

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

FACTORS INFLUENCING FOOD INSECURITY AND INTERVENTIONS
AMONG RURAL FARM HOUSEHOLD IN OROMIYA:
THE CASE OF DODOTA-SIRE WOREDA

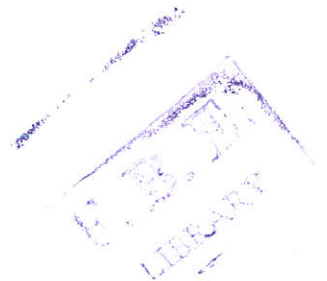
MOHAMMED BESHIR



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Factors Influencing Food Insecurity and European Union Food
Security Interventions among Rural Farm Households in Oromia:
The Case of Dodota- Sire Woreda

By

Mohammed Beshir Hamdda

Approved by the Board of Examiners:

Dejene Aredo
Advisor


Signature

Wassie Berhanu
Examiner


Signature

FARIDA SIDDIQUI
Examiner


Signature

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Acronyms/Abbreviations

CSA:	Central Statistical Agency
DPPA:	Disaster Prevention and Preparedness Agency
DSFSaD	Dodota Sire Woreda Food Security and Agricultural Development Bureau
EUFSF:	European Union Food Security Project
FAO:	Food and Agriculture Organization
FAM:	Food Aid Managements
FANTA:	Food and Nutrition Technical Assistance
FGFEDRP:	Federal Government food Emergency Drought Recovery Project
FIVIMS:	Food Insecurity and Vulnerability Information Mapping System
FSS:	Food Security Strategy
HFS:	Household Food Security
HICE:	Household Income and consumption Expenditure Survey
IFSP:	Integrated Food Security Program
MDG:	Millennium Development Goals
MEDaC:	Ministry of Economic Development and Cooperation
MOFED	Ministry of Finance and Economic Development
MOFED	Ministry of Finance and Economic Development
NGOs:	Non-Governmental Organizations
PSNP:	Productive Safety Net Program
SF:	Safety Net
WB:	World Bank
WBFSP:	World Bank Food Security Project
WFP:	World Food Program
WFS:	World Food Summit

Abstract

Food insecurity of farm households in Dodota-Sire has been a continuing public problem. This paper addresses the issue with the aim of identifying the factors and exploring some policy options for its reduction. Especially, it examines factors influencing food insecurity with emphasis on the impact of European Union food security project. To this effect, data have been collected from a sample of 380 households (non-beneficiary and beneficiary of the project) using stratified random sampling. Food poverty line at a cost of recommended minimum caloric intake (i.e. food energy intake method) has been set and then Tobit model was employed for each group. The model was fitted with 15 and 14 explanatory variables for beneficiaries and non-beneficiaries respectively.

The study shows that severe food insecurity (in which the majority of household) was prevalent among farm household in Dodota-Sire. There have been frequent climatic shocks and idiosyncratic shocks related demographic and socio-economic factors. As a result of such shock farmers have been adopted different coping mechanisms depending on common and idiosyncratic shocks happens to the household at their respective level. The empirical analysis reveal that household size, dependency ratio, total value of production, total expenditure, and share of food in total expenditure, participation in off-farm activities, seed usage, and net wealth, found to be significant and have expected sign. Further more, contribution of European Union food security project for beneficiary. On the contrary, education of head, age of head, diversification extent, fertilizer usage where found to be insignificant.

The study conclude natural factors, demographic and socio-economic factors such as large family size, high dependency ratio, low level of total value of production, low level of livestock wealth, low participation in off-form activities, lack of productive asset, and so on of farming are among the factors that increase the odds of food insecurity. Hence, replenishing the resources base, developing irrigation schemes, focusing of livestock related off-farm activities such as cattle fattening and dairy farming, enhancing the productivity potentially, and awareness creation strengthens and broadening project interventions are some of the policy options to be considered.

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CHAPTER ONE

1. INTRODUCTION

1.1 BACKGROUND

Food Security is becoming critical problem in the world in general, developing countries (Mainly African Countries) in particular. The 1996 World Food Summit (WFS) report indicates that there is an impressive food production increases in the recent decades so that enough food is available to meet the basic needs of each and every person in the world¹. However, not all regions and countries share equally these gains in productions and nutrition. More than 800 million people in developing world, which is about 20 percent of their total population, suffer from chronic under nutrition, millions more are vulnerable to food insecurity; and around 185 million pre-school children are seriously underweight for their age, and micronutrient deficiencies are widespread even where caloric consumption is adequate (FAO, 1996b).

It is with this background that the Summit called upon signatory nations to reduce the number of undernourished people suffering from hunger worldwide by half by 2015. This goal was further incorporated into the United Nations’ “Millennium Development Goals” agreed at the global, national and sub-national level on Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) to monitor and track food insecurity and hunger.

Sub-Saharan Africa produces less food per person today than it did 30 years ago compared with the other regions. Food and Agriculture Organization (FAO) projections reveal, the situation will deteriorate even further and hence increasingly disincentive food security circumstances. Food supplies per capita are expected to rise by only 3% for this region from 1988-2010 and around 30 % (264 million) people are expected to be undernourished as compared to 12 % in all other regions by 2010. The number of malnourished persons in all developing countries is expected to

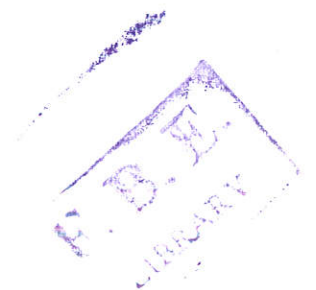
¹ (every person with more than the 2700 kilo calorie per day which is greater than the minimum requirement of 2100 kilo calorie).

fall by 2% from 1991-92 to 2010 but in Sub-Saharan Africa they rise by 23%. Studies and reports indicate that more than half of the African food insecure population lives in Ethiopia Chad, Zaire, Zambia, Uganda, and Somalia (Paarlberg, 1999; Ramakirshina, 2002; Pand and Braun, 1994).

Ethiopia has suffered from fundamental, sever and pervasive food insecurity on daily basis year after year most often generation after generation as a result of sever environmental degradation, recurrent drought, high population growth and so on. The estimate show that on average 4-5 people is classified as chronically food insecure every year and need relief assistance, which is met through annual appeals. Moreover, at least 50% of farm household production does not satisfy basic needs and most of them face a hunger season ever year. Despite significant external assistances the situation does not appear to be improving (MOFED, 2002; FSS, 2002).

Food insecurity has been prevalent in all the region of the country (11 regions in the country). In Oromiya, which is the largest region in terms of size and population, the number of food deprived population range from 10-25% of the its total population (though the figure varies depending on circumstances). The risk of insecurity prevails in 8 out of 12 zones of the region. Dodota-Sire is one woreda in Arsi zone, which suffer from chronic food insecurity in the last ten years. (CSA, 1998; FAO, 2000; MEDaC, 2002; DPPC, 2003; DPPC, 2004; DSFSDB, 2005).

With regard to food security, various approaches have been articulated on the role of market-based economic development in strengthening national and household food security (mitigate household food insecurity) by government, non-governmental organization (NGOs) and donors (USAID, WFP, EU). These have been started with the designing of policies, programs and strategies (such as Poverty Reduction and Sustainable Development Strategy (PRSDP), National Agricultural and Rural Development Strategy and other related policies) and their implementation (FSS, 2002).



To this effect, Food Security Strategy (FSS) has been designed in 1996 and revised in 2001 to address both the supply and demand sides of food security equation of availability and entitlement within the framework of the National Agricultural and Rural Development Strategy. The central objectives of this strategy are the realization of self sufficiency in food production through both horizontal and vertical expansion based on the three important pillars. These are: increasing domestic agricultural production (Supply side), ensuring access to food (Demand side) that supplements own production through market purchase and strengthening the capacity to manage food crisis (FSS, 2001; MEDaC, 2002).

Following the endorsement of strategy, efforts have been made to implement them in four Regions: Oromiya, Tigray, Amhara and Southern Nations and Nationalities Peoples Region (SNNPR), through preparation of their respective strategy and consolidated at federal level and submitted to donor for funding. Multilateral organizations and bilateral donors have been responding to the request and assisting food security through a variety of programs which have a direct or indirect bearing on household food security in different parts of the country. Henceforth, it is important to keep lessons learned from these efforts under constant review so as to make the best possible use of scarce resources. In its attempt to assess factors influencing food insecurity in the study area the paper attempts to evaluate the impact of food security program of European Union implemented in Dodota-Sire woeda (MOFED, 2002; FSS, 2002).

1.2 STATEMENT OF THE PROBLEM

Theoretically the causes of food insecurity are numerous, varied and complex, and there are overlaps between cause and/or factors that influence food insecurity. More over, depending up on the ecological zone, socio-economic characteristics, land use practices, the state of natural resources and extent of development of these resources, the factors that influence food insecurity and coping mechanisms may differ for different people and areas (FAO, 2000).

A number of studies try to identify factors influencing food insecurity in different parts of developing countries. According to these studies natural factors, demographic factors, socio-economic factors such as climatic risk, economic fluctuations and a large number of idiosyncratic shocks related to economic policy, availability of labor, and livestock makes the household vulnerable. More specifically: net worth (livestock) owned, farm size, age of household head, dependency ratio, crop diversification extent, diversification of income, remittance received, input usage(seed), food allocation, total expenditure, household level of production (cereal and others), growth of population which lead to diminishing of landholding, farm fragmentation, household income, fertilizer use, household size, off-farm activities, health condition, relative livestock and crop price fluctuations ,and educational level of households are among the factors that influenced influence household food insecurity (Bahiigwa ,1999; Kabbani et al ,2005; Dercon, 2000; Ramakrishna et al, 2002; Obamiro et al, 2003; IKPI et al, 2004; Negatu,2004).

Extensive literature pointed out that government and development agencies interventions in food security programs through creating off-farm opportunities, developing of irrigation schemes, developing livestock, increasing access to agricultural inputs, diversifying agriculture especially in agro-processing activities, improving agricultural financing and agricultural capital, enhancing extension services, developing and enhancing medium and small-scale and micro enterprises, replenishing the resources base (especially in productive asset) mitigate household food insecurity of those affected by frequent shocks (FANTA, 2003; WFP, 2003; FAO, 2000).

Dodota-Sire woreda has been identified as chronically food insecure woreda in the last ten years. Food balance sheets of the woreda show on average 36% of population were found to be chronically food insecure every year. For instance, in the year 2004 out of total population of 131, 898 and of which 36, 380 people were found to be food insecure. The data on food assistance provided show the program covers from 14-25% of food consumption need of the woreda. Despite this, the situation is getting worse as households deplete their potentials (live stocks and other related farm household resources) and little access to other sources of income to cope with the problem. To mitigate such problem different parties (government, multilateral donor's institution assisting food security, EU, WB) have been intervening through some of the proposed measures of Food Security Strategy (FSS.2002; DPPA, 2000: DPPA, 2001; DPPA 2003; DPPA, 2005; DSFSADB, 2000; DSFSADB, 2003;DSFSADB, 2004 ;DSFSADB,2005; DSFSADB, 2006).

Having noted the severity of risks of food insecurity in Dodota-Sire, the differences on causes and/or factors that influence food security, the contribution of some development programs in mitigating the problem, lack of empirical works and their implications in mind, the study put forward the following research question for the study area:

- What are the factors that influence food insecurity among rural farm households?
- What do households considered as the most critical factors influencing their insecurity?
- To what extent interventions of EU project helps rural households in mitigating food insecurity?
- How much is the extent of food insecurity?



1.3 OBJECTIVE OF THE STUDY

Household food insecurity carries with it important implications for development practitioners namely the need to assess the severity of their food shortfall and to characterize the nature of insecurity and evaluate the contribution of intervention programs (Hoddinott, 1999). In harmony with these, the main objective of this study is to assess food insecurity status of rural households with a view of identifying factors that influence food insecurity and project interventions among rural farm households with particular reference to the case of Dodota-Sire woreda of Arsi Zone.

More specifically the study:

- Identifies and investigate factors that contribute to and against household food insecurity at household levels.
- Try to investigate whether EU's intervention has contributed to improved food security in the target area.
- Recommend policy implications based on findings of the study that will guide to sustainable food security practices at household and study area level.

1.4 SIGNIFICANCE OF THE STUDY

Food security at household level is a prerequisite for national food security. As indicated above, the study area in particular the country in general has been facing food insecurity. Identifying and understanding factors that cause and/ or influence the problem as well as its intensity of insecurity at household level deserve rigorous empirical research where food shortage has been pronounced and has great importance for policy implications and interventions. However, there is little evidence about the factors and extent of household hunger and food insecurity situation in the study area. Therefore, the study is conducted to gain insight into the problem.

The result of the study provides policy related information that helps to prioritize among the many possibilities depending on the factors relative extent of influence. More specifically, it helps concerned bodies (planners and policy makers of government and other institutions) in their

effort to formulate policies and develop intervention mechanisms that are tailored to the specific need of the study area. Furthermore, this study attempts to make further contribution to the previous studies and can be used as a source material for further studies.

1.5 HYPOTHESES OF THE STUDY

Demographic (high household size and dependency ratio, household headed by a female) factors as well as entitlement failure positively effect on the household food insecurity. However, the availability of different economic opportunities and intervention lowers the odds.

1.6. DEFINION OF TERM AND CONCEPTS

Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (WFS, 1996 a)

Transistor food insecurity /acute/ is related to shocks that briefly push the level of food consumption below the requirements some of shocks are crop failure, seasonal scarcities, temporary illness or unemployment among the productive members of households. There is a line between the two, as unpredictable shocks do not suddenly lead to acute food insecurity unless people are already very poor as is the case with chronic one.

Chronic Food Insecurity prevails when a household is persistently unable to meet the food requirements of its members over along period of time marked by continuous, temporary lips of good and bad moments it is a result of over whelming poverty indicated by lack of assets. It is in ability to meet food consumption requirement over along period.

Entitlements refer to the various means through which household avails themselves of food whether through own production or through other income, generating activities such as sale of labor participation in trading.

Resources refers to tangible resources, such as land, animals, machinery, water resources, trees, forests, and common property resources, and intangible resource such as human capital (labor power, education, and health) and the right attached to a membership in the community and claims (loans, gifts, social contracts, social securities etc)

1.7. LIMITATION OF THE STUDY

Because of limited time and resources, the study concentrate on three kebel from chronically food in secured 18 out of 26 kebeles in the woreda. Hence, it was not possible to infer for the whole population as a statistically representative sample of any of the projects' catchments areas.

1.8. ORGANIZATION OF THE STUDY

Chapter two gives a brief description of the food security situation in the country, region and the survey area, followed by a discussion of some issues policy food security interventions. Chapter three of this report provides a conceptual framework for developing an analysis of food security issues, project interventions with empirical works. Further more, it reviews the methodologies of setting food poverty line and methods used to analyze factors influencing food insecurity in previous works. Chapter four presents the methods used for data collection and analysis. Chapter five addresses the factors influencing food insecurity including the interventions and its consequent impact on household food security. Information collected from the survey areas is utilized to lend empirical substance to this discussion. Chapter six summarizes the major points and draws some policy implications

CHAPTER TWO

2. THE STATE OF FOOD INSECURITY IN ETHIOPIA

2.1 THE AGRICULTURE AND FOOD SECURITY SITUATION OF ETHIOPIA

Ethiopia is endowed with huge natural and human resources (arable land, livestock, and man power). However, much of its potentials have not been exploited. Out of total arable of land (111.5 million hectares), 66% (73.2 Million hectares) is believed to be potentially suitable for agricultural but only 22% (16.5 Million hectares) is estimated to be under utilization. From these about 14.6 Million hectares is under crop and the remaining being under perennial crops such as coffee. Only 5% (3 Million hectares) of potentially irrigable land is irrigated. Although livestock wealth is the highest in Africa, its contribution to the economy is only 45% (MEDaC, 1999; Tully, 2003).

As in other developing countries agriculture plays pivotal role for the economy and household food security. It contributes for more than 52.3% of the total country's gross domestic production. It account for over 62% of export revenue and are main raw material and labor for industrial sectors. Furthermore, the sector is the main source of income and livelihood earnings for over 80% of population residing in rural parts of the country. There are about 10.6 million agricultural households mainly smallholders farming who are engaged in mixed farming such as crop production, livestock rearing and commercial crop productions, which contribute about 96% of country's food supply (MEDaC, 1999; CSA, 2003).

