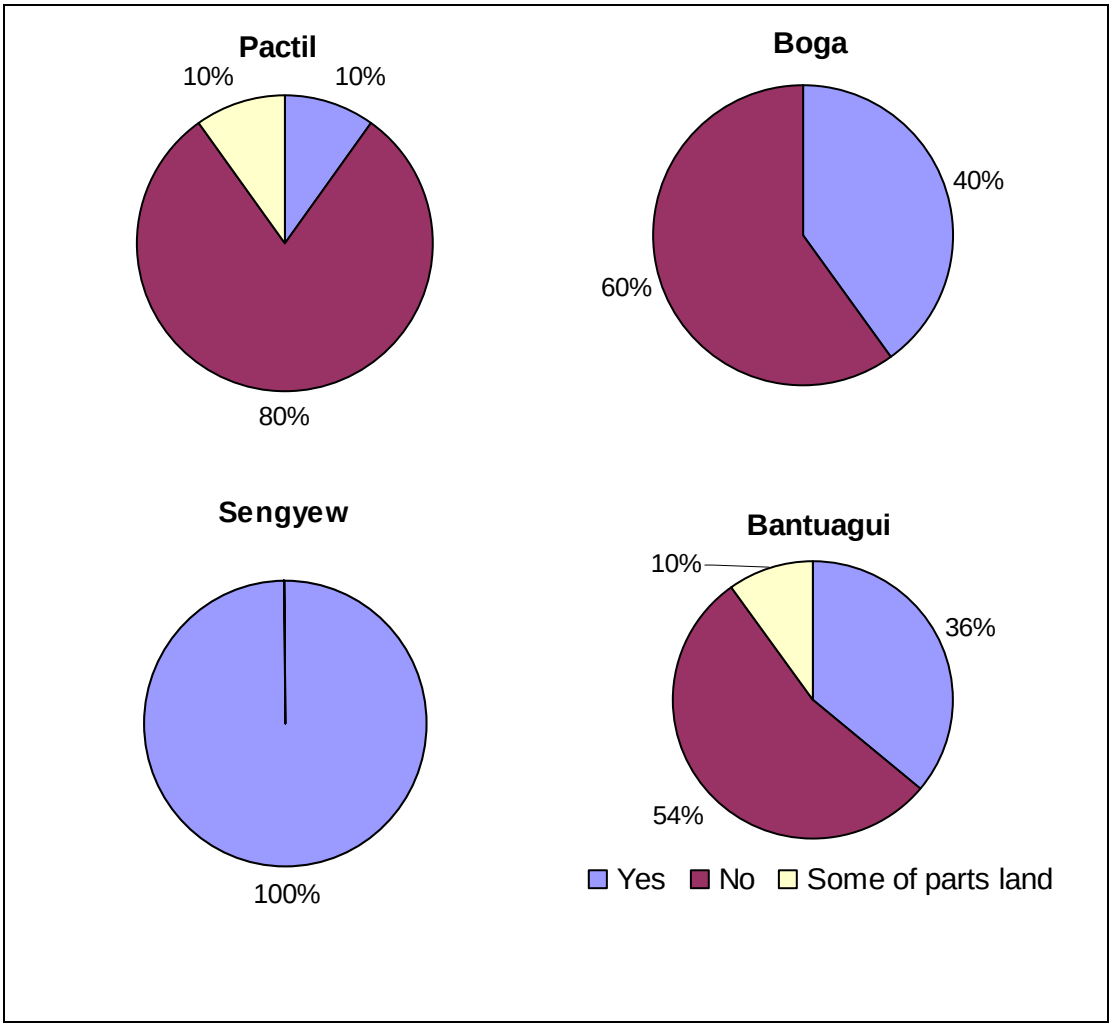


Data of rainfall and temperature in 2002 from PAGASA

5.2.3. Water availability

Figure 27 shows the percentage of respondents with /without irrigation system in each sitio. Although the land of farmers interviewed in sitio Sengyew is all un-irrigated, only 10% of the land in sitio Pactil is irrigated. Nearly 40% of land in sitio Boga and Bantuagui is irrigated (Plate14). During the summer season, irrigation is not possible because there is a water shortage problem in each sitio. While, in summer season farmers interviewed in sitio Sengyew can get enough water because their land is irrigated.

Figure 27. Percentage of respondents with / without irrigation system in each sitio

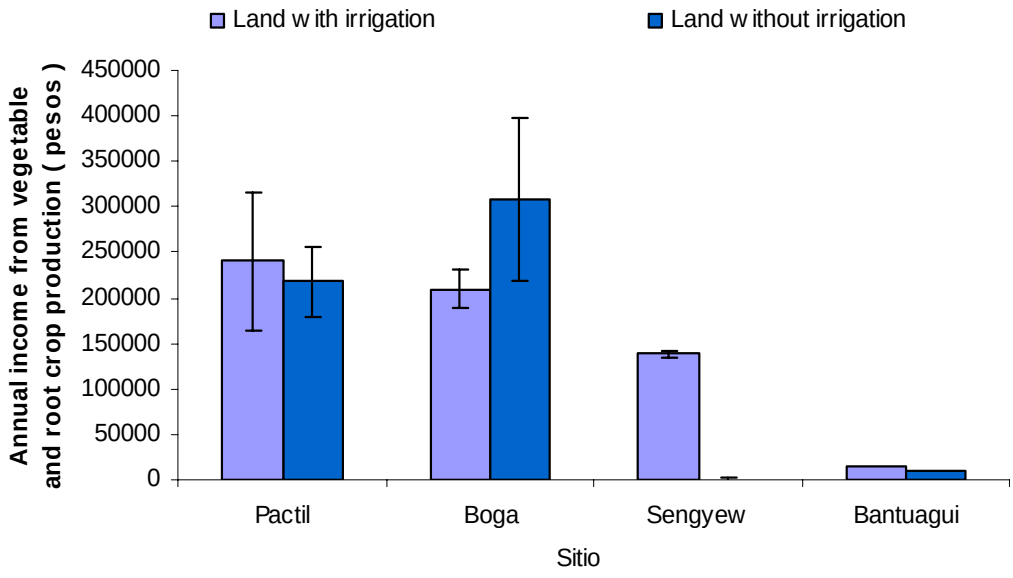


Source: Based on fieldwork interviews and questionnaires with mixed group of farmers

Plate 14. Land irrigated in sitio Bantuagui

Figure 28 shows that farmers who have land with irrigation do not have a higher income from vegetable production. In the villages studied, income from vegetable production in land without irrigation was higher than in land with irrigation. Two farmers said that even if the land is irrigated, there is a little rainfall over the summer season so irrigation does not work efficiently at the time. Although all farmers interviewed in sitio Sengyew have land with irrigation, the income is quite low.

Figure 28. A comparison of mean income from vegetable production and irrigation system in each sitio



Source: Based on fieldwork interviews and questionnaires with mixed group of farmers

A few sprinklers were seen in all three sitios and they were all working efficiently (Plate15). One sprinkler costs 200 pesos and this is affordable so most farmers should be able to purchase one. However, in the interviews, it was found that more than half farmers did not to buy sprinklers (Table23) because they said, sprinklers are not effective in places where water shortage is a problem. This sprinkler in Plate 15 does not need electricity and water pump to convey water to the top of the sprinkler. It only uses the gravity.

