The Contribution of Cultivating Haricot Bean to Rural Household Food Security: The Case of *Tach Gayint* Woreda of the Amhara National Regional State

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Title

The Contribution of Cultivating Haricot Bean to Rural Household Food Security: The case of Tach Gayint Woreda of the Amhara National Regional State.

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ACRONYMS AND ABBREVIATIONS

ANRS	Amhara National Regional State
BoARD	Bureau of Agriculture and Rural Development
CRDA	Christian Relief and Development Agency
CSA	Central Statistical Agency
DAP	Di-Ammonium Phosphate
EASE	Ethiopian Agricultural Sample Enumeration
EIAR	Ethiopian Institute of Agricultural Research
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
FSP	Food Security Program
FSPCDPO	Food Security Program Coordination and Disaster Prevention Office
GDP	Gross Domestic Product
MoARD	Ministry of Agriculture and Rural Development
MoFED	Ministry of Finance and Economic Development
PA	Peasant Association
SERA	Strengthening Emergency Response Abilities
TGWOoARD	*Tach Gayint* Woreda Office of Agriculture and Rural Development
TGWOoE	*Tach Gayint* Woreda Office of Education
TGWOoH	*Tach Gayint* Woreda Office of Health

GLOSSARY

Akimada	Storing material made from skins and hides of shoats
Amogneshign	Local name given to an insect pest known as Bean Beetle
Bederek Mares	Tilling the land during dry season of the year
Gota	Storing material which has a shape of barrel, made from mixture of mud and crop residues or straw
Gotera	Storing material.which resembles small grass-thatched houses, made from local woods and grass or iron covered roofs
Injera	Leavened, flat, traditional Ethiopian bread
Kebele	The lower sub-division of the Woreda Administration
Kesha	Storing material made from sisal and other fiber materials
Kollo	Toasted or roasted grain such as maize and barley
Maresha	Oxen pulled plough made from iron
Menkel	Uprooting the whole plants
Nifro	Is the mixture of boiled/fried maize or sorghum and haricot bean
Tef	A major food crop grown in most parts of the Region including the Study Site
Woreda	The lower sub-division of the Zonal Administration
Wot	Soup made from mixture of flours of different pulses or meat of livestock, spices, salt and water
Yedeha Siga	'Meat of the poor'
Yemich Beshita	Type of disease caused due to beliefs in certain cultural taboos
Zabutie	Local name given to haricot bean

ABSTRACT

Two sample Kebeles of Tach Gayint Woreda were randomly selected by lottery method without replacement from six potential Kebeles producing this crop, to explore the contribution of cultivating haricot bean to rural household food security. 100 sample households were randomly selected for the study. Of these, 5% of cultivators and non-cultivators were selected from the total in each sample Kebeles. Thus, 59 sample cultivators and 41 non-cultivators were taken out randomly by proportionate simple random sampling technique using lottery method without replacement respectively. Primary data was gathered via household interview, key informant interview, focus group discussion and field observation. Moreover, primary data was supplemented with secondary data obtained from different sources. Data was analyzed by using SPSS computer software. Cultivators of haricot bean were found to be better in their food security status than the non-cultivators. The crop output obtained by cultivators was higher than the non-cultivators simply because of getting additional output from haricot bean. On average, cultivators of haricot bean obtained 7,219.40 Birr/household/year from this crop as compared to the non-cultivators who lacked this opportunity. The available kilocalorie/person/day from own production was found to be 568153 for cultivators and 81998 for non-cultivators. The share of haricot bean from all crop outputs to income and available kilocalorie of households was found to be 56.6% and 35.1% respectively. Taking the 2200 kilocalorie/adult equivalent/day, which is the bench mark of measuring food security, cultivators and non-cultivators of haricot bean fulfilled only 70.8% and 10.2% of the minimum kilocalorie requirement respectively. However, it was identified that own production was not sufficient enough to bring up households from food insecurity. But, households were participated in different non-farm income generating activities such as the food and cash for work activities via the Productive Safety Net Program. Therefore, cultivators and non-cultivators had obtained 430144(42.4%) and 408172(50.8%) kilocalories/person/day from this food for work respectively. Similarly, from all the non-farm activities both types of households had obtained 5,798.50 Birr and 6,301.00 Birr in that order. Cultivators had fulfilled more than their minimum calorie requirement (113%) and non-cultivators fulfilled only 61%. However, still there are households who are unable to cover even a quarter of their daily kilocalorie intake and income requirement. Insect pests; shortage of rainfall; hail/snow; lack of farm land; lack of extension package support and improved seeds were reducing production and productivity of haricot bean in the area. Thus, employing extension package policies; provision of early maturing, moisture tolerant and insect pest resistant improved seed varieties; application of suitable moisture conserving activities; infrastructural developments; creating more labor based non-farm income generating activities and others are possible areas of intervention to improve food security of households of the study area.

CHAPTER ONE: Introduction

1.1 Background

Ethiopia is an agrarian country in which the sector employs nearly 85 per cent of the total population. Small land holding agriculture by peasant households has an overwhelming significance for the food security, welfare of the people and for the growth of the national economy. Agriculture contributes about 45 per cent of the total GDP and accounts for nearly 85 per cent of exported items (MoARD, 2007).

The *Amhara* National Regional State bases its major economic activities on agriculture. Agriculture is a source of livelihoods for the majority of the population residing in the Region. In 2005 it was found out that agriculture provides 57.91% of the GDP and employs nearly 88.7% of the population of the Region (ANRS Information Bureau, 2007). Regarding agricultural production the Region produces surplus. The Regional Government has been implementing different interventions such as an agricultural extension program, which has improved the agricultural productivity of farming households (BoARD, 2007).

Similarly, the livelihoods of the majority of the inhabitants of *Tach Gayint* woreda bases on agriculture, which encompasses crop and livestock production. Crops such as haricot bean (*Phaseolus vulgaris*), *tef (Eragrostis tef),* wheat (*Triticum aestivum*), barley (*Hordeum vulgaris*), faba bean (*Vicia faba*) and field peas (*Pisum sativum*). In addition to this, horticultural crops are cultivated in the Woreda. Livestock rearing among others includes the husbandry of bovines (cattles), capraines (shoats), equines (horses, mules and donkeys) and poultry (TGWOoARD, 2007).

Even though agriculture is the major source of livelihood to farming households of the Region, 64 Woredas including *Tach Gayint* were categorized to be food insecured. To alleviate the problem different development interventions such as food security programs have been undertaken by the Regional Government based on the National Food Security Program and Strategies since 2002. The target of the food security program interventions is mainly to ensure food security at household level and improve income of rural

households in areas where there is chronic food insecurity. As one of the food insecured areas of the region, *Tach Gayint* Woreda has been undertaking the program interventions based on the Regional Food Security Program and Strategies (FSPCDPO, 2007 and TGWOoARD, 2007).

When food shortage is a common occurrence, the level of calorie intake is an important welfare indicator in countries such as Ethiopia. The per capita calorie consumption is one indicator of household members' food security. Consumption of food is influenced by kilocalorie consumed per day per individual, number of meals taken per day, food intake, and variety of feed (feed component) among others. In chronically food insecure areas calorie generated from own production has been found to be less for large number of households. Similarly, in *Tach Gayint* Woreda households consume below the minimum recommended amount of food (Nurabdi, 2006 and FSPCDPO, 2007).

Credit opportunity plays a paramount importance in households' food security. Households' who get credit opportunity have experienced better food security situation as compared to those not participating (Degefa, 2002). In *Tach Gayint* Woreda households have the opportunity of getting different food security project credits in order to improve their food security status (TGWOoARD, 2007).

Poor savings negatively affect the food security situation of farming households. Concerning savings, the farming communities of the Woreda save little or none at all (Ibid).

It is difficult for farmers of *Tach Gayint* Woreda to have sufficient income from own production and assets in order to improve their food security status and living condition. Therefore, households engage themselves in different non-farm income generating activities in order to get additional income and improve their standard of living.

Haricot bean (*Phaseolus vulgaris* L.) is the best known and the most widely distributed of the *Phaseolus species*. Dried haricot beans are one of the most important sources of protein in the diet of many tropical people, and supplement the carbohydrate staple foods of rice, maize and other cereals. They also provide huge amount of kilocalories. Dried

haricot beans are eaten by boiling and combining with boiled maize or sorghum in the form of *Nifro*. It can also be consumed in the form of baked haricot bean and converted to flour and made as a *wot*. The leaves and shoots of young plants are also used as a pot-herb and the haulm as forage for livestock. In addition, haricot bean has the capacity of improving fertility of the soil. Moreover, haricot bean is the major source of income to farming households of rural areas (EIAR, 2007; Kay, 1979; cited in Abush and Leta, 2004).

Ecologically, the crop requires altitudes ranging from 1400 to 2000 meters above sea level. Areas that get medium amount of rainfall (350-1100mm per annum) are favorable for cultivating haricot bean. The optimum temperature for their growth is 24°C and it is adapted to a wide range of soils that must be free-draining such as soils with medium texture (loams) (EIAR).

Haricot bean is affected by various biotic and abiotic factors. These constraining factors among others include insect pests, diseases, weeds, unreliable rainfall, lack of extension services, lack of improved technologies and the like. These have been found to reduce quantity and quality of this crop (Fikadu, 1997 and EIAR, 2007).

The Federal Government of Ethiopia is encouraging the expansion of haricot bean production. Because the crop has been helping the country earn huge amount of foreign currency via exporting; in addition to its role in contributing to the endeavor of ensuring food security at household level. Investment activities which work on production and processing of haricot bean have been flourishing here and there in the country. For instance, there is an investment activity by private investors closer to *Tach Gayint* Woreda that is currently processing different haricot bean varieties for exporting to foreign market via the national market. This market potential in turn has encouraged farming households to increase their production. Thus, the potential areas of the Woreda which produce haricot bean need to boost production and productivity of this crop. Such a potential urges the researcher to duly examine the contribution of this crop to rural household food security.

1.2 Statement of the Problem

A lot of researches have shown that thousands and millions of people who reside in urban and rural areas are reported to be food insecure and are therefore living below the absolute poverty line. The rural areas, where the majority of the poor exists and whose destiny is almost completely tied to the subsistence agriculture, takes the biggest proportion of the problem of food insecurity. Household food insecurity could be due to either food availability decline, purchasing power decline or both (Elias, 2001). This challenge has got attention by many African countries, including Ethiopia. The country has been undertaking a lot of rural and agricultural development activities to curb up the challenge. One of these activities is implementing food security interventions at household level (Ministry of Information, 2003).

The problems of food insecurity are very much complex, less specific and deep-rooted to be easily solved. Therefore, these problems should be treated in an area specific manner by taking into consideration the opportunities and constraints of the local context. In order to come up with a timely and updated solution, further researches should be carried out.

The research, titled as the Contribution of Cultivating Haricot Bean to Rural Household Food Security, was carried out in sample PAs of *Tach Gayint* Woreda. The Woreda is found to be chronically food insecured. Even though haricot bean has been found to be one of the major crops as a source of food and income in the Woreda, particularly in potentially producing *Kebeles* there is no any research that has explored its contribution to food security of rural households.

Therefore, it is time to explore the contribution of haricot bean to food security of rural households of *Tach Gayint* Woreda by answering the research questions.

1.3 Objectives

1.3.1 General Objective

- The general objective of the research is to explore the contribution of cultivating haricot bean to rural household food security in *Tach Gayint* Woreda.

1.3.2 Specific Objectives

- To examine production status of haricot bean in *Tach Gayint* Woreda,
- To explore the contribution of haricot bean to food security of rural households in *Tach Gayint* Woreda,
- To identify the major challenges of cultivating haricot bean in *Tach Gayint* Woreda,
- To forward recommendations that might be useful as a policy input.

1.4 Research Questions

The following research questions will be considered in this research:

- What does the trend of production, area cultivated and yields per hectare of haricot bean look like in *Tach Gayint* Woreda?
- What are the changes observed on food security status, income, kilo calorie consumption food intake, sending children to school, livestock possession, saving and clothing of rural households due to cultivation of haricot bean in *Tach Gayint* Woreda?
- What are the major challenges that face farming households to cultivate haricot bean in *Tach Gayint* Woreda?

1.5 Significance of the Study

Food insecurity is the underlying problem in many parts of the country including *Tach Gayint* Woreda. That is why a lot of rural and agricultural development activities are being implemented to tackle the problem. This study generates basic information on the contribution of cultivating haricot bean to rural household food security. This information is expected to be used as an input for policy makers in order to establish policies that could enhance the contribution of this crop to rural household food security. The research finding can also be used as an input for further researches. The finding can also be utilized by Woreda experts and extension or development agents. In addition, it is very useful in providing valuable information for those participating in cultivation, promotion, investing and related activities concerning this crop.

1.6 Scope and Limitation of the Study

The thesis was assumed to explore the contribution of cultivating haricot bean to rural household food security in *Tach Gayint* Woreda. The study tried to assess different inter related issues to cultivation of haricot bean and food security. In addition, constraints which affect productivity and production of haricot bean were addressed.

The study was confined to only two out of the six potential haricot bean producing *Kebeles* because of budget, time and other resource constraints. Because of similar reasons, only 5 %(50) sample rural households and a total of 100 rural households were selected from the whole sample *Kebeles* to undertake the research.

1.7 Organization of the Thesis

The thesis was organized in to five chapters. The first chapter deals with the introductory part of the research. The second chapter refers to literature review including cultivation or agronomic aspects of haricot bean, status and challenges of cultivating haricot bean, and the like. Moreover, this chapter deals with the concepts of food security, determinants and indicators of food security, policy and situation of food security in Ethiopia and contribution of haricot bean to household food security and marketing opportunities of cultivating haricot bean. Chapter three focuses on the research methodology, methods of data collection, data sources, sampling methods and methods of data analysis. The fourth chapter presents the findings of the research. This includes the descriptive analysis of demographic characteristics of households and description of the study area. It also includes situation analysis of the status and constraints of haricot bean, extension and credit services, farming system of haricot bean, consumption and marketing of haricot bean. More importantly, this chapter deals with description of the contribution of haricot bean to household food security and income. Chapter five deals with the conclusions of the findings of the research and some important recommendations.

CHAPTER TWO: Literature Review

2.1 Cultivation, Ecology and Agronomic Aspects of Haricot Bean

2.1.1 Description and Origin of Haricot Bean

Haricot Bean is known botanically as *Phaseolus vulgaris* L. Haricot bean has got different names such as Field bean, Kidney bean, Garden bean, Common bean, French bean and Navy bean. It is an annual legume crop (Delwich, 1978 and Cubero, 1994).

Haricot bean was originated in Latin America but is now cultivated worldwide in diverse environments. Two major gene pools are recognized: the large-seeded Andean and Small-seeded Middle American, which correspond to the crop's two centers of origin and diversity (Norman *et* al., 1995).

2.1.2 Classification of Haricot Bean

Classification of types with *Phaseolus vulgaris* is based on determinacy of the main axis, growth habit, crop duration and seed characteristics. Plants may be erect ('bush' beans), semi-climbing or climbing (Voysest and Dessert, 1991; cited in Norman *et* al., 1995). There are also indeterminate non-climbing semi-bush types and indeterminate climbing types (Fikadu, 1997). There are three main types of haricot beans based on color such as red, speckled and white beans. These beans are also classified according to size as small, medium and large (Shaun and Elly, 2006).

2.1.3 Characteristics of Haricot Bean

The pronounced tap-root grows rapidly to a depth of one meter and there are extensive lateral roots mainly confined to the top 15-20cm of the soil. Nodules are irregular and knobbly. The central stem and branches bear alternate trifoliate leaves that are also some what hairy. The stems are somewhat hairy. The flowers are small, and vary in color from white to bluish; they are self-pollinated. The pods are 10-20 cm long, straight or curved and terminate in a prominent beak. They contain four to six seeds, sometimes more. The

seeds vary greatly in size (7-16 mm long) and color (Figure 1) (Fikadu, 1997 and EIAR, 2007).

2.1.4 Adaptation of Haricot Bean

2.1.4.1 Climatic Requirements

Haricot beans are a warm season pulse crop. They are grown whenever temperatures between 10 and 35 °C prevail. The optimum temperature for their growth is about 24°C. They are grown throughout the cooler tropics, but not in hot semi-arid or humid regions. The crop requires a minimum frost-free period of 140 days, as they are killed by frost (Fikadu, 1997 and EIAR, 2007).

The second climatic constraint to yield is water. Haricot beans do not require an excessive amount of moisture, although they are not drought resistant. Depending on the soil and climatic factors, the requirement for moisture is met with 300-600 milli meter rainfall per annum. Some rain is required during the flowering and pod setting stages. Water stress is common in haricot bean producing areas. Dry weather is required for harvesting, drying and threshing haricot beans (Laing *et* al., 1984; cited in Norman *et* al., 1995; EIAR, 2007).

In East Africa, haricot beans are best suited to the low and medium altitude areas from 900-2100 meters above sea level. In Ethiopia, haricot bean is lowland or medium–altitude crop, well–adapted to altitudes from 220 to 1600 meters above sea level (Fikadu, 1997 and Ethiopian Export Promotion Agency, 2004).

2.1.4.2 Soil Types for Cultivating Haricot Bean

Haricot bean is adapted to a wide range of soils but these must be free-draining with a reasonably high nutrient content. They are grown most successfully on well-drained soils of medium texture (loams) (Tu and Tan, 1991; cited in Norman *et* al., 1995; BoARD, 2007). In the humid tropics they are normally grown on Oxisols, Ultisols, Entisols and Inceptisols, which are acid soils (Thung, 1991; cited in Norman *et* al., 1995). In Ethiopia, haricot beans grow best on clay-loam and medium black clay soils (Kay, 1979; cited in Norman *et* al., 1995 and Fikadu, 1997).

2.1.4.3 Fertilizer Requirements of Haricot Bean

Haricot bean as one of the major components of legumes plays a significant role in fixing atmospheric nitrogen in to usable form by plants. This improves the fertility of the soil and contributes greatly in crop rotation, particularly with maize and sorghum. Even though haricot bean naturally increases fertility of the soil, it requires 100 kilogram of DAP and 50-100 kilogram of urea per hectare on non-fertile soils (Norman *et* al., 1995 and EIAR, 2007).

2.1.5 Cultivation of Haricot Bean

2.1.5.1 Cropping Systems of Haricot Bean

Haricot bean is cultivated in very heterogeneous situation in terms of ecology, cropping system and yield (Belay *et* al., 1998; cited in Tadele 2006). There are two seasons for haricot bean production in Ethiopia, the short rains season (*Belg*) from March to May and the longer rains (*Meher*) season from July to August. Most farmers focus their efforts on for the main season production and several farmers indicated that rainfall in the short

season is too unreliable to invest in commercial haricot bean production (Shaun and Elly, 2006).

2.1.5.2 Land Preparation for Haricot Bean

The land should be ploughed as early as possible in the season, the crop residues should be incorporated into the soil, and the field left in a suitable condition for the maximum storage of rain. Final land preparation, consisting of a deep ploughing followed by harrowing, is done a few days before sowing (Fikadu, 1997 and EIAR, 2007).

2.1.5.3 Sowing of Haricot Bean

Generally, haricot beans are planted later than maize and sowing can be delayed until the soil temperature is about 18.5°C. The recommended time of sowing of haricot bean in Ethiopia is mid to late June or early July. Haricot bean particularly the white bean is sown from end of June to mid July usually as a sole crop. Distribution of rainfall affects time of sowing (Fikadu, 1997; Ethiopian Export Promotion Agency, 2004 and EIAR, 2007).

2.1.5.4 Weed Control

Weeds should be removed while very small, before they can compete strongly with haricot beans. A couple of weedings should be carried out 2-3 weeks after sowing and before the crop sets flowers because this has a positive impact on the overall yield performance. Small holders rely on hand weeding, while large-scale growers aim to kill most of the weeds during seed bed preparation. Haricot beans are susceptible to most herbicides (Fikadu, 1997 and EIAR, 2007).

2.1.6 Harvesting, Threshing and Processing of Haricot Bean

Haricot beans are harvested when pods mature and yellow but not open. Small holders usually harvest haricot beans by uprooting whole plants by hand, heaped and dried by sun for a week to lower the moisture content of the seed to around 14%. In order to reduce shattering haricot beans should be pulled early in the morning when it is wet (Ethiopian

Export Promotion Agency, 2004). If the cultivars are non-shattering, harvesting should be delayed until the moisture content of the seed has come down to 10%. If harvested earlier, the plants are allowed to dry either on the field or, more usually, at the homestead on bare earth, mats, sacks, tarpaulins or corrugated iron, or on an area that has been smeared with cow dung and allowed to bake hard. When they are dry enough, threshing will be carried out manually by beating with sticks, either directly or after being put in sacks. Processing of the crop is largely accomplished manually. The haulms and pods are later removed by hand and by winnowing (FAO, 1961 and Ethiopian Export Promotion Agency, 2004).

2.1.7 Yield of Haricot Bean

In Africa average yields are very low, and are usually between 0.2 and 0.67 tone of dried seed per hectare. With regard to Ethiopia, the average yield of haricot beans is estimated to be minimum, 0.5-0.8 tone/hectare. This is far below the yield recorded at research sites using improved varieties (2.5-3.0 tones/hectare) (Ethiopian Export Promotion Agency, 2004). With improved cultivars and good management, including pest and disease control, 1-1.5 tone/hectare may easily be obtained. Yields of about 2.2 tone/hectare have been achieved on a field scale, but these are regarded as exceptional (Fikadu, 1997).

2.1.8 Storage of Haricot Bean

In the past years, there has been a boom in the construction of more than 20 large stores in the trading centre of *Shashamane*, with a capacity of more than 5000 quintals. According to traders, the Government is providing loans of up to USD 100,000-150,000 to invest in storage capacity (Shaun and Elly, 2006).

Most of the smallholder farmers of the country in general and the region as well as the study Woreda in particular store haricot beans in locally manufactured materials such as *Gotera.* In addition to this, the crop can be stored in *Gota, Akimada* or *Kesha* and the like (MoARD, 2007; BoARD, 2007).