Despite such big-socio-economic importance, due to many natural and manmade factors, the performances of Ethiopian agriculture are very low in any standards. The sector is characterized by subsistence and semi-subsistence farming, which is predominantly rainfed. Since long time domestic food supply had failed to meet the basic food requirements. The trend is according to Malthusian theory in which food production grows at arithmetic progression whereas populations

grow at geometric progression and hence food insecurity. Further more, the gap grows over time (Todaro, 1994). For instance, according to annual report of Ethiopian Economic Association year 2004/5, the average rate of growth of agricultural production for the 3 decade was 1.5% where as population growth is estimated to be 3%. The per capita output exhibits an average decline of around 2% per annum. Based on recommended food intake of 2200 Kcal per person per day (equivalent to 225 sq per heads of cereal per annum) the annual deficit increased from 0.75 million tones in 1979/80 to over three million tones in 1993/4 and to 5 million tons in 2004/5 which is more than five fold in just 14 years (Tully, 2003; WFP, 2000; MEDaC, 1999; DPPC, 2000).

With regard to the number of affected population, on average, 5 million peoples are insecure every year. The trend in number of affected population reveals increasing in 1990's and reaches are peak 2000 and then decrease (table-1). The drastic change in figure is with temporary shocks like drought, which increase the number of transitory food insecured population .For instance, in the year 2000, the number of insecured people starts with 3.6 million in January and gradually picking up to attains its peak of 7.3 million in June and finally reaching its minimum level of 0.7 million in December (DPPA, 2000; FSS, 2002).

The regional profiles of food insecurity reflect variation on deprivation among the regions indicate that even through the problem prevail in all region the risk is higher in Amhara, Oromiya, as the population are greater than the others. Oromiya, the largest region in the country in terms of size and population is the second in number of food insecured population over the last 10 years (Table 1).

Table 1: Food insecurity profile of regions (in number)

No	Region/ Adminis- tration	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	Tigray	719,200	675,000	1,361,100	703,275	1,047,400	938,500	917,2000	851960	1,422,500
2	Afar	50,000	35,000	50,000	23,909	272,704	127,700	225,400	94214	474,500
3	Amhara	966,300	676,120	2,854,800	765,632	2,534,915	2,130,000	1,724,800	3617	2,308,300
4	Oromiya	495,100	125,500	1,120,600	620,742	1,598,246	1,129,000	1,051,400	1,100,000	2,617,700
5	SNNP	579,300	249,600	310,000	314	852,740	868,800	3,031,3000	1,500,000	1,245,200
6	Somali	100,000	35,000	50,000	401,842	1,321,000	981,000	894,800	900,000	1,167,100
7	B.Gumuz	41,300	13,000		10	4,201		9,000	6,000	
8	Gambell a	12,000	41,500	1,000		46,600		32,800	24,000	44,700
9	Harar		11	12,800	13,313	7,070	17,600	13,000	10,000	16,500
10	Addis Ababa		56,000	17,615	19,614					
11	Dire- Dawa	28,600	90,006	3,350	58	47,459	48,700	10,000	12,000	73,200
Total		3,153,000	1,931,990	5731315	2,551,510	7,732,335	6,242,300	5,181,700	4,000,000	9,369,702

Source: DPPC various reports of early warning

When we look the number of food insecured peoples in Oromia for most of the years it is above million which put the region the second in relation to the others. In the region frequent shocks of drought prevail in 54 woreda out of 200 woredas/districts in which the number of insecured population account on average up to 20% of total population (DPPA, 2003; DPPA, 2004; OFSDPPC, 2004; OFSDPPC, 2005). Dodota-Sire is one of such woreda in which on average 36% of the total population is deprived of their basic necessity (food). It is with this intense situation that the studies focus on such vulnerable woreda with particular attention on the intervention mechanisms.

As a consequence, Ethiopia in general, Oromiya in particular, has become increasingly reliant on food aid to meet national food deficits. The annual volume of food aid has ranged from 2.3 %-26% of the total domestic grain production per year over the last to two decades in the average year it can account up to 20% of the market surplus. The figure is too large as compared to developing countries which show an average increase of 10% of the volume of national cereal production. These show that the country has suffered from serious food insecurity on daily basis year after year. Report and studies indicate that both chronic and transitory problems of food insecurity are wide spread and sever in the country (FSS, 2002; MEDaC, 1999).

2.2. Cause of Food Insecurity.

The prevalence of food insecurity can be attributed to a series (short-term and long-term causal factors) of mutually reinforcing, interlinked factors which closely correlated with poverty that include over dependence on subsistence farming, lack of assets, antiquated techniques, problems of land tenure, weak markets, poor infrastructure, lack of opportunities outside the sphere of agriculture, a fragile ecosystem, increased demand on limited resources, governance issues and ironical reliance on external food aid.

The sector is characterized by subsistence and semi-subsistence nature dependent farming. Both smallholder highlands that are relied on mixed farming and lowland agro-pastoral/pastoral systems are not efficient and productive enough to ensure food security through own production and/or purchasing capability (access). The level of technology is generally basic, and productivity per hecter and per person employed is perhaps the lowest in the world.

Farmers are reluctant to use modern agricultural packaging and technology which lead low productivity subsistence farming and hence food insecurity (FAO, 2000). In these regard efforts

have been made through extension package since long time but attitude and knowledge of the people have not been much changed on the utilization of these method (MEDaC, 1999).

In those parts of the region with higher potential (both with high and reliable rainfall, in which crop-based system predominate population densities and growth are highest (leading to diminishing land holdings, problem of land tenure), productivity is constrained by lack of knowledge, lack of financing and poorly articulated markets. In these areas substantial proportion of farmers live at the age of subsistence's and is food insecure simply because these have limited access to land limited areas. For instance, for over 80% of such peasant's cultivated land holdings on average around 0.5 hector and are even substantially less in some densely populated highland areas and the situation becoming worse with lower level farmers. (Gebeyehu, 1995; Ramakrishna et al, 2002).

The problems are manifested directly in three food security components: adequacy of supply (low level of production, reduction of post harvest losses, high import levels), stability of support (low production stability, low regional and inter-temporal price stability) and access to supply (purchasing power or income and access to employment is extremely) (MOFED, 2002; Negatu, 2004).

Total dependence on subsistence agriculture by household that is narrow economic resources base with few options for expanding their income either on or off-farm makes these farmers more vulnerable. Theses economic situation makes the farm household more vulnerable to even acute shocks that can be tolerated. For instance, FAO report indicate that, even in the worst famine year (1972/73, 1984/85, 1999/2000) the aggregate national production was not reduced more than 6 to 7 percent on the long-term average. Further more, with weak market petty commodity production and trading and wage labor remains limited to its geographic scope and distribution to households in rural areas (DPPA, 1998; DPPA, 2000).

The poor state of knowledge and information systems under a broad range of fields (social safety net, policies agricultural knowledge, environment etc) handicaps both households and communities in their effort to service and prosper under difficult conditions (FAO, 2000). As the market infrastructure was not developed, institutions in the commercial financial sector are unlikely to reach down to small farmers for many years and even in the future. This was because of the high transaction costs and perceived risks thus non-existence of credit market makes rural farm household deprived of important role to play in development. Furthermore, poor state of development infrastructures such as roads and transport and other facilities are also among the lowest, education and health facilities to support the poor as well as market good opportunists (MEDAC, 1999; DPPA, 2001; DPPA, 2000).

These factors combined with repeated effects of drought over the years which substantially erode the productive assets of communities and households which in turn lead to less ability to cope with shocks exacerbated the problem (FSS, 2000).

2. 2 Impact of food insecurity

The impact of food insecurity can be looked at from both humanitarians, economic, social, environment standpoints. On humanitarian and health aspect malnutrition and anemia are permanent problem resulting from chronic food insecurity. These and other health problem as a result of deprivation shortened life span of the poor. Further more, the incidence of the most common disease fluctuating through out the year, mainly depend on and negatively correlated with the availability of food: Malaria, respiratory infection (Tuberculosis), intestinal parasites, diarrhea, skin infections, malnutrition and anemia are the most common of such disease. For instance, malaria affects many migrants' workers coming from high land area of Tigray, Amhara, Oromyia, and Southern Nation and Nationalities Peoples Regions (SNNPR) in year 2003/4.

diarrhea

Water born disease such as dysentery and other has increased in drought-affected areas in the northern, the eastern and the southern part of the country. (DPPA, 2005; DPPA, 2002).

From economic point of view, seriously constrained large proportions of their populations are unable to contribute their full potential to economic activities as a result of the cognitive and physical disabilities, resulting in risk of food insecurity. The continuous decline in animal herd size eroded many households ability to cope with the problem also lead in the subsequent year food production decline (DPPA, 2004; DPPA, 2001; DPPA, 2000; FAO, 2000).

In addition to the above the terms of trade fluctuate with the common shocks. In Ethiopia experience and literature show that whenever there is a slightest abnormality (external shocks such as drought, floods, migratory pests and diseases) in food production or distribution lead to and concomitant food price rise which exacerbating the Poor's already precarious situations (Dercon, 2000; Tully, 2003). In almost all where food shortages occur the terms of trade have been deteriorating with grain price high and livestock prices low as sale increased and to a lesser extent, the poor quality of animal in the market. For instance, in the year 2000 as a result of weak market following food shortage steep price rise has been reported (DPPA, 2000; DPPA, 2001).

From environmental perspective: lack access to natural resources, lack of employment opportunities and income outside the sphere of agriculture as a means of coping mechanisms lead to the interaction between household and environments, that have long run adverse impact on this household and hence environmental degradation. Deforestation is a common in many parts of the country. These were with the intention of increasing land for cultivation and wood and its product for coping food insecurity. As a result these household rugged marginal land which lead to erosion copes by selling fire wood (FAO, 2000; Gebeyehu, 1995)



With regard to social aspect due to financial problems children interrupted their education and participate in labor-intensive activity beyond their age. Further more, forming social ties based on marriage as a potential coping mechanism has been well documented in the literature. This has been a known experience in among farm family in semi-arid area to give their children (This was one the reason for early marriage for women) for some one in high land area which is relatively less vulnerable to such problem. This is making a vicious circle of poverty between families.

2.3 Policy Response and project interventions

2.3.1 Policy Response

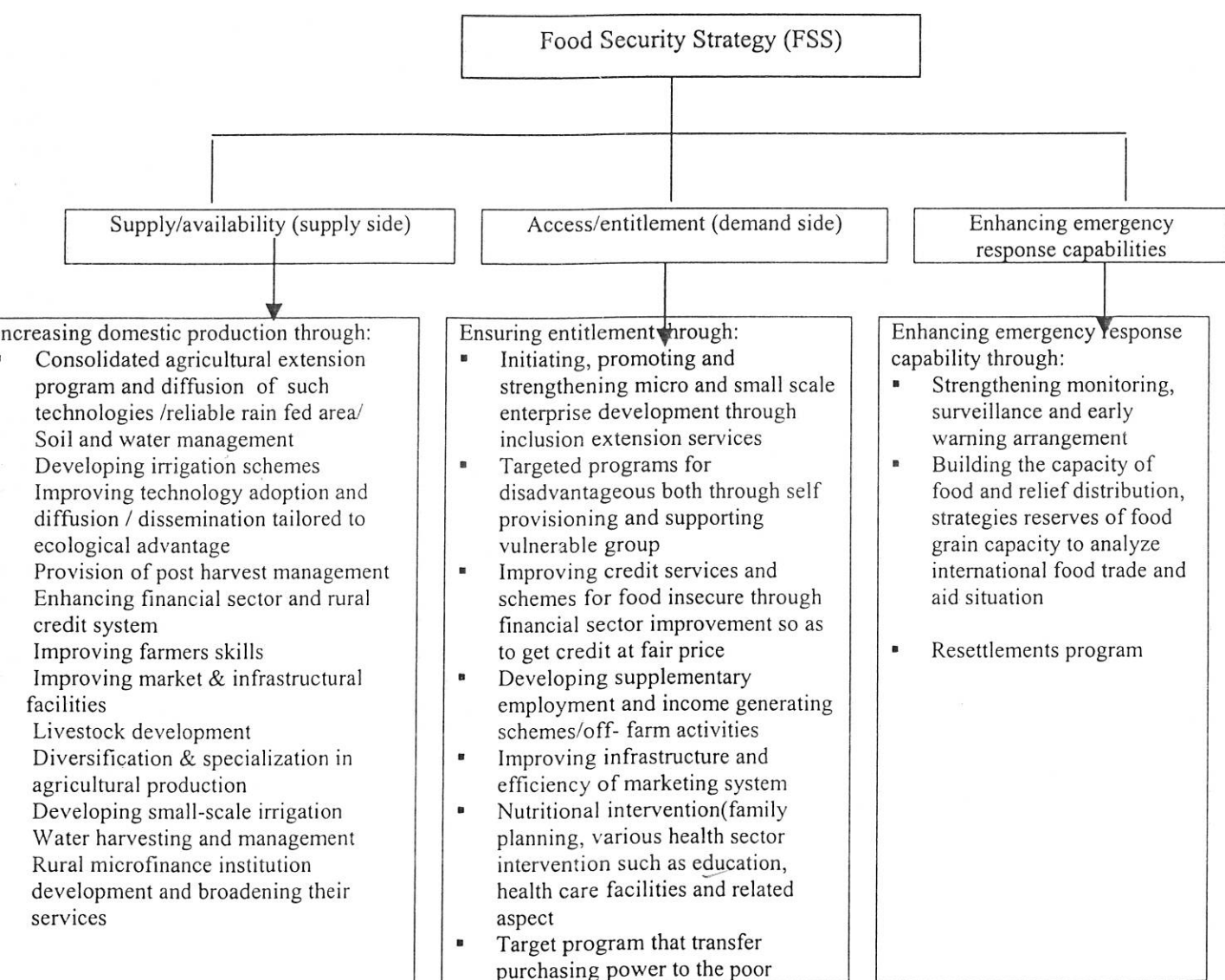
Having acknowledged the magnitude and depth of food insecurity, the natural responses to these economic, social and political challenges have been endeavors to increase productions as a means of improving household food security. In line with this government has launched food security strategy (FSS) with the overall objective of ensuring food security at the household level, thereby focusing on creating the conditions for national food self-sufficiency through Agricultural Development Led Industrialization (ADLI) within the framework of sustainable Development and Poverty Reduction Program. The strategy addresses both the supply and the demand side of food equation (availability and entitlement) respectively from both a national and household level perspective. Accordingly, the strategy adopted rests on three pillars:

- Increasing the availability of food through domestic (own) production;
- Ensuring access to food for food deficit households; and
- Strengthening emergency response capabilities (FSS, 2002; MOFED, 2002).

As domestic production is the main sources of food entitlement, increasing the production and productivity of food in a sustainable manner could address the problem of food shortage. These could provide surplus for farmers and employment of landless and unemployed rural communities. Further more, the increase will benefit domestic agricultural processing enterprise by supplying raw materials. As per the policy document, this part could be achieved through the

strategies summarized and mentioned under supply side. The attention is focused on the diversification of livelihoods of rural farmers to tailor options and strategies that fit to the specific needs of area and ecological zones through extensive research and development, improving infrastructure, soil and water management, plant nutrient generation and recycling, ensuring smooth and timely supply of agricultural inputs such as fertilizers and chemicals and seed, and other related issues (see diagram one) (MOFED, 2002; FSS, 2002).

Diagram one: Food Security Strategy of the Country and components



Source: reframed based on food security strategy.

Food insecure farming households as well as the non-farming communities get some and/or all of their food from markets. The former supplement its own production while the later use as primary source. To this end, the market led agricultural development could be through promotion of micro and small scale enterprise, encouraging participation of private sectors and cooperatives in marketing and distribution of food items, establishment of stabilization schemes (for prices of strategic food crops) along with agricultural price and market information in food deficit areas. Further more, activities that supplement own production and increase coping ability of farmers will be promoted through creation of off-farm activities. Developing different schemes linked with the priorities of rural farm household such as construction of road, small-scale irrigation schemes...etc promoted. Furthermore, Emergency capabilities building capacity is focus area in storage and early warning systems.