Plate 15. A sprinkler in sitio Pactil

Table 23. A comparison of water equipment available

	Bantuagui	**Pactil**	**Boga**	**sengyew**
Percentage of land irrigated	10%	46%	40%	100%
Percentage of farmers who have sprinklers	0%	10%	20%	20%

5.2.4. Human capital, skills and extension

Training courses in Mountain Province and Province Benguet usually are organized by the Agricultural Training Institute in Benguet State University and Manila. This is attached to the Department of Agriculture in Manila. The funds are from DA central office in Manila and Local Government Units. Twenty two training courses were held for farmers in La Union through ATI in 2003. These courses were divided between farmers in 22 municipalities; 750 farmers attended the training courses in 2003. The seminars were not only about crop production but fishery, rice and livestock. Of 26 respondents in sitio Bantuagui, there were only 3 who joined three different seminars because most of these seminars were prepared for farmer leaders in each barangay

Table 24 shows the how many farmers could have an opportunity to attend seminars about vegetables and root crops organized by ATI and DA in 2003.

Table 24. Training courses about vegetable and root crop production organized by DA in municipalities

	Province	
	La Union	**Mountain province**
Number of seminars done	7	No data
Number of farmers trained	210	No data
Percentage of farmers trained	No data	No data
Methods to inform the information	From mayor to barangay captain	From mayor to barangay captain
Funded from	DA and ATI	DA and ATI

Source: Based on the interview with DA staff in La Union and Mountain Province

Types of seminars and training courses organized by ATI and DA in 2003

1. Vegetables and root crop protection / package
2. Micro-Enterprise Development Course(Fruit, Vegetables, Meat and Fish processing)
3. Update on crop production

Source: Training Accomplishment report CY 2003

Nearly 5 seminars have carried out in 2003 in municipality of San Gabriel, however, e only three were related to vegetable and crop production (Table25). There were two seminars which focused on hybrid-rice production. In general, there were approximately 30 farmers in each seminar. There is no number limitation who can attend the one seminar. In both Municipality of San Gabriel and Buoko, the information of seminars was passed from DA staff in municipality to barangay captain then to farmers.

Table 25. Seminars and training courses done by DA and ATI in municipality of San Gabriel and Buoko in 2003

	San Gabriel in La Union	Buoko in Mountain province
Number of seminars by ATI and DA	3	No data
Number of seminars by LGUs	2	No data
Number of farmers trained by DA and ATI	Approximately 90	No data
Number of farmers trained by LGUs	60	No data
Methods to inform the information	Barangay captain	Barangay captain
Funded from	ATI and DA[1]	ATI and DA

Source: Based on the interview with DA and ATI staff in municipality of Bauko and San Gabriel and Report on Priority training and extension Programs 2003

After 6 months the seminars carried out, DA staffs in La Union visit farmers in barangay and municipalities where agricultural training and seminars were practiced and do monitoring and evaluation to farmers and barangay captain. Then staffs collect the data, such as how many farmers joined them, and farmers' insensitive for seminars

[1] LGUs is Local Government Units

Table 26 shows the number of farmers interviewed have attended the seminars and training courses organized by only DA and ATI.

Table 26. Seminars and training courses done by DA and ATI between sitios

	La Union	**Mountain province**		
	Sitio Bantuagui	**Pactil**	**Boga**	**Sengyew**
Number of farmers trained	6	4	4	5
Percentage of farmers trained (%)	23	40	40	50
Methods to inform the information	Barangay captain	Posters in Sitio	Poaters in sitio	Poaters in sitio
Funded from	DA and ATI	DA and ATI	DA and ATI	DA and ATI

Source: Based on fieldwork interviews with mixed group of farmers

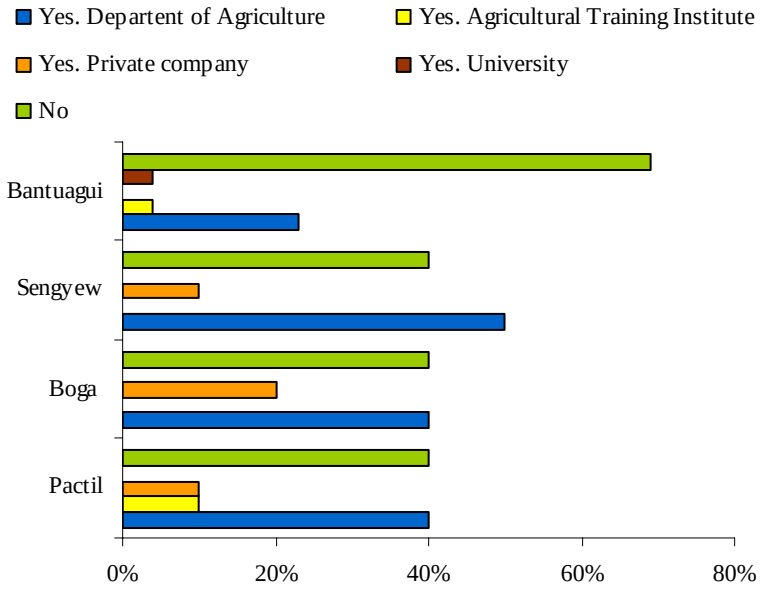
In Mountain province and Benguet province, many trainings courses are given to farmers by Agricultural Extension Workers (AEW) who have a great influence over farmers. The objectives of AEW are to expand farmers' knowledge and perception about agricultural production. The advantage of seminars organized by AEW is that all seminars meet the needs of farmers. A thousand AEWs in Cordillera Administrative Region visit sitios for arranging seminars and demonstration, they should know what farmers require now. In order to hold seminars, 25 farmers are collected by AEWs. AEW have to find the appropriate seminars and proper time and place, barangay hall, through a visit to farmers and then submit their proposal to ATI. AEWs can get funds from 200 to 3000 pesos for one seminar. The funds depends on type of seminars, the number of people, and how many times barangay has got seminars before.

JICA sponsored training approximately 15 – 20 people from farmers and staff in DA is chosen every year and are given to the opportunity to take agricultural training courses organized by Japan International Cooperation Agency (JICA) in Japan. Courses are mainly for vegetable production and the training period varies from only two weeks to one year. It is reported by DA that staff who have been trained in Japan made good use of their experiences and skills to solve problems which constrain farmers to produce

crops.

Farmers in sitio Bantuagui have less opportunity to attend the seminars compared to farmers in sitio Pactil, Boga and Sengyew and more than 70% of farmers have never joined the seminars before (Figure 29). According to the interview with staff in DA of CAR, AEW are spread out in Mountain province to investigate constraints of farmers', however, only 2 farmers have attended the seminars organized by AEW in sitio Pactil, Boga and Sengyew. Seminars by DA in sitio Pactil, Boga and Sengyew were carried out through municipality of Bauko, Mountain province.

Figure 29. Percentage of respondents attended seminars and training courses



Source: Based on fieldwork interviews and questionnaires with mixed group of farmers

More than 60% of total training cost was training about rice and the number of farmers attended seminars about rice was quite high, nearly 80%(Table27).

Table 27. Summery of training cost and participants trained, by commodity in 2004

Type of crops		**January to March**	**April to June**	**Total**
Rice	Cost (pesos)	243,808	977,703	1,221,511
	Number of participants	1,001	11,352	12,353
Maize (pesos)	Cost (pesos)	67,973	286,257	354,230
	Number of participants	111	1,349	1,460
Crops [1] (pesos)	Cost (pesos)	70,690	247,450	301,390
	Number of participants	254	1,016	1,270
Livestock /Fisheries (pesos)	Cost (pesos)	13,947	82,595	96,541
	Number of participants	557	906	1,517
Total (pesos)	Cost (pesos)	396,418	1,594,005	1,973,672
	Number of participants	1,977	14,623	15,600

Source: Based on Report of extension and training in Program I from Agricultural Training Institute in Manila

[1] Vegetables, root crops and fruits

5.2.5. Post production losses and marketing issues

Agricultural products grown in sitio Bantuagui are conveyed to market in Bacnotan and San Fernando by public transportation, such as jeepney[1]. A jeepney station is located in upper Bantuagui and products are transported by agricultural sleights from houses to the jeepney station. This is hard for farmers living in lower Bantuagui as the roads connecting households to the jeepney station are poor and badly maintained. It is difficult to pass through narrow roads and go up steep slopes with the heavy weight of crops. In any case there is a limitation in available labour and sleighs, so farmers must transport products by making several journeys. Return journey by jeepney costs 30 pesos to Bacnotan and nearly 70 pesos to San Fernando. Farmers go to markets every Thursday morning in Bacnotan and come back to sitio around 4 pm. Farmers do not decide to sell vegetables in markets of San Fernando. Common transportation is by bus, van and lorry from this area to towns in sitio Pactil, Boga and Sengyew. Lorries are used to convey crops to the market from both sitios. Although there are other options, such as bus, van to carry crop to trading post from sitio Pactil, Boga and Sengyew, it is difficult to load several tons of vegetables into these forms of transportation. Therefore, farmers often hire lorries from relatives or neighbours. However, there are quite a few farmers who have their own lorries in each sitio. Transport is not always available when farmers want to use and sometimes farmers miss the best time to lord their produce to markets even if they have already harvested crops. .