2.2 Status of Cultivating Haricot Bean Globally and in Ethiopia

2.2.1 Global Cultivation of Haricot Bean

The major producers of haricot bean in Africa are the eastern African countries such as Uganda, Tanzania, Kenya, Rwanda and Ethiopia. For instance, in 2004 these countries had produced 545,000; 280,000; 278,000; 198,000 and 175,000 tonnes of haricot bean in that order. Similarly, Brazil and Mexico are the largest producers of haricot bean in South America. Both countries had produced 2,965,000 and 1,400,000 tonnes of haricot bean respectively in the same year. India and China are also potential producers of this crop from the Asian continent. In the same period they had produced a total of 2,900,000 and 1,858,000 tonnes of haricot bean respectively. Similarly, the United States of America, Belarus and Turkey had produced a total of 807,000; 316,000 and 250,000 tonnes of haricot bean in that order (FAO, 2006). Over 4 million hectares of haricot beans are sown each year in Africa. The two main environments are the cool highlands of East and Central African countries (including Kenya, Uganda, Tanzania and Rwanda) and the warmer mid-elevation areas of Ethiopia, Democratic Republic Congo, and several countries of Southern Africa. Production trends to be more intensive where human population density is high, although a significant proportion of production occurs in areas of moderately low populations (Robertson, 1997; Shaun and Elly, 2006).

Of about 9 commercial seed types grown in Africa, the Calima (Rosecoco or mottled red) and the reds (large and small) account for about 50% of the production, primarily because of their high market demand. Other market classes include the navy bean, cream-colored, brown tan, yellow types, purples, white and blacks. Typically, three to six easily distinguished cultivars account for 95% of production in haricot bean producing community (Ibid).

2.2.2 Cultivation of Haricot Bean in Ethiopia

Haricot bean is a subsistence crop in traditional farming in Ethiopia (Belay *et* al., 1998; cited in Tadele, 2006). There are about 300,000-500,000 hectares of land, which is

favorable for cultivating haricot bean. The main production areas in Ethiopia are within the rift valley area, which runs diagonally across Ethiopia from top right to bottom left of the country. The two major haricot bean producing areas are the Oromiya National Regional State and the Southern Nation and Nationalities People Region, which produce 70,000 and 60,000 metric tones respectively. These two regions make up 85% of the production. The rest of the country covers the remaining percent (Shaun and Elly, 2006 and MoARD, 2007).

A total of 1.74 million quintals of haricot beans have been produced from 267,776 hectare of cropped area in 2001/02, which is almost 218 and 190 percent up from the 1997/98 output. The level of production in 2005 was approximately 175,000 metric tones. According to CSA (2007), a total of 2.23 million quintals of haricot bean was harvested from 223,256.66 hectares of farm land in 2006/07 production year. Haricot bean production ranges from 100,000-200,000 metric tonnes per year, with yields highly dependent upon rainfall. Average production is approximately 150,000 metric tonnes per annum (Shaun and Elly, 2006). The large share of haricot bean is believed to be the white beans. The haricot bean development plan prepared by Ministry of Agriculture and Rural Development estimated to achieve 629,002 tonnes from 297,043 hectares as a long-term plan (Ethiopian Export Promotion Agency, 2004; Shaun and Elly, 2006; MoARD, 2007).

Farmers indicated that haricot bean production in the short rain season was approximately equivalent to 625 kilo grams per hectare, with production increasing to 1750 kilo gram/hectare in the long rains season. Only farmers with more assets and larger farm sizes, of 2-3 hectare regularly use new seed and fertilizer. This group also hires labour and has access to animal traction for production. No irrigation is applied to haricot beans, even though simple irrigation systems are used in these regions for higher value crops (Shaun and Elly, 2006).

2.3 Marketing Opportunities of Haricot Bean

Given the new policies for export led agriculture, the Government of Ethiopia is promoting formal exportation of white haricot beans and to a lesser extent red haricot beans, through investment incentives to local and foreign companies. Despite the political situation, it appears that the private sector is responding to these opportunities and a number of new investments were observed in terms of storage and seed processing factories. These policies have encouraged investors in order to undertake lots of investment activities in expanding cultivation and market opportunities of haricot bean in the country (Shaun and Elly, 2006 and MoARD, 2007).

Specifically for the export markets, different marketing and processing companies have been maneuvering to enter the haricot bean markets. For instance, Poortman and ACOS are some of these. ACOS is a growing industrial processor that supplies almost 80% of the baked haricot beans in the United States of America and Canadian markets. The company already has significant investments in Argentina, China and through new leadership is now seeking to diversify into new world locations such as Ethiopia (Shaun and Elly, 2006).

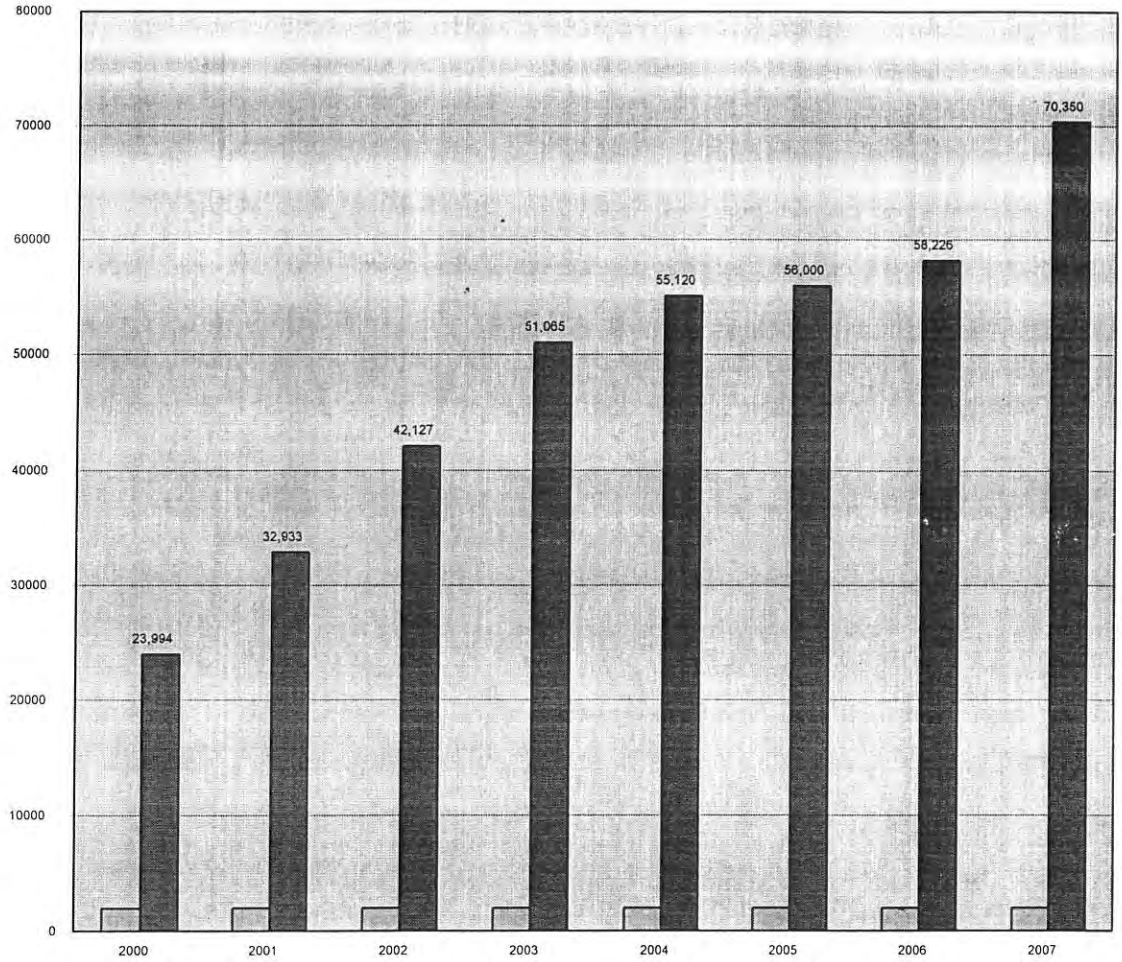
These new developments offer interesting new market opportunities for smallholder Ethiopian farmers if they can increase production and remain competitive with other exporting countries such as China, Argentina and India. If this can be achieved then prospects for increased revenue from this product appear good. The advantage of Ethiopia in this market is cost and time effective. It takes 9 weeks for sea shipment of haricot beans from China to European Union markets whereas, it only takes 3 weeks from Ethiopia and this confers an advantage for Ethiopia, as long as costs remain low. This is an area of concern as prices for haricot beans that were trading at 250-300 birr/quintal in 2005 were trading at 400+ in 2006. If the market continues to increase or hold high market prices, the larger buyers may defer sales to more competitive regions of the world (Ibid).

For the Ethiopian farmers, investments will be required to ensure that they are in a position to provide a regular supply of high quality haricot beans at a lower cost than the Chinese competition. As both types of haricot beans are produced by the poorest sectors of the farming community it is suggested that any public and private sector investment in this product will have strong pro-poor benefits and should therefore be considered as a high priority in market led agricultural development interventions (Shaun and Elly, 2006; MoARD, 2007).

The main marketing season of haricot bean is from September to January, with residual trading in February. In addition to the domestic markets, Ethiopia is supplying white haricot beans into the export canning industry in European Union and other Eastern European markets. In addition, it is exported to many African and Asian countries. In the past two to three years, Ethiopia has been a major supplier of red haricot beans into northern Kenya and this market has shown most rapid growth (Shaun and Elly, 2006).

The main destination markets in 2002 were Pakistan, Germany, Yemen, United Kingdom, South Africa, India and Mexico having 12.5, 7.8, 6.9, 5.79, 4.0, and 4.4% respectively (Ethiopian Export Promotion Agency, 2004). In 2006 and 2007 haricot bean was exported to more than 60 countries. Among these; the Sudan, Yemen and South Africa took the first three positions and imported 9706.70, 8772.70 and 6114.0 tones of haricot bean respectively. In 2000, 8.2 million USD was obtained via exporting haricot bean, where as in 2007 32.02 million USD was generated. Thus, it can be understood that haricot bean has been found to be one of the first priority export pulse crop in generating foreign currency as far as the country is concerned (MoARD, 2007).

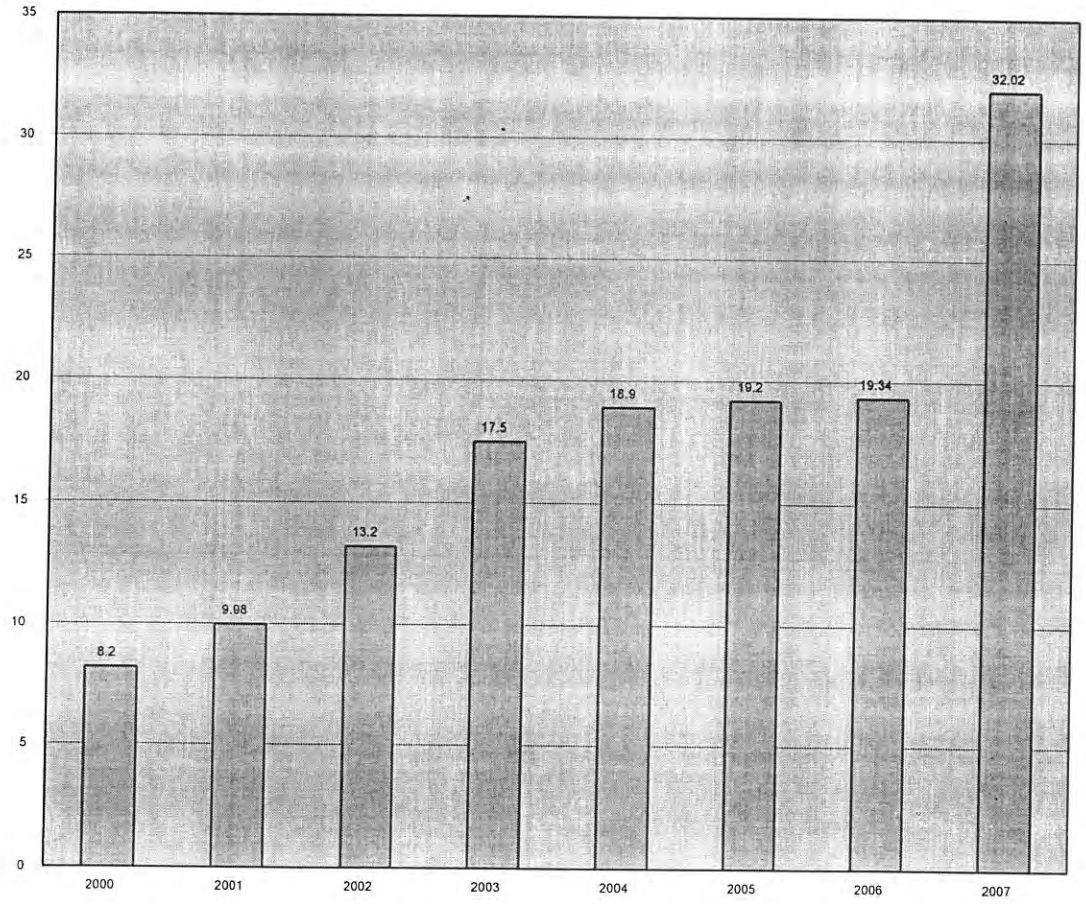
Figure 1: Total Amount of Haricot Bean Exported in Tones from 2000-2007



Source: Shaun and Elly, 2006; MoARD, 2007

In recent years the white haricot beans have got major share in the countries pulse export. The quality of haricot beans affects the export status of haricot beans. Quality is measured in terms of color, shape and other physical factors such as impurities (%). The Ethiopian white haricot beans have smaller sizes. However, almost all haricot beans produced in Ethiopia are grown by smallholders with out chemical inputs, and are organic by nature which could increase the importance of the crop (Ethiopian Export Promotion Agency, 2004).

Figure 2: Cash Obtained (Million USD) By Exporting Haricot Bean from 2000-2007



Source: Shaun and Elly, 2006; MoARD, 2007

2.4 Agricultural Extension Package and Cultivation of Haricot Bean

The majority of farmers in Ethiopia are illiterate. Therefore, an agricultural extension program plays significant role in assisting farmers by identifying and analyzing lots of production problems and by making them aware of opportunities for improvement. Thus, the effectiveness of input utilization and proper management of agricultural practices depends on sound agricultural extension support at the grass-roots level (Degefa, 2002).

In Ethiopia as well as in the Amhara National Regional State agricultural extension program was started in 1995/96 production year. In the same year the Woreda Office of Agriculture and Rural Development started implementing the program. The main focus of the program is improving production and productivity of crops, livestock and natural resources. Cultivation of crops such as *tef*, wheat, sorghum and barley has been supported by this program. But there has been no agricultural extension package support to haricot bean. To support the agricultural extension program, GTZ(the German Technical Cooperation) was closely working with the Woreda Office of Agriculture and Rural Development by popularizing new technologies of agriculture such as a hybrid of wheat and rye called Triticale, a plough known as Arm Strong or *Tenkara Kind* and a grass named as Vetiver (BoARD, 2007 and TGWOoARD, 2007).

2.5 Challenges of Cultivating Haricot Bean

The national seed yield is low under subsistence farming, 0.8 to 0.9 tone/hectare (CSA, 1999; cited in Tadele, 2006), due to diseases and climatic factors, particularly low rainfall and temperature. Rainfall stress is a limiting factor in semi-arid areas and moderately limiting in sub-humid regions (Belay *et* al., 1998; cited in Tadele, 2006). In Ethiopia the commonest insect pests that affect cultivation of haricot bean seem to be the Bean aphid (*Aphis fabae),* the American boll worm (*Heliothis armigera*), bean beetles (*Acanthosclides obtectus*) and African bollworm (Fikadu, 1997 and EIAR, 2007).

Anthracnose (*Colletotrichum ildemuthianum*) is one of the most destructive diseases of haricot beans in the country. Root Rot, which is caused by *Fusarium oxysporium,* is another disease that attacks this crop. The other disease is bean rust (*Uromyces phaseoli*) which is also found world wide (Roberts, 1987; MoARD, 1997 and Bahirdar Plant Health Clinic, 1995). Weeds affect cultivation of haricot bean and reduce its quantity and quality (MoARD, 2007). Moreover, other factors constrain cultivation of haricot bean. Among these, lack of extension support and lack of improved technologies such as improved seeds and agro-chemicals (Shaun and Elly, 2006).

In *Tach Gayint* Woreda cultivation of haricot bean is challenged by different biotic and abiotic factors. The known biotic factors that challenge cultivation of haricot bean were found to be insect pests, particularly bean beetles and African boll worm. A tremendous yield loss of haricot bean is also observed due to abiotic factors such as shortage of rainfall and snow/hail. In addition, cultivation of haricot bean is challenged because of lack of agricultural extension services and improved technologies (TGWOoARD, 2007).

2.6 Household Food Security

2.6.1 Definition of Food Security

Food security is a multi-dimensional concept and has got different definitions. It is concerned with availability of adequate food supply at the global and national level. In addition it is concerned with adequate nutrition and well-being. Based on the world food conference, food security was defined as availability at all times of adequate world food supplies of basic food stuff to sustain a steady expansion of food consumption and to offset fluctuation in production and prices (UN, 1973; cited in Tilaye, 2004).

The World Bank defines food security as access by all people at all times to enough food for an active and healthy life (Maxwell and Frankenberger, 1992; cited in Tsegu, 2006). The UN also defines food security as the ability of the household members to assure themselves sustained access to sufficient quantity and quality of food for an active and healthy life (Eshetu, 2000).

In 2001 food security was redefined as a situation that exists when all people at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and nutritious food and food preferences for an active and healthy life (FAO, 2002).

Another definition of food security has included securing access by vulnerable people to available supplies; as the ability of households to produce, purchase, or acquire through public or private transfer an adequate amount of food to meet biological requirements (Harrigan and Others, 1990; cited in Elias, 2001).

On the contrary, Food insecurity can be defined in connection to the minimum recommended allowance (MRA). Based on this food insecurity is defined as a situation in which a household obtains Minimum Recommended Allowance less than 80% of caloric intake for an individual Per day to be active and healthy (Reutlinger, 1987; cited in Degefa, 2002).

There are two types of food insecurity: current or transitory food insecurity and chronic food insecurity. Current food insecurity refers to food shortage in the current season. This type of food insecurity can be divided into cyclical where there is a regular pattern of food insecurity and temporary, which is the result of a short term, exogenous shocks. It usually happens as a result of unexpected shocks to the food supply systems (i.e. production, consumption and market). Shocks may include: inflation (general increase in the price of essential food stuff or agricultural inputs), unexpected fall in total income, fall in the amount of rainfall, uneven distribution of rainfall, and the like. Chronic food insecurity on the other hand, refers to the type of food insecurity which has reached chronic stage and which can not easily be treated. Chronic food insecurity arises from long-term or deep rooted economic problems of the community. Causes of chronic food insecurity include land degradation, deforestation and population pressure among others (Filmon, 2001; Getahun, 2003, Devereux, *et* al., 2003).

Food insecurity can also be defined as a situation in which the individuals of a society have neither the physical nor the economic access to the nourishment they need (FAO, 2002).

2.6.2 Core Concepts of Food Security

There are lots of concepts concerning household food security. Among these, the four core concepts are sufficiency, access, security and time (Maxwell, 1996; Devereux, *et* al, 2003).

2.6.2.1 Sufficiency

The first core concept of food security is sufficiency. The concept of adequate food is ambiguous by itself. As it can be visualized from different literatures, it refers to enough

food, minimum calorie requirement and adequate to meet nutritional needs. Its main concern is more on calorie requirement for an active and healthy life but not for survival. This means, having enough to eat is not enough by itself rather it requires adequate calories for an active and healthy person on a sustainable basis (Maxwell and Frankenberger, 1992; cited in Nurabdi, 2006).

2.6.2.2 Access and Entitlement

The second important core concept of food security is access and entitlement. According to Sen (1981), a decline in food availability is neither necessary nor sufficient to create hunger. Own production of households could fail and result in shortage of food. This situation can be reversed through purchase. Moreover, households can get access to food via exchange and remittance (gift). Excess production in a certain area does not mean that households can obtain what is required. Because households need to have the purchasing power.

2.6.2.3 Security

The other core concept of food security is security. It means the balance between vulnerability, risk and insurance. It is securing access to enough food. It builds on the ideas of vulnerability to entitlement failure focusing more clearly on risk. There are many sources of risks to food entitlements. Among these; variability in crop production and food supply, variability in market price, risk in employment and wages, risks in health and morbidity and conflicts can be mentioned (Maxwell, 1992; cited in Nurabdi, 2006).

According to Bohle (1993) and Alexander (1992) cited in Tsegu (2006), there are three dimensions regarding risks to food insecurity. These are the risk of exposure to crisis or shocks; the magnitude or consequences of the crisis and Vulnerability of households to these crises. The third dimension is categorized as an important aspect that is determined by the adequacy of households' capacity to cope up with crisis.

From the above perspective, Oshaug (1995); cited in Tsegu (2006), identified three kinds of households. 1) enduring households, who maintain household food security on a continuous basis; 2) resilient households, who suffer from shocks but recover quickly

and; 3) fragile households, who become increasingly insecure in response to shocks (Maxwell and Smith, 1992).

2.6.2.4 Time

This is a fourth core concept of food security dealing with whether food insecurity could be chronic, transitory or cyclical. According to Maxwell and Frankenberger (1992) and the World Bank (1986); cited in Nurabdi (2006), chronic food insecurity is a long term decline in households' access to enough food. On the other way round, it is a sign of poverty and illustrates a structural deficit in production and lack of the ability to purchase. Transitory food insecurity refers to short term fluctuation in food production resulted from climatic changes and or fluctuation in food prices or incomes. The time dimension refers to the intensity and characteristics of food insecurity in terms of its duration and frequency (Maxwell, 1992; cited in Nurabdi, 2006).

2.6.3 Determinants of Household Food Security

Most literatures indicate that household food security has three core determinants (Gittinger *et* al, 1987; Alamigir and Arora, 1991; Hubbad, 1995; Omosa, 1998; cited in Nurabdi, 2006). These core determinants are availability of food, access to food, and utilization of food. Availability and access are the major determinants of household food security (Young, 1997 and World Bank, 2000; cited in Tsegu, 2006). Availability refers to the preference of sufficient food for all people through production and purchase. Domestic food stock, commercial food imports, food aid and domestic food production determine availability of sufficient food. Literatures indicate that households' entitlements have four forms, which can be converted in to purchasing power such as production based, own-labor, trade based and exchange. The appropriate use of the available food is determined by the utilization dimension (FAO, 1997 and Nurabdi, 2006).