2.3 Project intervention

Following the endorsement of the first version of strategy in 1996 and revised version in 2002, efforts have been made to implement the strategy in four regions: Oromiya, Tigray, Amhara and Southern Nation and Rationalities Peoples Republic through developing their respective strategy document with the frame work of national food security strategy.

Multilateral organization like European Union and World Bank, bilateral donors, NGOs, and federal government have been assisting such interventions in four regions mentioned above in different mentioned above. There are about five on-going projects in Oromiya that have been b are designed by the government and donors to attain the objective of food security under integrated food security program and are summarized in table below.

These are: First, Productive Safety Net Program (PSNP) that provides cash and/or food transfers to chronically food insecure households to prevent asset depletion at the household level while creating assets at community level. Second, World Bank Food Security Project (WBFSP) that

uses a community grants mechanism to support a range of food security interventions by mobilizing communities, facilitating participatory planning and overseeing implementation. Third, European Union (EU) that targeted budget support food security program and it intervenes in many dimensions of assisting food insecure population. Fourth, World Bank Emergency Drought Recovery Project (WBEDRP) help the affected families to survive the emergency retain productive assets, and develop sustainable livelihoods. Fifth, Federal Supported Food Security Project (FSFSP) supported by federal capital budget designed for both asset creations at household and community level (DSFSAD, 2004; DSFSAD, 2005; DSFSAD ,2006).

Table 2: On going Food Security Projects in Oromiya (1997 E.C)

Sir No	Project title	Focused activities	Funding Agency	Total Fund for 1997EC (2005)(in birr)	Project duration	No. of Woreda	Coverage	
							HHs	Popn
1	Targeted Budget Support Food Security Program (FSP) (MOU,2002)	<ul style="list-style-type: none"> - Labor intensive public work (Rehabilitations of natural resources e.g. land and water and vegetation - Direct support for labor poor household especially elderly of ill people. - Asset replenishing through provision of goats & sheep's for rearing and fattening 	EU	12,815,380	Piloted for 3 years	7	12,986	56,517
2	Food Security Project	<ul style="list-style-type: none"> - Community grant mechanisms 	FG/FSB	136,557,621	Budget is allocated every year project duration is not specified	54	18,337	1,152,940
3	World Bank Financed Food Security Project	<ul style="list-style-type: none"> - Funding employment generation schemes of labor intensive public works - Capacity building to develop small-scale irrigation - Asset replenishing through provision of goats & sheep's for rearing and fattening. 	WB-IDA (loan), SIDA (Canada), DFID & Italy (grants)	28,724,590	6 years	13	16,144	80,720
4	World Bank Emergency Drought Recovery Project	<ul style="list-style-type: none"> - Expansion of irrigation infrastructure - Helping farmer to diversity on farm and off farm sources of income - Public work related to road and market infrastructure - Small scale water harvesting. 	World Bank, IDA	7,112,451	3 years	4	15,816	79,080
5	Productive Safety Net Program	<ul style="list-style-type: none"> - Asset creation such as goat and sheep for rearing and fattening - Public work on infrastructure. 	Different Donors	297,545,940	5 years	52	210,827	1,054,134
	Total			482,775,982			274,110	2,423,391

Source: prepared based on reports of Oromiya Food Security, Disaster prevention and preparedness' Commission (DSFSAD, DPPC)

In line with the food security strategy, set to improve rainfed agriculture the mechanism of interventions are mainly through labor intensive public works on rehabilitation of natural resources e.g. land, water and vegetation, rain water harvesting, forestry and agro foresting development, beekeeping, capacity building on small-scale irrigation, asset replenishment through provision of sheep for rearing and fattening and so on (These projects are providing such things.

Even though the range of activities is more or less similar, the number of beneficiary and the coverage, the duration differs for these projects (see Table2). The duration of projects ranges from 3 years to 6 years. Further more, the number or beneficiaries differ greatly in which case the World Bank Food Security Program taking the largest. PSNP is providing support for in 52 districts for about 210,827 households with the fund of 298,545,940 birr and mainly asset creation such as goat and sheep for rearing and fattening public work on infrastructure. EU has been funding a project on 7 woradas that cover about 12,986 household with a total of 12,815,380 birr budget through labor intensive off-farm activities, replenishing the resource base. The project has relatively longer period since implemented as compared to others and enables as to see some of its outcomes (the duration of project shown above is not since it has been started but the plan for the project).

It is with this background that the study focus on evaluating the project intervention especially that of European Union as the project implement since 1996 enables as looking at the change that bring to the food in secured farm households in the region in general and Dodota- Sire in particular.

Chapter Three

3. Review of Related Literature

3.1. Conceptual Framework

Food security is a flexible concept as reflected in many attempts to define it in research and policy environment. The criteria for definition depend upon the stage of development, institutions, country or region, cultural setup and so on. There are about 200 definitions in published writing even a decade ago; hence, whenever the concept is introduced in the title of a study and its objectives, it is necessary to look closely to establish the explicit or implied definition (Hoddinott, 1999).

The idea of food security appeared for the first time on the World Food Conferences in 1974¹. The question was whether a nation or a region could command enough food to meet the aggregate requirements of people. The perception of food insecurity was a (temporary) failure of aggregated food supply, notably of domestic food production, caused by a natural disaster such as drought or a flood (Sijm.1999). Special attention was paid to fluctuations in aggregate food supply, and food security interventions were primarily concerned with providing effective buffer mechanisms against such fluctuations².

However, many countries that were considered as food self-sufficient in food at national level were found to be food insecure due to the fact that they either lack an efficient food system or the capacity to raise the level of food entitlement. Furthermore, the issue of food insecurity is not a transitory shortfall.

As a result, food security as an operational in public policy has gained wider recognitions and the focus of attention in both academics and policy circles has gradually shifted towards micro level: to

² "Available at all times of adequate world food supplies of basic food stuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices"

households and further towards the individual (Sijm.1999). Contrasting definitions and redefinition of food security to that of 1974 were adopted in official FAO and World Bank documents of the mid-1980s³.

By the mid-1990s food security was recognized as a significant concern, spanning a spectrum from the individual to the global level. However, access now involved sufficient food, indicating continuing concern with protein-energy malnutrition. But the definition was broadened to incorporate food safety and also nutritional balance, reflecting concerns about food composition and minor nutrient requirements for an active and healthy life. Food preferences, socially or culturally determined, now became a consideration. The potentially high degree of context specificity implies that the concept had both lost its simplicity and was not itself a goal, but an intermediating set of actions that contribute to an active and healthy life.

The 1996 World Food Summit adopted a still more complex definition:

“Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (WFS, 1996 a)

Essentially, food security can be described as a phenomenon relating to individuals. It is the nutritional status of the individual household member that is the ultimate focus, and the risk of that adequate status not being achieved or becoming undermined. This risk describes the vulnerability of individuals in this context. As the definitions reviewed above imply, vulnerability may occur both as a chronic and transitory phenomenon. Hence, the 1996 World Food Summit definitions is adopted useful working for this study.

The above definition of food security has a multifaceted dimension, which is highly influenced by geographical socio- economic structure; political conditions international economic environment and

³ In 1983 FAO define the term “ensuring that all people at all times have both physical and economic access to the basic food that they need”. This implies the attention is to balance between the demand supply side of food security equation:

In 1986 World Bank focuses on temporary dynamics of food insecurity which introduce the distinction between chronic and transitory insecurity. The defining put for word is access of all people at all times to enough food for an active, healthy life!

so on. As the literature has spiraled many definitions, the conceptual frameworks (models) also differ. Researchers, different research institutions and universities decompose the concept of food security in different manners⁴.

One group of these /the committee on World Food Security, USAID, and many researchers/ argue that food security as a tripartite concept, reflecting the criteria of availability, access and stabilization and their relationship to one another /see Annex 2/ (Asenso-okyere et al, 1987; USAID, 1995; Weber et al, 1988; Maxwell and Frankenberger, 1992)

The other group (Osmanis 2001 and others) suggests that food security or insecurity can be seen as a combination of two distinct components: that of acquirement and that of utilization. Regardless of the definition put forward, all agree that household food security includes issues of food availability, sufficiency, security, risk, safety, time and food composition and minor nutrient requirements for an active and health life (Maxwell and Frankenberger, 1992). As the paper focus on the household food security particularly factor influencing food insecurity the framework suggested by the second group seems more appropriate to this study and hence adopted.

According to Osman's (2001) food security or insecurity can be seen as a combination of two distinct problems: a problem of acquirement and/or problem of utilization. Food insecurity is a situation where people lack secure access to sufficient amount of safe food, which can be either result of food unavailability, in accessibility, and in appropriate distribution of or in adequate use of food at household and individual level. The problems of acquirement and utilization each can be consequently each sub-divided in a level and a shock that combined to yield a four-dimensional characterization of food security or insecurity.

⁴ Acquirement refers to the ability of a household and its members to acquire enough food, which in turn determined by food availability, and access and entitlement that are no separate but complements of each other (Ramakrishna et al, 2002). Food use and utilization encompasses both preparation and storage.

It is the ability to:

- Improve and maintain the level of acquirement;
- Cope with shocks to acquirement;
- Improve and maintain the level of utilization; and,
- Cope with shocks to utilization.

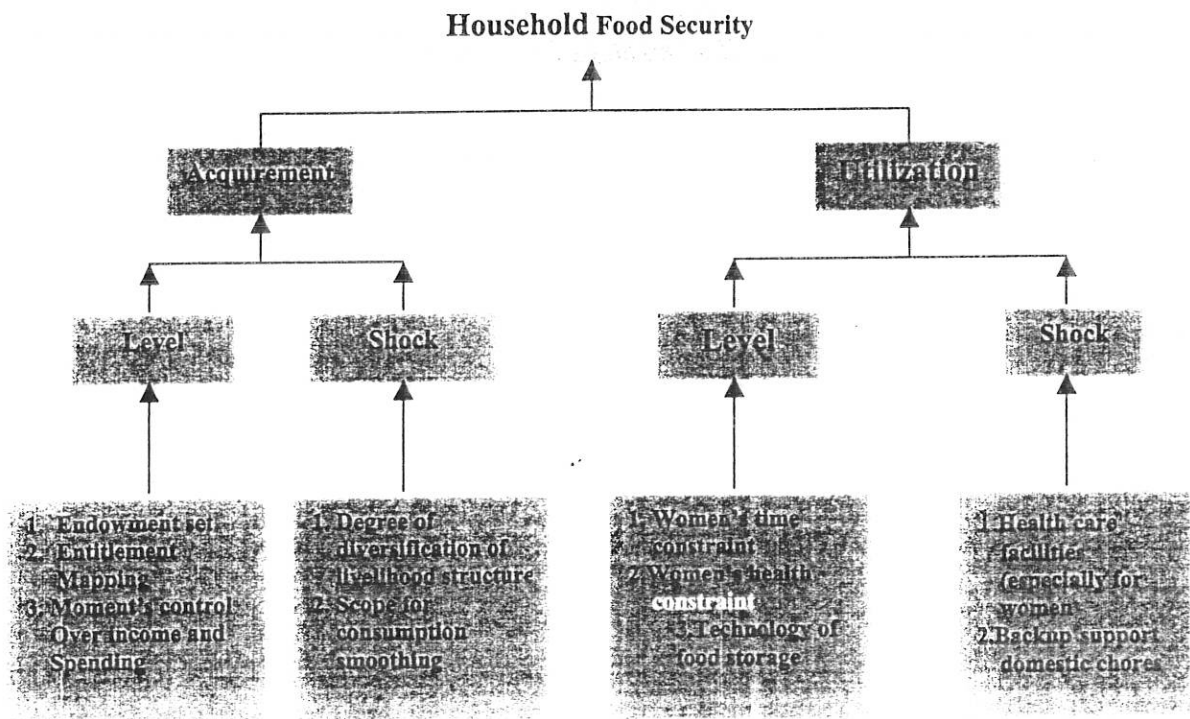
This fourfold classification provides a convenient framework for analyzing the determinants of household food security or insecurity (HFS) and factors that influence insecurity. The identification of determinants or factors is rather tricky, partly because there are different levels of determinants. Some of these factors have a direct effect on one or more of the four dimensions of food security mentioned above, while others work at several levels by operating through other determinants.

Each household has a portfolio of assets and claims that are managed according to evolving food security coping strategies and breathe and risk ness of these options will map the vulnerability profile of each household. Hence the analysis of the relative importance of these idiosyncratic dimensions of a household's food security strategies and the identification of the synergies derived by the individual households reliance on more than one of these sources. The contribution of supporters (government and multilateral agencies) to foster food security will provide the basis for locating the relative contributions of each intervention mechanisms and household coping strategies on most vulnerable segments of a given population (Dacron, 2000).

In order to keep the analysis simple and systematic, it is necessary to begin by identifying the direct or first-order determinants. The impacts of all other determinants, including policy variables can then be analyzed by tracing their effects on the first-order determinants. This framework can serve multiple purposes. It can be utilized both for the conceptual analysis of food security issues and for the empirical analysis of the impact of determinants on household food security or insecurity with a view to drawing lessons for the future. The general methodology is based on the recognition that the food insecurity impact of any change in the factors on the level of food security and they operate

through four dimensions listed above. A flow-chart setting out a list of the most important of these determinants and their relationship with the four dimensions of food security is given in Diagram one.

Diagram two: Flow Chart of the Determinants of Household Food Security



Source: Adapted from Osmanis, 2001

3.1.1 DETERMINANTS OF THE LEVEL OF FOOD ACQUIREMENT

Following Amartya Sen's (1981) Entitlement analysis which refers to the various means through which household avails themselves of food whether through own production or through other income, generating activities such as sale of labor participation in trading. According to this author the first two determinants of the level of acquirement can be described as the endowment set and entitlement mapping. The endowment set consists of all the resources a household owns or over

which it has a rights, whether legal, or conventional⁵. The availability and access to these resources determine the ability of a household or individual within household to express effective demand for food and the household's capacity to produce or trade.

Entitlement mapping refers to the rate at which the resources of the endowment sets can be converted in to food. Subsequent works on the area by Maxwell and Frankenberger, 1992 and Osmanis, 2001 and many others confirmed importance of these resources. They added institutional aspects, the importance of agro-ecological differences and the socio-economic condition that influences such resources. According to Osmanis (2001) there are three main components of entitlements mapping: a production component consisting of various input-output ratios or production function, exchange component made up of the rates of exchange involved in trading and the transfer components.

3.1.1.1 PRODUCTION COMPONENT (PRODUCTION BASED ENTITLEMENT)

Agricultural output and productivity vary greatly with the stage of economic development, resources endowments, socio-economic structure, government policy and stability, agro-ecological conditions. In many developing countries in general, Africa in particular where the majorities are engaged in subsistence farming, agriculture production is synonymous to food security (Paarlberg, 1999). In such peasant economy, this component can be influenced or determined by: rainfall level and stability (climatic condition), availability of irrigation infrastructure, quantity and quality of human resources (proportion of economically active age group, proportion of educated and skilled man power), quantity and quality of accessed to productive assets (land, draught power, implements), access to agricultural inputs (seeds, fertilizers, and agro-chemicals), institutions, and availability of knowledge and technologies or infrastructure (Maxwell and Frankenberger, 1992; Hui-Shung Chat, et al 1998; Bonger et al, 2004).

⁵ The resources include tangible resources, such as land, animals, machinery, water resources, trees, forests, and common property resources, and intangible resource such as human capital (labor power, education, and health) and the right attached to a membership in the community and claims (loans, gifts, social contracts, social securities etc)

It is widely recognized that a high level of uncertainty (natural, market fluctuations, social, state action and war) typifies the lives of people in peasant farm households in developing countries. Events such as civil unrest, climatic disaster, presence of trypanosomiasis (pests and disease that routinely attack crops, livestock, and people), and other natural and manmade calamities affect the people and their livelihood. Agriculture is dominated by the vagaries of nature that cause a state of risk and uncertainty influencing farmer's production and consumption decision. Farmers tend to be risk averse under such condition. The climatic anomalies adversely affect production and seriously depleted household's resources potential and increase the likelihood of structural food insecurity (Maxwell and Weibe, 1998; DPPA, 2000; FAO, 2000; Ellis, 1993; Nliro and Urass, 1995; Aredo, 1995; Paarlberg, 1999; Bagiiwa, 1999)

Land size, quality, its access and mechanism of utilization, land tenure policies are important determinant for agricultural production and food security of farm household. The increased access and security of land tenure enable more efficient and profitable agricultural production and hence greater access to food both via own production and trade. These depend on the population (size and growth rate) that affect production in general and agricultural output in partial by furnishing the required labor and exerting pressure on the available resource (land). In many developing countries average land holding is declining and increasingly fragmented from time to time due to high rate of population growth (Maxwell and Weibe, 1998; Paarlberg, 1999).