Almost all respondents (87%) who produce cabbage mentioned that post-production problems are a serious issue and they had to consider it substantially now because post-harvest losses in vegetables reduce income for farmers. Table 28 shows post-harvest losses in each vegetable in sitio Pactil, Boga and Sengyew. Five farmers (16%) said that although they usually pay attention to carrying and dealing leafy vegetables the most, nearly 20 to 30 % of leafy vegetables are lost from the agricultural fields to consumers.

[1] Jeepney is one of common transportation for local people in the Philippines. It is very suitable for travelling over rough terrain (see Plate 3.4)

Table 28. Estimated post-harvest losses in vegetables in sitio Pactil, Boga and Sengyew

Crops	Manner of loss	Post-harvest losses
Cabbage	Handling, transport,	20-27%
Potato	Transport	5-10%
Lettuce	Handling, transport,	20-30%
Chinese cabbage	Handling, Transport	20-27%
Carrot	Handling	12-38%
Bell pepper	Handling	20-27%
Sweet peas	Handling,	5-50%

Sources: Industry situational review written by Bureau of Plant Industry and based on interviewed with farmers in La Trinidad

Whilst great effort and a lot of expense is spent in ensuring high yields by using large quantities of fertilizer, pesticides and fungicide, but are less interested in post harvesting activities and the subsequent quality of produce. Containers, handling and transport systems are not favourable to preserving products with best condition and post-harvest facilities are meagre at best. For example, cabbage, Chinese cabbage, carrots and bell peppers are transported in bamboo crates with no lining. This situation leads to post-harvest losses of 30-50% in total which is very serious. The roads to the market in La Trinidad are quite steep and vegetables are crushed and squashed.

This is the flow of the post-harvest losses in vegetables from farmers to consumers

1. Harvesting
2. Roads from farm to sorting and washing places
3. Sorting and washing
4. Packing
5. Transport from packing places to the wholesale markets
6. Repacking in the markets
7. Storage
8. Retail
9. Kitchen

There are 20 to 30 % losses in vegetables from stage 1 to 5 and from 6 to 10, 20 to 40% of vegetables are lost. It is estimated that total losses of vegetables were approximately 30 to 50%.

Source: Based on Industry situational review written by Bureau of Plant Industry and interview with dealers in La Trinidad

Plate 16. Vegetable market in La Trinidad

All respondents interviewed for this study said that all the vegetables in sitio Pactil, Boga and Sengyew were sold in the trading-post[2] in La Trinidad (Plate16). A few interviewees complained that the trading-post is not a desirable place for farmers even though their product can be sold to dealers because farmers cannot decide any prices of vegetables. This is because the price of vegetables is determined by dealers and it is difficult to sell vegetables when the supplies of vegetables are high. It is not allowed by the government to sell vegetables directly to consumers in the market in La Trinidad. Farmers like to make contracts with dealers to ensure a constant income; however, dealers are not keen to do this because they would like to be flexible in buying vegetables every day after checking the quality and freshness and the harvest date. These responses are summarised in table 29.

[2] A Trading post is a place where farmers sell their own products and it is located in La Trinidad, Benguet

Table 29. Advantages and disadvantages of trading-post

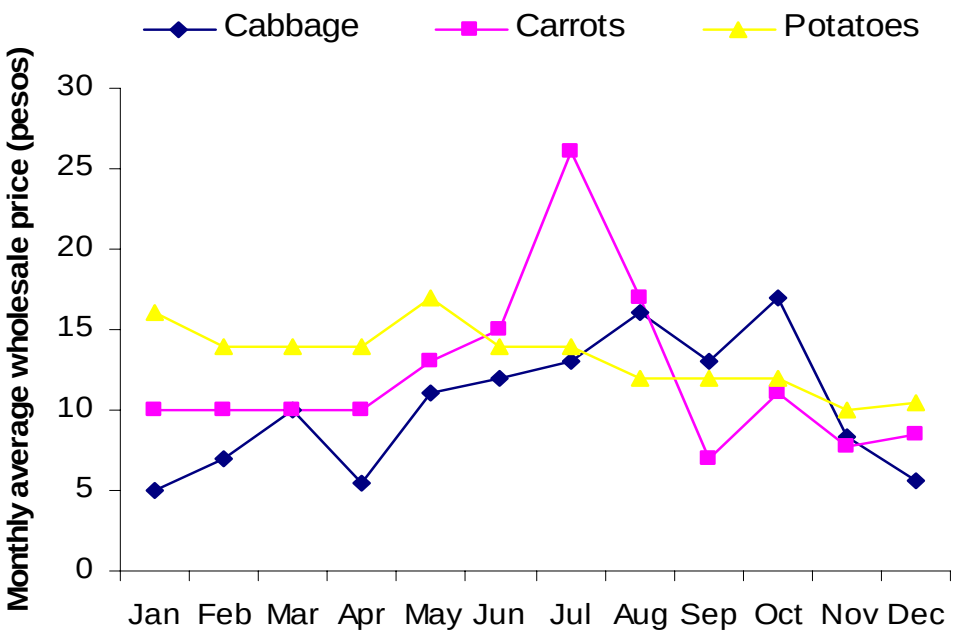
Advantages	Disadvantages
* Farmers can sell as much of their crop so they want to * Farmers can sell when they choose to	* Prices are determined by dealers, and lower than farmers would like

Source: Based on fieldwork interviews with mixed group of farmers

Market prices have been always determined by dealers and middlemen in La Trinidad. The gate price is usually just about 30% of the final retail price. During interviews with farmers, it was found that abundant harvests do not always mean a large income the as price goes down when the price is high. The price fluctuation of vegetables day by day is a serious problem as well.

Figure 30 shows the price of potatoes, carrots and cabbages which are the main vegetables produced in sitio Pactil, Boga and Sengyew. The price of these three vegetables varies significantly through the year and the time when they harvest. Cabbage and potatoes which have high demand but high supply are marketed usually at low price. Potatoes especially start imported from Australia and United States since 1994 and the demand of Pilipino potatoes has decreased slightly since then because potatoes from other countries are cheaper and of better quality than potatoes from the Philippines.

Figure 30. Mean monthly wholesale price from January 2003 to December 2003 in La Trinidad



Source: Inflow and Outflow of major highland vegetables in Baguio city and La Trinidad from DA provincial office in Baguio city

There are several factors that determine the price of vegetables at La Trinidad:

1. The quantity of crops brought the market every day in La Trinidad
2. Environmental events.
3. The price of vegetables change along with seasons.