Supply, access, and stability are the components of household food security. Adequate food supply at national, household and individual level and access of each family member to sufficient food to meet nutrient requirements determines the supply side of

household food security. Access includes physical, economic and social access to foods that are culturally acceptable (FAO, 1997). Stability according to FAO implies the ability of the household to have all year round to produce or buy food. Studies on determinants of household food security in Amhara National Regional State indicated that sex of the household head, family size, the size of crop harvest, proximity to town, livestock holding and number of oxen owned by the household are found to positively and significantly affect per capita food.kilo calorie availability of households (Eshetu, 2000 and Degefa, 2005).

In Ethiopia, the specific sources of household food security are summarized in to five sets of dimensions. The first set is related to food production mainly based on crop and livestock. The second set is related to cash income from different sources mainly based on marketing and other trade based incomes. The third set is related to reserves of food stock or other assets that would possibly be liquidated. The fourth set is related to institutional assistance from formal and mutual basis. The fifth set is related to different forms of remittances (FAO, 1998 and CRDA, 2000; cited in Filmon, 2001; Getahun, 2003 and Workneh, 2005).

The most direct and measurable outcome of the livelihood process is the composition and level of individual or households income at a given point in time. Income is a combination of both cash and in-kind contribution. The cash earnings include crop or livestock sales, wages, rents, and remittances. The other component is the in-kind component of income, which refers to consumption of produces obtained from own farm, payments in kind (e.g. in food), and transfers or exchanges of consumption items that occur among households with in rural communities (Grace, 1997; Ellis, 2000; Frankenberger, 2002; Scoones, 1998; cited in Tsegu, 2006).

Generally, household level food security is very important because household is the basic unit of analysis that determines the production and consumption level of its members (Chambers, 1983).

2.6.4 Indicators of Household Food Security

According to Frankenberger (1992), food security indicators are summarized into process and outcome indicators. Food supply and food access situations are included in process indicator whereas outcome indicator serves as proxies for food consumption. The most common indicators of food security revolve around measures of food consumption (Frankenberger, 1992; cited in Tsegu, 2006). The availability of food required in kilocalories equivalent is the benchmark of measuring food security of households (Maxwell, 1996; Samson, 2002; cited in Nurabdi, 2006).

In most assessments, analysis and monitoring of household food insecurity, both quantitative and qualitative measurements are utilized. Early warning systems use three sets of indicators. These are food supply indicators such as rain fall, area planted, yield forecast and estimate of production; social stress indicators such as market prices, availability of food in the market, labor pattern, wage and migration; and individual stress which include nutritional status, death and mortality (Debebe, 1995; cited in Abera, 2002).

Supply indicators provide a general picture of a given area and society. Such indicators are in most cases aggregated and hardly serve to monitor food stress at household level unlike access indicators. Out come indicators serve as proxy estimates for measuring household food situation. Supply indicators include data concerning meteorology, situation of natural resources, agricultural production, and the like. Food access indicators among others include dietary change, sales of productive assets, and income diversification. Outcome indicators include frequency of household food consumption, change in household budget and expenditure, nutritional status among others (Frankenberger, 1992 and Devereux, 2001; cited in Tsegu, 2006).

Therefore, assessments concerning household food security can assume variety of approaches ranging from relatively broader indicators to immediate proxies, which can be employed to measure food security depending on the situation at hand. It can be understood that there is no fixed rule as such. Because some one uses process indicators whereas another one uses out come indicators and still others use a combination of both.

More rigorous approaches would be preferred to assess calorie intakes in order to determine individual nutritional status. Topographic diversity, agricultural condition and the people influence the relevance of specific household food security indicators. Therefore, it can be inferred that the application of a given set of indicators needs to be area or population group specific (Maxwell, 1996 and Abera, 2002).

In this research, household food balance model was used in order to assess food security level via amount of calorie generated. For this purpose, data on food availability (per capita food supply) was converted into calories using the nationally recommended level, 2200 kilocalorie per adult equivalent per day and grain calorie equivalent conversion factors.

2.6.5 Food Security in Ethiopia

2.6.5.1 Challenges and Causes of Food Security in Ethiopia

In Ethiopia, particularly in rural areas households encounter food deficit because of several underlying factors. Among these; variability in crop production and food supply, market and price variability; loss of employment and wage earnings; health problems and morbidity; and a drop in the quantity or quality of assets can be cited. These factors have been found to influence the ability to either produce food for consumption or to generate or maintain assets that can be used to purchase adequate food (Dejene, 2004).

A study on food security constraints in Northern Ethiopia indicates that land holding size is the main constraint (84%) for achieving food security. There are also other important constraints such as high prices of inputs (67.4% of the respondents), in sufficient rainfall (64.2% of the respondents), high population growth (62.8% of the respondents), pest and disease (35.8% of the respondents), land degradation (35.4% of the respondents), malaria (33.3% of the respondents), limited access to credit (28.8% of the respondents) which affect the level of food security (Tilaye, 2004).

Households' risk of food insecurity and famine were greatly increased by long term secular decline in resource endowment, combined with unfavorable food policy

intervention. It is underlined that the prevailing inability of Ethiopia's small-scale agriculture to feed its population is mainly generated by the neglect of rural development policy especially the neglect of the poor and the decline in access to productive resources up on which most of the livelihood are built (Getachew, 1995).

There are a number of interrelated factors that contribute to famine such as proneness to climatic-driven production fluctuations, lack of employment opportunities, limited asset bases, isolation from major market, low level of technology, constraints to improvement in human capital and poor health and sanitation of the environment (Webb *et* al., 1994; cited in Getahun, 2003).

The economy of the country is dependent on agriculture. The food security of the country can be realized by assessing the performance of this sector. Agriculture employs nearly 85% of the peoples of this country and creates means of livelihoods to them (Eshetu, 2000). Even though this is the case, it provided little of what has been expected from it and the livelihoods of the people is being threatened. Thus, food insecurity has been the major problem of the country. The reasons, the number, and the magnitude vary from place to place with in the country. Research findings from a community assessment of 21 *Kebeles* of South *Wollo* and *Oromia* Zones of the Amhara National Regional State has come out with several factors resulting in severe food shortage and household food insecurity or poor performance of the agricultural sector. Among these, poor management (lack of manpower), lack of improved technologies (improved seed), lack of appropriate policies, lack of stable organizational structure, population pressure, inadequate or diminishing farm size and land degradation, lack of oxen, inadequate and variable rainfall; land tenure insecurity; lack of credit and inputs, backward farming practices and lack of adequate extension, poor infrastructure (road and marketing); and others such as crop pests and crop and livestock diseases) and war can be cited(Yared, 2001; Elias, 2001; Devereux, *et* al. , 2003; Nurabdi, 2006).

2.6.5.2 Situation of Food Security in Ethiopia

In actual fact, agriculture is the foundation of Ethiopian economy that accounts for nearly 85% of employments, 85% of the export revenue and 45% the GDP (MoARD, 2007). Nevertheless, food production in Ethiopia, contrary to the world food production, has shown a declining tendency (Bezabih, 2000). Basically, resource degradation due to pressure from human and livestock populations, coupled with many other physical, socio-economic and political factors are identified to be one of the major reasons for this distressing trend in the food production and economic growth (Holden, 1999 and Sonneveld, 2002).

Studies indicate that in the 1950s Ethiopia had been self-sufficient in staple food and was classified as a net exporter of food grains. Its annual grain export to the world market rose to the level of 150,000 tonness in 1947/48 (Debebe, 1999; cited in Eshetu, 2000). However, starting from early 1960s, the country's domestic food supply has been declining and failed to meet the food requirements of the people. Because of this situation, the country requires an import of about 8 million metric tones of emergency food aid per year and becomes a major food aid recipient in Africa (Clay *et* al, 1999; Mulat, 1999 and Temesgen, 2001).

Even in normal years, Ethiopia does not have enough food to meet its peoples' needs. The average per capita dietary energy supply (DES) is now substantially less than the minimum requirement, i.e., 2200 kcal/individual/day. This has a devastating effect on children, in particular, who face life-long physical and cognitive disabilities. Different documents show that, in Ethiopia two-thirds of children are stunted. The nutritional status of women, who are the main participants in productive activities and careers of families, is also a grave concern (FAO, Undated).

According to studies by the United Nations Development Program (UNDP) in 2004, Ethiopia is the poorest country, whose Gross Domestic Product (GDP) per capita is c.110 USD. UNDP's Human Development Index (HDI) shows that the country ranks 170 out of 177 countries for which the measurement was done. This clearly shows that the situation of poverty in Ethiopia, particularly in the rural areas is severe. Research finding

indicates that 45% and 37% of the rural and urban people respectively are affected by poverty (Degefa, 2005).

2.6.5.3 Situation of Food Security in Amhara National Regional State

Concerning the Amhara National Regional State, it is identified that the Region is one of those Regions which produces surplus from different crops. Though this is true as far as the Regional figure is concerned, the situation at household level is different. This is particularly the case in those Woredas identified as chronically food insecure. Chronic food insecurity is affecting livelihoods of millions of peoples living in the Region. An assessment carried out by the Region verified that 76.5% of the sample households do not have enough stock until the next harvest (BoARD, 2003).

According to households' social security study by the Central Statistical Agency(the former Authority) in 1995/96 and in 1999/2000, out of the total population living in the Region 54.3% and 41.8% live below the poverty line in that order. The same study in 2004/05 indicates that 30.5% (32.55% in rural and 14.5% in urban areas) live below the poverty line. This ratio is equivalent to 5.49 million people of the 18 million people living in the Region during the study period. Out of those living below the poverty line 437,838 households or 2.19 million people had more than three months food deficit or were categorized as chronically food insecured (FSPCDPO, 2007).

An impact assessment study on food security program interventions by the Regional Food Security Program Coordination and Disaster Prevention Office in 2006 indicates that, out of the total sample households(3628), only 1178(32.5%) of sample households in the study areas were found to be food secure during the study period. On the other hand, about 76% of sample households have pointed out that the food availability and food consumption have improved after implementing different food security program interventions (Ibid).

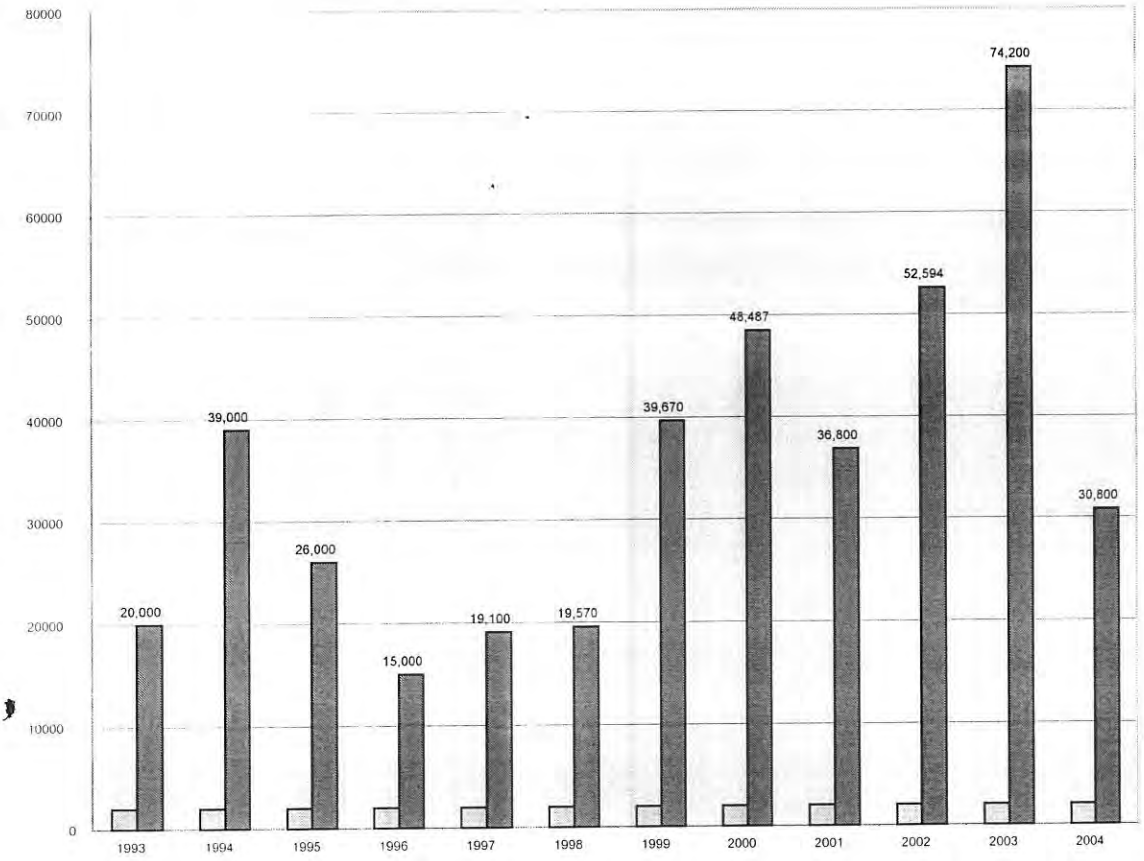
2.6.5.4 Situation of Food Security in *Tach Gayint* Woreda

Even though agriculture is the source of livelihood to farming households of *Tach Gayint* Woreda, it has not contributed much. Thus, the Woreda has been facing chronic food

insecurity and became food aid dependent for several years as can be seen from the figure displayed below. Large number of food aid beneficiaries (74200) was registered in 2003, whereas the least number of beneficiaries (15000) was documented in 1996(Figure 3). To alleviate the problem different food security program interventions have been undertaken by the government in collaboration with various stakeholders. Thus, the World Bank Food Security Project, the Federal Government assisted Food Security Project and the Productive Safety Net Program activities have been carried out since 2003 and 2005 respectively. Since then through these food security projects a total of 8,191,700.00; 23,368,609.40; and 45,838,056.00 Ethiopian Birr were disbursed in that order. The sum of money disbursed by these projects equals to 77,398,365.40 Ethiopian Birr (TGWOoARD, 2007).

The Productive Safety Net Program activities provide temporary employment opportunities, which lasts for six months from January up to June to chronically food insecure rural households. Its major objective is to protect assets of individuals from depletion and build community assets. In 2005, 2006, 2007 and 2008 the beneficiaries of this program are 36,620; 54,198; 54,198 and 54,198 respectively. The main objective of the World Bank and the Federal Government assisted Food Security Projects is provision of food security credits to targeted poor farming households. These credits are mainly used for asset creating activities, such as livestock rearing. According to the PIM (Project Implementation Manual of the Productive Safety Net Program), the eligible beneficiaries of these projects are those beneficiaries who are involved in the Productive Safety Net Program. This is the case because all the food security project resources should be provided to them in order to make them food secure and graduate from the Productive Safety Net Program within short period of time (three to five years) (TGWOoARD, 2007 and FSPCDPO, 2007).

Figure 3: Total Number of Food Aid Beneficiaries from 1993-2004



Source: TGWOoARD, 2007

2.6.6 Policies and Strategies to Enhance Food Security in Ethiopia

Addressing micro level interventions have much to do in alleviating household food insecurity with improving income and reducing poverty; increasing agricultural productivity and production by food insecure rural households; ensuring fair prices to producers and consumers and making basic services available to the food insecure households (Abera, 2002).

The incumbent Ethiopian Government has formulated a lot of favorable agricultural and rural development policies. One of these policies is food security policy. Among these,

the National Policy for Disaster Prevention and Preparedness (NPDPP), the National Food Security Strategy (FSS) and the National Poverty Reduction Strategy Paper (PRSP) can be mentioned (FSP, 2003).

The promotion of rural development that focuses on sustained poverty reduction among the rural obviously improves food security. Appropriate technologies and producers' incentives to enhance both production and employment are also the strategic remedies of food insecurity and poverty. Provision of rural credit and agricultural extension designed at food insecure households are also important instruments of addressing household food insecurity. Equally attitudinal changes to strengthen local leadership and empowerment of women and community participation are vital instruments to make external resources more productive in alleviating household food insecurity (Abera, 2002 and BoARD, 2003).

Revising food security strategy was an important issue and given due attention by different regions. Therefore, based on the new rural and agricultural development policy and strategy, the Amhara National Regional State Food Security Strategy has been revised. At the national level, the aim of the strategy is increasing the availability of food through domestic or own production in order to ensure access to food for food deficit households and strengthening emergency response capabilities. Addressing both the supply and demand sides of the food equation, the revised strategy in this Region is targeted mainly to the chronically food insecure moisture deficit areas. It focuses on environmental rehabilitation as a measure to reverse the current trend in land degradation, and as a source of income generation for food insecure households. In addition, the focus of the revised strategy is to include new development elements such as water harvesting and the introduction of high value crops, livestock and agro-forestry developments in order to solve food insecurity and to attain household food security (BoARD, 2003).

2.6.7 Contribution of Haricot Bean to Household Food Security

Haricot bean plays a paramount importance in human nutrition and market throughout rural and urban areas of the Tropics in general and Eastern Africa in particular (Roger *et* al., 2000; Shaun and Elly, 2006)

Even though haricot beans have been considered as a low status food, or as the ''meat of the poor'', they provide the second most important source of human dietary protein in the diet of many tropical people after maize and the third most important source of calories after maize and cassava for over 100 million people in rural and poor urban communities in Africa, supplementing the carbohydrate staple foods of rice, maize and other cereals. As in other grain legumes, the protein in haricot beans is somewhat deficient in the sulphur-containing amino-acids (methionine and cystine), but is rich in lysine and tryptophan, which are deficient in cereals. Thus, haricot beans complement the amino acids of cereals. Its protein is cheaper than the animal form, making it highly competitive and important in dietary regimes of poor people in Africa (Roger *et* al., 2000).

Dried haricot beans are eaten boiled, baked or fried, and are included in many soups. The immature pods and seeds of most kinds of haricot beans are also eaten as a vegetable. The leaves and shoots of young plants are used as a pot-herb in some parts of the tropics, and the haulm is used as forage and the stalk is used to make soda ash (Fikadu, 1997 and Pachico, 1993; cited in Roger *et* al., 2000).

Per capita haricot bean consumption is highest in Africa. For instance, in Rwanda its consumption reaches 55 kilo gram per year. Consumer preferences for seed types, color, shape, and brilliance or seed coat luster of dry haricot bean vary greatly even within a country. However, many consumers also place value upon sweet taste and fast cooking attributes, and varieties that excel in these respects sometimes obtain higher prices than those having the most attractive appearance (Ibid).

Although haricot beans are largely produced for subsistence, mainly by women farmers, approximately 40% of production in Sub-Saharan Africa is marketed at a retail market value of 452 million USD. Such huge amount of money contributes to the improvement of food security and income of rural households in many parts of rural Africa (Roger *et* al., 2000; Shaun and Elly, 2006).

The assessment made in Uganda revealed that 88% of adopters of varieties of haricot bean such as K132 reported to have income gains due to higher productivity and price. Improved food security and health were important benefits mentioned by adopters of this variety (Roger *et* al., 2000).

In Ethiopia, farmers grow haricot beans for market and for home consumption in rural and urban areas. Haricot bean is a principal food crop in many parts of Ethiopia providing huge amount of kilocalories, protein and income.

In eastern, western, northern and southern parts of the country, in addition to sole cropping it is widely intercropped with maize and sorghum to supplement farmers with additional food and income. Therefore, haricot bean has been found to be an important crop in the provision of food security and as a commercial product of Ethiopia (Ethiopian Export Promotion Agency, 2004; Shaun and Elly, 2006).

The same holds true in *Tach Gayint* Woreda, where haricot bean contributes greatly to food security and income of rural households. The assessment carried out by the Crop Husbandry and the Food Security and Disaster Prevention Teams of the Woreda Office of Agriculture and Rural Development in 2006/07 production year, shows that farmers have obtained up to 20,000 Ethiopian Birr per household from haricot bean and improved their food intake (TGWOoARD, 2007).

The short maturity of haricot beans (3 months on average), ease of handling and storability among others make them a coveted cash crop for small-scale farmers (Wortmann *et* al., 1999; cited in Roger *et* al, 2000).

2.6.8 Analytical Framework of Household Food Security

Many literatures indicate that household food security is determined by three core determinants. These determinants are food availability, accessibility and utilization (consumption) components (Omosa, 1998; Alamigir and Arora, 1991; Hubbad, 1995; and Gittinger, *et* al., 1987; cited in Nurabdi, 2006). Food availability is dependent on production of food such as domestic food production and food stock. Moreover, food availability is dictated by food accessibility (Figure 4).

According to Sen (1981), access to food can be achieved through purchase even if households are not self sufficient from own food production. The model (Figure 4) clearly shows that food accessibility is determined by household income. Household income comprises of household asset, non-farm income generating activities (such as Productive Safety Net Program's Cash or Food for Work), credit opportunity and saving. In addition, there is a foreword and backward relationships between food availability and food utilization.

Food utilization is the third determining component of household food security. It is influenced by food accessibility and food consumption. Food consumption includes food intake, number of meals per day, kcal consumed per day per individual, variety of feed (feed component) and health situation (Figure 4).

Household income influences consumption of food and it is in turn influenced by this determinant. The food production component is affected by household income, cultivation of haricot bean and by status of cultivation of this crop (Figure 4).

Cultivation and status of cultivation of haricot bean depends on food production. Moreover, it is influenced by consumption of food. Consumption of food is further influenced by cultivation of haricot bean (Figure 4).