Furthermore, African soil tends to be poor, even by the standards of tropical countries; they are highly weathered, acidic, and generally low in fertility and even that soil nutrients have been depleted through time. As a result of this in rural areas a substantial proportion of farmers live at the edge of subsistence, and are food-insecure simply because they have no or limited access to land (Mama, 1995; Obamir et al, 2003; Bagiiwati, 1999; Mwalulcasa et al, 1999; ECA, 2004; Kirkos. A, and Dejene. N. 2000; Paarlberg, 1999; FAO, 2000; Ramakrishna et al, 2002).

Not only the size and growth of population but also the socio-economic characteristics of the households and population are important for agricultural production and food security. Household size, skill (literacy), age and sex structure and composition, dependency ratio of population together with its social division of tasks and cultural value are that determine the status of household, its potential, actual productivity and food security. The old, infirm and very young (children), person who have poor health condition, as well as women in general, tend to be disproportional affected by food shortages so do household with characteristics young household. Because they (these young) are at their beginning of life and have low wealth potential to coping ability at the time of shocks. These members of the household are low potential and ability to participate in livelihood earning activities mainly farming for peasant households (Obamiro et al, 2003; FAO, 2000; CSA, 2003; FAO, 2000).

In peasant economy men and women work within different sets of time constraints, work burden, responsibility and roles, face different constraints in accessing to different resources and adopting new technologies these. It as argued that female- headed can find it more difficult (though the extent differs from place to place) than their male counterparts to gain access to valuable resources such as land, credit, agricultural inputs, technology, extension services, education, training, participate in off-farm activities and other services that would enhance their productivity and coping capacity. Furthermore, Female-headed household have a considerable burden on capacity to produce, provide and prepare food in the face of existing obstacles. These may be attributed to legal and cultural constraints that are placed on women access to resources which hamper their ability to make more effective contribution to agricultural production and have negative influence on food security of female- headed households. (Rahji, 2000; Aredo, 1994; Fieldstein et al 1989).

Education (knowledge, experience and skills possessed by people involved in the production process) is a pillar in agricultural development in rapidly changing technological or economic as

well as natural environment. It may provide substantial external benefits by affecting acquisition, assimilation (adoption and utilization of technology) and its effect increase as the level of educational attainment increase as it increase the ability to adjust to disequilibria, (weir, 1997; Appleton, 1995;Weber et al, 2000). Hui-Shang Chat et al (1998).

Though all agreed on external benefits of education, written works differs in classification and level of education that bring about the proposed benefits. For instance, Appleton (1995) classify it as formal and in formal and argue as level educational attainment increase its effect is observed after four of education while the example Weir (1990) classify in to formal; informal, non-formal.

Increased food production, and increased population growth may not be incompatible if human capital develops and governance systems work properly. Farm production technologies in the late twentieth century have reduced the relative importance of natural endowments and have made investment capital and human capital more important components of productive agriculture. Agricultural intensification (production of multiple cropping, changing crop mix, crop rotation, use of modern inputs) may become possible through improvement in infrastructure (roads, electricity and irrigation), which are essential. For instance, in the close settled zone of Kano in Northern Nigeria, a semi-arid region with poor soils and variable precipitation, a dense and rapidly growing population (local population densities of more than 500 people per square kilometer in the 1980s) supports itself with system of farming based on high labor inputs. These areas produce a diversified mix of high value crops partly for sale in nearby with no evidence of declining output, decreasing soil fertility, or recent erosion (Gebeyehu, 1995; Paarlberg, 1999).

However, traditional techniques, lack of timely, insufficient access, reasonably priced access to agricultural inputs; inefficient markets and poor infrastructure; inadequate national savings and investment and slowing international assistance, particularly to agriculture are among the challenge

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However, traditional techniques, lack of timely, insufficient access, reasonably priced access to agricultural inputs; inefficient markets and poor infrastructure; inadequate national savings and investment and slowing international assistance, particularly to agriculture are among the challenge

to produce sufficient food to sustain a healthy and productive life (Andersen et al 1997; Aredo, 1995).

In peasant economy access to productive assets such as draught power and farm implement and inputs play crucial role in production. The significant role of oxen in Ethiopian context has been documented in research papers, policy and supporting documents (EARO, 2000, Aune et al, 2001; Gebresenet et al, 1997).

3.1.1.2 Exchange component (Trade based Entitlement)

Households that are unable to meet their food requirement through their own production must rely on market with the consequent risk of entitlement failure derived from market shocks. First for those who sell one food crop in order to purchase another or for those who sell food at the time of harvest at low price in order to pay taxes and other social expenses purchase buy during food shortages during to meet their food needs. Food access and acquirement depends on the rates of exchange (relative to the price of food) involved in trading with the cash he/she own or earns by selling one's own labor power (Own-labor based Entitlement) (Hoddinott, 1999; FANTA, 2003). These depend on the functioning of rural product and factor markets in grain deficit area and the development of infrastructures and internationalization of food market that help to balance food in case of disasters (Maxwell and Frankenberger, 1992; Scanlan, 2001).

However, in many developing countries these rural distribution markets are thin, and prices are consequently volatile. Price volatility hits hardest for these poor households that sell grain early in the season to meet pressing cash needs (specialty tax payment) and repurchase grain late in the season to satisfy consumption needs. High variability in market price of farm production and farm input poses significant risks to households income as do inefficient marketing institution and inadequate rural infrastructure (Mackinnon, 1999; Staatz et al, 1988; Dercon, 2000; DPPA, 2002).

3.1.1.3 Transfer component (Inheritance and transfer entitlement)

Different resources (income and wealth) and the pattern of social supports have greater impact on the procurement strategies of food supplies. Some of the basic sources which determine the possibility of increasing entitlement to food are cash, labor, markets and public services, and right to own what is willingly given by others (government, donors and others) as remittances, gifts etc. Furthermore, what is transferred by the state, as pension, food aid, and social security benefits or the free distribution of food grain to the poor through public funds are included in these? Such social safety nets of various sorts are not only part of solution in exceptional cases but also over long periods required to arrive at socially exclusive sustainable solution and development (Bahigwa, 1999; Dercon, 2000; Osmanis, 2001; Ramakishna et al, 2002; IKPI et al, 2004).

3.1.2. Determinants of Ability to Cope with Shocks to Acquirement

Rural households in developing countries face substantial common and idiosyncratic risk such as harvest failure due to natural and man-made (such as flood, drought frost), policy shocks (taxation, forced labor), economic shocks (fluctuation such as high price of food, change in cost, unemployment, interest rate), productive asset problem, community shock (loss of access to some common property), low purchasing power are resulting in high income variability. The nature of the shocks (Frequency and intensity of shocks) has an implication for ability to cope with its consequence on farmers' decision-making, allocation and managements of available resources.

Moreover, coping strategies vary by region, community, social class, ethnic group of household, gender, age and seasons, severity and duration of potentially disruptive conditions. Households in risky environments have developed sophisticated (ex-ante) risk management and (ex-post) risk-coping strategies. Their determinants can be classified as those that reduce fluctuations in income and those that reduce fluctuations in consumption given the fluctuation in income (Dercon, 2000; Omanis, 2000; Maxwell and Frankeneberger, 1992).

Perhaps the most important determinant within the first category is income diversification, through combining activities with low positive covariance and income skewing. At low levels of income and high levels of destitution and food insecurity, diversity in income composition may be even more important than the actual income level in securing the survival of vulnerable members in event of food entitlement failure. The degree diversification differs from one household to another depending on resources constraints and opportunities presented by the external environment (Osmanis, 2000). The households are usually involved in a variety of activities including food crop production, commercial crop production, and off-farm activities (Dercon, 2000; Aredo, 1997; Ramatho, 1991).

Commercialization among smallholders' farmers in Africa has often been signaled as being detrimental to the economic conditions and food security. This may not be complete transformation to cash crop rather partial substitutions among crops that are commercialized in different degree by market-integrated farmers. As shifts to ward commercial crop production involve significant reallocation and increase productivity of household resources particularly land and labor and are associated with significantly higher household incomes. The specific economic and food security outcome of commercialization are likely to be conditioned by the relative net returns of the different crops and on the degree of crop substitutions, the macro-level policy environment consisting of market conditions, market prices, rural infrastructure, access to credit, technological changes focused on food productions, and adequate availability of food. Most literature identified the trade offs between food crops and cash crops. Cash crop production allow individuals households more fixable in timing their cereals sales by making farmers to meet their post harvest cash needs and hold-off selling grain until later in the year willed price are higher. (Stratz et al.1988; Immink et al, 1993; Fieurel, 1980; Deway, 1979; Lunven, 1982).

Income generated through off-farm activities are often a prerequisite for successful agricultural undertakings of resources-poor farming households and coping of risks, as it is supplementary to

agricultural income. Off-farm activities provide for timely purchase of inputs and enables payment for hired labor. Both the future and present patterns of off-farm employment are determined by the sets of factors influencing the demand for and supply of these economic activities. Households may be lured in to more profitable off-farm activity or pushed in to off-farm activity by necessity (insufficient agricultural incomes or the high-risk nature of agricultural under takings) (Meinderisma, 1997).

The role of off-farm activities such as selling labor, part time wage employment, petty trading especially for poor and average farmers with less access to land and other necessary resources signify how farmers respond to decreasing food availability (Osmanis, 2000). The literature on coping strategies when famine strikes also report attempts to earn additional income through a reallocation of labor, including temporary migration, earning income from collecting wild foods (also for own consumption, gathering activities such as increased firewood collection) but these activity are low cost low return.(Dercon, 2000).

A fundamental elements in the second category (consumption smoothing) is the household's asset base /net worth/. Asset ownership is a common form of precautionary savings among household in rural communities in circumstances where financial market are highly imperfect or non-existent and also play an important role in buffering households against food insecurity and help to temporarily smooth food consumption. Households build up assets in good years to tide them over during less productive times (FANTA, 2003).

Low yields and financial instability to purchase enough food through out the year creates food insecurity and adversely affects people's livelihood. A household with several assets can more effectively maintain its consumption level by disposing of some of these assets. In case of rural household livestock's such as cattle's, sheep's, and so on can minimize the risk of food insecurity.

Its ability to do so increases according to the proportion of assets held in liquid form such as small animals are often used by poor rural household for consumption smoothing. Thus, the value and liquidity of assets are important determinants of a household's ability to cope with shocks to acquirements. (Mwalukasa, 2001; Osmani, 2000; Velazco et al, 1990).

Households experiencing a negative income shock and/or unexpected new expense can avoid the problem of decreasing consumption if they have alternative sources of funds available. In this regard the existence and nature of credit market is an equally important factor. In theory, a perfect credit market would minimize the effect of an income shock by allowing the households to achieve whatever degree of consumption-smoothing it desires. But absence and lack of adequate access to credit prohibited smallholders from assuming risk of food insecurity at fair loan price (Gundersen and et al, 1999).

In most rural societies the existence of informal moneylenders who lend money with high interest rate and a reciprocal system of mutual help among friends, relatives and neighbors provide some scope for consumption smoothing, access to these mechanisms vary enormously. Furthermore, the repayments of owned appear to depend upon the random production and consumption shocks received by borrowers and lenders in which case the borrower get in risk of paying debt in time of food insecurity and in the time of harvest at low food price (Immink et al 1993;Gundersen and et al, 1999).

The other important determinants of consumption smoothing include the operation of buffer stocks and the public food grain distribution system at the macro level. Furthermore, the social support patterns that allow additional possibility of exploiting the existing social ties and indigenous coping mechanisms against shocks in the society are equally important. Mutate Swift (1989) identifies a variety of support arrangement: such as loan and gift systems, assistances in food and other productive resources, exemption in the community contribution and government tax, and security

international assistance are other important determinants of consumption smoothing. A well-functioning public distribution system, especially one that provides free or subsidized food, would also contribute to consumption smoothing under most shock situations. If the shock to acquirement is the result of higher prices and the reduced availability of food on the market, then the operation of a food buffer stock would ensure consumption-smoothing by infusing a greater supply into the market and lowering prices. (FAO, 2000; Dercon, 2000).

3.1.3 Determinants of the Level of Food Utilization

Food use and utilization at household levels is associated with health and nutrition that are further influenced by socio-economic factors and cultural eating habit of the people under consideration. Some of food use and utilization indicators are: food expenditure and food prices, meal frequencies and composition, calorie supply, anthropometrics data (stunning, wasting), basic health services, safe drinking water and adequate sanitation. Given a certain basic level of food acquirement, a household's food security level would depend on how well this food was utilized. This component encompasses both preparation and storage. Differences in the quality of preparation or storage will yield different levels of food security given the same level of acquirement. Household that has the capacity to acquire all the food it needs may not always have the ability to utilize that capacity to its full level in a manner that yield the best nutritional value, or perhaps the household's storage facilities are insufficient for maintaining adequate quantities of food in good condition outside the harvest season (Osmanis, 2001).

Perhaps the most important determinant of food utilization is women's time constraint. Evidence indicates that poor rural women are severely pressed for time much more so than men due to ignorance and local cultural practices. Even if there is access to food and to the right kind of knowledge, the over burdened mother may simply not have the time to prepare the nutritional food. The extreme burden placed on women's time may not only ruin their health and condemn them to a

life of drudgery, but it may also have an adverse affect on household food security by forcing them to compromise in terms of the quality of food preparation. Since women who have to spend a lot of time outside the home in production activities and market transactions are often obliged to cook only once a day, requiring household members to eat the left-over food many hours later. Since methods of hygienic preservation of cooked food are rarely used in these households, not only do the members not derive the full nutritional value from the food they eat, but whatever nutrition they do obtain is often offset by illnesses related to the eating of food stored unhygienically(Osmanis, 2001).

The other determinant level of utilization is the facilities for food storage within the household. In most part of Africa, rural households that produce their own food and store food for at least a part for the lean season. In most cases, however, the storage facilities are woefully inadequate, resulting in substantial losses both in the quality and the quantity of food. Improved facilities for food storage would raise the level of a household's food security given any level of acquirement (Ibid).

3.1.4 Determinants of the Ability to Cope with Shocks to Utilization

Social actions may also have a role to play by raising men's consciousness so as to help them become more willing to provide support in the performance of domestic chores, not only for the sake of the women, but also for the sake of the protection of the household's food security. But this is not the case for rural household due to cultural and other problems.

In view of the key role played by women in ensuring the proper utilization of food, shocks to utilization naturally arise, mainly because of shocks to the ability of women to play this role and shock to storage facility (inadequate storage facilities). A wife's sudden illness is one obvious example of such shock. Women also face health constraints. If their health is poor, this not only lowers their quality of life, but also reduces the food security of the household because food preparation tasks cannot be carried out in the best possible manner. The ability to cope with these shocks depends on two sets of factors: the availability and the quality of women's health-care

facilities and the existence of a support network that can provide help to women in the performance of domestic chores through the education of family head and women (Staatz et al, 1990).

The first determinant is to some extent an external phenomenon, depending as it does on the willingness and ability of external agencies to provide the right kind of health-care facilities. Partly it is also largely a phenomenon internal to the household. In a culture rife with gender bias and where women's status within the household is inferior to that of men, women's needs, including their health-care needs, tend to be neglected. The second determinant, namely, support for women in the performance of domestic chores, is largely dependent on the household's make-up: whether there is more than one woman in the home. Especially if other females are children, and the extent to which the household can draw on the support of an extended family is low that make women over burdon.

However, limited time, measurement requirement and resources have made it impossible to collect data on all four dimensions of food security and their first-order determinants. In particular, it has not been possible to collect any direct information on the quality of food utilization. The report therefore deals primarily with the problem of food acquirement; in so doing, it examines both the level of food acquirement and the ability to cope with shocks to acquirement. With regard to the first-order determinants of food acquirement, (availability and access) information will be collected on the above factors discussed under determinants.