Figure 31. Expenses paid by dealers in La Trinidad

Expenses paid by dealers in La Trinidad	
1. Trucking fee to collectors	2.0 pesos / kg (paid by middlemen)
2. Baggage fee	0.5 pesos / kg (paid by middlemen)
3. Transportation fee from La Trinidad to Manila	

Source: Interview with traders in La Trinidad

Traders usually decide the price of vegetables in consideration of their expenses such as the trucking fee to collectors and the baggage fee (Figure31). Some dealers, who hire trucks with a capacity of 8-10t also have to pay 2-3 pesos/kg to the Benguet Trader

Association. This association plays an important role in marketing because dealers who do not have their own truck can hire trucks from this association or ask the association to convey the produce to Manila instead of dealers. A few traders said this arrangement was cheaper than owning trucks.

After the vegetables arrive at the market in La Trinidad, they are classified into several categories according to their size and quality. Potatoes are grouped into five different sizes, the largest ones being sold at the highest price. Similarly, cabbages are divided into first class and second class according to quality, which is determined pealing off a couple of outer leaves. After classification, all vegetables are packed by collectors for loading to the lorries to Manila (Plate17). The cost of this process is paid for by the middlemen.

The price of cabbage can be determined by the size, the colour and the proportion of damaged items. Harvesting at the best time is quite important for cabbage. Farmers have to consider two factors when choosing the time to harvest, the crop quality and the market price. For instance, when the cabbages have reached the best quality, the market price could be low, so farmers would not harvest them. As a result, farmers sometimes miss the opportunity to sell and wait for the time when the price is high.

Plate 17. Trucking cabbage to Manila

In the market of Bacnotan (Plate18) the price of crops is determined by farmers. Table 30 shows the mean price of crops collected through interview. These prices will be less if the produce is still remained when the market is nearly close.

Table 30. Mean price of vegetables sold by Bacnotan

Commodity	Price (pesos/kg)	Commodity	Price (pesos/kg)
Rice	7-9	Cassava	10
String beans	15-25	Taro	10
Sweet potatoes	10	Black beans	8
Bell pepper	20	Baguio beans	10-15
Ginger	No data	Peanuts	30

Source: Based on fieldwork questionnaires with mixed group of farmers

Plate 18.Market in Bacnotan

All farmers interviewed in sitio Sengyew said that the Philippines' joining GATT has caused them difficulties. One of the problems was that it has become harder to sell their products, especially cabbage due to competition from cheap and high quality imports.

5.2.6. Physical impacts

Figure 32 shows that how delay in shipping and vegetables losses affect the price farmers receive. It is reported that it takes two weeks after a typhoon has passed for the price to return to normal.

Figure 32. Reduction in market price caused by typhoon in June 2004

	Before a typhoon	During a typhoon	After a typhoon
Carrots	10-20 pesos/kg	30 pesos/kg	15-20 pesos/kg
Potatoes	15-17 pesos/kg	25-30 pesos/kg	22-25 pesos/kg

Source: Based on Interview with dealers in La Trinidad

Plate 19. Landslides on the way to La Trinidad

Natural disaster, such as typhoons not only causes the amount of vegetable production to decrease but also prevent transport of products to market (Plate19). There were more than 20 typhoons in 2003, may caused landslides. Nearly one third of roads leading to markets are hilly, narrow and unpaved. Landslides caused by typhoons prevent farmers from transporting produce to markets. Leafy vegetables such as cabbages are easily damaged and rot faster than any other vegetables. Furthermore, transfer from the truck on one side of a landslide to another truck on the other side lead to losses in vegetables

5.2.7. Employment

There were only five respondents who had income from sources other than farming such as owning shop or teaching in school. For the rest of farmers in sitio Pactil, Boga and Sengyew, income from labouring in fields is the only supplement. Labouring work is usually undertaken by farmers in the same sitio and for relatives. Male labour is paid at 150 pesos / day and female are paid at 100 pesos / day. The working day is from 8am to 5pm with 1 hour break. Employers have to prepare lunch and snacks for labours but require them to bring their own tools. Seven farmers out of twenty five who do not have constant income from other resources mentioned that they have been looking for work because their basic farming incomes are not reliable due to environmental impacts, such as typhoons and also price fluctuations.

5.2.8. Location in each sitio

The location is the important to convey products from sitio to the markets and it might effect on income in each sitio (Table31). Farmers in sitio Bantuagui have difficulty in carrying their products to main roads. Although sitio Sengyew is not located near main roads, farmers hire lorries and drive lorries to agricultural fields. There are not serious problems to carry crops in sitio Pactil, Boga and Sengyew.

Table 31. Description of location in each sitio

	Access to main road	**Type of roads through the main road**
Pactil	Good access	Although some farmers go down the
Boga	Good access	Facing the main road
Sengyew	Poor access	Quite steep and narrow slope and 30 mins walk
Bantuagui	Some households have difficulty to get to main roads	Some roads are not paved and steep slope

Source: Based on fieldwork questionnaires with mixed group of farmers

5.3. Benefits from vegetable production

5.3.1. Livelihoods and income

Farmers in sitio Bantuagui sell more than 70% of their agricultural products within the sitio cooperative, and in the markets of Bacnotan and San Fernando. Thirty percent are consumed within the household. The annual income of farmers interviewed in this area ranged from 4,950 pesos to 30,000 pesos. There were 3 farmers with income from other sources, including teaching in school, running shops, or from relatives working abroad in countries such as Saudi Arabia. For these households, incomes were as high as 70,000 pesos. In general, the low annual income from growing vegetables does not allow a surplus to be accumulated and farmers are forced to live a minimal life, unreliable to short term cash flow problems. The major source of income in sitio Pactil, Boga and Sengyew is vegetable production though some farmers get wages from labour and shops. The average anuual family income is estimated at 200,000 pesos in three sitios. Despite their higher income than sitio Bantuagui,[1] the total inputs of crops are quite high and their total net yearly amount is nearly 50,000 pesos.

Table 32 shows that farmers in sitio Pactil, Boga and Sengyew are generally wealthier than sitio Bantuagui. This difference in wealth is mainly due to income from vegetable production.

Farmers in sitio Bantuagui do not have regular and dependable source of income and cannot afford to live the income from selling vegetable and rice. There are 3-5 livestock in each household. To supplement their income from selling crops, they sell meat mainly to relatives and neighbours in order to earn cash. A kilogramme of pork which is new breed of Chinese pig is sold for nearly 100 pesos and Philippines negative pigs can be sold more than 100 pesos per kg. Respondents in sitio Pactil, Boga and Sengyew have a higher average total income compared to sitio Bantuagui. However they use more fertilizer and pesticides than that of sitio Bantuagui. Although vegetables are planted in all areas in sitio Pactil, Boga and Sengyew, vegetable production in sitio Bantuagui occupies less than 40% of the area and the rest of the land is used for rice production.

[1] The average annual salary of university staff is nearly 180,000 pesos

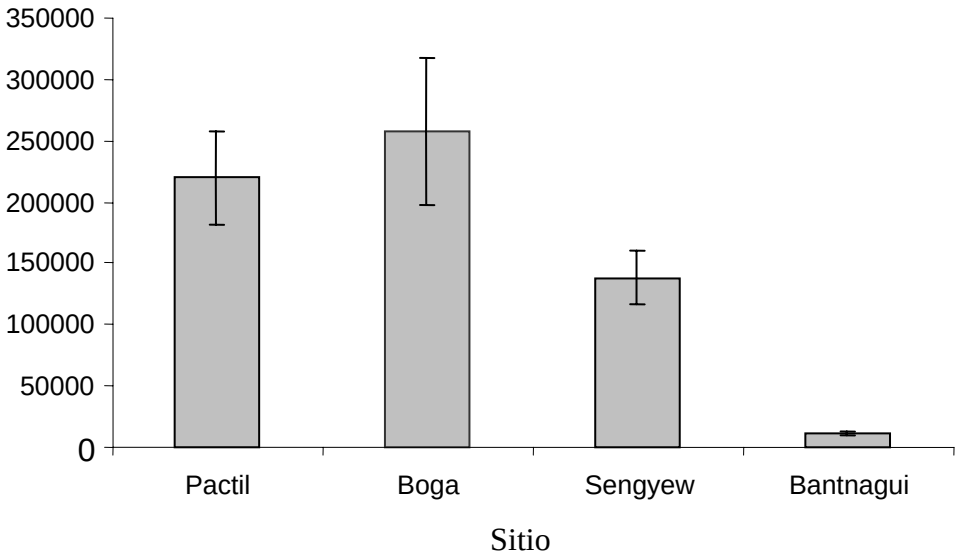
Table 32. Mean income and net income in each sitio