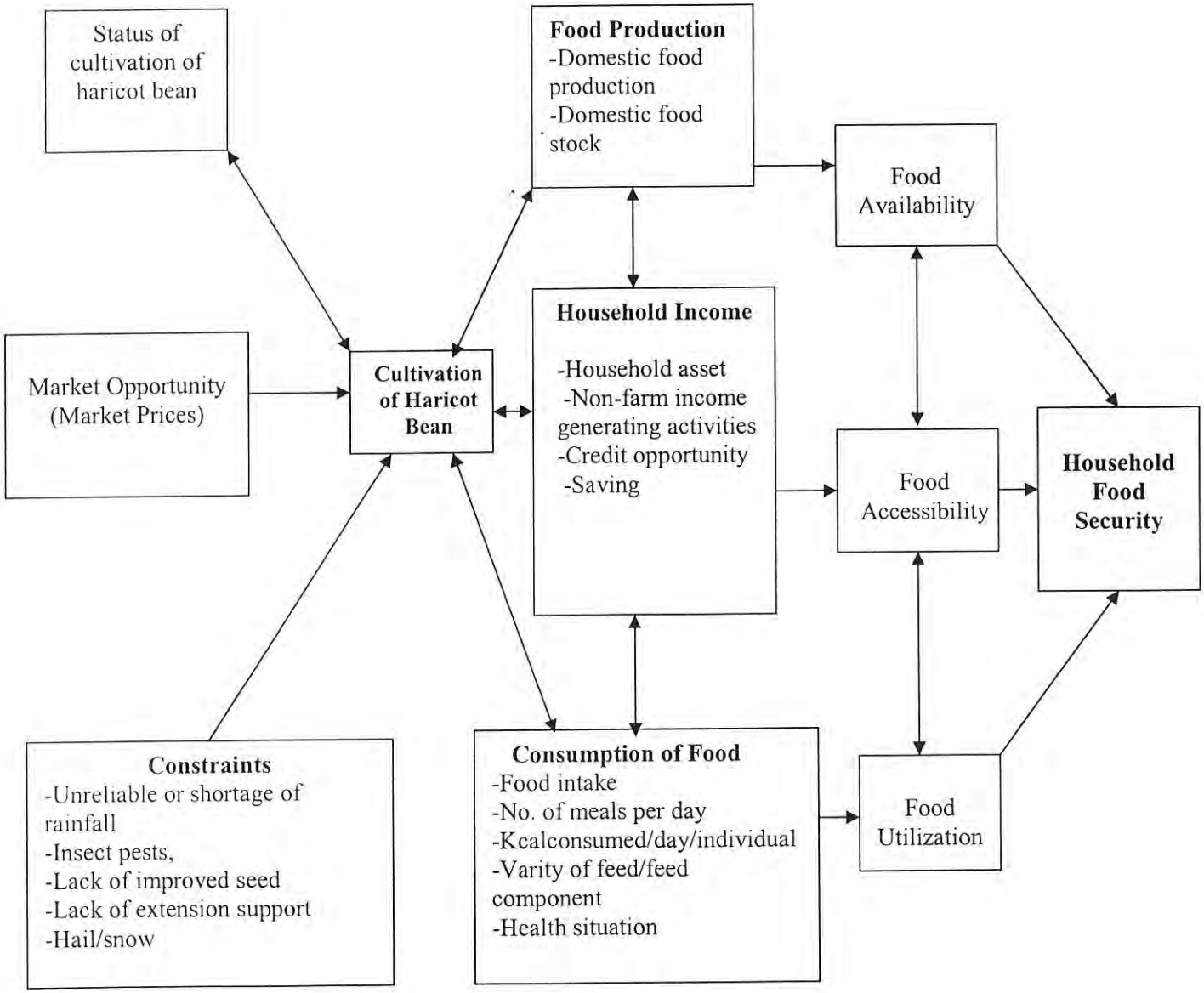
There are a lot of factors that constrain cultivation of haricot bean. Thus, these factors reduce quantity and quality of this crop. These constraining factors are found to be insect pests, weeds, drought or shortage of rainfall; which are found to be natural constraints.

Lack of appropriate technologies such as improved seeds and extension support are human induced factors that constrain cultivation of haricot bean (Figure 4).

Status of cultivation of haricot bean influences cultivation of haricot bean and food production. The reverse scenario does prevail too. From the working model (Figure 4) some one can understand that, market opportunities determine cultivation of haricot bean.

To sum up, this working model (Figure 4) will guide the research titled as the Contribution of Cultivating Haricot Bean to Rural Household Food Security in sample *Kebeles* of *Tach Gayint* Woreda of the Amhara National Regional State.

Figure 4: Analytical Framework of the Determinants for the Contribution of Cultivating Haricot Bean to Rural Household Food Security



Source: Adapted from Nurabdi, 2006; Helen Young (1992); cited in Elias, 2001 and organized by the author.

CHAPTER THREE: Methodology

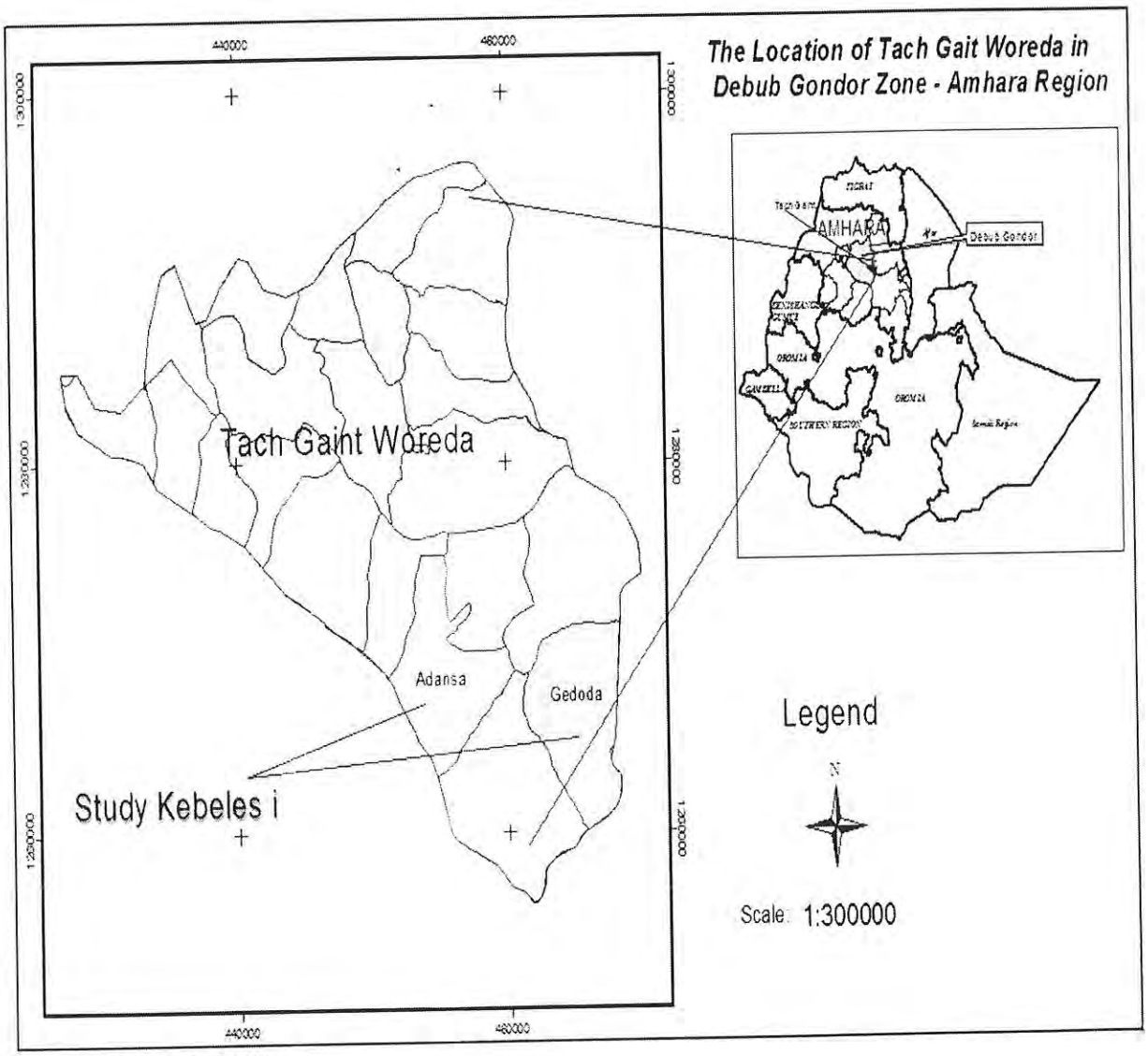
3.1 Description of the Study Area

3.1.1 Location of the Study Area

This research was undertaken in *Tach Gayint* Woreda, which is located in the Western part of South *Gondar* Administrative Zone of the *Amhara* National Regional State (ANRS). It is one of the 11 Administrative Woredas. *Arb Gebeya* is the capital of the Woreda. It is located 761 Kilometers, 197 Kilometers and 100 Kilometers North West of Addis Ababa, Bahirdar (the Regional capital) and *Debre Tabor* (the Zonal capital) respectively (TGWOoARD, 2007). The Woreda is bordered by *Lay-Gayint* Woreda in the North; *Estie* Woreda in the West; South *Wollo* Administrative Zone in the South east, *Simada* Woreda in the South and South West; and North *Wollo* Administrative Zone in the East. Astronomically, the Woreda is located between 11°23′ and 11°44′north latitudes and 38°20′ and 38°44′ east longitudes (SERA Project, 2000). It extends for about 40 Kilometers in the North-south direction and about 44 Kilometers in the East-west direction and has a semi compact shape. Administratively, the Woreda has 15 rural *Kebeles* and 1urban *Kebele*. The rural *Kebeles* are named as *Bethelihum, Efrata, Gomenge, Agat, Aduka, Adansa, Endewa, Gedoda, Jaji, Aketo, Eskinderawit, Anseta, Bete Yohannis, Kutmender, and Enjit*. The urban *Kebele* is named as *Arb Gebeya*.

The Woreda has an area of 99,484 hectares. *Endewa*, the biggest *Kebele*, accounts for about 12.5 per cent while *Arb Gebeya*, the smallest *Kebele* constitutes about 1.3 per cent of the total area. Out of these fifteen rural *Kebeles*, twelve of them can produce haricot bean but six of them are found to be potential producers. They are named as *Gedoda, Endewa, Adansa, Aduka, Efrata and Betelihum*. Average land holding of households is 0.78 hectares (TGWOoARD, 2007 and SERA Project, 2000).

Figure 5: Map of Ethiopia, ANRS, *Tach Gayint* Woreda and the Study *Kebeles*



Source: CSA, 1994

3.1.2 Altitude and Topography of the Study Area

Tach Gayint being part of South *Gondar* Administrative Zone where we find the *Debre Tabor* massif which rises more than 3500 meters, its northern part lies with in this massif. Hence, *Gomenge, Bete Yohannis and Kutmender* PAs are higher grounds of the Woreda. In *Gomenge* some places rise to more than 3300 meters above sea level. The north-eastern, north-western and central parts of the Woreda have medium elevation while the south and south-western are lower areas of the Woreda. Altitude decreases as one move from the northern part to all directions. The lowest place with 1440 meters is found in *Gedoda* PA. Most of the areas of the Woreda are above 2000 meters above sea level. Of this, rugged terrain takes the highest share (28%) followed by gorges and valleys (27%), mountainous (23%), and plain land (22%) (SERA Project, 2000 and TGWOoARD, 2007).

3.1.3 Population of the Study Area

Total population of the Woreda in 2008 is estimated to be 117139, of which 58585 are males and 58554 are females. The total population of the rural and urban areas is 112080 and 5059 respectively. Population density of the Woreda was found to be 140 people per square kilometer (CSA, 2007).

3.1.4 Crop Production

The livelihood of the inhabitants, especially in the rural areas is mainly based on crop production. Crop production is highly dependent on unreliable or erratic rainfall. Irrigation and water harvesting activities are also being practiced. Crop production encompasses crops such as haricot bean (*Phaseolus vulgaris*), *tef (Eragrostis tef)*, and sorghum (*Sorghum bicolor*) among others. The average yield per hectare of haricot bean is 8 quintals. For *tef* and sorghum it is 6 and 5 quintals respectively (TGWOoARD, 2007).

3.1.5 Livestock Husbandry

Livestock husbandry includes sheep, goats, cattle and others. According to the livestock study by the Woreda Office of Agriculture and Rural Development in 2006, the livestock population was 13,989 oxen; 11,529 cows; 7,450 calfs; 4,693 heifers; 3,654 bulls; 45,277 shoats; 9975 equines; 7000 beehives and 17336 poultry. Thus, the study shows that the total livestock population was 120,903. The cultivation of crops is the most important occupation. But it does not mean that livestock rearing is not important; rather its importance is increasing through time. Livestock plays vital role in the life of a peasant. Without livestock life in rural areas of the Woreda is unbearable (TGWOoARD, 2007).

3.1.6 Rainfall and Temperature of the Study Area

The rainfall is scanty and unreliable. Even though the Woreda receives rainfall for 5 months a year (May to September), rainfall is concentrated in July and August. The mean annual rainfall ranges between 900-1000 mm. More than half of the annual rainfall occurs in these months. And two third of the rainfall comes in the summer season. Hence, the production of crops is once in a year. To put it differently, the woreda is mono-cropping. That is why only the traditionally known *Meher* cropping season, which occurs from May to December, exists in the Woreda. In other words, there is no *Belg* cropping season in the Woreda (SERA Project, 2000 and TGWOoARD, 2007).

With regard to temperature, the mean average monthly temperature varies between 11°C in January and 14.4°C in April and May. The average annual temperature is 12.7°C. The monthly minimum temperature ranges from as low as 4.5 °C in January to as high as 9.1°C in June. Conversely, the mean maximum temperature has a variation of 2.2°C. The values vary between 18.1°C in January and 20.3 °C in March and April (Ibid).

Based on the traditional climatic zonation, there are three agro-ecological zones namely; *Dega* (the high-land which covers about 23.7% of the Woreda), *Woina-dega* (the mid-land which coves about 63.2% of the Woreda) and *Kolla* (the low-land which covers about 13.1% of the Woreda) (Ibid).

3.1.7 Water Bodies of the Woreda

The Woreda is found in the *Abay* drainage basin particularly within the *Beshilo* sub-basin. The major rivers, *Chefa* and *Zita* with their tributaries – *Kuwant*, *Shodeb*, *Aduka*, *Fikana* and *Barguwada* drain in the south and southeastern direction to *Beshilo* River (SERA Project, 2000). Even though so far little has been obtained from these rivers, there is huge potential to exploit them for irrigation farming (SERA Project, 2000 and TGWOoARD, 2007).

3.1.8 Soil Types of the Woreda

From the national atlas it is identified that cromic, eutric and calcic canbisols are the dominant soil types in the Woreda (Ibid).

3.1.9 Infrastructure of the Woreda

Regarding infrastructural development, the Woreda has 1 Comprehensive High School and 32 Elementary Schools (TGWOoE, 2007). There are 2 Health Centers at *Arb Gebeya* and *Agat*, 15 Health Posts and 2 Emerging Health Centers (TGWOoH, 2007). The Woreda has an all weather type of road (covers 25 kilometers) which connects it with *Lay Gayint* Woreda. It has different dry weather roads that interconnect different *Kebeles* with the Woreda capital and among each other. The Woreda gets potable water from different sources. The urban *Kebele* obtains potable water from one bore-hole while there are 57 spring developments and 68 hand-dug wells that provide potable water to the rural *Kebeles*. The Woreda has different markets, of which the *Arb Gebeya* market is the biggest one. It has a telecommunication and no electricity services (TGWOoARD, 2007).

3.1.10 Land-use Pattern of the Woreda

Cultivated land, grazing land, forest land, bush land, land covered by water, unutilized (non-productive) land and land used for construction purposes is 31,739.41; 8,107.11; 2,346.45; 781.00; 5,190; 46,174.03 and 5,146.00 hectares respectively(Table 1).

Table 1: Land-use pattern of the Woreda

No.	Land-use Type	Area (Hectare)	Per cent cover
1.	Cultivated land	31,739.41	31.90
2.	Grazing land	8,107.11	8.15
3.	Forest land	2,346.45	2.36
4.	Bush land	781.00	0.79
5.	Land covered by water	5,190.00	5.22
6.	Unutilized (non-productive) land	46,174.03	46.41
7.	Land used for construction purposes	5,146.00	5.17
	Total	**99,484.00**	**100.00**

Source: TGWOoARD, 2007

3.1.11 Characteristics of Sample *Kebeles*

Out of the fifteen rural *Kebeles* of *Tach Gayint* Woreda six *Kebeles* namely *Gedoda, Endewa, Adansa, Aduka, Efrata* and *Betelihum* are potential producers of haricot bean. *Gedoda* and *Adansa* were selected for the study and their characteristics were provided below.

3.1.11.1 *Gedoda* (*Kebele* 09)

The total population of *Gedoda* is 5,879 for 2007/08. The number of males and females was 2,998 and 2,881 respectively. The total number of households of the *Kebele* was 1,015. Cultivators of haricot bean were 614 whereas the non-cultivators were 401 in number. The agro-ecology of the area is dominantly low-land (*Kolla*). Its cropping pattern is mainly dominated by *meher* production season. Annual crops such as haricot

bean, *tef*, sorghum, and maize are dominantly cultivated in the *Kebele*. Perennial crops such as coffee, *gesho* and cotton are produced rarely in the *Kebele*. The *Kebele* has a total area of 2,898 hectares. Of this, cultivated land; grazing land; land used for construction; unproductive land; forest land and land covered by water bodies equals to 1664.6 hectares; 705.9 hectares; 285 hectares; 145 hectares; 72.5 hectares and 25 hectares respectively. It has an altitude that ranges from 1440-1600 meters above sea level. Its average annual rainfall is from 500-800 millimeter. The average temperature of the area is 23.5 ℃. The major soil types of the *Kebele* are sandy with mixtures of other soil types such as red soil. Crop production, livestock husbandry and non-farm income generating activities also play important role in generating household income in the study *Kebele* (TGWOoARD, 2007).

3.1.11.2 *Adansa* (*Kebele* 11)

The total population of *Adansa* is 5,268, of which males and females are 2,687 and 2,581 respectively. The total number of households of the *Kebele* was 1,000. Cultivators of haricot bean were 568 whereas the non-cultivators were 432 in number. The agro-ecology of the area is dominantly low-land (*Kolla*). Its cropping pattern is mainly dominated by *meher* production season. Haricot bean, *tef*, sorghum, millet, and maize are some of the crops that are cultivated in the *Kebele*. The *Kebele* has a total area of 2902.58 hectares. Of this, cultivated land; grazing land; land used for construction; unproductive land; forest land and land covered by water bodies equals to 1,740 hectares; 867 hectares; 118 hectares; 58 hectares; 116 hectares and 3.5 hectares respectively. It has an altitude that ranges from 1500-1600 meters above sea level. Its annual rainfall is almost similar to that of *Gedoda*. Average annual temperature of the area is 23 ℃. Soil type of the *Kebele* includes clay soil, red soil and sandy soil with mixtures of other soil types. Crop production, livestock husbandry and non-farm income generating activities contribute significantly in generating household income in the study *Kebele* (Ibid).

3.2 Data Collected

In order to answer the major objectives of this research, it was necessary to collect a wide range of data or information. These information includes among others; the change in income of households due to production of haricot bean, change in production and area for producing haricot bean, amount of haricot bean to be produced and its productivity per hectare of farmland, food security status of households, demographic situation, socio-economic aspects, constraints and challenges to produce this crop, future prospects of haricot bean production, the perception of households concerning the contribution of haricot bean to rural household food security and other related information was gathered.

3.3 Data Sources

For the fulfillment of the objectives of this research, primary and secondary sources of data were utilized. Primary data was generated from a sample survey that was conducted from December 2007 to February 2008, using a detailed household questionnaire.

Key informant interviews, group discussions as well as field observations were also employed to collect primary data. The interviews and discussions, as supplementary sources were found to be useful in generating information on issues probably not captured in the questionnaire. They were used as mechanisms for cross-checking information obtained from other sources. They also provide information of local context that reflects the reality, what is on the ground that is not readily available in written records for a number of reasons.

In addition, the research required different data from secondary sources. These sources were the ANRS Bureau of Agriculture and Rural Development, the ANRS Food Security Program Coordination and Disaster Prevention Office, *Tach Gayint* Woreda Office of Agriculture and Rural Development, books, journals, internet, published and unpublished sources and other relevant sources were utilized.

3.4 Method of Data Collection and Analysis

In this research both quantitative and qualitative methods of data analysis were used. More of quantitative data analysis was utilized and this was supplemented by qualitative methods of data analysis. Data for the research was collected via primary and secondary sources.

3.4.1 Primary Data Collection

In this research, primary data collection methods such as household questionnaires, key informant interviews, focus group discussions and field observation were utilized.

3.4.1.1 Sampling Design

This research employed a random sampling design to collect the desired information from sample households. There are six *Kebeles*, which are potential producers of haricot bean in the study woreda. Two *Kebeles* which consist of cultivators and non-cultivators of this crop were selected by using lottery method without replacement, to compare the food security situation of households. Then by proportionate simple random sampling technique, using lottery method without replacement, in each *Kebele* 50(5%) rural households and a total of 100 rural households were selected from the whole sample *Kebeles* (Table 2). In order to do this, name of the total household heads of the sample *Kebeles* of the current year was obtained from Offices of the Woreda Agriculture and Rural Development and sample *Kebeles* or Development Agents.

Table 2: Sample Size of Households

No.	Category	Sample *Kebele*				Total	
		Gedoda		*Adansa*			
		No.	5%	No.	5%	No.	5%
1.	Cultivators of Haricot bean	614	31	568	28	1,182	59
2.	Non-cultivators of Haricot bean	401	19	432	22	833	41
	Total	**1,015**	**50**	**1,000**	**50**	**2,015**	**100**

Source: Field Survey, 2008

Before starting the actual field work, the household questionnaires for both cultivators and non-cultivators of haricot bean were translated in to Amharic. The sample frame of the cultivators and non-cultivators of this crop was arranged to be prepared in each *Kebele* in advance. Six enumerators, who are fit enough to do the activity were recruited in collaboration with *Tach Gayint* Woreda Office of Agriculture and Rural Development. One supervisor was also employed to effectively monitor the work at study *Kebeles*.

3.4.1.2 Interviewing Household Heads

Structured interviews with close-ended questions were provided to sample household heads. The enumerators were given two days training by the researcher on how to shoulder this activity. After completing the training, enumerators exercised data collection on non-sample households in the nearby *Kebele* for a day.