3.2. Project intervention and food security

Having established the relevant dimension of food security and its indicators, the next step is to outline the link between food security and interventions. Household activities alone do not result in food access and security, as physical resources by themselves may be necessary but not sufficient conditions. Many things that can be fulfilled by governments are beyond the scope of households such as public goods. Theoretically, interventions in agricultural sector are most likely to have positive impact on households though their impact depends on physical environment of the rural

households, government policy toward agricultural sector, the presence of social conflict, the resources endowment of households (labour and capital) (Hoddinott, 1999).

Many governments, multilateral agencies and non-governmental organizations intervene in agricultural sector in order to mediate between potential and reality or improving access and hence augment household food security. For instance, FANTA (2003) heights four main categories of food availability and access interventions:

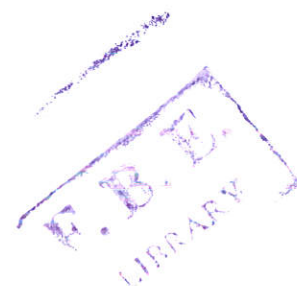
1. Farm productivity and profitability protection or restoration of natural resources, post harvest storage and handling, and landtenure security, improving natural resource management practices in marginal areas;
2. Rural credit and marketing services;
3. Infrastructure development (water, and sanitation, road etc) and
4. Capacity to address food security (improving health, nutrition, maternal child health services etc)

The details Series of these interventions (activities the agencies implements to convert resources (i.e. inputs) in to good and services (i.e. output)) designed to improve the broader environments of household food security is given in table 4

Table 4: Range of Title II Agricultural Interventions by Objective (Intermediate Result

Objective	Increase agricultural production	Reduce seasonal food gap	Increase market access	Protect or restore resource base (NRM)
Program intervention	<ul style="list-style-type: none"> ▪ Adaptive research ▪ New seed varieties for local food crops ▪ Improved cultural practices (Planting in lines) ▪ Application of organic matter (animal or green manure) ▪ IPM/low external inputs ▪ Inventory credit ▪ Inventory credit ▪ Increase market access as incentive to produce more 	<ul style="list-style-type: none"> ▪ Increase production ▪ Improves storage ▪ Inventory credit ▪ Support community grain storage ▪ Diversify crops ▪ Encourage agro processing ▪ Support income generating activities ▪ Build greenhouses ▪ Support agriculture base 	<ul style="list-style-type: none"> ▪ Build marketing associations ▪ Attract input suppliers ▪ Supply price information ▪ Improve rural road work ▪ Add value ▪ Establish rotating credit fund for input purchase ▪ Diversify crops (including tree crops) 	<ul style="list-style-type: none"> ▪ Agro-forestry ▪ SWC measures (terraces, barriers, drainage) ▪ Reforestation ▪ Irrigation ▪ Water harvesting ▪ IPM/low external inputs ▪ Incorporation of organic matte ▪ Controlled burning (no burning)

Source: Adapted from FANTA (2003)



The most common and recommended approach by many development intervention programs in food insecure areas are targeted to enhance longer-term sustainability spatial in those areas where future vulnerability is likely to be high through impact on current emergency by reinforcing and building up existing coping patterns. For those vulnerable, depending on the locations, skills and other specificities these agencies try to generate entitlement to food through providing appropriate institutional environment for private agriculture through developing irrigation schemes, provisions of credit, development of new technologies, increasing stock of knowledge (training and formal education), promoting employment generation activities, strengthening small farmer's association and the like (Hoddinott, 1999). This approach was developed under the assumption that the potential beneficial effects of food security related programs would ultimately trickle down to all the household members not directly targeted.

In terms of our conceptual framework explained above interventions can be carried out through four dimensions and have direct or indirect bearing on food security. For instance, interventions that have impact on the level of acquirement through acquiring new assets (livestock, machines, education, irrigation schemes etc) and with regard to improving the ability to cope through generating income-earning activities such as off-farm activities. Food utilization interventions through focusing on women at reducing work burden and improving storage health facilities. In the quest to improve the household's food security different institutions intervene through varieties of interventions programs with different expected outcomes. For instance, the European Union intervenes in employment generation, replenishing wealth, and economic-enhancing activities where as the Adventist Development and Relief (ADRA) emphasizes on agricultural education and training to increase agricultural productivity, income, and nutritional status in Ghana (Fanta, 2003).

3.3. Review of Methodology

Once the definition of household food security has been adopted, various dimensions of food insecurity, their determinants and coping strategies have been identified, the next step in the attempt to operationalize the household food security calls for choosing the particular indicators to be used in characterizing the food insecure. As food security is a concept that has evolved considerably overtime and there is much literature on potential household food security indicators.

There are many and differing views on food poverty line measurement (what kind of measure is suitable, its intensity and so on). Likewise, several models have been developed by researchers and research institutions to investigate the factors that cause and /or influence food insecurity /security at household level. Methodological choices naturally depend on the purpose of investigation, measurements, and data availability. To gain better insight into the works already done and then choose the one appropriate to this story, we briefly discuss some major studies with their respective strength and weakness and choose the model that fits most this study.

3.3.1. Indicators and measurements of food security

Government policy makers, donor agencies, and non-governmental organizations (NGOs) have all attempted to operationalize the concept of food security and derive series of indicators depending upon the need for the decisions that they are going to make (Maxwell and Franknebrger, 1992). Variety of indicators and their chronological evolutions reflect the shift in paradigms documented from earlier the aggregate level indicators of supply to access and vulnerability of particular groups. Consensus has still not been reached on acceptable indicators and methods of measuring household food security (Haddad et al, 1994; Morries, 1999)

There are approximately 450 indicators of food security each with their respective strength and weakness. One volume of household food security by Maxwell and Frankenberger (1992) lists 25

broadly defined indicators. Reily and Moocky (1995) list 75 such indicators, somewhat more disaggregated and likewise, others did so (Hoddinott, 1999). As food security requires a multi-dimensional consideration which is influenced by factors interrelated to socio-economy environmental and political aspects, the choice and utilization of indicators varies with the specific objectives of the research/project (to assessing, analyzing and evaluating a project or developing and monitoring household food security strategy), characteristics of investigation, procedure and level of aggregation, and the trade-off between resources constraints and information needs (Osmanis, 2001).

Traditional indicators have been often included both the supply side indicators such as food production and consumption side indicators such as households food consumption, total expenditure and calorie adequacy (direct) measure and anthropometrics (indirect) measure. In the work of Maxwell and Frankenberger (1992) indicators distinction is made in to “process indicators” and “outcome indicators”. The former provide an estimate of food supply and food access situations, and the latter serves as proxies of food consumption. With regard to this WFP, and OBrien-place and Frankenberger (1988) identified three types of indicators that can be monitored for changing coping response, thus, suggesting worsening conditions and heightened food insecurity. These are leading indicators, concurrent indicators and trailing indicators. There are some similarities between these indicators and that of Maxwell and Frankenberger(1992)

According to Maxwell and Frankenberger(1992) supply indicators reveal the likelihood of shocks or disasters (food shortage) that will adversely affect national or sub-national (regional) the and hence the households food security. These provide a signs of an impending problem and may call for a detailed seasonal analysis to determine the problem, causes and need for monitoring. These are similar to leading indicators that show change in the conditions and response prior to the onset of decreased food access. The most prominent once are four: crop failure, sudden deterioration of range land conditions and conditions of livestock, significant deterioration in local economic conditions (e.g. increase in price of grain, unseasonable disappearance of food staff, increase in unemployment

among laborers, unusual low level of food stock in the households), significant accumulation of livestock by some.

Access indicators are apparent when government and development agencies realized that households are food insecure and famine conditions were occurring despite food availability. Socio-economic indicators that are sought to represent the degree of disasters being experienced by a population as economic and social conditions change and how the people respond to shocks are important in HFS and vulnerability assessment. This is consistent with concurrent indicators such as unusually increase in land sales, reduction in the number and amount of meals and so on. Simple measures such as household access to assets household size and composition, access to asset, land use and ownership, asset liquidity are often be successfully used indirect locate the most vulnerable group in terms of food security (Champer, 1989; swift, 1989; Haddad et al, 1994). Major indicators of the three classes are presented below in table 3

Outcome indicators can be classified as direct and indirect. They are relatively accurate as it shows the actual consumption of food. This are the classifiably at thing level and they occur after access has declined, and shows the extent to which particular household or community has been affected. Indicators of this type are: reduction in the meal consumed, sign of malnutrition, high rate of morbidity and mortality, increased land degradation, consumption of seed stock and permanent migration. According to FANTA (2003) consumption indicators (outcome indicators) go one step further than food access and can be used as a proxy for access. These are well stipulates in the table under outcome indicators. These are what are referred as trailing indicators for WFP.

Table 3: Major indicators mentioned by Maxwell and Frankenberger

Food supply indicators	Food access indicators	Outcome indicators
<ul style="list-style-type: none"> • Metrological data (Rainfall) • Information on access to resources (grazing land and others) • Agricultural production data (crop and animal) • Food balance sheet • Information on pest damages • Institutional and market supply structure • Regional conflict and its consequence 	<ul style="list-style-type: none"> • Land use practice (sale of land, multiple seed strain with different maturity, fragment holdings) • Dietary change (shift from preferred to lower, fluctuation in consumption of staple food) • Diversification livestock • Sale of livestock • Sale of productive assets (land and oxen) • Access to credit • Seasonal migration • Disasters migration • Diversification of income (off- farm activities) 	<ul style="list-style-type: none"> • Household budget and expenditure survey • Food consumption frequency • Household perceptions of food security • Subsistence potential • Nutritional status • Storage estimation (amount stored in the given year)

Source: prepared based on Maxwell and Frankenberger, 1992

Broadly speaking food security measurements of outcomes indicators can be characterized in three ways: those comparing estimates of dietary energy availability or intake with energy requirements; those measuring nutritional outcomes; and those measuring perceptions of food insecurity and hunger. The first two approaches to food security have relied on what is viewed as objective (actual) measurement whereas the third is subjective measurements (Walla and Valdes, 1980).

As indicated by Hoddinott (1999) energy calorie intake measure the crude estimates of caloric available for consumption by households over a defined period of time usually either seven or 14 days. Nutritional assessments are measurements of body size, body composition or body function, intended to diagnose single or multiple nutrient deficiencies. There are numerous different measure of nutritional status, varying with respect to their ease of measurement, relation to dietary intake, and velocity of change following shocks or improvements in the individual's environment (Morries, 1999; FANTA, 2003)). Measuring perception of food insecurity and Hunger the mechanism through which a series of question regarding food situation experienced by the household is asked as

perceived by the household members (usually head). Households are classified in to three distinct classes: food secure, food insecure with out hunger and food insecure with hunger.

Development agencies designed impact indicators with different levels in order to monitor and evaluate interventions of government and development agencies. According to FANTA (2003) and FAM (2004) three levels are identified in line with their (USAID) food security conceptual framework (see Annex-1 for conceptual framework). Level 1 impact indicators measure change in income which represents improvements in capacity to acquire food; Level 2 impact indicators measure changes in food consumption or adequate dietary intake; and level 3 impact indicators measure changes in nutritional status. Moving from one level signifies moving up through the various levels presented in the conceptual framework. Different agencies use different indicators depending on their interventions and expected out comes. In general the most common indicators are presented in table 5 below.

Table 5: Food access indicators by category

Level 1: Food Security Impact and Income Indicators	Level 2: Food Security Impact and Consumption Indicators
<ul style="list-style-type: none"> - <u>Direct measure</u> - Gross crop and livestock income (direct measure) - <u>Indirect measure</u> - Households expenditure on specific items that are highly correlated with income - Diversity of household income source - Household asset - Debt -to-asset ration - Food provision - Crop handing and storage losses 	<ul style="list-style-type: none"> - <u>Quantitative measure of Food Access</u> - Dietary diversity - Number of daily eating occasions - Increased % of household consuming minimum daily calorie requirement - Percentage of total expenditure on food - Indices of household coping strategies - <u>Qualitative measures</u> - Measure of household's and communities perceived food security condition - Number of months of adequate - -household food provision.

Sources: adapted from FANTA (2203) and FAM (2004)

Direct measures capturing of income are often the best measures of changes in a household's ability to obtain food. However, due cultural problem hiding income information and relatively high time and skill needed for

data collection proxy indicators such as household expenditure, diversity of income sources and asset ownership, are used. Further more, qualitative information from project beneficiaries can help interpret changes in quantitative indicators.

Different perceptions and ideological under pinning shapes the parameters in which programmes are finally implemented and the view of those most directly concerned affect the out come of intervention, often in a way unforeseen by the donors or state. Some improve the food security situation while the other.

To conclude among the three categories of indicators the first (supply side) is used for early warning measurement and preparation while the last two are for identifying the most vulnerable group and respond accordingly. Food access indicators are relatively better than supply indicators in detecting the widespread prevalence of shock as household may not correct tell their nutritional level and easily detected and have serious long run impact. On the other hand, out come measures are very strong is showing the problems at household and individual level despite its intensive data requirement. Further more; it seems to require the identification of some form of indicators for policy analysis to identity the food secured from insecure. Some formal exploration is fully complemented by multi-criteria analysis of food security. This leads to uses of both qualitative and quantitative indicators for comparisons (These include: access indicators and out come indicators).

3.3.2. Method of measurement of food poverty and intensity

In order to formulate a program aimed at combating poverty, information on the number of the poor is crucial. It is also desirable to measure the intensity and severity of their poverty. Poverty measurement assumes that there is a predetermined and well-defined level of standard of living called "poverty lines" below which a person is deemed to be under poverty. That is, there exists a level of consumption of various goods (food and non-food) below which the very survival of an individual is threatened. In fact, in most societies (especially poorest societies) the notion of what

constitutes poverty might go beyond the attainment of the absolute minimum needed for a mere survival. Hence, a poverty line exists but values differ based on their location and the type of society in which people live. Determining the amount of total poverty requires summary statistics measuring the extent or severity of food poverty within a population (MOFED, 2002).

In the literature, there are four major methods for setting absolute poverty lines, the Food Energy Intake (FEI) approach, and the Cost of Basic Needs (CBN) approach, the dollar-a-day criterion used for international comparisons by the World Bank and others, and a social subjective poverty line. There are three methods of setting poverty lines that use caloric requirement: direct calorie intake, food energy intake, and cost of basic need methods. In the case of direct calorie intake method, a poverty line is defined as the minimum calorie requirement for survival. Individuals who consume below a predetermined minimum level of calorie intake are deemed to be under poverty. Hence, this method equates poverty with malnutrition. The drawback of this method is that it does not take into account the cost of getting the basic calorie requirement. It totally overlooks the non-food requirement (MOFED, 2002).

In this case the “Food-Energy-Intake” (FEI) and the “Cost-of-Basic-Needs” (CBN) method may be superior as they take into account the monetary value. In the former method, the poverty line in each sector and period is obtained by finding the expenditure or income level at which the expected minimum recommended level of caloric intake. That is, conditional on expenditure, equals predetermined minimum food-energy requirements. The latter method involves setting the poverty line at the cost of a “normative basic needs” bundle of goods. That bundle is normally chosen to be sufficient to reach a predetermined caloric requirement, with a composition that is consistent with the consumption behavior of the poor (Greer and Thorbecke, 1986). The precise measure used in practice can vary, it may simply be money income, or it may be money metric, where by money

income is adjusted for the price faced in a way consistent with an ordinal representation of the individual preferences over alternative commodity bundle.

Each of the methods has advantages and disadvantages. The main arguments for the FEI method are that it: results in consistent estimates (i.e. on average people on the poverty line will have the same food-energy intakes relative to requirements); reflects differences in preferences between subgroups as these preferences do affect the poverty line derived; and has a practical advantage in that it does not require data on prices. This last advantage is, however, not fully realized because to estimate the FEI data on the quantities of food consumed are required and expenditures are collected to compute unit or average “prices”. The main disadvantage of this approach is an empirical one; the “implicit” bundle of goods varies so much as to be inconsistent even with the same standard of living. The CBN method has its problems too. The most serious one is that the poverty lines generated ignore utility-compensated substitution effects. It is, nevertheless, thought to be a more favorable method especially for making poverty comparisons, in that it explicitly aims at controlling for differences in purchasing power over basic consumption needs.

Aggregate poverty measures entail a normative construction of what is considered to be an acceptable poverty line. The distance of each household from the line is then measured. This is not without controversy in particular regarding the method of aggregation and what is regarded as “acceptable”. This has led to the use of various poverty indexes. These indexes have proved useful in explaining certain aspects of poverty distribution. The most basic way of assessing poverty are: head-count ratio, mean sum of squares of poverty gaps index, Gini-coefficient, shortfall index.