Livelihood indicators	Bantuagui	Pactil	Boga	Sengyew
Degree of wealth	Low	High	High	Middle
Mean income from vegetables (pesos / year)	11,301 ± 1,765	219,906 ± 59,778	257,500 ± 21,217	138,400 ± 21,217
Mean net income (pesos / a year)	___	148,890 ± 29,225	199,889 ± 52,503	98,534 ± 19,455
Income sources	Vegetables Remittance from family Shops	Vegetables Labour	Vegetables Labour	Vegetables Labour

Source: Based on field work questionnaires with mixed group of farmers

Figure 33 shows sitio has a significant difference in income from vegetable production. (p=0.000)

Figure 33. Annual income from vegetable production in each sitio



Source: Based on field work questionnaires with mixed group of farmers

5.3.2. Co-operative membership

A cooperative is an organization in which a group pools its resources together equally for their benefit of all members. The co-operative has been identified by people as the most important social and economic institutions for development of the nation in the Philippines. Sitio Bantuagui has a co-operative and this gives farmers an opportunity to sell vegetables. It also supports farmers in finance and in buying inputs. Sitio Pactil, Boga and Sengyew do not have co-operatives. Most farmers in these sitios use large amounts of fertiliser, pesticide, fungicide and insecticide, much larger than are used in sitio Bantuagui.

There are advantages and disadvantages to the use of a co-operative (Table33). Farmers can obtain an advance on future earnings of money to buy inputs, such as fertilizer, pesticides and insecticides from the co-operative. They must return the money to the co-operative when they sell their produce. If they cannot pay money to the cooperative, it is possible to extend the due date and the interest is free. The cooperative purchases

fertiliser, pesticide and insecticide in Bacnotan. They buy large quantities, and so get the inputs at a lower price. The co-operative does not profit from selling them to members because they sell at cost. Farmers repay loans to buy fertiliser and manure from co-operative after harvest. If farmers cannot afford to repay loans due to a crop failure, repayment can be postponed to the next harvest season or anytime when they are able to pay. Interest will not be increased in this case.

Table 33. Advantage and disadvantages of co-operative

Advantages	Disadvantages
1. Easy to borrow money	1. Payment for co-operative
2. Good maintenance of hoses	2. Lack of capital for co-operatives
3. Cheap input, such as fertiliser	3. Lack of cooperation among members

Source: Interview with the secretary of the cooperative in sitio Bantuagui

5.4. Summary

5.4.1. Suggestion from farmers

Table 34 shows suggestions which farmers would like to focus on in the future in each sitio. Water shortage problem in all four sitios are difficult to solve because there is no solution to increase the rainfall over the summer. Therefore, in order to solve this problem, water tanks or reservoirs to keep water during summer season must be put in place. Total income in sitio Bantuagui is not so high compared with sitio Pactil, Boga and Sengyew; sitio Bnatuagui is facing problems about a lack of capital. The low inputs in sitio Bantuagui are due to the low income. Sitio Pacyil, Boga and Sengyew are still facing the problems caused by pest and disease although they spend lots of inputs to reduce this problem. Farmers suggested what they would like to focus on in the future as a result of discussion.

Table 34. Suggestions in the future to solve problems in each sitio

Problems	Sitio				Mean
	Bantuagui	Pactil	Boga	Sengyew	
Water supply [1]	43%	90%	70%	50%	63%
Lack of capital	8%	30%	40%	50%	30%
Technical Donor support	20%	10%	20%	20%	18%
Avoid damaged by pest and disease	8%	60%	50%	70%	47%
Decision of vegetable price	0%	80%	90%	70%	80%

Source: Fieldwork interviews and questionnaires with mixed group of farmers

5.4.2. Farmer problem scoring

According to the results of preference ranking, occurrence of pest and disease is the biggest problem in restricting vegetable production in all sitios followed by lack of capital (Table35 and 36). The price of products in market is an only constraint in sitio Pactil, Boga and Sengyew. Landslides caused by typhoons result in difficulties to convey produce from sitios to the market. This problem happens only rainy season in sitio Pactil Boga and Sengyew. Land ownership and also soil erosion are perceived as less serious problems. Figure 34 shows the Preference ranking man score of all farmers' responses.

[1] This problem is only summer season

Table 35. Ranking of farmers' problems in sitio Bantuagui

	Total score	Ranking
Occurrence of pest and disease	136	A
Lack of capital	134	B
Inadequate water availability	130	C
Soil fertility	111	D
Inadequate labour	103	E
Soil erosion	89	F
Land tenure	28	G

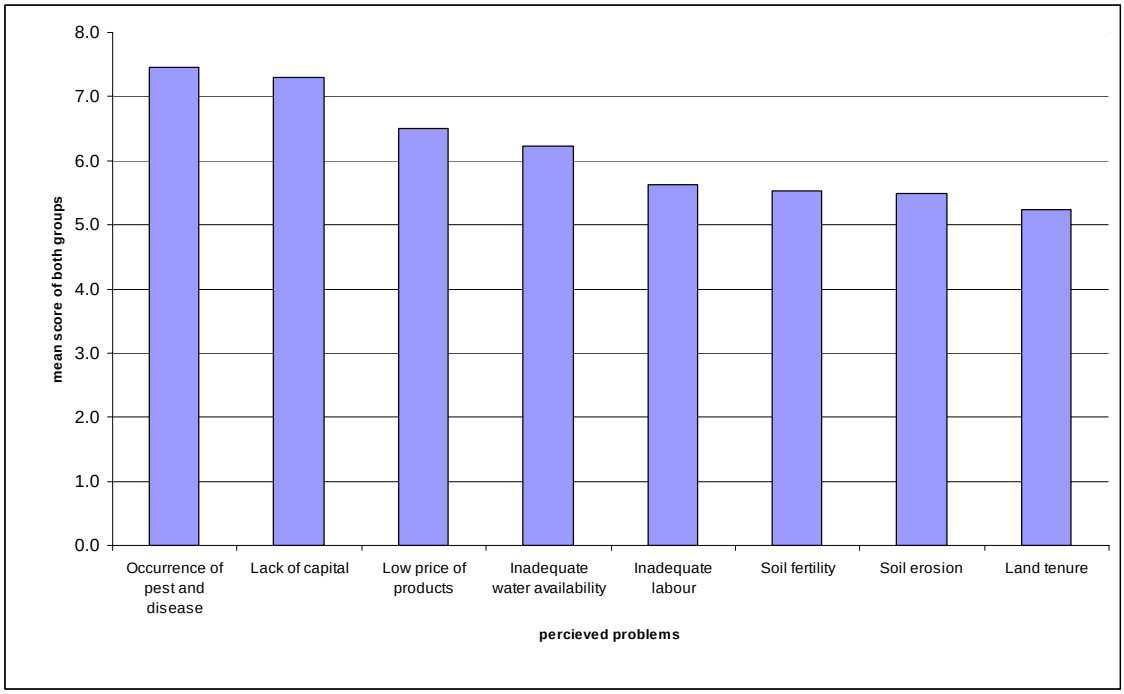
Source: Based on fieldwork questionnaires with mixed group of farmers