3.4.1.3 Focus Group Discussion (FGD)

It was important to carry out an FGD via structured interview. Two FGDs, one from each study *Kebele* were undertaken. The members of the FGD were considered to be 6 in number. They were from producers and non-producers of haricot bean, *Kebele* Administration, Churches and or Mosques and others. In addition to the researcher, one

agricultural expert or a Food Security and Disaster Prevention Officer, who take important notes during discussion was used.

3.4.1.4 **Key Informant Interview**

Structured interview with closed and open-ended questions was utilized. Information on amount of production, change in household income, socio-economic, cultural and other related issues was gathered. Key informants, who have sufficient knowledge, includes 2 Woreda OoA and RD Officers, 1 Woreda Food Security and Disaster Prevention Officer, 4 DAs, 1 Private Investor working on processing and supplying this crop for the national market, 1 Expert, each from *Kebele* health and education offices were used.

3.4.1.5 Field Observation

Observation was another tool to get primary information for this research. Field observation was made in the sample PAs with the help of local PA leaders, Development Agents and supervisors. In this activity the crop stand, the food security situation of households, the process of harvesting, threshing and related observations were made.

3.4.2 Secondary Data Collection

Secondary data are assumed to fulfill information that was not gathered via primary sources. Secondary data was obtained from sources such as published and unpublished documents, internets, journals, books, and the like.

3.4.3 Methods of Data Analysis

Quantitative data, concerning cultivation of haricot bean and its contribution to rural household food security was analyzed by using descriptive statistics such as means and standard deviations. In addition, tables were also used. While qualitative data was analyzed via descriptive framework and theoretical prepositions. Moreover, data was analyzed by using SPSS (Statistical Package for Social Scientists) computer software in order to compute frequency distribution and percentages.

3.4.4 Kilocalorie Calculation

The calorie available is the most important indicator of knowing whether that particular household is food secure or not. Based on this general consensus, the net total crop output budgeted for family consumption in quintal was converted into kilograms. Then this was converted in to available calorie equivalent.

To calculate the available calorie, a household food balance model was adapted from Degefa (1996). There were various steps followed to calculate available calorie for a household. In the first step the sum of crop outputs sold, reserved for seed and 10% post harvest losses were subtracted from the total grain output of both cultivators and non-cultivators of haricot bean in order to get the net total outputs of grain. The second step was converting the net total outputs of grain into equivalent kilocalories. To do this different calorie conversion factors were used. The conversion factor for 1 kilogram of barley and wheat, maize, legumes and oil crops was 3.78, 4.03, 4.07 and 4.07 respectively(Agren *et* al., 1968; cited in Degefa, 1996). The total kilocalories obtained in this step will give us the total kilocalories food available for that particular household. The third step was dividing the total kilocalorie obtained in step two by the number of families (Adult Equivalent) of households. This will give us the per capita kilocalorie available for a year. The fourth step was calculating the average daily kilocalorie requirement. This was calculated by multiplying the per capita kilocalorie by 1000 and dividing this by the number of days in a year.

The result obtained at step four was compared with 2200 calories/person/day set by the Ethiopian Government and which was taken as the minimum daily calorie requirement by an individual in order to lead active and healthy life.

CHAPTER FOUR: Findings and Discussion

4.1 Demographic Characteristics of Sample Households

4.1.1 Sex, Age and Family Size of Sample Households

92% of sample households were male and 8% were female (Table 3). This shows that male households are huge in number and dominate the household food security related decisions in the study area. Similar finding by Elias (2001) supports this argument. 90% of sample household heads had ages ranging between 15-49 years, 4% had ages ranging between 50-59, while the age of the remaining 6% was found to be 60 and above. This indicates that most of the sample households are economically active and contribute positively to food security and income of their family. The study by Tsegu (2006) and CSA (1995) strengths this finding. More family size in the age group of 0-14 and above 60 implies that food security of that household will be affected negatively, because of existence of few working labor. On the contrary, more family size in the age group of 15-49 implies the existence of huge family labor that contributes positively to food security of that household. The average family size of households was found to be six. This figure is slightly higher than the rural average for the Region which is 4.8 (EASE, 2003).

Table 3: Frequency Distribution of Sample Household Heads by Type and Sex

Type of Households	Sex		
	Male	Female	Total
Cultivators of Haricot Bean	53(89.8%)	6(10.2%)	59(100%)
Non-cultivators of Haricot Bean	39(95.1%)	2(4.9%)	41(100%)
Total	**92(92%)**	**8(8%)**	**100(100%)**

Source: Field Survey, 2008

4.1.2 Marital Status of Sample Households

96% of sample household heads were married, 1% divorced and 3% widowed (Table 4). From this it is possible to infer that most of the sample households were married and thus this has positive impact on their food security and income. Generally, the marital conditions of households influence the income and the consequent food security situation of the family. More married household heads had better food security status and income than the non-married or others (Nurabdi, 2006).

Table 4: Percentage Distribution of Marital Status of Sample Household Heads by Type

Type of Households	Marital Status				
	Married	**Not married**	**Divorced**	**Separated**	**Widowed**
Cultivators of Haricot Bean(N=59)	58(98.3%)	0(0%)	0(0%)	0(0%)	1(1.7%)
Non-cultivators of Haricot Bean(N=41)	38(92.7%)	0(0%)	1(2.4%)	0(0%)	2(4.9%)
Total(N=100)	**96(96%)**	**0(0%)**	**1(1%)**	**0(0%)**	**3(3%)**

Source: Field Survey, 2008

4.1.3 Ethnicity and Religion of Sample Households

The result of this research indicates that all of the sample households belong to the Amhara ethnic group. Out of the total sample households, 95% were Orthodox Christians and the remaining 5% were Muslims.

4.1.4 Educational Status of Sample Households

42% of cultivators and 61% of non-cultivators were illiterate. 49% of cultivators and 27% of non-cultivators were able to read and write. 7% of cultivators and 8% of non-cultivators had completed grade 1-4. 2%, each from cultivators and non-cultivators had completed grade 5-8. No one had completed grade 9-10 from cultivators of haricot bean and only 2% of non-cultivators did so (Table 5). Educational status of cultivators is better than the non-cultivators. But the educational status of sample cultivators did not have an influence on cultivation of haricot bean. The illiteracy rate of the Woreda was found to be higher similar to most of the rural areas of the country. Literatures indicate that illiteracy is a common scenario in Ethiopia and its rate is higher among poor rural households than the better-off households (MoFED, 2000 and Tsegu, 2006).

Table 5: Educational Status of Household Heads by Type and Gender

Description	Sex	Level of Education					
		Illiterate	Read and Write	Grade 1-4	Grade 5-8	Grade 9-10	Total
Cultivators of Haricot Bean	Male	23(39)	26(44)	3(5)	1(2)	0(0)	53(90)
	Female	2(3)	3(5)	1(2)	0(0)	0(0)	6(10)
	Subtotal	25(42)	29(49)	4(7)	1(2)	0(0)	59(100)
Non-cultivators of Haricot Bean	Male	23(56)	11(27)	3(8)	1(2)	1(2)	39(95)
	Female	2(5)	0(0)	0(0)	0(0)	0(0)	2(5)
	Subtotal	25(61)	11(27)	3(8)	1(2)	1(2)	41(100)
Grand Total		**50**	**40**	**7**	**2**	**1**	**100**
Percent		50	40	7	2	1	100

(Figures in parenthesis are percentages).

Source: Field Survey, 2008

4.1.5 Land Holding Size and its Fertility of Sample Households

Average land holding by sample households is 0.75 hectare, which is less than the Regional average (0.95 hectare) and the National average (0.97 hectare) (CSA, 1998; cited in Degefa, 2002). The land holding size of households ranges from 0.0 to 2.0 hectare. The majority of the sample households (87%) had less than a hectare of farm

land, while few (11%) had greater than a hectare of farm land. 2% of the farming households were landless (Table 6). Generally, the land holding size of households is too small to contribute to food security and income of rural households. A study by Tilaye (2004) on food security constraints in northern Ethiopia indicates that small land holding is the main constraint (84%) for achieving food security.

Regarding fertility of farm lands 17%, 79% and 4% of the sample households confirmed that it is poor, medium and higher respectively. Most of the farm lands in the low land areas of the Woreda are more or less favorable to cultivate haricot bean. The discussion held with focus group discussants confirms this statement. Moreover, the assessment made in low land areas of *Tach Gayint* Woreda shows that these areas have favorable environmental conditions such as soils and temperature to cultivate important cash crops such as haricot bean (TGWOoARD, 2007).

Table 6: Frequency Distribution of Land Holding of Sample Households

Type of Households	**Size of Land Holding in Hectares**				
	0.0-0.5	**0.6-0.75**	**0.76-1.0**	**1.1-2.0**	**≥2.0**
Cultivators of Haricot Bean(N=59)	4(6.8%)	19(32.2%)	28(47.5%)	6(10.2%)	2(3.4%)
Non-cultivators of Haricot Bean(N=41)	13(31.7%)	15(36.6%)	10(24.4%)	3(7.3%)	0(0%)
Total(N=100)	**17(17%)**	**34(34%)**	**38(38%)**	**9(9%)**	**2(2%)**

Source: Field Survey, 2008

4.2 Participation of Households in Non-farm Income Generating Activities

70% of cultivators and all of the non-cultivators were participated in non-farm income generating activities. In both groups, 90% of the non-farm income was generated from the PSNP (Productive Safety Net Program). The remaining 6% and 4% of the non-farm income was generated from petty trading and small-scale handcrafts respectively.

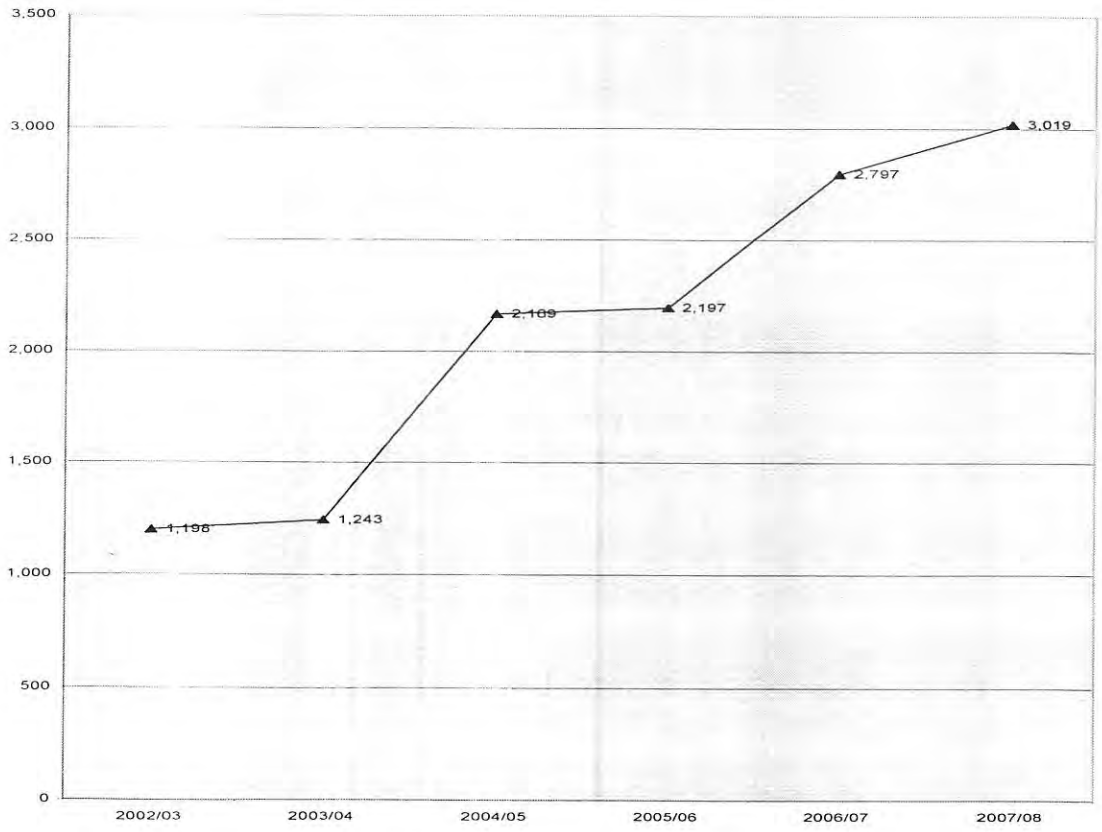
In 2007 cultivators have earned 4,996 Ethiopian Birr and the non-cultivators 5,338 Ethiopian Birr from non-farm income generating activities. On average, the cultivators gained 225 kilograms of wheat, 15 kilograms of pulses and 5 liters of edible oil. On the other hand, the non-cultivators earned 270 kilograms of wheat, 18 kilograms of pulses and 6 liters of edible oil.

The total income obtained from non-farm income generating activities for non-cultivators was higher because all of the non-cultivators were participated in the non-farm income generating activities. Income generated from these non-farm income generating activities contributed positively to improvement of food security and income of rural households. Supporting this argument, a finding by Degefa (2002) verified that employment in non-farm income generating activities has a paramount importance to diversify sources of livelihoods of households and improve their food security and income.

4.3 Cultivation of Haricot Bean in *Tach Gayint* Woreda

In 2002/03 a total of 1,198 hectares of land was cultivated and in 2003/04 the total land covered by haricot bean was increased to 1,243 hectares. Again the trend in cultivated land has shown increment to 2,169 hectares in 2004/05 production year. In 2005/06, total land allotted for cultivating this crop was increased to 2,197 hectares. In 2006/07 a total of 2,797 hectares of farm land was covered by haricot bean. In 2007/08 production year, a total of 3,019 hectares of land was planned to be covered by haricot bean (Figure 6).

Figure 6: Trend in Total Area (in Hectares) Covered by Haricot Bean from 2002/03-2007/08



Source: TGWOoARD, 2007

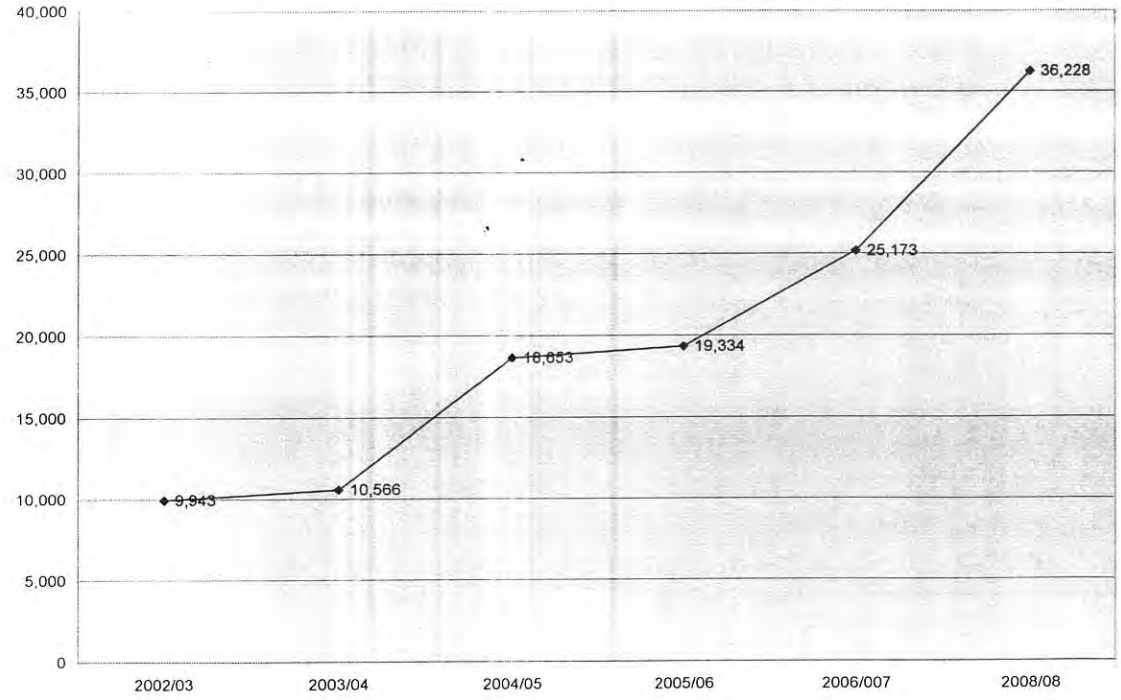
96.6% of sample cultivators of haricot bean responded that land covered by haricot bean was increasing. Few or 3.4% gave their reply as the land covered by this crop remaining the same.

The trend of total area covered by haricot bean shows increment over the stated years. This indicates that farmers have been allocating more farm lands to cultivation of haricot bean rather than other crops in order to. get more output and improve their standard of living.

The basic reason for the increment in cultivated land is mainly attributed to the favorable market opportunity. The investment activity established six years back created conducive market situation and pays reasonable price to cultivators of haricot bean. This intervention supports farmers by providing inputs such as improved seeds of haricot beans in collaboration with the concerned Government bodies. Moreover; the crop is early maturing, better in tolerating drought and helps cultivators to solve their immediate problems such as the inability of repaying loan. Therefore, these and other related factors have been encouraging cultivators to allocate additional farm lands for haricot bean. The focus group discussion and key informant interview undertaken strengths the finding.

The result by EASE (2003) indicates that increment in cultivated land for high value crops made farmers to cultivate more and harvest better outputs. A total of 267,776 hectares of farm land was cultivated in 2001/02. The total area being covered by haricot bean has been increasing from year to year. The haricot bean development plan prepared by Ministry of Agriculture and Rural Development estimated to increase cultivated land to 297,043 hectares in long-term plan (Shaun and Elly, 2006; MoARD, 2007).

Figure 7: Trend in Total Production (in Quintals) from 2002/03-2007/08



Source: TGWOoARD, 2007

In 2002/03 a total of 9,943 quintals of haricot bean was produced. In 2003/04 the trend indicates increment to 10,566 quintals. In 2004/05 total production was increased to 18,653 quintals and in 2005/06 it was raised to 19,334 quintals. The total production was increased to 25,173 quintals in 2006/07 production year. In 2007/08 the plan was to harvest an estimated total output of 36,228 quintals of haricot bean (Figure 7).

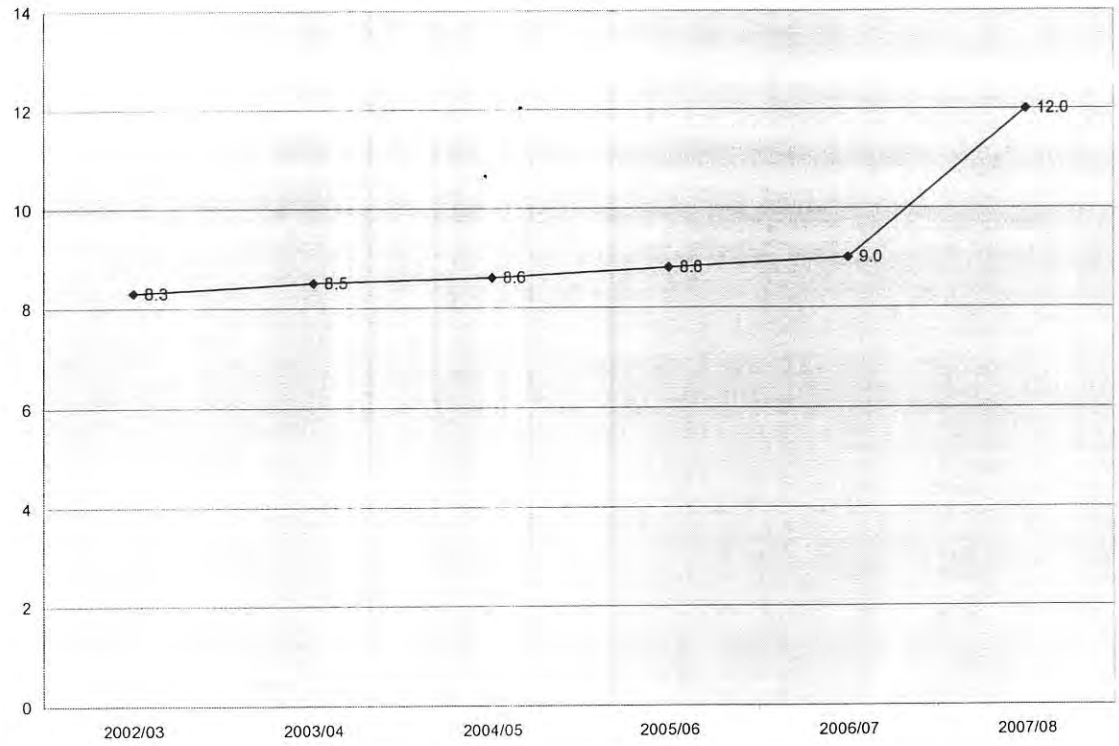
72.9% of sample households responded that total output obtained from haricot bean had increased, 16.9% said it remained the same and the rest 10.2% mentioned that it had decreased.

The trend shows that total production obtained in these years was increasing. The increment in outputs of such high value crops has a paramount significance in contributing to the improvement of livelihood of the rural community and alleviating food insecurity.

The increment in total production was not due to extension services. Extension service had no contribution in the process of cultivating haricot bean because the crop was not included in the package program. Therefore, the increment in total output of haricot bean was mainly because of the increase in total area allotted for cultivating this crop. In addition, the Office of Agriculture and Rural Development has been closely working with the cultivators of haricot bean in order to obtain improved local seed varieties from the neighboring Woredas of South *Wollo* Administrative Zone and *Simada* Woreda. Therefore, this activity has also contributed to the improvement of total output. Also, cultivators have been employing locally important cultural agronomic practices to improve their output. In addition, the agronomic and market related advices given by extension agents and experts contributed to the increment of total output. This result is strengthened by the discussion held with focus group discussants and key informants.

In 2001/02 a total of 1.74 million quintals of haricot beans have been produced which is almost 218 and 190 per cent increment from the 1997/98 output. The total production of haricot bean has been showing an increasing trend over several years. The long-term plan of the MoARD is to further increase the current production of haricot bean to 629,002 tones and increase the impact of this crop (Shaun and Elly, 2006; MoARD, 2007).