3.3.3. Models on determinants of food insufficiency

The analysis of the above factors, the interpretation and policy implication depends on the methodology adopted. Different models have been used based on the objective of the study. Lets

review some of them with their respective advantages and drawbacks for better understanding and concentrate on the one chosen for these particular study. Gudersen and Gruber (1998) developed theoretical model to investigate the dynamic determinants of food insufficiency. According to these researchers households make consumption decisions over multiple periods based on their expectations of future income, their current income, their stock of savings, and their ability to borrow. Unexpected changes to a household's budget and losses of income can adversely affect this consumption and render any households susceptible to food insufficiency. For them, by looking at current income alone, we cannot accurately portray the dynamic nature of household's consumption decisions. The theoretical model takes household maximizing its utility subjected to budget constraints over multiple periods. At time $t=0$, a household solves the following problem:

$$\text{Max } E (U (F_t, O_{gt}))$$

Subject to

$$A_{t+1} = A_t + Y_t - P_f F_t - P_{oG} O_{Gt}$$

Where E is the expectations operator, T is the end of the planning horizon, U is the one- period utility, F is Food consumption, OG , is other goods consumption (i.e. non-food items). A is assets, Y is income, P_f is the price of food, and P_{oG} is the prices of other goods. Except income, all the variables are known with certainty. The model assumes households know the mean of their income and variance. They do not however, know why income shocks will occurs and households can borrow against future to smooth the consumption. The shock may be higher price on food and/or other goods that prices changes and used to stabilize Z (Level of income at which households are self sufficient).

The draw backs of the model are: its assumption of perfect planning horizon are not applicable to the situation at hand, borrowing in rural is limited and possible only with high interest rate charge by local money lenders which have high impact on future income. Further more, it neglected rural households that do not shift their income to smooth consumption in case of chronic food insecurity as the future is highly uncertain, and the model does not look at the variables that influence or bring

about shock in income and other aspects of food insecurity .Hence, the models do not capture the factors that contribute for and /or against food insecurity rural farm households.

Other group adopts logit and other extensional forms of model that look at the marginal effect of the variable. For instance, Ramakrishaa and Demeke (2002) estimated logit model to elicit the factors influencing food insecurity at household level. The model uses food insecurity among the households as the dichotomous dependent variable. A food insecurity variable is defined on the basis of shortfall of food availability to a household during the year. The model uses various household resources such as cereal production: Household income, fertilizer use, household size,livestock owned, land size and education of head of households as the factors influencing food insecurity.

However, as they classify the whole population into two, they neglect different depth and intensity of food insecurity. Further more, only few and aggregate variables are used makes the model grossly simplified. In addition, it did not include some of variables such as net worth, remittances, contribution of safety net and other support from government and non-governmental institutes in reducing food insecurity.

An extension of logit to multinomial logistic regression has also been used for empirical analysis of food security at household level. It was developed and used by Kabbani et al (2005). The model classified households in to three mutually exclusive state of food security: Food secures, food insecure with moderate hunger and food insecurity with sever hunger. The classification was based on the households' perception about their food security. The explanatory variable used were family size, age, sex of head of household, education head of household, net wealth sources especially live stocks and income sources for coping.

Some of the advantages of the model are: it allows a focus on the full household economy and classifies the household based on their situation. That is, food secured, food insecure with moderate intensity and food insecurity with sever problems. Furthermore, it allow the exploration of potential

inter connections among different production branches of the household economy, farming and non-farming activities of different classes. By so doing, it enables to see the effect of different variables on different classes of households. In contrast, to the above the proposed advantages criticisms of the models are there is no clear classification of the household economy and it is subjective and high probability of misreporting by household to get support.

IKPI et al (2004) base their calculation on the recommended calorie intake (food insecurity indices the cost of calorie (COC) method) for classifications households and then use Tobit model to look at the determinants of the in-secured part of population. By defining the minimum level of nutrition necessary to maintain healthy living, they set the level of food insecurity line and then estimated calorie adequacy by dividing estimated calorie supply for households by family size adjusted for age- sex categories.

Some of the explanatory variables are households size, dependency ratio, gender of household head, age of household heads (yrs), food allocation (as % of total expenditure), value of crop output (birr), total expenditure (in birr), Household net worth (in birr), child dependency ratio, diversification extent (measured by herfindahl index), remittance received (birr), input usage, educational level of household head, Membership of cooperative, Farm size (in hectors), fertilizer usage and so on.

There are some aspects lacking in the model. One major aspect lacking in this approach is that the measurement of calorie intake may not be handled with one spot data collection and based on recall methods as explained above. Another aspect ignored in the model is that different depth and intensity of food insecurity have not treated separately as the influences of factors differ with them. That is, they can not provide the level of detail required to prioritize the food insecurity factors in such a way that development practitioners use. However, the criticisms are not believed to be impediments since classification of households are according to the problem faced and perceived by the households. Whether they are rich or median or poor at the time of food security which, in turn

depend on cultural, agro-ecological, socio-economic and other set ups. This model is appropriate for the work at hand and used for this study.

Obamiro et al (2003) use backward stepwise discriminate analysis where by all variables that are relevant in classifying the two groups (food secure and food insecure) based on a priori knowledge are first included in the model. After which at each step, variables that contribute least to the prediction of group membership are eliminated. The variable elimination at each step is determined by F- value and eliminates variables with small F-value. The discriminate function approach tool for classifying causes into value of a categorical dependent, mostly dichotomous, has the following shortcomings. The variable that will be discarded can have important effect indirectly and should be taken in to account

From above review one can understand, what kind of poverty line to use and how to determine the level of the line depends on how one chooses to define poverty, which is multidimensional and manifests it self in various forms. Further more the model used for analysis differ for different researcher base on the perception of the effect that the variable considered likely to have.

3.4. Empirical Evidence

Study by Gundersen et al (1998) using panel of SIPP, a multi panel longitudinal survey of the non institutional population of United States show low income households are more likely to face income shock (any event that cause a decline in the resources available to a household to purchase food) than their counterparts. Further more, the availability of saving and ability to borrow lowers the income shock and hence food insufficiency. By comparing food insufficiency and insecurity measures with objective measures of food expenditures and subjective measures of food needs they found food hardships are positively associated with food expenditures and negatively associated with needs.

Broad finding of studies undertaken in Africa (Kenya, the Gambia, Rwanda) indicate that large family size, high dependency ratio, poor health condition of those economically active age group and those young households (currently married) have found to be more food insecure than their counterparts. (Rahji, 2000; Bonger et al, 2004; Enberg et al, 1998; Fieldstein et al, 1989).

A study by Breslin (1994) on U.S Aid, the state and food insecurity in rural Zimbabwe (Gokwe) show indirectly that the extraction of food crop (assistance) from vulnerable regions of Zimbabwe has exacerbated plight of deficit households.

An empirical study in North Wollo using logit model found that cereal production, education, fertilizer consumption, livestock, land size, reduce the probability that household food insecure while, family size, pests and diseases, adverse weather condition increase the probability of insecurity (Ramakrishna, et al, 2002).

Obamiro et al (2003) using backward discriminant analysis mentioned above found of variables such as household size, average family size, cash crop grower /non-grower, number of days loss to illness, income group, amount spent on illness and accessibility market were statistically significant in influencing permanent rainfed farms. These people have further examined the impact of perennial farm on food security by comparing the result between permanent rainfed farms. The result shows both similarities and difference in variables for the two farming systems. For permanent rain fed per capita income, number of days loss to illness, amount spent on illness and accessibility to market is significant. For perennial, in addition to the first two above percentage of family income from off-farm, of income, household size, and average farm size were significant. Further more, the results reveals that there is no significant difference between the food security statuses of households in both crops.

As per study in Uganda the main cause of seasonal food insecurity is associated with weather related problems (little or too much rain) followed by pests and disease. Idiosyncratic factors that contribute to such insecurity were inadequate labor, inadequate land, not growing enough food during the seasons and soil infertility, poor health, lack of planting materials, lack of oxen for ploughing and so on. The farmers coping strategies include donations from relatives and neighbors, reducing the number of meals or ration, sale of livestock and exchange of labor for food. The study also shows that female-headed households were more food insecure than male-headed households. Furthermore, no specific pattern that indicates the higher level of education of the household head, the more food source a household will be (Bahiigwa, 1999).

The study in Nigeria using Tobit model found that sex of head, educational level, dependency ratio, net work, farm size, input usage, commercialization extent, being a member of cooperative, food expenditure, remittance have negative influence on insecurity, whereas, age of head, household size, positively influences the problem and all the variables are significant (IKPI et al, 2004).

A study conducted in India by Chakravarty et al (2005) identified the main causes of food insecurity as lowering purchase power among the poor and vulnerable populations (rural and urban). This was result of shrinking of agrarian and informal sectors income coupled with the inefficient/failure functioning of the state both due to policy of farming as well as implementation of total public distribution system. This includes support programmes and development expenditures on essential infrastructure like power, primary health and basic education.

A case study of Morogoro rural of Nigeria by Ndiro and Urassa(1995) reveals that bad weather conditions, poor technologies used in agricultural activities and lack of capital were major contributing factors. Unequal ownership of means of production between men and women. It also indicate a burden of women's domestic work as compared to men, limited women decision-making,

poor participation of men in non-farm income generating activities, were some of contributing factors on household food insecurity though not main.

A study by Christiansen and Boisvert (2000) identified official aid and family food gift as important insurance mechanisms. Further more, vulnerability can be reduced through off-farm employments generation in area and greater access to irrigation infrastructure.

A study by Neison et al (2001) show that health as negative impact on food security by taking persons with diabetes and its impact on level of his household food security by taking persons with diabetes and its level of food security.

A study carried out in PLEC sites of Arumeru, Arusha, Tanzania revealed that socio-economic factors have adverse implication on livelihood and agro diversity. Farm size per household, response to market forces and off-farm opportunities are the major influencing factors on agro diversity status, which in turn affect farmer's livelihood. Further more, low yields and financial inability to purchase enough food through out the year creates food insecurity and adversely affects people's livelihood (Mwalulcasa et al, 1999)

The broad findings of studies undertaken in LDCs (Kenya, The Gambia, Rwanda, The Philippines and Guatemala) indicate that shifts to ward commercial crop production involve significant reallocation and increased productivity of household resources. These were associated with significantly higher household income, which in turn leads to food security. Further more, the study in Guatemala reveals that access to rural saving and credit institutions that earn farmers confidence may contribute to raising household budget and thus household food security.

Recent evidence from Mali show that cash crop and food crops as complementary by using coarse grain production and cotton in which case cotton production cultivation enhance food security through the residual effect of cotton fertilizer on course grains grown in rotation with cotton. Further

more, cash crop (cotton) production allowed individual households more flexibility in time of their cereals sale and found that 80% of total cereals sales occurred in four months immediately following harvest when price typically are at their nadir particularly to pay tax as compared to 37% in cotton production areas (Staatze et al, 1988)

Different researchers examined the impact of different determinants using The Ethiopia Agricultural Sample Enumeration 2001/02 in Oromia region.

- Tesfaye .M. and Adno. T. (2005) examined socio-economic characteristics of agricultural household and their relationship to the value of crop production and food availability in West Showa zone, and found statistically significant effect of sex of head of household, education of head of household and household labor on productivity.
- Using the same data Zekaria.S. and Beyene. H. (2005) look at the effectiveness of new extension package program on crop productivity. The empirical results indicate high yield of maize and wheat from plots under the programme as high as 50 % for maize and 39 % for wheat compared to the yield of the same crop under non-programm plote.
- Likewise, Mergia,. T and Legesse, A. (2005) see the effect of ownership of oxen, method of cultivation and gender on crop area and yield the stated region and found statistically significant effect of cropped area with oxen ownership especially plough two oxen. Furthermore the result reported that female-headed household has fewer oxen than their counter part and recoding a mean ownership of 0.90 oxen as compared to 1.3 oxen per household in case of male
- Kirkos. A and Dejene.N. (2005) examine the effect of land tenure, fragmentation, farm size, and soil conservation on farm productivity. The result reveals that positive significant relationship between the variables on out put and hence food security.

CHAPTER FOUR

4. Data source and Methodology of the Study

To effectively address the purpose of the study in general and test the hypothesis in particular, the research method employed in this study is “descriptive survey method” which includes both quantitative and qualitative data analysis. The method enables assessing the issue at hand through formulation of hypothesis, data collection (sampling and data gathering technique), data analysis (testing), interpretation and development of generalization from a relatively manageable number of respondents (sample) taken to a large population. Accordingly, this section presents the background of the study area, data sources and method of analysis.

4. 1 Study area and method of data collection

4. 1.1 Background of study area

Dodota –Sire is one of the 12 woredas in Arsi Zone in the Oromiya Regional State. Dera is the administrative town for the woreda and it is found in the south east of Addis Ababa at about 125km (or 25 km from Adama town). The woreda is bounded by Seru woreda in the north , Tiyo woreda in the east, Liben woreda in the northwest and Adami-Tulu woreda in the south.

The woreda is approximately 2,312-sq.km areas that ranges from 400 to 2200 meters above sea level. The estimate shows that out of the total area 70% are arable land but only 40% is utilized. The area encompasses the three ecological zones: lowland (Kola), moderate land (Woina-Dega) and high land (Dega) which constitutes about 50%, 30%, and 20% of the area respectively. There are two rainy seasons: Belg, which is a short rainy season between February and March, and Maher, which is a long rainy season between June and September. However, there has been a fluctuation in rain fall level there and was no adequate rain in the last ten years.

According to the woreda's Population Desk, the woreda has population of about 131,898 of which 48% are male and 52% are female. There are about 20,384 farm households which constitute about 93% of the total population with an average family size of 4.5 and an average land holding size of 2.8 hector per household. The per capita land holding has been declining due to population growth and land tenure policy. Furthermore, the holdings are fragmented and in some cases scattered.

Agriculture is the main stay of farm households. Farming systems are generally characterized as mixed subsistence farming, which includes crop production, livestock rearing, and in some areas commercial farming/cash crop production (e.g vegetables, sugarcane). Crop production mainly concentrates on cereal such as wheat, barley, teff, which account 60% of total production.

Low level diversification of crops so as to cope with adverse weather, low level utilization of modern agricultural packages (extension) such as improved seeds, fertilizers and other related inputs, limited opportunities of off-farm employment, are distinct characteristics of the study area. According to the woreda's Food Security and Agricultural Development Bureau information, out of total farm households 40% have two or more oxen and the rest have only one or no ox. The main market is found in Dera town, but there are small markets in the local area in which petty traders from local peoples participating in trading grains, live stocks, coffee, salts, to supplement their livelihood.

Such characteristics of the study area make it vulnerable to different shocks such as drought for the last ten years. Furthermore, the number of food insecure population increase from time to time. Out of the total 26 kebeles in the woreda, 18 were identified to be insecure by the woreda Food Security and Agricultural Development bureau. As per bureau officials response the main cause of a problem was frequent draught coupled with low wealth potential as well as traditional mechanism of farming. Some of the coping strategy adopted were minimizing current consumption level in quantity and quality, use of inter-household transfer and loans, petty trading, participating in off-farm activities

dispose productive asset such as cattle, donkeys, sheep and goats, farm implements, sale of firewood, charcoal etc. As a result, household's has been depleting their wealth potentials.

Recently under Integrated Food Security program (IFSP) governments and non-government organizations such as European Union, World Bank, and NGOS have been participating with the objectives of minimizing disaster through improving soil fertility, creating income generating activity, replenishing the resources base etc. There are five on going food security programs/ projects in the area; Productive Safety Net Program (PSNP), World Bank Food Security Project, World Bank Emergency Drought Recovery Project, European Union Food Security Project and Federal Government Supported Food security Projects. These projects have been intervening though providing cash and/ or food transfer to food insecure (especially chronically food insecure) households, the others support by creating off-farm employment opportunities, enhancing irrigation schemes, food for work, provision of sheep for rearing and fattening in a way designed to prevent asset depletion at household level while creations assets at commodity level.