Table 36. Ranking of farmers' problems in sitio Pactil, Boga and Sengyew

	Total score	Ranking
Occurrence of pest and disease	67	A
Lack of capital	62	B
Low price of products	38	C
Inadequate water availability	30	D
Inadequate labour	12	E
Soil fertility	9	F
Soil erosion	8	G
Damage by typhoons	2	H
Land tenure	0	I

Source: Based on fieldwork questionnaires with mixed group of farmers

Figure 34. Preference ranking man score of all farmers responses



Source: Based on fieldwork questionnaires with mixed group of farmers

Chapter 6. DISCUSSION AND CONCLUSITION

6.1. Production system

6.1.1. Cropping system and types of vegetables and root crops grown

All farmers interviewed in sitio Bantuagui have practiced sequential cropping and most of them plant rice and beans or root crops through the year. They feel not necessary to change their cropping pattern because they are satisfied with this combination. Rice, beans and sweet potatoes are all for household consumption needs and also there is a strong in the market as well. On the other hand, in sitio Pactil, Boga and Sengyew not all farmers are happy to plant crops which they are growing now because they had to decide which they plant crops in consideration of bio-physical aspects, such water availability and altitude. Also, Farmers had to choose crops which are drought tolerant and high demand in the market of La Trinidad. Although they produce cabbage during rainy season and mainly root crops over the summer season, farmers mentioned that they want to grow different type of crops. This was because selling potatoes and cabbage is very competitive and prices are low and quality is important. The Philippines has also started importing potatoes, and better quality of cabbage is being smuggled in from China. The main differences in cropping between sitio Batuagui and sitio Pactil, Boga and Sengyew can be attributed position and market location. If the market changes, farmers are unable to change their production systems because the biophysical nature of the watershed and lack of water cannot be changed.

6.1.2. Storage

There were no storage facilities in sitio Bantuagui and farmers there believed they did not need storage because they harvest crops just before they market them. The situation in sitio Pactil Baga and Sengyew was similar and there were not enough storage. If the price of vegetables is low, farmers did not go to the market: they waited for the time when the price increased. Until the price goes up, farmers usually keep their products in storages. Therefore, a lack of storage was a constraint in the areas where farmers cannot decide the price of crops and also to get better price.

6.2. Factors which affect productivity

6.2.1. Pest, disease and farmer inputs

As mentioned in the results section, occurrence of pest and disease was the most serious problem in all four sitios. It is important to find reasons why farmers in sitio Pactil, Boga and Sengyew are facing problems caused by pest and disease even though they are applying pesticides and insecticides. Many problems here are including lack of knowledge of pests and of ways of managing Integrated Pest Management (IPM), correct application rates and other cultivation practices.

Some farmers interviewed in sitio Pactil, Boga and Sengyew did not know how much pesticides and insecticides to input for crops at once. In general, they put pesticides and insecticides on agricultural land at every cropping but the amount of inputs was different in each of the farmers. It is necessary to use the proper amount of inputs for each vegetables and root crops in three sitios, otherwise the high expenditure of inputs will be insignificant.

Farmers have spent an inappropriate amount of time on using pesticides and insecticides. Moreover, there is a possibility that farmers used pesticides and insecticides which were useless for insects and disease. On the matter of soil fertility, farmers did not perceive a problem but observations by farmers in sitio Sengyew noticed differences where chicken manure was used.

The important points to draw from the results are that farmers are not able to easily afford inputs and where they do use them they are not being used effectively. Apart from being a constraint to realizing better productivity and therefore better potential profit, there are land management and livelihood implications. ‘Mis-use’ of inputs is likely to be damaging soil and bio diversity. The lack of soil fertility measures is also likely to alter not only potential to grow vegetables but the eventual structure of the soil and resistance against erosion (Knott, 1967).

6.2.2. Water management system

The effects of water availability are important. All farmers rely on rainfed systems. Farmers response is to grow drought tolerant root crops and lower value vegetables. If

farmers could extend the growing season they would be able to plant different crops, such as high value crops. Therefore, if farmers use enough water during the summer season, the crop productivity will increase and also their potential income will be higher than at present.

All farmers interviewed in sitio Sengyew had irrigation systems with 20% of farmers having irrigation systems in sitio Pactil. Comparing the mean production of vegetable and root crops, there is nearly 23t in sitio Pactil and 17t in sitio Sengyew, a difference of 5t. Figure28 shows that land with irrigation do not always produce higher income than land without irrigation. Farmers in these two sitios had the different inputs and it might affect on their income. As a result of two mentioned before, irrigation system are not efficient methods to improve water availability in this area. Irrigation systems work efficiently if there is plenty water during the year.

Water hoses with leaks could be seen in all four sitios. Farmers usually fix individual hoses but farmers do not pay attention to the common hoses which connect springs and creeks with individual hoses. Sitio Bantuagui has the Water Sewerage Association which supports the fixing of common hoses using money collected from all farmers in sitio. In sitio Pactil, Boga and Sengyew, the damage of water hoses must be considered.

There is a river in lower sitio Bantuagui. There is a plenty of water in the river during the rainy season but farmers do not have water pumps, so only farmers living in lower sitio can use water from the river. If farmers dependent on water from rainfall alone during the rainy season had water pumps, they could increase their productivity.

There are cost-effective ways that farmers might be able to achieve soil and water management.

1. Fish ponds

Fish pond is a good method to keep water for agricultural land until next rainy season. The evaporation rate has to be considered when fish pond is constructed. Fish pond should be made after diverted from creeks. Gabion[1] should be put in place prior to fish ponds in order to reduce sediment contents. Sediment trap and planting bamboo also makes water slow down and stop silt. Also the depth of fish ponds should be less than 1 m,

[1] A pile of stones

otherwise fishes can not live in fishponds because of lack of oxygen

2. Collecting rainfall by gutters on roofs

Using gutters on roof can be easiest and simple methods to collect water and it does not sot too much compared with the other methods. Water collected is used for domestic use and gardens beside houses.

3. Selection of vegetables and root crops

After harvesting leafy vegetables, such as cabbage and Chinese cabbage from August to October, in sitio Pacti, Boga and Sengyew, farmers can plant three months crops if they do not need fallow periods after then.

Most of farmers do not use these beneficial methods in order to improve water availability.

6.2.3. The size of landholding

As shown in Table 13, it is clear that sitios with large agricultural lands have a higher income from vegetable production. However, if the inputs and the price of crops are considered, it will be difficult to say that large agricultural lands do indeed result in a high income from crops. Although farmers did not state land tenure as a problem, it was clear that farmers with larger parcels of land also had fewer land tenure problems.

6.3. Socio-economic aspects

6.3.1. Seminars and agricultural extension

The differences between requirement and supply of seminars must be one of constraints for farmers Staff in DA in Benguet reported that AEWs usually visited sitios in Mountain Province and collected information about types of seminars farmers needed and what kind of constraints farmers were facing. However, farmers interviewed have taken seminars organized by AEWs even though some farmers did not know about AEWS. It is obvious that AEWs visited sitios in Mountain province, but it is clear that there were several sitios which AEWs have not visited recently or have never visited before. There are more than a thousand sitios even in Cordillera Administrative Region (CAR), so it will be difficult for only a thousand AEWs visit all sitios to have seminars. While the

author was staying in sitio Marketing Sengyew, the advert of the seminar about the use of pesticides and insecticides was found on the wall of farmer's shed. There was only one sheet of paper around the sitio. There were some farmers living in same sitio did not know about when and where the seminar was going to be held. One farmer said that the date, place and time or seminars should be stated to farmers a few days before at least, because this information is passed from mouth to mouth. Otherwise, it is very difficult to gather farmers in one place.