Figure 8: Trend in Productivity per Hectare (in Quintals/Hectare) of Haricot Bean from 2002/03-2007/08



Source: TGWOoARD, 2007

In 2002/03 and 2003/04, productivity per hectare of haricot bean was 8.3 and 8.5 quintals per hectare respectively. In 2004/05 it was slightly increased to 8.6 quintals per hectare, where as in 2005/06 productivity per hectare was raised to 8.8 quintals per hectare. The productivity per hectare was increased to 9.0 quintals per hectare in 2006/07 production year. In 2007/08 it was planned to raise the productivity per hectare of haricot bean to 12 quintals (Figure 8).

81.4% of sample households responded that productivity/hectare was increasing, whereas 18.6% replied that there was similar trend in productivity of haricot bean.

The productivity per hectare shows only a slight increment in the stated production years. The productivity per hectare of haricot bean did not show a satisfactory increment as desired because of various challenges.

The basic reasons identified were lack of agricultural extension package supports and improved seeds, insect pests, shortage of rainfall and hail/snow. These factors have been threatening cultivation of haricot bean in *Tach Gayint* Woreda. The discussion held with focus group discussants and key informant interviews supports the finding.

To alleviate these problems and improve productivity per hectare of haricot bean in a better way, the Regional BoARD in collaboration with the Woreda Office of Agriculture and Rural Development has been carrying out preparations to support cultivation of haricot bean with an extension package services starting from 2007/08 production year.

The Productivity per hectare of haricot bean has been showing an increasing trend in the past years. But drought, pests and diseases, shortage of farm land and weak agricultural extension services have been challenging the productivity of haricot bean. Therefore, it has been found that supporting cultivation of high value crops such as haricot beans with extension package plays significant role to increase productivity of these crops (TGWOoARD, 2007 and BoARD, 2007).

4.3.1 Land Preparation and Sowing of Haricot Bean

All of the sample households accomplished land preparation of haricot bean from May first up to May 15. The interviewed households as well as the focus group discussants explained the activity during this time as "***Bederek Mares***". This is literally to mean dry plowing, which is used to expose eggs and larvae of insects to excessive sunlight and get

rid of their damage while the crop is growing in later time. Farmers carry out the activity with the help of oxen pulled *Maresha*. Land preparation was undertaken similar to the duration recommended at the National level for this crop. Preparing the farm land at the right time of the year plays a paramount importance in improving productivity and production of haricot bean. The research finding by the EIAR (2007) strengths this finding. It states that land preparation for haricot bean should start at the beginning of May and continue up to mid of May.

97% of sample cultivators sow haricot bean from June 15 to July 5. 100% of the cultivators responded that they do not apply chemical fertilizers or natural fertilizers such as composts. Their reason was that haricot bean by itself fertilizes the soil and adding natural or chemical fertilizers will do nothing without incurring additional costs to cultivating this crop. 85% of cultivators applied the recommended seed rate, where as the rest did not do so. Sowing of haricot bean is one of the major agronomic activities which need to be carefully accomplished. This is due to the fact that proper accomplishment of the activity has positive impact on productivity and production of haricot bean. Most of the cultivators sow haricot bean at the recommended time of the year. The majority of cultivators used the recommended seed rate though few did not. In relation to the finding of this study, Fikadu (1997); Shaun and Elly (2006) and MoARD (2007) argue that application of all agronomic management practices of haricot bean contributed greatly to the overall yield increment.

91.5% of sample cultivators of haricot bean accessed seeds from their own seed reserves, by purchasing from local markets and through seed exchange among themselves and from neighbors. 5.1% of sample households replied that in addition to the above sources they had seeds by borrowing from relatives or neighbors. The rest 3.4% of sample households indicated that the sources of seeds were purchasing from local market and borrowing from relatives and neighbors. The source of seeds of haricot bean for the majority of cultivators of haricot bean was found to be own seed reserve, purchase from local markets and through exchange. Even though there is problem of accessing seeds of haricot bean in the area, to some extent these sources have alleviated the problem. Thus, this situation made cultivators to accomplish sowing at the right time. The assessment made by the Crop Husbandry Team of *Tach Gayint* Woreda Office of Agriculture and

Rural Development in 2006 indicates that most of the cultivators of haricot bean obtained seeds from the stated sources.

4.3.2 Weeding of Haricot Bean

89.8% of cultivators responded that they did not weed fields of haricot bean. 10.2% responded that they weed fields of haricot bean by employing family labor through hand weeding. The majority of sample cultivators and focus group discussants explained that usually farms of haricot bean have not been weeded because if some one tries to enter and weed it, what they call it "***Yemich Beshita***" might affect it and reduce yield. But this is not scientifically proved and might call for further researches. Haricot bean similar to other crops can be affected by weeds. Thus, the total production obtained from this crop can be reduced. Similarly, quality of the product can be lowered. As one of the major agronomic activities of cultivating haricot bean, weeding operation is essential and needs to be carried out as recommended scientifically. Bahirdar Plant Health Clinic (1995) supports this finding by stating that weeds cause tremendous yield losses (up to 10%) to most of cultivated crops including haricot bean and so the operation should be given due attention.

4.3.3 Harvesting and Threshing of Haricot Bean

Farmers call harvesting of haricot bean in local language as "***Menkel***", that denotes uprooting the whole crop. 100% of cultivators of haricot bean harvest their yield when the crop reaches at the right maturity stage by using family labor. This operation is carried out starting from September 15 and ends in October 15. Threshing of haricot bean takes place after October 15. 97% of sample cultivators thresh haricot bean by employing family labor, where as 3% thresh by using family labor and cattle. All of the cultivators harvest and thresh haricot bean more or less during the right time of the year, which has its own positive contribution to the quantity and quality of the product. Almost all of the cultivators of haricot bean thresh the crop by beating it with sticks after filling sacks with the crop or simply on the floor. Here, family labor was found to be important to do the activity. The finding of FAO (1961) and the Ethiopian Export Promotion Agency (2004) also state that haricot beans are harvested when pods mature. Harvesting of this crop is

usually undertaken by uprooting the whole plants, heaped and dried by sun for a week to reduce the moisture content to about 14%. Most of the threshing activity will be carried out manually by beating with sticks, either directly or after being put in sacks.

The field observation shows that the way farmers thresh haricot bean was not good. Because when the crop is beaten with sticks or threshed with cattle, there was an observable quantity and quality losses. This has its own negative impact on the amount of food and income households get from this crop. In line to this, the assessment made by the Crop Husbandry and Agricultural Development Extension Teams of *Tach Gayint* Woreda Office of Agriculture and Rural Development in 2007 indicates that, most of the farming households thresh all crops particularly haricot bean with family labor and the rest with the help of cattle on the floor or in the field. Therefore, they come to conclude that such an operation results in increasing losses of this crop.

4.3.4 Processing and Storage of Haricot Bean

Processing of haricot bean was almost totally carried out manually by females though there were few numbers of males participating in the activity. Because it has been believed that culturally females are well accustomed to such activities. The key informant interview held with an investor; who buys, processes and sends haricot bean to the main branch at Nazareth also confirmed this statement. 100% of cultivators of haricot bean store the product in locally made materials namely *Gota, Gotera, Kesha (Keretit)* and *Akimada*.

Most of the processing activities are left to females because of traditions that females are well accustomed to the activity and the belief that it is only the activity of females. The above mentioned storage equipments are dominantly used in the area to store different crops including haricot bean. Locally made storing materials are selective cost wise. The result of the assessment carried out by the Woreda Office of Agriculture and Rural Development (2006) indicates that all of the farming communities of *Tach Gayint* Woreda do not have the opportunity of storing their output in improved storage devices. Devices which are produced from local materials have been helping farmers as storage mechanisms for long period of time.

4.3.5 Marketing of Haricot Bean

An investment activity closer to the study area started operating six years back. Soloti Trading House Private Limited Company, which is located at Nazareth, has opened its branch at *Nefas Mewcha*. This investment activity has created favorable market and job opportunity to local farmers. All of the cultivators replied that this market opportunity created conducive environment to enhance cultivation of haricot bean. From the interview made with the investor, the company had 250 temporary laborers and 16 permanent workers. Most of the daily workers were females, because they are culturally accustomed to the processing activity. The interview held with the investor shows that he is very much delighted because of creating this job opportunity to the poor more than any thing else.

For a quintal of haricot bean the investor pays 410 Ethiopian Birr. He also underlined that the product supplied to the company had quality problem even though measures have been taken to reduce the impurity level to about 13%. A quintal of haricot bean was processed by paying 15 Ethiopian Birr per processor. Had it been farmers supplying quality product, the money that is paid to daily laborers for cleaning (i.e., 15 Birr/quintal/worker) would be added to payment of cultivators, which became 425 Ethiopian Birr. In this year the investor supplied more than 5,000 quintals of processed haricot bean to the national market.

The future plan of the investor is to provide improved seeds of haricot bean to farmers, expanding the crop and supporting the agricultural extension intervention of the government, particularly concerning haricot bean with relevant Woreda Offices. For instance, about 450 quintals of seed of this crop was planned to be distributed in order to encourage increased production in three potentially producing Woredas, namely *Tach Gayint, Lay Gayint* and *Simada*.

The market process had constraints. All of the cultivators transport the output with the help of their own labor and pack animals. 88% of the sample households pointed the existence of poor road network. In addition, 79% of sample cultivators replied that individuals who are in between themselves and the investor affected the efficiency of the

market process. Because these middlemen collect the product from farmers with lower market price(even by reducing the normal price to 100 Ethiopian Birr) and selling to the investor with the normal price(i.e., 410 Ethiopian Birr). The focus group discussion held with farmers and key informant interview with the investor strengthens this finding. *Tach Gayint* Woreda is an area characterized by very poor infrastructural developments. It has poor road networks to use vehicles for transporting commodities, no ware houses and telecommunication services among others. These infrastructural related problems directly affect the efficiency of the market process and indirectly production and productivity of haricot bean. In addition, the middle men negatively affected the efficiency of the market process. They have been collecting lots of money at the expense of farmers. This can discourage farmers to produce more. In support of this finding, the above constraints have been well considered by the Regional and the Woreda Administrations. Efforts have been underway in order to improve the infrastructural facilities and reduce unnecessary chains in between producers and the investor (TGWOoARD, 2007).

The investor underlined that farmers who cultivate haricot bean for sure will attain hundred per cent food security as far as they continue cultivating this crop. Their income will also be tremendously increased if they improve their cultivation, because haricot bean is the first priority marketable pulse crop and provides more money.

4.3.6 Value Share of Haricot Bean

Cultivators of haricot bean gave more priority to haricot bean and allotted extra lands for haricot bean cultivation as compared to other crops. Haricot bean requires less labor for different farming practices, requires less moisture and matures earlier so that escaping shortage of rainfall, resists weeds and diseases, requires less or no fertilizer as it naturally fixes atmospheric nitrogen, and provides better output as compared to *tef* and sorghum in the study *Kebeles*. Land preparation, fertilizer application, seed supply, weeding, insect pest and disease control, harvesting, threshing and storing incur costs of production. To this end, the study finding verified that cultivation of haricot bean required 583 Ethiopian Birr, but cultivation of *tef* and sorghum required 1,745 and 1,480 Ethiopian Birr in that order (TGWOoARD, 2007).

Table 7: Value Share of Haricot Bean compared with *Tef* and Sorghum

Crop Type	Average Yield obtained per Cultivator (Quintal)	Market Price (Birr/Quintal)	Total Value (Birr)	Value Share (percent)
Haricot bean	20	410	8,200	61.4
Tef	7	480	3,360	25.1
Sorghum	6	300	1,800	13.5
Total	-	-	**13,360**	**100.0**

Source: Field Survey, 2008

Cultivators of haricot bean expended 583 Ethiopian Birr and obtained 8,200 Ethiopian Birr, which shows net gain of 7,617 Ethiopian Birr. The cost of cultivating *tef* was found to be 1,745 Ethiopian Birr, while the gain was 3,360 Ethiopian Birr. The net gain was 1,615 Ethiopian Birr. To cultivate sorghum sample households expended 1,480 Ethiopian Birr and gained 1,800 Ethiopian Birr. In this case the net gain was 320 Ethiopian Birr (Table 7). Value share of haricot bean compared to the other major crops was found to be higher (61.4%). For *tef* and sorghum the value share was 25.1% and 13.5% respectively (Table 7). Cultivators obtained a large sum of money by selling their haricot bean to the nearby market. Thus, as compared to the other crops haricot bean took the highest value share in providing better income to households. This has a positive impact to income and food security of rural households of *Tach Gayint* Woreda. The crop market value assessment made by the Woreda Office of Agriculture and Rural Development in 2006 strengths this finding. The result released by MoARD (2007) states that haricot bean has got the highest value share among exported pulse crops. For instance, in 2007 32.02 million USD was obtained by exporting this crop.

4.3.7 Credit Services

In *Tach Gayint* Woreda food security credits have been given mainly by the World Bank Food Security Project (WBFSP), the Federal Government assisted Food Security Project (FGFSP) and the Amhara Credit and Saving Institution (ACSI). The former two projects provide their credits through the Woreda Cooperative Promotion Office, where as the later provides the service by itself.

These Food security Project credits have been given based on individual interest and group formation. In the case of the World Bank Food Security Project and the Federal Government assisted Food Security Project, group formation is required simply to effectively monitor and evaluate projects in later times. But group formation in the case of ACSI is to serve as collateral. Regarding the WBFSP, interest rate has been decided by the beneficiaries based on local situations but the interest rate in the other two projects is fixed by the region. Thus, the current interest rate of the WBFSP and the FGFSP is 5% and 7.5% respectively, where as that of ACSI's is 15-18%. Concerning the interest rate of ACSI, 15% of the interest rate is fixed for petty trading and 18% for livestock rearing (TGWOoARD, 2007 and Office of ACSI, 2007).

89.8% of sample cultivators of haricot bean took the loan while 10.2% did not in 2007. Similarly, in the same year 63.4% of non-cultivators took the loan and 36.6% did not (Table 8).

Table 8: Proportion of Food Security Credit Recipient Households by Type

Response of Credit Recipients	Cultivators of Haricot Bean		Non-cultivators of Haricot Bean		Total	Percent of Total
	Frequency	Percent	Frequency	Percent		
Yes	53	89.8	26	63.4	79	79
No	6	10.2	15	36.6	21	21
Total	**59**	**100.0**	**41**	**100.0**	**100**	**100**

Source: Field Survey, 2008

66.7% of cultivators utilized the total credit for the intended purpose they took for. 33.3% used it for activities not planned earlier. 93.3% of non-cultivators used the credit properly while the 6.7% did not. The reasons for not properly utilizing the credit were found to be

lack of the required initial and on-job trainings and follow-ups (60%) and provision of less credit (40%). Proper utilization of credits impacts positively on food security and income of rural households. Large number of cultivators did not keep their promise they made to creditors unlike the non-cultivators because of the stated reasons. In most parts of the country the above reasons prevail and reduce the positive impact of credits. A study by Tsegu (2006) on the impact of agricultural extension package on food security and income of rural households in northern Ethiopia strengthens this finding.

26.7% of cultivators repaid the loan in full, 40% in partial and 33.3% not yet started the repaying process. 16.7% of non-cultivators repaid fully and 83.3% did not start repaying their loan. Though this is the case, it could be too early to comment on the loan repayment status because the agreed time for repaying most of the credits is not reached. The repayment period for dairy cow, goat rearing, purchase of farm oxen was fixed to five years, three years and two years respectively. However, loan taken for petty trading and beekeeping was fixed to be repaid in one year (TGWOoARD, 2006).

4.3.8 Agricultural Extension and Cultivation of Haricot Bean

Though haricot bean has been found to be one of the priority crops in food security of households, it is still not a package crop of the Woreda. But based on its increased importance the Regional BoARD has planned to make it a package crop and provide every necessary extension support to cultivators starting from this production year. The key informant interview made with the Woreda experts indicates that about 750 cultivators of haricot bean will be selected as package beneficiaries. These beneficiaries are going to be provided an in-depth extension package training and support in 2007/08 production year.

All of the sample cultivators responded that they were not participated in the program, except getting some informal agronomic and market based advices from Development Agents and Woreda experts. Due to this they lacked provision of improved technologies (inputs) and related technical supports. Thus, they believe that this had its own negative impact to cultivate haricot bean and obtain good yield. They also added that this was resulted because nobody went to them and provided the package. These results have been

strengthened with focus group discussants and key informant interviews. Contrary to the above facts, agricultural extension program has played a paramount importance in improving productivity and production of the agricultural sector in general and crop production in particular. Because, farmers can have the opportunity of identifying and analyzing lots of production problems. Moreover, they can effectively and efficiently utilize improved agricultural technologies and improve their outputs (MoARD, 2007 and BoARD, 2007). Degefa(2002) in support of this finding indicates that in developing countries such as Ethiopia, where the majority of farmers are illiterate, agricultural extension plays significant role in assisting them by identifying and analyzing different production problems and by making them aware of opportunities for improvement. Thus, the effectiveness of input utilization and proper management of agricultural practices depends on sound agricultural extension support at the grass-roots level.

4.4 Challenges of Cultivating Haricot Bean in *Tach Gayint* Woreda

76.3% of sample cultivators responded that lack of improved seeds, lack of agro-chemicals such as insecticides, shortage of farmland and damage of insect pests were their priority challenges in cultivating haricot bean. 20.3% of sample households replied that in addition to the above factors, unreliable rainfall was also the other problem they face while cultivating haricot bean. 1.7% of sample households indicated that lack of agro-chemicals, unreliable rainfall and lack of farm land was their number one problems. The rest 1.7% mentioned lack of agro-chemicals, unreliable rainfall and insect pests to be priority problems constraining cultivation of haricot bean. In *Tach Gayint* Woreda many factors challenge cultivation of haricot bean. Among these; improved seeds, lack of agro-chemicals, shortage of farm land, shortage of rainfall and damage of insect pests can be raised. All of these factors and others have been reducing production and productivity of haricot bean in the Woreda. The study by Tilaye (2004) on food security determinants and household coping mechanisms; by Biruk (2007) on effects of planting density and varieties of Common bean intercropped with Sorghum on performance of the component crops and productivity of the System; and by the Crop Husbandry Team of *Tach Gayint* Woreda (2007) on pre and post-harvest crop performance assessments supported the finding of the study.

All of the sample non-cultivators of haricot bean responded that they know very well the importance of cultivating haricot bean for human food, livestock feed, generating better income to households and improving fertility status of soils. Although this was their perception, they did not cultivate haricot bean and achieve the stated benefits. The underlying reasons for this were forwarded from sample households. 58.5% did not cultivate this crop because of lack of farm-land. 14.6% responded that they did not have improved seeds and farm-land. 21.9% had fear of damage from insect pests and 5% had fear of shortage of rainfall. In *Tach Gayint* Woreda lack of farm land, lack of improved seeds and insect damage greatly hindered non-cultivator households to be engaged in cultivation of haricot bean. Particularly, lack of farm land was repeatedly raised by most of the non-cultivators. This problem was duly acknowledged by focus group discussants and key informants.

The household interview and focus group discussants indicate that an insect pest called bean beetle has been causing tremendous losses of haricot bean. This insect pest is known by local name as "***Amogneshign*** ", which literally denotes-you cheated me. They say this because when farmers come closer to this insect pest for destroying it, the pest turns upside down to make itself similar with the environment and become unidentifiable. This situation helps this pest to easily fly away without facing any damage. That is why farmers call this insect pest as *amogneshign*. The other insect pest that caused lots of damage to haricot bean in the area is African Ball Worm.

Table 9: Trend in Losses of Haricot Bean due to Different Factors

No	Production Year	Losses Due to						Total Loss in Qts (Quintals)
		Insect Pests		Shortage of Rainfall		Hail or Ice		
		Loss (Qts)	% loss	Loss (Qts)	% loss	Loss (Qts)	% loss	
1.	2002/03	-	-	-	-	7,173	98	7,173
2.	2003/04	-	-	5,083	40	136	66	5,219
3.	2004/05	5,721	85	-	-	-	-	5,721
4.	2005/06	-	-	5,170	15	385	50	5,555
5.	2006/07	8,582	35	-	-	930	75	9,512
	Total	**14,303**	**-**	**10,253**	**-**	**8,624**	**-**	**33,180**

Source: TGWOoARD, 2007

4.5 The Contribution of Cultivating Haricot Bean to Food Security and Income of Rural Households of *Tach Gayint* Woreda

4.5.1 Contribution of Cultivating Haricot Bean to Income of Rural Households of *Tach Gayint* Woreda

The income obtained from crop production, livestock and their byproducts and non-farm income generating activities by cultivators of haricot bean was compared with that of the non-cultivators from the same sources. The total and average annual income obtained from cultivation of crops is presented in table 10.

Table 10: Income Obtained from Crop Production in 2007 Production Year

Type of Households	Income Obtained	
	Total (Birr)	Average/Household (Birr)
Cultivators of Haricot Bean (N=59)	787,491.00	13,347.31
Non-cultivators of Haricot Bean (N=41)	129,169.00	3,150.46
Total (N=100)	**916,660.00**	**9,166.60**

Source: Field Survey, 2008

Cultivators of haricot bean obtained 747,491.00 Ethiopian Birr from crop production as compared to the non-cultivators, who generated only 129,169.00 Ethiopian Birr from the same source (Table 10). The same holds true when we see the average income per household. The average income of cultivators of haricot bean was 13,347.31 Ethiopian Birr, which was by far greater than that of the non-cultivators, which is 3,150.46 Ethiopian Birr (Table 10). The total income contributed from haricot bean was 425,944.00 Ethiopian Birr (Table 11). Therefore, this huge amount of income difference was seen due to contribution of haricot bean. Contrary to this situation, non-cultivators of

haricot bean have lost that much amount of money. The focus group discussion supports the finding. An assessment by the BoARD (2003) and TGWOoARD (2007) on the contribution of important cash crops to income of rural households indicates that cultivators had generated additional income compared to the non-cultivators. The study by Shaun and Elly (2006) also supports the finding.