The European Union Food Security Project intervenes in five kebeles that were chronically food insecure in the woreda. It has been funding employment generation schemes, mainly labor-intensive work, providing livestock (such as sheep's and goats for rearing and fattening) and developing small-scale irrigation schemes (Rehabilitation of Koro-Degaga Small scale irrigation, construction of Shere-Mire) with the aim of replenishing and graduating such household in a sustainable manner. According in Dodota –Sire woreda about 200 farm households have been beneficiaries of livestock's and related interventions, 300 crop production, 80 small-scale irrigation schemes (even though the output has not been obtained till now), and 700 have been beneficiaries of off-farm activities (DSFS ADB, 2005).

4.1.2. Data and Collection Technique

4.1.2.1 Data Type and Sources

The study used both primary and secondary data sources with the main focus on primary data sources as it deals with the current facts and conditions that prevail, in the study area. Primary data on the factors that influence food insecurity were collected from beneficiaries of EU project and non-beneficiaries. Furthermore, secondary sources of data such as books, reports, journals, and unpublished materials were used in order to substantiate as well as compare the relationship of key points of the study with that of previous studies

4.1.2.2. Data collection technique

4.1.2.2.1. Sampling technique

The data required was collected using purposive sampling and stratified random sampling. To this end, first, from five kebele in which EU project has been working, three kebele were selected using purposive sampling based on the project duration (those above one year as products of livestock related intervention were not observed below that). Then, from these three kebeles based on information obtained from kebele administrators and project coordinator record population was stratified in to beneficiaries of EU and non-beneficiaries. Then, households were selected from each stratum using simple random sampling. Accordingly, from 1500 households in the three kebele (470 in Dire-Qiltue, 550 Aminga-Dabaso, and 480 in Dodota-Alem) 130 households from each Kebele and hence total of 390 households were selected and interviewed.

These include 210 beneficiaries and 180 non-beneficiaries of the project more specifically 60 household non-beneficiaries and 70 from beneficiaries from each kebele. The sample selected is nearly equal as intervention of the project was wide and majority of them were beneficiaries. Out of these 10 household questionnaires were found to be defective and hence the analysis in this study area is based on 380 households (167 from non-beneficiaries and 213 from beneficiary households).



Furthermore, data has been collected from project coordinators, extension agents, kebele administrators and experts in woreda Food Security and Agricultural Development Bureau.

4.1.2.2.1. Tools for Data Collections

To collect data, two forms of questionnaires (for households and coordinators or administrators) both close and open-ended were prepared based on a simplified check lists of yes or no and detailed information requirements along with any kind of comments given by the respondents (see annex3 the English version of questionnaire to make smooth for every body who want to see it). The instrument was presented in Afan Oromo as almost all of the respondents are capable of comprehending the selected language and hence avoid language barriers and minimize response bias due to misunderstanding.

Questionnaires was piloted for the purpose of revising and determining the specificity, relevance and clarity of the instruments to collect data that best fit for the analysis and to create favorable working conditions. It was tested on 20 household (10 from beneficiaries and 10 from non beneficiaries). Then based on the pilot the necessary amendment was made, and prepare for final data collection. Data collection was carried out by the researcher and enumerators (trained by the investigator).

4.2. Method of Analysis

As can be understood from the title of the study, the main target of this paper is to investigate the factors influencing food insecurity. Literatures spawn so many method and indicators ranging from supply indicators at the country level to household food intake and anthropometric measures each with their own advantages and drawbacks. Food security or insecurity must be evaluated in relation to different variables and specific socio-economic context. As analysis of the single factor indicators for food security may be ambiguous, using many factors is more exhaustive measure that would attempt to rank household vulnerability in a less ambiguous manner. To this end, simple composite indicators of access can add substantiality to the specificity and accuracy of analyses geared towards

the identification of archetypes of households, based on their vulnerability to food insecurity. For these reasons, simple access indicators of household food insecurity proposed by Maxwell and Franknebergner (1992) as well as household calorie intake were used. These access indicators were used to analyze the descriptively part as insecurity involves so many qualitative aspects. Some of these are: presence of shock, crop production condition and levels, household asset base and their disposal on the condition of shocks, asset diversification, and household to coping strategies. These access indicators have been used by the woreda officials and the donors in the local area to identify the most vulnerable group. For econometric part among the several scientific methods of setting food poverty line, we applied cost of calorie method applied.

4.2.1. Descriptive Methods

We used descriptive statistical analysis and a qualitative explanation in relation to the above indicators to describe certain characteristics of the population. Some of these specific methods of data analysis involve tabulation, cross-tabulation, computations of frequencies and percentages and computations of descriptive statistics such as mean, standard deviation.

4.2.2. Econometric Method of analysis

To identify the insecure household the approach used was to set the poverty line and then analyze the factors influencing food insecurity. That is, setting poverty line based on cost of calorie (COC) function, index of food shortfall, model specification and tests have been done before going deep in to analysis.

4.2.2.1. Cost-of-calorie (COC) Function

Among the several approach indicated in the literature part, in this paper cost of calorie method (Food energy intake) was used for delineating food poverty line. The approach used is preferable over the others as it allow for better integration between theory underlying food poverty measure and

the actual empirical measurements. Furthermore, it takes in to account prices and dietary taste and preference and it is conceptually and computationally simple. The approach taken in this study for the determination of food insecurity follows the identification and aggregation procedure. Identification is the process of defining minimum level of nutrition necessary to maintain healthy life that is setting the food poverty line. The aggregation, on the other hand, derives food insecurity statistics for the society, which is used to measure the extent of food insecurity among the rural households in the study area.

In order to generate food poverty line, the methodology adopted is cost of calorie function proposed by Greer and Thombbeck (1986) for it takes in to account regional price and dietary tastes and preference, with the advantages of simplicity and ease of computation. It sets the poverty line as cost of 2200 Kcal daily, which is recommended intake for adult. Letting X_j represent food expenditure (measured in Birr) and C_j be calorie consumption (measured in kilocalorie) for household j , both adult equivalents, the cost-of-calories function is

$$\ln X_j = a + b C_j \quad 1$$

Since household food access is a function of own-production and income from on farm off-farm sources, the implied (potential) amount of food access by a household is obtained through dividing the income set aside for food by the average market price of particular grain consumed or used. Then the total amount of grain produced and purchased is converted to their respective calorie content. The calorie content is based on Ethiopia Nutritional agency food composition table (see annex -3). The calorie adequacy was estimated by dividing estimated calorie supply for the household and the sample size adjusted for adult equivalence using the consumption factor for age-sex categories. (MoFED, 2002). Based on the detailed data collected from the household, the cost of food consumption corresponding to the recommended daily allowance of calories was computed. As food poverty line was computed on the bases of the observed diet consumed, it presumably reflects the prevailing food prices faced by households.

The food energy intake (FEI) poverty line corresponds to the level of expenditure per capita at which caloric intake is equal to the recommended daily caloric requirements per capita. The caloric contents of the recommended daily nutrients (L) was used to derive food insecurity line $Z = e^{(a+bL)}$

$$Z = e^{\hat{a}+2200\hat{b}} \quad 2$$

Where \hat{a} and \hat{b} are the estimates of coefficients a and b in equation of cost of calorie function which gives increasing costs per calorie at an ever increasing rate.

4.2.2.2. Index of food shortfall

After the food poverty line is set, each household's relative shortfall or gap below it reflects its degree of food deprivation or poverty or it is food expenditure shortfall for individual. Based on Z several food security measures were calculated with the shortfall index given as P.

Among several poverty indices the Foster, Greer, and Thorbecke (1984) class of poverty measures denoted by P is useful for its ability to capture a range of value on the incidence, depth and severity of poverty. The FGT (Foster- Greer- Thorbecke) poverty index is (i) is adaptively decomposable with population share weights, (ii) satisfies the basic properties proposed by Sen, and (iii) is justified by a relative deprivation concept of poverty. The inequality measure is shown to be the squared coefficient of variation and indeed the poverty measure is pressed as a combination of inequality measure, the headcount ratio, and the income gap-ratio. FGT index of deprivation depends on the distance between a poor household's actual income and the poverty line.

The FGT (Foster- Greer- Thorbecke) measure of poverty indices such as head count ratio, poverty gap, and severity of poverty can be expressed using the same formula but with different exponent as follows

$$P = \frac{1}{n} \sum_{j=1}^q \left[\frac{Z - X_j}{Z} \right]^\alpha$$

Where, n ranges from j=1 to q, Z gives the cost of buying the minimum calorie intake (L)
L= Recommended daily energy levels (2200kcal)

X= actual mean expenditure

G_i =Food expenditure deficiency for household I

M=the number of food insecure households

N =Total population

Where α ranges from zero to any number. It becomes Head count ratio (H) when α is 0, poverty gap when α is one, and poverty severity measure when α is two.

Head Count Index is the proportion of the population below the property line and one of the widely used measures in poverty. Head count ratio (H) it show the number of food insecure peoples relative to the total population. HCI is simple to construct and easy to understand. It is a measure of prevalence of poverty.

$$H = M/N$$

This is also a good measure in assessing the overall progress in reducing poverty, it is easily understood and communicated but it is insensitive to difference in depth of poverty. In implementing food security police and programmes the value of the index could be monitored over time and compared among the different groups of the population.

Poverty Gap index: poverty Gap measures the depth of poverty and is defined as a means deviation of income of the poor from the poverty line. The shortfall index (P) measures the extent that the poor households are food insecure. The index is a reflection of insecurity situation in a society. It is an average gap between the living standard of the poor household and poverty line. The major drawback of this method is that it does capture difference in severity. It is defined as

$$Pg = \frac{1}{n} \sum_{j=1}^q \left[\frac{Z - X_j}{Z} \right] \quad G_i = (Z - X_i)/Z$$

$$Pg = \frac{1}{n} \sum_{j=1}^q [G_i]$$

Poverty gap -square is a measure of severity of poverty. The index is defined as:

$$P = \frac{1}{n} \sum_{j=1}^q \left[\frac{Z - X_j}{Z} \right]^2$$

The poverty measurement was across the type of the food insecure of the rural farm households. The measurement result indicates the prevalence of food poverty, depth of poverty and severity of poverty. Though it is difficult to interpret, the contribution of each part to total food insecurity was measured. What we learn more is the relative severity food poverty in relation to the other group that between beneficiaries and non-beneficiaries (MoFED, 2002).

4.2.2.3. Model Specification

The absence of generally acceptable model that capture the factors that influence food security /insecurity among farm household lead to the selection of model depending on the objective at hand and the efficiency of the model in showing the factors. The model used is based on the theoretical framework that food security is sum of food acquirement and utilization. However, we restrict ourselves to the acquirement side as mentioned in the literature part. Food acquirement is a function of food endowment set and entitlements mapping. The factors that influence these dimensions have effect on food security at household in one way or another as mentioned in the literature part of the study. Furthermore, the selection of the model is based on our objective to see the factors influencing food security among the insecure part of population. Thus, it is important to have a model that implies the insecure part of the population and predict the value for the variables.

With this background, the empirical analysis was conducted by using Tobit regression model. The model used food insecurity index of the household as dependent variable. The food insecurity is defined on the basis of shortfall of adequate access to food as measured by the minimum caloric adequacy. Model is used for those beneficiaries of EU project and non-beneficiaries in order to see the policy effect and compare with the other (non-beneficiaries).

Following McDonald and Moffit (1980), and IKPI and Kormawa (2004), Tobit model used to identify the factor influencing food insecurity expressed as:

$$F_{\text{insi}} = BQ_i + e_i \dots$$

Where, $F_{\text{insi}} = 0$ for $Q_i \geq Z$ and

$$F_{\text{insi}} = (Z - X_i) / Z \text{ for } X_i < Z$$

Q_i = vector of explanatory variable

e_i = Independent distributed error term

F_{insi} = Food insecurity status of household i (0-1)

Z = food insecurity line (computed by calorie intake)

X_i = Calorie consumption of household

B = coefficients of explanatory variables

Where Q_i is a vector of household characteristics. The independent variables, which are the socio-economic, demographic, agricultural production and household demand variables, are captured as:

Q_1 = households size (+)

Q_2 = Gender of household head (1 for male (-), 0 for female (+))

Q_3 = age of household heads (yrs) (-)

Q_4 = Dependency ratio (+)

Q_5 = Educational level of household head (-)

Q_6 = total expenditure (in Birr) (-)

Q_7 = food allocation (as % of total expenditure) (-)

Q_8 = Household net worth (in Birr) (-)

Q_9 = Value of crop output (Birr) (-)

Q_{10} = Diversification extent (measured by herfindahl index (-))

Q_{11} = Input usage (-)

Q_{12} = Fertilizer usage (-)

Q_{13} = Farm size (in hector) (-)

Q_{14} = off-farm activities (-)

Q_{15} = Contribution of EU (-)

B_i is the marginal effect of each explanatory variable on state of food insecurity. The expected sign of each variable are shown in the bracket above.

Descriptions of the variables and their theoretical expectations for proposed model:

- The inclusion of the household size (Q_1) is based on the assumptions that large household needs more food resources to be food secure as compared to low household size through creating pressure on the available food resources (IKPI et al, 2004). Hence the coefficient of the variable is assumed to be non-negative.
- Regarding the second variable called gender of households (Q_2): as explained in the literature part of the study, the two groups have different access to resources and work burden in their ability to attain food security (Aredo, 1994; Feldstein et al 1998). As economic theory suggest we expect negative sign for female. This variable is used as dummy variable, 0 for female and 1 for male.
- Age of head of household (Q_3) is an important determinant as younger group has less access to economic resources such as land and farm implements. The economic potential increase with age, hence, it is positively related to food security. It has been argued that the higher the age of the household head the more stable the economy of the farm household, because older people have relatively richer as well as greater experience of farming activities. By contrast, younger men either to have a wait for land distribution, or have share land with their families (Haile et al, 2005)
- Dependency ratio (Q_4) is one of the variables that influence the food security of household through increasing the number of individual consuming the available resources with out much contribution for the household income. It is calculated as the ratio of the number of individual below age of 14 and above 65 to those in the working age group in the household.
- Level educational attainment or development in human capital (Q_5) lead to high productivity directly by improving the quality of labor and increase the ability to adjust to disequilibria and through its effect upon the propensity to successfully adopt innovation. Therefore, it has positive influence on food security (Ellis, 1993). Even though, there are different classifications of

education by researchers as indicated in the literature, for the purpose of this study we used the level of formal educational attainment due to its simplicity in computation. Educational attainment is hypothesized to have negative influence on household food insecurity. We only concentrate on the head of households' educational attainment as it is decision maker in the household and measured by the level of grade completed.

- The income of the household is an important determinant to food security. The level of income determines the quantities of food that is consumed, the consumption of the diet and access to social services that have some link with the nutritional conditions of individual or households. The increase in the level of household income increases the capacity of farming households to consume and hence food security. Experience show that collecting household income is challenging. Total expenditure (Q6) is used as proxy measures because it is easier to obtain information about household expenditures than about total income from all source expenditure (FANTA, 2004; MOFED, 2002).
- Vulnerable households or low-income group often devote a large proportion of income to food purchase (Q7). It is useful as annual tracking indicators that provide insight in to vulnerability trend in target communities. Food purchases may be one of the expenditure tracked if the indicators are to be used to track vulnerability to declining food access. Thus, in our case household share of food expenditure as percentage of total expenditure (FANTA, 2003)
- Household net worth can be examined from different perspectives as determinant for food security. It is assignment provides finance for maintaining and sustaining the production process, in case of emergency as well as insurance and collateral at the time of risk or shock. For the rural household livestock is classical indicators of wealth potential that can be used as insurances. Their availability amount is positively related to food security. It is measured by the estimating the market value of all livestock that the household owns. As food insecure household, used the animal or they're by product at various time through out the year, during shock.
- For farm household crop production is the main sources of food for consumption for subsistence

farmer, which is influenced by socioeconomic, agro-climatic and environmental characteristics. Aggregate production is expected to influence the income of the household whose income is depending on food produced. In addition, price play crucial role for farm household that sell their product at the time of harvest to meet their pressing cash need and buy food during shortage. In order to capture these two important variables total value of production is used which is calculated based on the average prices of the food in the stud area of the time of survey⁶.