These key issues should be considered in seminars and agricultural extensions:

1. Seminar agricultural extension has to be correct topics for farmers.
2. Appropriate time and convenient place of meetings for farmers

6.3.2. Marketing

Figure33 shows the significant differences in income between each sitio. Factors which made differences in income between sitio are the following:

1. Income from other resources such as teaching in school and running shops
2. Type of crops produced
3. Type of places to sell farmers' produce
4. The number of people who owns lorries in sitios
5. Price fluctuation
6. Crop productivity

Results suggest that vegetable and root crop production do have the potential to increase the income of some farmers. For example, farmers that are relatively poor may increase their annul income through planting vegetables and root crops and farmers that are relatively rich prior to planting vegetables and root crops may further increase their wealth. However, data concerning crop production and personal income remains unknown for some areas and the data that is available is only from 2003. Therefore, it is recommended that data concerning the farmers' income and the production of vegetables and root crops should be collected on an annual basis and on a broader geographical scale. This data would allow the relationship between income and vegetable and root crop production to be investigated more thoroughly and for more reliable conclusions to be

drawn.

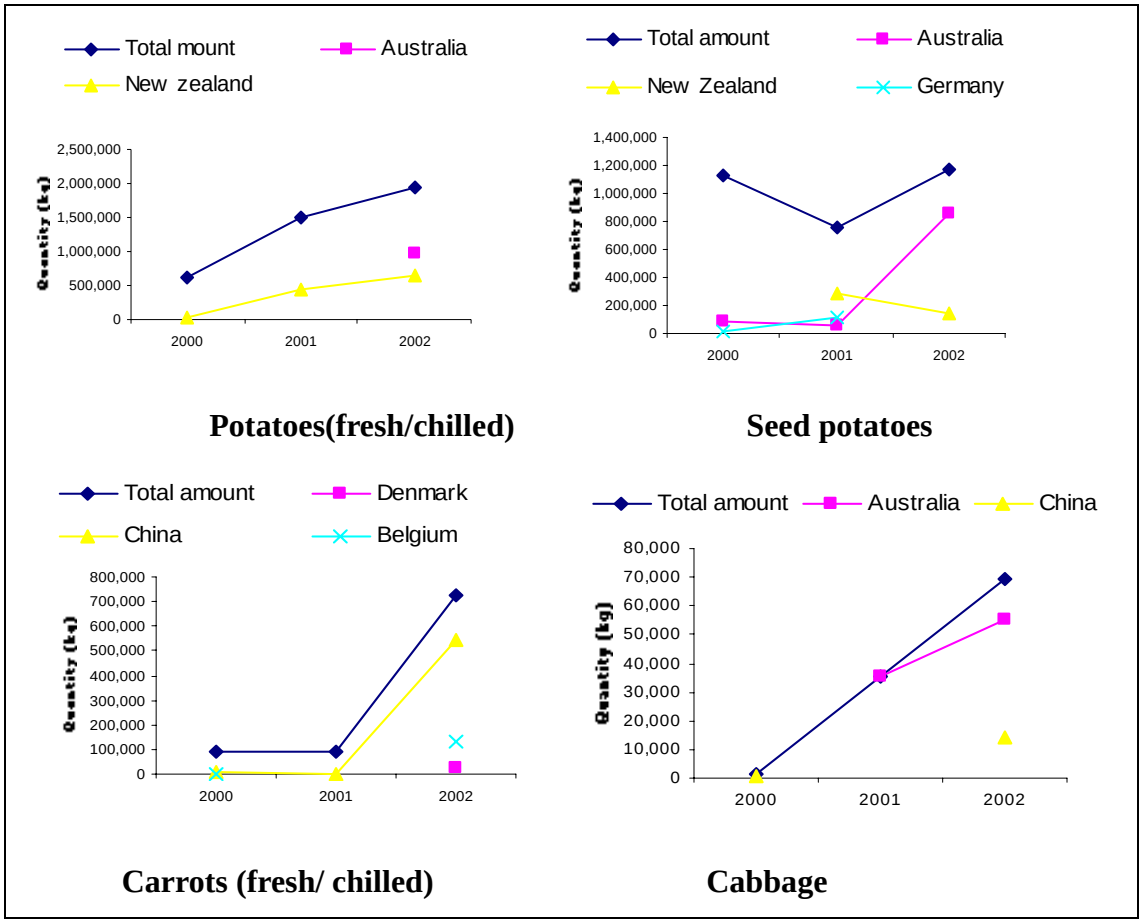
Some farmers in sitio Pactil, Boga and Sengyew complained that they were not able to decide the price of crops. Even though farmers have to sell their products at the low prices determined by dealers, farmers can sell their products. On the other hand, some farmers in sitio Bantuagui said that there were some days which farmers could not sell products even they set a lower price in the markets. These two different situations will cause the different income between sitio Pactil,Boga and Sengyew and Bantuagui.

The price fluctuation has a great affect on income in sitio Pactil, Boga and Sengyew because the price of their main products, such as cabbage, carrots and potatoes change through the year (Figure 30). Timing to sell vegetables is important to get higher income. The expense to hire lorries is also a problem in all sitios. Farmers in sitio Bantuagui spend 30 pesos of transport of vegetables to the market in Bacnotan. All farmers interviewed usually use jeepney even if they carry their products to the market and the quantity of crops they can convey is limited. On the other hand, farmers in sitio Pactil, Boga and Sengyew usually carry their produce by lorries which they hire from neighbors and relatives paying 1.2 – 2.0 pesos per kg for lorry owners. The price of some vegetables such as cabbages and carrots is sometimes less than 7 pesos per kg in La Trinidad. Farmers' profits must be small if expenditure, such as expense of lorries are reduced in this situation. The low prices and small profit margins act as a constraint balancies at the benefits.

General Agreement on Tariffs and Trade (GATT) is an agreement on tariffs and rules that govern the conduct of international trade. Since 1994, the Philippines has been a member of GATT the membership has been widely debated among policy makers and opinion makers. Membership of GATT has been beneficial because Philippines has opened up markets for exports and has made local industry more efficient, and is able to avail of opportunities to increase their exports. The Philippines imports potatoes, carrots and cabbages. After the GATT agreement, the Philippines started importing carrots and potatoes from several countries using 19 ports of entry. Australia exported 974,400 kg of white potatoes and which in nearly half of total amount in 2002 (DA, 2004). China exports large amounts of carrots to the Philippines and this is expected to increase in the future. As a result of GATT, the total amount of several vegetable imported has increased sharply (Figure35).

According to municipality of Bauko in Mountain province, GATT is ruining farmers and the entry of GATT makes it difficult to compete with cheap imports coming from developed countries which subsidise their own agriculture. In order to sell more of their vegetable products, the quality should be improved and the price must be less than that from other countries.

Figure 35. A comparison of quantity of select imports to the Philippines from 2000 to 2002



Source: Base on Quantity and Value of Selected Vegetables Export Data Bank from 1999 to 2003 from department of agriculture

It is reported by the DA staff in Manila that cabbages from countries other than the Philippines can be seen a lot and at low prices in markets of Manila. They are not sure where the cabbages come from. However, it is obvious that some cabbages in the market are of completely different quality, colour and shape. The DA staffs believe that some of

these cabbages are smuggled in from China without going through the customs. According to the DA, it is impossible to guard around all ports opened to foreign countries to prevent smuggling vegetables because of the expense. This is not considered to be a big problem by the Filipino government in general because consumers prefer to buy cheaper cabbage of better quality from China and only the Filipino farmers producing cabbages are complaining. All farmers interviewed thought that the Philippines entry to GATT was a serious problem and the import of cabbage from China illegally has made their lives worse because their sales have decreased slightly since 2002. Of the farmers interviewed, three farmers (10%) mentioned that their annual income in 2003 decreased more than 5000 pesos compared to the income in 2002. Some staff in the DA are investigating the route by which cabbages reach the market in order to prevent smuggling. Staff in the provincial office in La Trinidad said the volume of smuggled vegetables, such as cabbage and carrots from July to 15 October 2002 had reached nearly 900,000 kilograms.