Table 11: Comparison of Percent Income Share Obtained from the three Major Crops

Type of Households	Income from						Total Income (Birr)
	Haricot Bean		*Tef*		Sorghum		
	Income (Birr)	% share	Income (Birr)	% share	Income (Birr)	% share	
Cultivators of Haricot Bean (N=59)	425,944.00	56.6	260,842.00	34.6	66,010.00	8.8	752,796.00
Non-cultivators of Haricot Bean (N=41)	0.00	0.00	59,904.00	74.8	20,170.00	25.2	80,074.00

Source: Field Survey, 2008

The study compared the three major crops to assess their contribution to total income of sample households. Based on this, cultivators of haricot bean obtained more income (with share of 56.6%) from haricot bean compared to the other major crops. Also 34.6% share of income was drawn from *tef* and the rest 8.8% from sorghum. On the contrary, non-cultivators obtained their major income from *tef* (74.8%) and the rest from sorghum (Table 11). They did not get an additional income of 425,944.00 Ethiopian Birr from haricot bean because they were not cultivators of this crop (Table 11). Moreover, the computed T-test value (Table 12) asserts this finding. Generally, the finding clearly indicates that haricot bean contributes greatly to income of rural households of the study area as compared to the other crops.

Table 12: Comparison of Income obtained from Haricot Bean with *Tef* and Sorghum by Type

Type of Household	Parameter	Haricot Bean	*Tef*	Sorghum	T- calculated
Cultivators of Haricot Bean (N=59)	Mean	7,219.40	4,421.10	1,118.8	6.1**
	Standard Deviation	2,719.50	2,174.90	1,032.30	
	Maximum	13,920	11,520.00	3,960.00	
	Minimum	1,520	708.00	0.00	
Non-cultivators of Haricot Bean (N=41)	Mean	0.00	1,461.10	492.00	
	Standard Deviation	0.00	2,446.33	1,039.42	
	Maximum	0.00	2,880.00	1,900.00	
	Minimum	0.00	576.00	0.00	

**-significant at 1% error level

Source: Field Survey and Own computation, 2008

The mean annual income obtained by cultivators from haricot bean was 7,219.40 Birr/household. Income obtained from haricot bean ranged from 13,920 to 1,520 Birr/household. There was a difference of 12,400 Birr in between. The standard deviation of the cultivators for haricot bean was 2,719.5 Birr/household. But the mean (4421.1 Birr) and standard deviation (2174.9 Birr) of *tef* and sorghum (with mean of 1118.8 Birr and standard deviation of 1032.3 Birr) were found to be less than that of haricot bean (Table 12). Generally, for cultivators of haricot bean the mean and standard deviation of haricot bean was found to be greater than the other crops. Moreover, the computed T-test value was found to be 6.1** (Table 12) indicating the significant contribution of haricot bean to income of rural households.

Table 13: Income Obtained from Livestock and their Byproducts in 2007

Type of Households	Income Obtained			
	From sale of Livestock (Birr)	From sale of Livestock and their Byproducts (Birr)	Total (Birr)	Average/Household (Birr)
Cultivators of Haricot Bean (N=59)	44,434.60	7,841.40	52,276.00	886.03
Non-cultivators of Haricot Bean (N=41)	55,984.40	9,879.60	65,864.00	1,606.44
Total (N=100)	**100,419.00**	**17,721.00**	**118,140.00**	**1,181.40**

Source: Field Survey, 2008

The study clearly indicates that non-cultivators of haricot bean obtained more money from livestock and their byproducts. The average income they (1606.44 Birr/household) obtained was almost twice as compared to the cultivators of haricot bean (886.03 Birr/household) (Table 13). All of the non-cultivators reared more livestock than the cultivators as they had lost opportunities of cultivating haricot bean. However, total average annual income of cultivators of haricot bean was found to exceed that of the non-cultivators because of contribution of haricot bean.

87.6% of total income of households was contributed from crop production, 11.3% from livestock and their byproducts and the rest 1.2% from non-farm income generating activities. Cultivators obtained 93.1% of income from crops, 6.2% from livestock and their byproducts and 0.7% from non-farm income generating activities. Similarly, non-cultivators obtained 64.2% of income from crops, 32.7% from livestock and their byproducts and the remaining 3.1% from non-farm income generating activities (Table 14). In both cultivators and non-cultivators of haricot bean, crop production contributed

the lions share to income of households. Particularly, the contribution of haricot bean was great. Thus, this again illuminates the contribution of haricot bean to income of rural households in the study area. The study by Tsegu (2006), indicates that crop production was found to be the major source of rural household income, but livestock and non-farm activities were found to be the second and third important sources of household income in that order.

Table 14: Summary of Total Income by Source and Type

Type of Households	Income Source			Total
	Crop Production	Livestock and their Byproducts	Non-farm Activities	
Cultivators of Haricot Bean (N=59)	787,491.00	52,276.00	5,798.50	845,565.50
Non-cultivators of Haricot Bean (N=41)	129,169.00	65,864.00	6,301.00	201,334.00
Total (N=100)	**916,660.00**	**118,140.00**	**12,099.50**	**1,046,899.50**

Source: Field Survey, 2008

The average annual income of households from crop, livestock and non-farm activities for cultivators and non-cultivators of haricot bean was found to be Birr 14,331.62 and 4,910.58 respectively. The average annual income of cultivators of haricot bean was greater than that of the non-cultivators by 9,421.04 Birr (Table 15). The highest share to income of cultivators of haricot bean was brought due to contribution of haricot bean.

Table 15: Summary of Average Annual Income of Households in Birr by Source and Type in 2007

Income Source	Type of Households	
	Cultivators of Haricot Bean(N=59)	**Non-cultivators of Haricot Bean(N=41)**
Crop Production	13,347.31	3,150.46
Livestock and their Byproducts	886.03	1606.44
Non-farm Income Generating Activities	98.28	153.68
Total Average Household Income	14,331.62	4,910.58

Source: Field Survey, 2008

4.5.2 Contribution of Cultivating Haricot Bean to Food Security of Rural Households of *Tach Gayint* Woreda

In this study the amount of kilocalorie generated by households will be a good indication whether that household is food secured or not. The perception concerning change in household food consumption, health situation, clothing, schooling situation of children, situation of household saving, livestock possession and related issues are important to say a household is food secure or not. Moreover, clearly identifying months of food gap and the coping mechanisms that households employ are very crucial in assessing food security of households.

Table 16: Distribution of Kilo calorie Generated by Households compared with the Minimum Requirement

Type of Household	Kilocalorie Generated			
	>2200 Calorie/Person/Day		<2200 Calorie/Person/Day	
	Frequency	Per cent	Frequency	Per cent
Cultivators of Haricot Bean (N=59)	10	17.0	49	83.0
Non-cultivators of Haricot Bean (N=41)	2	4.9	39	95.1

Source: Field Survey, 2008

Compared with 2200 calories/person/day, only 17% of cultivators of haricot bean fulfilled the minimum calorie requirement from their own production (Table 16). On the other hand the percentage of non-cultivator households who fulfilled their minimum daily calorie requirement was 4.9% (Table 16). Haricot bean contributed 35.1% to the total kilocalorie generated by cultivators of haricot bean. But non-cultivators lacked that amount of kilocalorie because of not cultivating haricot bean. The calorie generated by cultivators of haricot bean was found to be higher due to great contribution of haricot

bean. At this junction it is possible to see the contribution of this crop to food security of rural households. The study by Roger *et* al., (2000) supports this finding.

Table 17: Kilo calorie Comparison of Haricot Bean with *Tef* and Sorghum by Type

Type of Households	Parameter	Haricot Bean	*Tef*	Sorghum	T- calculated
Cultivators of Haricot Bean (N=59)	Mean	3381.6	2557.3	915.6	8.06***
	Standard Deviation	1496.7	1248.4	856.6	
	Maximum	6674.8	6048.0	3326.4	
	Minimum	488.4	371.7	0.0	
	Range	6186.4	5676.3	3326.4	
Non-cultivators of Haricot Bean (N=41)	Mean	0.0	774.44	413.2	
	Standard Deviation	0.0	268.24	392.0	
	Maximum	0.0	1512.0	1596.0	
	Minimum	0.0	302.4	0.0	
	Range	0.0	1814.4	1596.0	

***-Highly significant at 1% error level

Source: Field Survey and Own computation, 2008

For cultivators, the mean and standard deviation of kilocalorie generated from haricot bean was 3381.6 and 1496.7 respectively. But it was zero for non-cultivators. Similarly, the mean and standard deviation of kilocalorie obtained from *tef* was 2557.3 and 1248.4 in that order for cultivators. For the non-cultivators it was 774.44 and 268.24 respectively. In the case of sorghum, the mean and standard deviation generated was 915.6 and 858.6 respectively for cultivators. For non-cultivators it was 413.2 and 392.0 in that order. The T-test value computed was 8.06*** (Table 17). This indicates that kilocalorie generated from haricot bean was highly significant as compared with *tef* and sorghum. Generally, all these computations show that cultivators generated more

kilocalorie from haricot bean as compared to other crops. Similarly, kilocalorie generated by cultivators exceeds that of the non-cultivators because of similar reason. The finding of Roger *et* al., (2000) strengths this statement.

Table 18: Distribution of Available Kilocalorie per Household Generated from Own Production in 2007

Available Kcal	Type of Household				Total	
	Cultivators of Haricot Bean		Non-cultivators of Haricot Bean			
	Number	Per cent	Number	Per cent	Number	Percent
86432-343575	12	20.3	23	56.1	35	35.0
342576-699997	16	27.1	13	31.7	29	29.0
699998-790298	21	35.6	3	7.3	24	24.0
790299-1607825	10	17.0	2	4.9	12	12.0
Total	**59**	**100.0**	**41**	**100.0**	**100**	**100.0**

Source: Field Survey, 2008

- **Distribution of Available Kilocalorie per Household**

35% of sample households (20.3% of cultivators and 56.1% of non-cultivators) have eleven months food deficit. 29% of total sample households (27.1% of cultivators and 31.7% of non-cultivators) have seven months food deficit. 24% of sample households (35.6% of cultivators and 7.3% of non-cultivators) have two months food deficit. The majority or 64% of sample households have greater than six months (seven to eleven months) food deficit (Table 18). Large numbers of non-cultivators (87.8%) have more than six months or seven to eleven months food deficit. On the contrary, only 47.4% of cultivators of haricot bean have more than six months or seven to eleven months food deficit (Table 18). This indicates that cultivation of haricot bean contributed much to the amount of food available to rural households. Even though cultivators had increased their

kilocalorie availability by cultivating haricot bean, food deficit is still found to be big problem for the majority of rural households of the study area (TGWOoARD, 2007).

- **Kilocalorie Generated from PSNP (Food for Work) Intervention by Type**

Though food deficit is still a big problem, through the Productive Safety Net Program households obtained food payments (grains, pulses and edible oils) for food for work activities. Based on this background, the total available kilocalorie per person per year was computed and presented in table 22. All of the cultivators of haricot bean fulfilled the minimum calorie requirement because of additional calorie (340144 kilocalorie or 42.4% kilocalorie share) obtained from the food for work interventions. Thus, cultivators had generated excess kilocalorie (908297=113%) greater than the minimum requirement/person/year, which is 803000. Similarly, the food for work interventions have increased available calorie of non-cultivators by 50.8% and their total available kilocalorie/person/year was raised to 490170(61%) (Table 19). A study by Tsegu (2006) supports this finding and states that households who have participated in food for work interventions raised their kilocalorie requirement from 67.5% to 107.9%.

Table 19: Average Available Kilocalorie per Person per Year by Type for 2007

Type of Households	Kilocalorie Available				Minimum Calorie Requirement per person per Year	Total	
	Own Production		Food for Work				
	Amount	%	Amount	%		Amount	%
Cultivators of Haricot Bean (N=59)	568153	70.8	340144	42.4	803000	908297	113
Non-cultivators of Haricot Bean (N=41)	81998	10.2	408172	50.8	803000	490170	61

Source: Field Survey, 2008

4.5.2.1 Perception of Households on their Food Security Status

72.9% of cultivators of haricot bean had the capacity of covering six to nine months of food requirement. 18.6% of them had the ability of covering food requirements for nine to twelve months. Only 3.4% covered their food requirement for a year. But the situation was changed during cultivating haricot bean. 81.4% of cultivators perceived that they can cover their food requirement for twelve months due to cultivation of haricot bean. 10.2% and 6.8% covered food requirement for nine to twelve months and for six to nine months respectively (Table 20). These all show the improvement in covering food requirement of households. This improvement was basically because of cultivation of haricot bean. The focus group discussants also agreed with this idea. Improving food security of rural households of *Tach Gayint* Woreda requires integration of lots of agricultural and rural development interventions. Working by focusing on high value marketable crops has got priority attention in the process of improving food security of rural households of the Woreda. For instance; expansion of haricot bean cultivation and promotion of apple can be mentioned (TGWOoARD, 2007).

Contrary to what was achieved by cultivators, non-cultivators of haricot bean had the following scenario. 65.8% had the ability of covering food only for three to six months. 19.5% covered their food requirement for six to nine months. 12.2% and 2.4% of them covered their food requirement for nine to twelve months and for less than three months in that order. From non-cultivators of haricot bean nobody had the capacity of covering his/her food requirement for the whole months in a year (Table 20). Non-cultivators had no possibility of cultivating haricot bean and that is why they lost the opportunity of covering their food deficit in a better situation similar to the cultivators. Focus group discussion undertaken strengths the finding of the study.

Table 20: Perception of Households on their Food Security Status

Number of Months of Food Gap Covered by Households	Type of Households					
	Cultivators of Haricot Bean (N=59)				Non-cultivators of Haricot Bean (N=41)	
	In absence of Cultivating Haricot Bean		In time of Cultivating Haricot Bean			
	Frequency	%	Frequency	%	Frequency	%
12 months	2	3.4	48	81.4	0	0.0
9-12 months	11	18.6	6	10.2	1	2.4
6-9 months	43	72.9	4	6.8	8	19.5
3-6 months	3	5.1	1	1.6	27	65.9
< 3 months	0	0.0	0	0.0	5	12.2

Source: Field Survey, 2008

4.5.2.2 Perception of Households on Changes brought about due to Cultivating Haricot Bean

Qualitative questionnaires were forwarded to sample cultivators of haricot bean concerning changes brought about by cultivating haricot bean. These questionnaires were based on important food security indicators such as household food consumption, livestock possession, income, students attending school, health situation, clothing and saving.

There was an improvement in household food consumption, livestock possession, income, number of students attending school, health situation and clothing. Saving did not show improvement; rather it remained similar with the existing situation. Contrary to this finding, there were few sample cultivators who replied that there was no improvement in the stated parameters due to cultivation of haricot bean. Similarly, other few sample cultivators responded that it was difficult to respond about the changes observed due to cultivating this crop. The rest of sample cultivators reported that there was no improvement or deterioration on the above parameters (Table 21). Improvements

observed in most or all of the parameters were due to contribution of haricot bean. The discussion held with focus group discussants enforces this finding.

Table 21: Perception of Cultivators of Haricot Bean on Changes brought by Cultivating this Crop

Parameter	Deteriorated (%)	Same (%)	Improved (%)	Do not know (%)	Total (%)
Food Consumption	2	30	65	3	100
Livestock Possession	5	35	55	5	100
Household Income	2	23	75	0	100
Number of Students Attending School	2	38	56	4	100
Family Health Situation	6	42	47	5	100
Clothing	10	40	49	1	100
Saving	12	65	22	1	100

Source: Field Survey, 2008

4.5.2.3 Housing Condition of Households

81.4% of cultivators of haricot bean live in grass thatched houses, 3.4% in iron sheet covered houses and 15.3% in both grass thatched and iron sheet covered type of houses. On the contrary, all (100%) of the sample non-cultivators of haricot bean live in grass thatched houses. Housing condition could be one indicator of judging whether that household is in good position of food security or not. Cultivation of haricot bean improved the housing condition of households. The data obtained from focus group discussants provide similar argument. Moreover, Legesse (2007) supports the finding by stating that cultivation of important marketable crops has been helping cultivator households in order to change their housing from grass thatched to iron sheet covered houses.

4.5.2.3 Relief Food Aid Requirement of Households

Need for relief food was reduced significantly (69.5%) among cultivators of haricot bean. Contrary to this, the requirement for relief food was significantly increased (63.4%) among non-cultivators. Therefore, it is possible to observe the positive impact of haricot bean in reducing relief food aid requirement among cultivators of haricot bean compared to the non-cultivators. The assessment by the Woreda Food Security and Disaster Prevention Team of the Office of Agriculture and Rural Development (2006) indicates that there was a dramatic reduction in the number of cultivators of haricot bean who appeal for relief food aid. But the number of non-cultivators who need relief food aid has been rising. Similar argument was forwarded by focus group discussants.

4.5.2.4 Coping Strategies of Households

All of the cultivators of haricot bean employed mostly reducing number of meals, reducing quantity of meals, and participation in food and cash for work activities. The same was true with the non-cultivators. Eating less preferred foods, sale of livestock, migration in search of job, eating wild foods and appealing for relief food were also other coping strategies employed by households of the study area (Table 22).

Rural households employed various coping strategies in order to cope up with adverse food shortages. There are lots of coping strategies that farmers take in to account. Among these reducing quantities of meal, reducing number of meal taken in a day, participating in food or cash for work activities, eating less preferable foods, sale of livestock, migration in search of job, eating wild foods and appealing for relief food aid are some of them to be mentioned. The finding of Tilaye (2004) states that rural households utilized similar coping mechanisms to withstand food deficit. Similarly, the study by the Woreda Food Security and Disaster Prevention Team in 2006 states that rural households of *Tach Gayint* Woreda employ various coping mechanisms during food shortage. It states that reducing number of meals, reducing quantity of meals, participation in food for work or cash for work interventions, appeal for food aid, sale of productive assets and sale of labor are some of the coping strategies employed by households.

Table 22: Coping Strategies of Households by Type

Parameter	Cultivators of Haricot Bean (N=59)			Non-cultivators of Haricot Bean (N=41)		
	Frequently	Rarely	Never	Frequently	Rarely	Never
Reducing quantity of meals	13(22.0%)	15(25.4%)	31(52.5%)	2(4.9%)	38(92.7%)	1(2.4%)
Reducing number of meals	0(0.0%)	18(30.5%)	41(69.5%)	1(2.4%)	38(92.7%)	2(4.9%)
Participation in food or cash for work	6(10.2%)	41(69.5%)	12(20.3%)	28(68.3%)	8(19.5%)	5(12.2%)
Eating less preferred foods such as *"Kollo"*	4(6.8%)	37(62.7%)	18(30.5%)	9(21.9%)	9(21.9%)	23(56.1%)
Sale of livestock	1(1.7%)	19(32.2%)	39(66.1%)	2(2.4%)	39(95.1%)	0(0%)
Migration in search of job	2(3.4%)	10(16.9%)	47(79.7%)	5(12.2%)	14(34.1%)	22(53.7%)
Eating wild foods	2(3.4%)	5(8.5%)	52(88.1%)	6(14.6%)	16(39.0%)	19(46.3%)
Appeal for relief food	0(0%)	8(13.6%)	51(86.4%)	8(19.5%)	27(65.9%)	6(14.6%)

Source: Field Survey, 2008

4.5.2.5 Future Prospects of Cultivating Haricot Bean in *Tach Gayint* Woreda

Households call haricot bean as *"Yedeha Siga"*, which literally denotes '**Meat of the poor**'. They explained that haricot bean is very useful because farmers have been trained that they can easily obtain essential nutrients from this crop with less cost, which can be obtained from meat of livestock with additional cost. That is why they come to say that haricot bean to be *yedeha siga.*

All of sample cultivators of haricot bean strongly expressed in their local language the contribution of haricot bean by saying that, "***Zabutie besefiwu mameret kechalin sigawun magignet bicha sayihon Negusim enihonalen***", meaning they will not only obtain this 'meat of the poor' but also become a king by cultivating haricot bean. But they also indicated their fear concerning constraining factors such as the bean beetles (***Amogneshign***) that advererselv challenges this prospect. Though this is their fear they hope that they will be a king (*Negus*) if the Government provides them different extension package supports. However, all of them believe that there will be more and strengthened cultivation and promotion of haricot bean in the future. Cultivation of haricot bean has got due attention by cultivators, the Government and other development partners. This is due to the increasing importance of the crop to food security and income of rural households and its role in generating huge amount of foreign currency. Therefore, it can be clear that the future prospect of cultivating this crop in *Tach Gayint* Woreda will be promising. The discussion held with focus group discussants and key informants supports the finding. Moreover, the information obtained from *Tach Gayint* Woreda Office of Agriculture and Rural Development, the Regional BoARD and the MoARD in 2007 enforces this finding.

CHAPTER FIVE: Conclusion and Recommendations

5.1 Conclusion

Chronic food insecurity is a major problem in many parts of the country in general and the Amhara National Regional State in particular. *Tach Gayint* Woreda is among those areas of the Region, which has been affected by chronic food insecurity. To alleviate this problem, the Federal and the Regional Governments in collaboration with lots of stakeholders have designed various Food Security Program Interventions since 2002. For instance; the Productive Safety Net Program, the World Bank and the Federal Government assisted Food Security Projects can be mentioned.

The current study has concluded on improvements made in food security status and income of rural households, different agronomic practices and challenges of cultivating haricot bean as follows.

Tach Gayint Woreda is generally classified as an area which has huge potential and favorable condition to cultivate haricot bean. All of the six low-land (*kolla*) *Kebeles* namely *Gedoda, Endewa, Adansa, Aduka, Efrata* and *Betelihum* are potential producers of haricot bean. Some parts of the other six mid-land (*weina-dega*) *Kebeles* namely *Enjit, Anseta, Eskinderawit, Aketo, Jaji* and *Agat* are also favorable for cultivating haricot bean though they are not potential producers.

Area cultivated, total production and productivity of haricot bean have shown increment over the stated years. On average cultivators of haricot bean had obtained 7,219.40 Birr per annum as compared to the non-cultivators, who had lacked this amount of money. There was gap in income among both types of households. However, due to cultivation of haricot bean the gap for cultivators was less than the non-cultivators.

The amount of kilocalorie generated per individual per year by cultivators of haricot bean was found to be 568153 and for non-cultivators 81998. Again this difference was attributed to contribution of haricot bean. The result of the study clearly indicates that both cultivators and non-cultivators of haricot bean faced gap in amount of kilocalorie

requirement. For cultivators the gap was 234847(29.2%) and for non-cultivators it was 721002(89.8%). Here also the gap for cultivators was less than the gap for non-cultivators due contribution of haricot bean.

However, the gap in available kilocalorie requirement was fulfilled by the food for work intervention of the productive safety net program and other non-farm income generating activities. Thus, all (100%) of cultivators who had food gap and who participated in the program had achieved more than the minimum kilocalorie requirement (113%). On the other hand, non-cultivators had raised their minimum kilocalorie requirement by 50.8% and obtained 61% of their minimum kilocalorie requirement. In addition, cultivators had obtained 5,798.50 Birr and non-cultivators 6,301.00 Birr from this intervention and other non-farm income generating activities. This helped households to raise their income.

Lack of adequate farm land is one factor for exacerbating the problem of food insecurity in *Tach Gayint* Woreda. Only 11% of sample households had greater than or equal to a hectare of farm land. The rest had farming land which is less than one hectare. Moreover, 2% of households were found to be landless. This problem has affected both cultivators and non-cultivators of haricot bean. Because of this the majority of households, particularly non-cultivators have lost the opportunity of cultivating haricot bean in order to improve their food security status and income.

Various biotic and abiotic factors have caused yield losses of haricot bean. The major biotic factors were insect pests (Bean beetles and African boll worm). Moreover, yield loss was registered because of abiotic factors such as unreliable or shortage of rainfall, hail or snow, lack of agricultural extension support, lack of improved seed varieties and other related factors.

Market opportunity closer to *Tach Gayint* Woreda at *Nefas Mewucha* has been playing significant role in encouraging cultivators of haricot bean to do more. The payment of reasonable market price to cultivators of haricot bean contributed positively to their food security and income. Though the establishment of the market has a paramount

significance to expand cultivation of haricot bean, the problems identified have been affecting the efficiency of the market process.

In addition to generating income from agriculture, households obtained additional income from different non-farm income generating interventions. This had its own positive contribution to food security and income of sample rural households.

Though the food security and income of most of the cultivators of haricot bean were improved by cultivating haricot bean, still there are households who had no sufficient food and income in order to bring themselves out of the food insecurity they have been facing.

5.2 Recommendations

Some essential recommendations, which were emanated from the findings of the current study are provided below. These recommendations are assumed to be useful to expand cultivation of haricot bean and contribute to rural household food security of *Tach Gayint* Woreda.

- *Tach Gayint* Woreda is a moisture stress area. This negatively affects cultivation of haricot bean. Thus, in order to reduce its impact all concerned bodies should consider measures like provision of early maturing and moisture tolerant improved seed varieties of haricot bean and employ area specific moisture conserving strategies.
- Cultivation of haricot bean has lacked policy support. For instance, there has been no any agricultural extension package policy support concerning this crop unlike other crops. Therefore, the Regional Government and other concerned stakeholders should formulate and implement favorable policies of extension package for haricot bean to enhance the contribution of this crop to food security and income of rural households.
- *Tach Gayint* Woreda Office of Agriculture and Rural Development and other stakeholders should address the damage of insect pests. Therefore, they should

take immediate and essential remedies such as provision of insect resistant improved seed varieties and appropriate insect control chemicals (insecticides).

- The nearby market opportunity has positive impact to enhance expansion of haricot bean cultivation. But the market process had constraints which threaten its efficiency. Therefore, measures such as infrastructural development (for instance; roads and storage houses) activities and breaking unnecessary market chains between the cultivators and the investor should be carried out by concerned bodies in order to enhance the contribution derived from haricot bean.
- Rural households generate additional kilocalorie and income requirement from different non-farm income generating activities. Therefore, there should be an effort to create more labor based non-farm income generating activities by concerned bodies.
- Shortage of farm land is one of the major problems exacerbating food insecurity of *Tach Gayint* Woreda. Therefore, concerned bodies should undertake the following measures in order to reduce the impact of this problem:
  - Adaptation of appropriate or area specific new technologies that can maximize productivity per given plot of land should be undertaken,
  - Rehabilitating gullies will provide new farm lands. Therefore, activities of rehabilitating lots of gullies in the area should continue in a strengthened manner,
  - It is very much important to effectively and efficiently utilize the fertile low land plain areas of the Woreda, which are bordered by big potential rivers such as *Beshilo*, *Zita*, *Shodeb* and *Chefa*.

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Appendix 1: Household Questionnaire

Name of *Kebele*:_____
Household Code:_____
Name of Enumerator:_____Signature:_____ Date:_____

Part 1: Demographic Data

1.1 Name of Household Head:_____
1.2 Sex: 1: Male; 2: Female
1.3 Age: 1: 15-49; 2: 50-59; 3: ≥60
1.4 Marital Status : 1: Married; 2: Not Married; 3: Divorced; 4: Separated; 5: Widowed.
1.5 Religion and Ethnicity:_____
1.6 Family Size: 1: Male_____; 2: Female_____; Total:_____
1.7 Detail Description of Households:

No.	Name	Age	Sex		Education	Type of Job	
			Male	Female		Major	Additional
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10							
	Total						

Codes for Qn.1.7

Education

0: Illiterate;
1: Read and Write;
2: Grade 1-4;
3: Grade 5-8;
4: Grade 9-10;
5: Grade 10 and above.

Type of Job

1: Farming;
2: Petty trade;
3: Handcrafts;
4: Student;
5: Retired;
6: Other (Specify).

1.8 Land Holding Size 1: 0-0.5 hectare(ha);
2: 0.6-0.75 ha;
3: 0.76-1.0 ha;
4: 1.1-2.0 ha;
5: ≥2 ha.

Appendix 1: Household Questionnaire

Name of *Kebele*:_____
Household Code:_____
Name of Enumerator:_____Signature:_____ Date:_____

Part 1: Demographic Data

1.1 Name of Household Head:_____
1.2 Sex: 1: Male; 2: Female
1.3 Age: 1: 15-49; 2: 50-59; 3: ≥60
1.4 Marital Status : 1: Married; 2: Not Married; 3: Divorced; 4: Separated; 5: Widowed.
1.5 Religion and Ethnicity:_____
1.6 Family Size: 1: Male_____; 2: Female_____; Total:_____
1.7 Detail Description of Households:

No.	Name	Age	Sex		Education	Type of Job	
			Male	Female		Major	Additional
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10							
	Total						

Codes for Qn.1.7

Education

0: Illiterate;
1: Read and Write;
2: Grade 1-4;
3: Grade 5-8;
4: Grade 9-10;
5: Grade 10 and above.

Type of Job

1: Farming;
2: Petty trade;
3: Handcrafts;
4: Student;
5: Retired;
6: Other (Specify).

1.8 Land Holding Size 1: 0-0.5 hectare(ha);
2: 0.6-0.75 ha;
3: 0.76-1.0 ha;
4: 1.1-2.0 ha;
5: ≥2 ha.

1.9 Fertility of the land

1: Poor;
2: Good;
3: Medium;
4: Higher.

1.10 Were there family members, who participated in non-farm income generating activities in the last 12 months?

1: Yes; 2: No.

1.11 If Yes, fill the table below

No.	Name of Participant	Type of Activity	Distance of the work place(km)	No. of Days in the Year	Total Income obtained			
					Birr	Type		
						Kind	Unit	Quantity
1.								
2.								
3.								
4.								
5.								
	Total							

Code for Qn. 1.10

1: Weaver;
2: Pottery;
3: Carpentry;
4: Grain trade;
5: Food or cash for work;
6: Leather works;
7: Other (Specify).

1.12 Did you receive relief aid in the last 12 months?

1: Yes, 2:No.

1.13 If Yes, explain the type of aid and amount

1.13.1 Food----kg(kilogram);
1.13.2 Edible oil----- liters;
1.13.3 Nutritious food-----kg (kilogram) (Nutritious food includes CSB and Pulses).

1.14 If in cash amount obtained was Birr_____.

1.15 Average Monthly income of households?

1: <100 Birr;
2: 101-350 Birr;
3: 351-600 Birr;
4: 601-900 Birr;
5: ≥901 Birr.

1.16 Household Assets

No.	Type of Asset	No. of Assets					
		0	1	2	3	4	›4
2	Ox						
3	Cow						
4	Heifer						
5	Calf						
6	Donkey						
7	Mule						
8	Horse						
9	Beehive						
	Type of Asset	**‹5**	**5-10**	**10-15**	**15-20**	**›20**	
1	Poultry						
2	Goat						
3	Sheep						
4	Other(Specify)						

1.17 Income obtained from sale of Livestock and their Byproducts

No.	Type of sale	Unit	Quantity	Average selling price(Birr)	Total(Birr)
1	Sale of livestock				
1.1	Ox				
1.2	Non-ox cattle				
1.3	Small Ruminants				
1.4	Poultry				
1.5	Bee colony				
1.6	Equines				
2	Sale of livestock byproducts				
2.1	Milk of cow				
2.2	Butter of cow				
2.3	Honey				
2.4	Egg				
2.5	Skins and hides				
	Total				

Part 2: Cultivation of Haricot Bean

(Questions to be presented only for Cultivators of Haricot Bean)

2.1 When did you start expanded cultivation of haricot bean?
1: before a year;
2: before two years;
3: before three years;
4: before four years;
5: before five years.

2.2 Why do you cultivate haricot bean?
1: for human food;
2: for improving household income;
3: for livestock feeding;
4: all;
5: Other (Specify).

2.3 Do you use improved technologies to cultivate this crop?
1: Yes, 2:No.

2.4 If yes, rate of fertilizer used in accordance to expert's advice
1: Same;
2: Less;
3: Greater.

2.5 What about improved seeds?
1: same;
2: Less;
3: Greater.

2.6 What about agro-chemicals?
1: Same;
2: Less;
3: Greater.

2.7 If the answer of Qn. No. 2.3 is No, what is your possible reason(s)? Because,
1: I did not need it;
2: I can not afford it;
3: Nobody brought these technologies to us;
4: Other (Specify).

2.8 Do you use organic fertilizers?
1: Yes, 2: No.

2.9 If yes, type of organic fertilizer used is _____.

2.10 What is the source of seeds of haricot bean?

1: reserved local seeds;
2: purchase of local seeds;
3: borrowing local seeds from relatives and neighbors;
4: exchange of local seeds;
5: all;
6: other (specify).

2.11 Do you use the proper seed rate?
1: yes, 2: No.

2.12 Do you get agricultural extension services?
1: yes, 2: No.

2.13 If yes, how do you evaluate the support of Woreda Experts and DAs?
1: very good support;
2: good support;
3: weak support.

2.14Number of visits made by DAs and Experts in a week is
1: throughout the week;
2: five days per week;
3: three days per week;
4: one day in a week;
5: no visit at all.

2.15Land covered by haricot bean has shown
1: increment;
2: decrement;
3: no change.

2.16 Is there increment in productivity of haricot bean?
1: yes, 2: no.

2.17 If yes, the reasons are?
1: use of improved local seeds;
2: use of organic fertilizer;
3: use of other locally useful experiences/knowledge;
4: other (specify).

2.18 Major challenges during cultivating haricot bean are
1: lack of improved seeds;
2: lack of pest and disease control chemicals;
3: unreliable or shortage of rainfall;
4: lack of farm land;
5: Insect pests, weeds and diseases;
6: all;
7: other (specify).

2.19 State type of crops you cultivate
1: Haricot bean;
2: *Tef*;
3: Sorghum;
4: Millet;
5: other (specify).

2.20 Amount obtained from these in this production season
1: Haricot bean_____qts (quintals);
2: *Tef*_____qts;
3: Sorghum_____qts;
4: Millet_____qts;
5: other (specify).

Total:

2.21 Cash obtained if sold
1: Haricot bean_____qts (quintals);
2: *Tef*_____qts;
3: Sorghum_____qts;
4: Millet_____qts;
5: other (specify).

Total:

2.22 Amount consumed by family members
1: Haricot bean_____qts (quintals);
2: *Tef*_____qts;
3: Sorghum_____qts;
4: Millet_____qts;
5: other (specify).

Total:

2.23 Yield of haricot bean obtained per hectare shows
1: increment;
2: decrement;
3: same.

2.24 Costs to cultivate haricot bean_____.

2.25Do you think that the nearby market opportunity encourage cultivation of haricot bean?
1: yes; 2: no.

2.26 Market price of a quintal of haricot bean is
1: 200-300 Birr;
2: 301-400 Birr;
3: 401-500 Birr;
4: 501 Birr and above.

2.27 Marketing problems observed_____

2.28 Weeding mechanism is
1: by hand weeding (labor based);
2: by machineries;
3: other (specify).

2.29 Among haricot bean, *tef* and sorghum which one requires less labor?

2.30 Which one requires less moisture or early maturing?

2.31 Which one is more resistant to weeds and diseases?

2.32 Which one requires less or no fertilizer?

2.33 Which one provides better output?

2.34 When and how do you harvest haricot bean?

2.35 How do you thresh haricot bean?

2.36 How do you process and store haricot bean?

Questions to be provided only for Non-cultivators of Haricot Bean

2.1 Why don't you cultivate haricot bean?
1: because of lack of improved seeds;
2: because it has less use;
3: because of lack of farm land;
4: because of fear of unreliable rainfall;
5: all;
6: other (specify).

2.2. Do you know the importance of haricot bean?
1: yes; 2: no.

2.3 If yes, mention some of the importance
1: it is useful for human feeding;
2: it increases income of households;
3: it is useful as livestock feed;
4: all;
5: other (specify).

2.4 Do you think that you get some or all of these uses if you have an opportunity of cultivating haricot bean?
1: yes; 2: no.

2.5 How do you express the contribution of haricot bean to food and income of households?

1: very great contribution;
2: great contribution;
3: no contribution;
4: other (specify).

2.6 Type of crops you cultivate
1: *Tef*;
2: Sorghum;
3: Millet;
4: Maize;
5: other (specify).

2.7 Amount obtained in this production season
1: *Tef*_____Qts (Quintals);
2: Sorghum_____Qts;
3: Millet_____Qts;
4: Maize_____Qts;
5: other (specify).

Total:

2.8 Have you sold some of the outputs?
1: yes; 2: no.

2.9 If yes, cash obtained from each
1: *Tef*_____Birr;
2: Sorghum_____Birr;
3: Millet_____Birr;
4: Maize_____Birr;
5: other (specify).

Total:

2.10 Amount consumed by family members
1:*Tef*_____Qts;
2:Sorghum_____Qts;
3:Millet_____Qts;
4:Maize_____Qts;
5:other (specify).

Total:

Part 3: Credit Services

3.1 Did you get food security credits in 1999/2000 E.C production year?
1: yes; 2: no.

3.2 If yes, for what activity
1: for sheep and goat rearing;
2: for purchasing farm oxen;
3: for purchasing dairy cow;
4: for petty trading;
5: for purchasing crop seeds;
6: all; 7: other (specify).

3.3 Who provided you the credit?
1: World Bank Food Security Project;
2: Federal Government assisted Food Security Project;
3: Amhara Credit and Saving Institution (ACSI);
4: All;
5: other (specify).

3.4 Did you get the amount needed?
1: yes; 2: no.

3.5 Who informed you to take the credit?
1: Development Agents;
2: Woreda experts;
3: *Kebele* leaders;
4: all;
5: other (specify).

3.6 Did you use the credit properly?
1: yes; 2: no.

3.7 If no, why?
1: because of lack of initial and on-job trainings;
2: it was given to me without my interest;
3: failure of the activity due to environmental constraint;
4: the credit given was less than the required amount;
5: the credit was used for unplanned or unproductive activities;
6: all;
7: other (specify).

3.8 Do credits of food security projects support directly or indirectly cultivation of haricot bean?
1: yes; 2: no.

3.9 If yes, why so?
1: because it improves household income;
2: useful to fulfill important inputs;
3: all;
4: other (specify).

3.10 Do you repay the credit timely?
1: yes, totally; 2: yes, partially; 3: no at all.

3.11 If no or partially, what are the possible reasons?
1: it is not the right time to pay;
2: failure of the project due to environmental impact;
3: the credit was used for unproductive or unplanned activities;
4: due to lower output market;
5: all;
6: other (specify).

3.12 If the answer is totally and partially, what are the possible sources of repayment?
1: non-farm income;
2: income from sale of livestock and their byproducts;
3: income from sale of crop output;
4: all;
5: other (specify).

Part 4: Perception of Households on their Food Security Status

4.1 Capacity to cover food gap in absence of cultivation of haricot bean (only for cultivators of haricot bean?)
1: for 12 months;
2: for 9-12 months;
3: for 6-9 months;
4: for 3-6 months;
5: for ≤ 3 months.

4.2 What about during cultivation of the crop?
1: for 12 months;
2: for 9-12 months;
3: for 6-9 months;
4: for 3-6 months;
5: for ≤ 3 months.

4.3 Perception of Households on changes brought on food security indicators due to cultivation of haricot bean

No.	Type of change	Improved (2)	Same (1)	Reduced (0)	Don't know (3)
1	Food consumption				
2	No. of livestock				
3	Income of households				
4	Schooling situation				
5	Health situation				
6	Clothing situation				
7	Saving situation				

4.4 Housing condition of households
1: Grass thatched;
2: Iron cover;
3: Grass thatched and iron cover;
4: other (specify).

4.5 Need for relief food shows
1: increment;
2: no change; 3: decrement.

Checklists for Focus Group Discussion

1. From where and by whom do households get seeds of haricot bean,
2. Area, yield/productivity and production/amount of haricot bean,
3. Type of crop(s) for which farmers give more attention to and their reasons,
4. The current market opportunity and market price for haricot bean,
5. Major challenges of cultivating haricot bean and
6. Possible remedies to these problems.

Checklists for Administration Staffs

1. What was the role of your Organization in promoting haricot bean?
2. Has cultivation of haricot bean impacted positively on the livelihood or food security of the people of the area?
3. What are the problems being solved due to cultivation of haricot bean in the area?
4. Are there policies formulated concerning haricot bean? If so, how do you evaluate their impact?
5. What will be the plan of the regional government in general and your own Organization in particular to increase the impact of haricot bean on livelihood of farmers of the area?

Checklists for Investor(s) working in processing and selling Haricot Bean

1. How do you evaluate the quantity and quality of haricot bean product supplied by farmers to you for further processing or sale?
2. Do these fit the market standard? If not, why?
3. What is the market price you pay for a quintal of haricot bean supplied by farmers?
4. How much do you pay for processing one quintal of haricot bean?
5. What are the main challenges and opportunities in purchasing, processing and marketing haricot bean and possible solutions to overcome these problems?

Appendix 3: Name of Key Informants, their Position and Representing Organization

No.	Name of Key Informant	Organization	Responsibility
1.	Ato Asefa Abate	TGWOoARD	Agronomist
2.	Ato Tilahun Kassaw	TGWOoARD	Food Security Expert
3.	Ato Fasikaw Adane	TGWOoARD	Livestock Development Expert
4.	Ato Melak Dagnaw	TGWOoARD	Development Agent
5.	Ato Kindu Belete	TGWOoARD	Development Agent
6.	Ato Eyayaw Malede	TGWOoARD	Development Agent
7.	Ato Zigyalew Gashaw	TGWOoARD	Development Agent
8.	Ato Mulualem Alene	Private Company	An Investor
9.	Ato Fikre Kassaw	TGWOoE	School Director
10.	W/o Huluager Demile	TGWOoH	Head of Health Post

Source: Field Survey, 2008

Appendix 4: Kilocalorie Conversion Table of Crops

No.	Type of Crop	Amount	Conversion Factor
1.	Maize	1 Kilo Gram	4.03 Kcal
2.	Other cereals	1 Kilo Gram	3.78 Kcal
3.	Legumes(Pulses)	1 Kilo Gram	4.07 Kcal
4.	Oil Seeds	1 Kilo Gram	4.07 Kcal

Source: Agren *et* al. 1968; cited in Degefa, 1996

Appendix 5: Conversion Factors used to estimate Adult Equivalent Units

Age Group	Male	Female
0-24 Months	0.40	0.40
25-48 Months	0.48	0.48
49-59 Months	0.56	0.56
5-6 Years	0.56	0.56
7-8 Years	0.64	0.64
9-10 Years	0.76	0.76
11-12 Years	0.80	0.88
13-14 Years	1.00	1.00
15-18 Years	1.20	1.00
19-59 Years	1.00	0.88
60-98 Years	0.88	0.72
Not Specified	1.00	1.00

Source: World Bank, 1993; cited in Tsegu, 2006

Based on the presented scales and in accordance to the categorized date on age of family members, the average values were used to generate the following table.

The following table shows the Adult Equivalent Values used in the study for age groups

Age Group(Years)	Male	Female
≤ 14	0.65	0.66
15-64	1.1	0.94
> 64	0.94	0.86

Appendix 6: Seed Rate of Major Crops sown in the Woreda

No.	Type of Crop	Seed Rate(Kilogram/Hectare)
1	Haricot Bean	95(for row planting) and 125(for broad casting)
2	*Tef*	25-30
3	Sorghum	10
4	Wheat	125
5	Barley	125
6	Faba Beans	175
7	Field Peas	120-150
8	Chickpea	100-110

Source: MoARD, 2007

Appendix 7: Crop Calendar of Major Crops cultivated in *Tach Gayint* Woreda

No	Type of Crop	Crop Calendar(According to Ethiopian Calendar)				
		Land Preparation	Sowing	Weeding	Harvesting	Threshing
1	Haricot Bean	May1-15	June 15-July 5	No	Sept15-Oct15	After Oct. 15
2	*Tef*	Jan1-Jun 30	May1-Aug5	Aug10-Sept15	Oct1-Nov30	Nov1-Dec30
3	Sorghum	Jan1-Apr30	Mar15-May15	Jun15-Aug15	Dec1-30	Jan1-10
4	Barley	Jan1-Mar30	May1-Jun15	Jul15-Pag5/6	Oct1-Nov30	Oct15-Dec10
5	Wheat	Jan1-Mar30	May20-Jun15	Jul15-Pag5/6	Nov1-Dec10	Nov30-Dec30
6	Chickpea	Jun1-Aug15	Aug20-Pag5/6	Sept1-30	Nov1-30	Dec15-30
7	Faba Beans	Jun1-Aug15	Aug20-Pag5/6	Aug15-Pag5/6	Oct1-30	Nov1-20
8	Field Peas	Apr1-May30	Jun15-30	No	Oct1-25	Nov1-10
9	Millet	Jan1-Apr1	Mar15-Apr15	Jun15-Jul15	Nov1-15	Nov16-30

Source: TGWOoARD, 2007

Declaration

I, the undersigned, declare that the thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Declared by:

Candidate

Confirmed by:

Advisor