6.3.3. Market information network

The information of seminars organized by DA in municipality of Bauko was informed barangay captain them he/she tell farmers' leader and farmer. Farmers who do not meet farmers quite often miss seminars because nobody tells him/ her about seminars. As mentioned, it is important to have information network to inform farmers about seminars and information

6.3.4. Infrastructure

Road condition from agricultural lands to markets, sometimes prevents farmers from carrying their own products to markets. A landslide is the biggest constraint for farmers in sitio Pactil, Boga and Sengyew. One farmer said that it took 15 hours to convey vegetables to the market because he had to drive along the different roads to avoid the landslide to the markets. The roads which the farmer passed by were steep. As a result, many cabbages were damaged and he had to sell them at a lower price. Landslides are not considered as constraint but local roads are constraints in sitio Bantuagui because farmers have to carry products by the agricultural sleight. It is quite hard and the amount of crops

they can convey at once is small. Therefore, it is difficult to sell all products in the markets even though they harvest the huge amount of crops.

Conclusion

The goals to overcome constraints found through the fieldwork in four sitios are the following:

1. Water

The improvement of water availability is the key point to extend the growing season of vegetables and increase income in four sitios. As farmers get water over the summer season, they can plant more variety of vegetables and high value crops, such as bell pepper. They also grow vegetables for consumers need in domestic markets international markets. Produce of vegetables which are high value and high demand in markets will cause stable income and more secure livelihoods for farmers

2. Extension and training

Agricultural extension and training should be better tailored to farmers and needs realities. It also provides in ways which suit farmers, especially appropriate topics, time and places. Extension and training are organized owing to farmers and as many as farmers can attend them. They should be useful to solve current constraints which farmers are facing. Topics should be determined not only by staff in DA but with people who know the current agricultural constraints in each area.

3. Marketing

Marketing of crops which could include infrastructural improvement, the information network between farmers and the government and post-harvest should be focused on in the future. To avoid vegetable production of losses with nearly 30 -35 %, these issues must be addressed.

4. Potential increase livelihood security is realized by following:

High value crops

High value vegetables should be promoted as they will give a higher income for farmers. Choosing high value crops which farmers have never grown before, bio-physical aspects, demand by consumers should be considered.

Root crops

Root crops can be grown in rainfed areas, with increase in water availability the production of these crops will secure livelihoods in the future.

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APPENDIX I

Individual Questionnaire

Date and time of interview: _____

Name _____

Village: _____

Male or Female Age: ~19 / 20~39 / 40~ 59 / 60~

Is farmer head of household? Yes____ No____ If no, note relationship of farmer to household head? _____

1, Ethnic group _____

2, Educational level _____

3, How many years have you lived in this village / area?

Since born ____ Less than 5 years ____ 5~10 years _____ More than 10 years ____

4, How many years have you been engaged in agriculture?

Since born ____ Less than 5 years ____ 5~10 years _____ More than 10 years ____

Crop production

5. Types and quantity of crops

Proportion of land (ha)

Vegetables	( )
Root crops	( )
Fruit trees	( )
Pasture	( )
Woodland	( )
Homestead	( )

Rice field ( )

If you grow vegetables or root crops, what kind of products do you grow? And main crops you grow and any specific reasons?

Type of crop	Reason

6. Are there any crops you want to grow in the future? And which crops?

_____

7. Where do you sell your products? And who sells your products?

In your village ( ) A middleman comes to your village to buy your products

Local market ( ) Where? _____

Selling your products for a middleman / Selling your products by yourself

Export ( ) Which countries? _____

Within the community / co-operative ( )

Within household ( )

If you sell your products in the market, are there any problems?

Access to main roads / Local roads / Transportation

8. Inputs for crop production

	Type	How much (kg/ bag/ l)?	How often?	Annual cost (pesos)
Fertiliser				
Compost				
Manure				
Herbicide				
Pesticide				
Insecticide				

Percentage of inputs

1. Labour _____%
2. Fertiliser / Manure / Pesticide _____%
3. Vehicles _____%
4. Land loan _____%
5. Seeds _____%

9. Do you practice any inter-cropping or cropping sequence with vegetables and root crops? If yes, what kind of vegetables or root crops?

Inter-cropping

Yes / No Type of crop _____ Reason_____

Cropping sequence

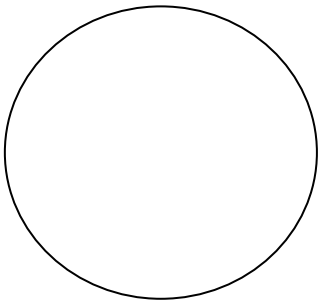
Yes / No Type of crop _____ Reason_____

10. Degree of impact

	Degree of impact	Name	What kind of impacts they cause?
Insect pest	0 1 2 3 4		
Disease	0 1 2 3 4		
Weeds	0 1 2 3 4		

0 - None 1 - slightly 2 – moderate 3 – Severe 4 – Very severe

11. What amount of income comes from crop production?



12. Have you had any agricultural loans or support? If yes, from where?

_____

13. What kind of equipment do you use when you practice preparing, ploughing lands and harvesting?

Land preparation _____

Ploughing _____

Harvesting _____

14. What problems for vegetable production, if any, are caused by animals?

_____

15. Are there any technical problems? If yes, can you explain in detail?

_____

16. Have you had extension services and experience before? If yes, can you explain in detail?

_____

17. Annual income P2,500- below ( )
P2,501 – 5,000 ( )
P5,001 – 10,000 ( )
P10,001 – 15,000 ( )
P15,001 – 20,000 ( )
P20,000 and above ( ) _____ pesos

18. Type of crops grown

	Type of crop	Area (ha)	When planted	When harvested	Household consumption (kg)
1					
2					
3					
4					

	Price (pesos/kg)	Income (pesos/ a month)	Occurrence of pest and disease	
1				
2				
3				
4				

19. Do you preserve seeds? Yes No

If yes, how to preserve them? _____

Land management

20. Total landholding _____ ha

21. Slope Flat or Steep or Very steep

22. Soil Very poor Poor Moderate Good Very good
0 1 2 3 4

23. Land use Agroforestry ( ) Agri-crop ( ) Rice firelds ( )
Tree crops ( ) Pasture land ( )

24. What type of land ownership do you possess? Private land titled ( )

Tax declaration ( )

Ancestral land ( )

Government ( )

If you are a self farmer, how much do you pay as a tenant? _____

25. Have you had any problems about land tenure? If yes, can you explain in detail?

_____

26. Do you have any methods to avoid from soil erosion? If yes, can you explain in detail?

Terraces Hedgerows Bunds Agroforestry Inter-cropping

Other _____

Water management

27. Do you have access to enough water for irrigation? If yes, how far away is the source? How regularly is water available? What is the water filtered?

_____

28. How is irrigation water going to your farm or fields?

Gravitational hose ( ) Pumping machine ( )

Irrigational canal ( ) Others _____

29. Do you think your land needs more irrigation land or water?

_____

30. Who owns the water rights?

_____

31. How is irrigation water going to your farm or fields?

Gravitational hose ( ) Pumping machine ( )
Irrigational canal ( ) Others _____

32. What are the water sources that are available to you all year round?

Well _____ Pond _____ River _____ Dam _____ Spring _____
Other _____

Ranking

What kind of problem do you encounter to grow vegetables in your farming activities?

Land tenure ( )
Soil erosion ( )
Lack of capital ( )
Soil fertility ( )
Occurrence of pest / disease ( )
Inadequate water availability ( )
Inadequate labour ( )
Others _____ ( )

What are your suggested solutions to these problems encountered?

1. _____

2. _____

3. _____