- Theoretically as long as the different income sources are not perfectly correlate diversification of income benefits by capturing the potential harmful effect of a reduced cushion of subsistence production. It is a proxy measure for access and income when it is difficult to or unfeasible to collect information on income. It captures household income diversification strategies and it is based on the assumption that a more diversified set of income sources will result in fewer episodes of income shortfall (Downing, 1989). But highly diversified portfolio of non formal income may not always associate with higher levels of food security. There are several measures of diversification extent such as Gini coefficient, Herfindahl - Simpson index and Herfrendl

index and so on. For the purpose of this study, herfidahl index is used. Algebraically, $K = \sum_{j=1}^q Si^2$

where Si =share of income I in total income is the concentration extent. The reverse which say

$K = 1 - \sum_{j=1}^q Si^2$ is measure of diversification. It is the sum of square of the weight by each sources

of income.

- Input usage (seed) is the basic input for agricultural production. The extent of productivity influence of seed depends on the seed variety used in the production process. Modern variety of seed influence is higher than that of traditional type of input. Theoretically as the use of this input increase the production increase and hence household food security. Hence it has positive influence on food security. It is measured by the amount of money spent or the on the imputed inputs.

⁶ The price of each out put is based on the average market price of each crop during the survey time that is may 15-25 in Dera Twon

- Fertilizer use is used by most studies as a proxy for technology. According to the literature, subsistence farming, by its nature, is production for direct consumption. Any farm inputs that augment agricultural productivity is expected to boost the over all production. This contributes to wards household food security (Haile et al, 2005). In this study fertilizer was used by the amount of money that household spend for it.
- Farm size is continuous variable. Theoretically under subsistence agriculture holding size is expected to play a significant role in influencing farm household food security. This based on the theoretical and empirical underpinning that as the farm size increase the level of production will increase (ECA, 2004; Haile et al 2005). The size of the holding of farmer is measured in hector of land that they own and use for the production.
- Regarding the project intervention, it has been argued that project intervention in food security through different mechanism such as developing irrigation schemes, generating off-farm activities , replenishing the vulnerable group have positive impact on the household food security (Haddinot,1999;Osmanis,2001).
- Off-farm activities are among the most factors influencing food security of household under stress. This income substantiates household income and consumption not only under risk condition but also under normal conditions. It contributes to the consumption smoothing (Osmanis, 2009; Dercon, 2000). This variable is measured by the amount of money obtained from these activities.

4.2.2.3.1. Test of the model

The binary choice model can often be interpreted as being derived from the underlying utility maximization problem (our case to be food insecure). Since we used Tobit model, the parameters are estimated by the method of maximum likelihood estimation as the discrete nature of the outcomes variables, and non-linear in the parameters, the functional relations between the choice probabilities of P_i and the explanatory variables (Griffiths et al, 1993). The maximum likelihood estimates are known to be consistent and asymptotically efficient under the assumption that errors are independently and identically distributed. This means that we must be sure about the entire distribution that we impose upon our data.

A violation of such distributional assumptions will generally lead to inconsistent estimators for parameter and variance. In particular non-normality and heteroscedasticity as well as omitted variables are a concern. (Varbeek, 2000). In the literature there are three tests: likelihood ratio test, Wald test, and Lagrangean multiplier tests. Each method has its own advantage and disadvantage. Among the stated alternative, likelihood ratio test was used for this study as it is based on the first order condition from general model that specifies an adversative hypothesis. Usually, Specification are motive from the latent variable model and reflect heteroskedasticity or non-normality of error term. In addition, we may want to test for omitted variables without having to re-estimate the model. This was tested by the likelihood ratio test.

CHAPTER FIVE

5. ANALYSES AND INTERPRETATION

In the previous sections, household food insecurity was conceptualized in terms of sets of variables deemed likely to contribute to household's vulnerability to entitlement failure. This section try to examine the vulnerability of households in Dodota-Sire woreda to different shocks and the household's ex post coping mechanisms using data collected from the households. The analyses is presented in two section; Descriptive and econometric. The first gives qualitative finding using composite indicators supported by simple statistical analysis and the second concentrate on econometric or empirical analysis. Both sections supplement each other as the first enable us to explain certain variable that are not captured by the second methods.

5.1. Descriptive analysis

Vulnerability is one of the welfare dimensions and refers to all forms of household insecurity, the risk of being in poverty or the probability of falling in to deep poverty (insecurity) in the future. It is a combination of shocks and the ability of household to cope up with shocks (ex ante and ex post shocks). It has very important implication for the household as it leads to change in consumption, production decisions and other related livelihood of the poor. It is more difficult to measure vulnerability than the other dimensions of well-being such as capabilities and economic opportunities. As a result of these one can resort to qualitative information such as perception of individual about the shock and their ability to obtain income. This may indicate the extent of vulnerability of households (individual) to various shocks and the level of current and expected income compared to past, and ex ante and ex post risk coping mechanisms. (Dacron, 2000; MOFED, 2002; Askal, 2003). Shocks may come from different sources that may be common like climatic or idiosyncratic that are risk specific to the individual household. Household food insecurity is a function of productive assets, demographic structure of household sources of employment and of agro-ecological zone (Eshete, 1995). Shock to any of these can adversely affect household food

security. We try to consider these under each specific determinant and their likelihood impact on the household food security.

5.1.1 Profile of Shocks (common shock)

Frequent drought and other natural calamities are among the main causes of common shocks for subsistent farmers in many LDCs in general, Horn of Africa, in particular (FAO, 2000). Such shock is one of the hypothesized reasons for food insecurity in the study area. Farmers were questioned about the cause of their vulnerability as they experienced it. About 90 % of household put forward shortage of rain as major cause for crop failure followed by weeds.⁷ For them the problem of rain failure was critical either at the seed germination and/or crop growing period which resulted in partial or complete crop failures. Drought has a unique impact on agricultural system because of its duration which extends over several seasons or even years. Extension agents', kebele administrators, project coordinators and other officials have confirmed this. Furthermore, metrological expert indicated the insufficient nature of rain. As it has been documented in the literature, Ethiopia has experience a frequent drought in 1973/4, 1984/85, 1987, 1992, 1994 and 1999/00 in different part, which result in high food shortage and famine. For instance, in Wolita such droughts lead to great lose and had negative consequence on farm household. Similar weather related problem has been experienced in Uganda in 1990s that lead to great starvation of farmers (Bagiiwa, 1999)

Weeds were unwanted plants that share the soil nutrients and suppress the growth of crop and its productivity. As per the farmer response, weed was affecting the crop after at middle growth stage and their effort to eradicate using traditional mechanism was ineffective, since the type of weeds were more or less similar to the crop. An alternative mechanisms could not been used because of high cost of chemicals that could not be managed by such farm household. The other mention idiosyncratic shock related to lack of access to land and productive assets.

⁷ As the problems were common putting them in table form is difficult and does not give any further implication.

Such shock is consistence with the theoretical as well as empirical studies cited in the literature part of the study. There is also a similarity with poverty incidence analysis 1999/00 Household Income and Consumption Expenditure (HICE) Survey conducted by Central Statistical Agency during typical drought in the country.

5.1.2. Sources of household food security

Food self-sufficiency at household level as main determinant of subsistent household food security has been well articulated in the literature on the grounds of endemic nature of the imperfections and uncertainty characterizing food market, policy environment and so on (MOFED,2002;FSS,2002). According to farmers' response, own production is the major source of food for household in Dodota-Sire in spite of adverse conditions and low return that appear to reflect the premium that the poor households were willing to pay in order to secure a minimum level of food adequacy and to ensure them against riskier portfolio choice. The major type of crop produced in the study area are cereals such as wheat, teff, barely, maize, sorghum and to a lesser extent vegetable and fruits.

Even this low return (output) that the farm household produced varies considerably among the households (different groups) in total value of production term. As per the Food Security and Agricultural Development Bureau information the total production of this society in monetary term was low as compared to the normal year. When we compare the total value of production between three groups it is extremely low for beneficiary (2175.5 Birr) with high variability that range from 0-6800(see table6).

Table 6: Summary statistics for total value of production (in birr)

Variable	Status	Observations	Mean	Std. Dev.	Min	Max
Total value of production	Beneficiary	213	2175.3	1144.33	0	6800
	Non beneficiary	72	3074.3	1268.4	860	6790
	Food secure	95	4123.1	1908.1	789	9140

Source: computed from survey data

To assess the vulnerability of household information about the length of time they can feed their family well from own production has been collected. Based on their own perception, own production on average last only for seven months. The majority of household found to be food secures during harvest time (October-January) and the status decline and reaches its bottom level during summer (June-September) (see Table 7). On average about 36% of the households all food insecure for seven months. From this we understand the households were food insecure.

Table 7: Length of time household is food insecure in the year (in month)

No	Status	Season or Month of in Security	Count	Percent
1	Food insecure up to 3 month	July to August	50	24
2	Food insecure from 4-6 month	June to September	210	55
3	Food insecure from 7-9 month	March to September	120	21
	Average	Seven months	380	34

Source: computed from survey data

5.1.3. Demographic characteristics and food security in the study

Production, consumption pattern, decision-making and hence household food security are partially affected by demographic characteristics of the households. Household size, age-sex structure, educational attainments are important factors that influence the household's contribution to farming activities and livelihood earnings. The result of the survey indicates the average family size of Dodota- Sire is 6.5 people per household. This number of household size is large compared the analysis based on 1999/00 HICE for rural Ethiopia (5.9) but lower than Eshet (2001) found for and Wolita district 10.3 (see table 8). Furthermore, the mean household size the highest for project beneficiaries with high variability. There is some indication that such large family size was the cause for household food insecurity.

Similarly, the beneficiary/non-beneficiary food insecure household tends to have larger proportion of dependents as compared to food secured. Furthermore, average dependency ratio is the highest among the beneficiaries as compared to the others.



Table 8: Summary statistics for household demographic characteristics (in number of households' size, age of head,)

Variable	Status	Observations	Mean	Std. Dev.	Min	Max
Family size (in the number of household size)	Beneficiary	213	7.35	2.385	2	14
	Non beneficiary	72	6.38	2.322	3	14
	Food secure	95	5.78	2.11	2	12
	Average	380	6.5	2.31	2	4
Dependency ratio (in the number of those below 14 and above 65 years of age over working age group i.e. 15-64)	Beneficiary	213	1.64	2.3856	2	5
	Non beneficiary	72	1.37	.87	0	4
	Food secure	95	1.04	.752	0	3.5
	Average	380	1.33	0.5	0	4.25
Age of household(in age)	Beneficiary	213	30	14	18	90
	Non beneficiary	75	45	13	21	80
	Food secure	95	45	15	22	70
	Average	380	40	14.5	13	90
Education of household head(in formal educational attainments)	Beneficiary	213	2.5	3.0	0	11
	Non beneficiary	72	3	3.2677	0	12
	Food secure	95	3	3.427	0	12

Source: survey data

The average age of the household head is 40 as compared to 44 for the country level from 1999/00 HICE survey. From the data one can observe certain relationship of age with food security status of household. For instance, the project beneficiaries have distinct characteristics in that the age range from the lowest (30) to the highest (90) which give some clue that very young and very old household tend to be food insecure. Further more, larger member of the household heads are younger age group for beneficiaries as compared to the other groups. This age group is found to be relatively food insecure or insecure with low deviation from the means.

Even though the mean level of education is lower for beneficiaries, there is no much difference in educational attainment between food secured and insecure non-beneficiaries.

5.1.4. Productive assets and household food security

The resources endowment for farm household may vary depending on the economic status of the household. For food security purpose asset ownership can be characterized on the base of presence

of productive assets such as land, labor, traction-power (animals), financial capital, seeds that can affect farmer's economic performance and food security. Greater access to such resources improves household food security by improving entitlement mapping conceptualized in the literature part.

Household landholdings are good indicators of his productive potential. As per the survey result, there is difference in landholding and its average size. The holding ranges from zero with those lacks of access to such resources to 7.5 hectors per household (see Table 9). Relative to the other groups the secured households have higher landholding on average (3.266) with moderate variability. When we divide the household land holding for the average family size of each group, (i.e. per capita land holding size) is found to be less than 0.5. The small land holding size for large amount of population (beneficiaries and food insecured non-beneficiaries) on top of large young married couples who have got small amount of land as gift from their family indicate some type of vulnerability in this study area.

Table 9: Summary statistics for household access or ownership productive asset (landholdings)

Variable	Status	Observations	Mean	Std. Dev.	Min	Max
Land holding size	Beneficiary	213	2.038	1.126909	0	3.6
	Non beneficiary	72	2.751	3.2	0	4.5
	Food secure	95	3.266	1.527	0	7.5
	Average size	380	2.66	2.4	0	7.5

Source: survey data

Another important input in agricultural production in Ethiopian setting is the availability of traction power. The food security of this household is considerable (positively related) related to such asset. Based on the survey the majority (69%) of the household does not have the traction power enough for cultivation (i.e. less than two oxen) (see table10). For these reason they combine their oxen with some bodies since they both use the power on daily base, the cultivation of their individual land cannot be done in away that lead to high productivity and appropriate time. Those how have no oxen can be in a worse situation. These may be consistent with the experiences and empirical works that

put for ward shortage of draft animals as among the root cause of growing food insufficiency and poverty (Eshet, 1995).

Table 10: Oxen ownership of farm household in Dodota- Sire(in number of oxen owned)

Number of oxen	Number of Household	Percent
No ox	110	29
Only one ox	155	40
Only two ox	60	16
3 and more oxen	55	15

Source: survey data

Like wise, farm inputs (seeds, fertilizer and chemical) usages have positive impact on the household food security on the ground that such assets importance for agricultural production. Like in the case of traction power and other productive assets access and usage of seed and fertilize is low for beneficiaries as compared to the other groups with low variability (see table11). These may be due to low economic capacity of among beneficiaries as compared to the other groups as well as lack or low access to the productive asset such as land .If we relate table 9 and table 11 the data reveals the low holding size is related to low input usage. Relative to seed the utilization of fertilizer is low even though its price is higher. As per the response of extension agent the utilization of fertilizer and improved seed were low. Most of the households in the study area have no access farm or these inputs lead to share cropping and other means of farming that have adverse effect on the subsequent year's household food security.

Table 11: Input usage and its relation to food security (in birr)

Variable	Status	Observations	Mean	Std. Dev.	Min	Max
Seed	Beneficiary	213	551.79	295.5	0	1630
	Non beneficiary	72	831.916	549.99	123	3870
	Food secure	95	923.28	562.2315	240	4090
Fertilizer	Beneficiary	213	113.20	139.0572	0	864
	Non beneficiary	72	201.13	164.22	0	632
	Food secure	95	240.53	202.65	0	931

Source: survey data

To say input usage were low or not we try to compare the amount used in monetary term to the amount required to be used on certain size of farmland. According to the agricultural extension agent recommended amount of fertilizer for one hector is 100kg and from 150-200kg of seed. In terms of money 100kg of fertilizer cost 266 birr and 50birr chemical for weeds. If we take the average amount of seed 175kg per hector it requires up to 440birr (one quintal cost 250 birr) in terms of wheat required which is common crop for every farmer.

Table 12: Required and actual input usage by farmers (in terms of birr)

Group	Farm size average	Seed utilization			Fertilizer utilization		
		Required	Utilized	Deficit	Required	Utilized	Deficit
Beneficiary	2.038	896.7	551.79	345	642	113.20	529
Non beneficiary	2.751	1210	831.916	379	831	201.13	630
Food secure	3.266	1437	923	514	1018.7	240.53	778

Source: survey data

As can be seen from the table 12 the amount utilized was low for both inputs. Further more it was extremely low for fertilizer as compared to the other

5.1.5 Household coping strategies against shocks

For subsistence farmer failure to produce what is required for their livelihood forced them to get involved in an alternative option available for them and/or depend on the asset they have .In the previous sections we have identified Dodota-Sire woreda is among the area hit by recurrent drought. The response to entitlement failure differ depending on the extent (length and depth) of the shock, the socio-economic characteristics of the household such as asset ownership, income status, level of food reserve of each household, family labor availability and the like. Rural households adopt coping strategies in sequential pattern as the severity of food shortage increase. Davies (1994) classifies such coping mechanisms in to stages: a self-insurances strategy, income stabilization strategy, asset

disposal, and distress migration and family separation. These are; reducing consumption, diversify secondary economic activities, borrowing, support from relative, sale of small animal, sale of family labor, etc.

However, not all households adopt the same strategies and responses in the same sequences or with the same intensity (Eshet, 1995). Some response fall under the first can be combined with the second and third. Official sources and field work information indicate that over 90 % of the peasant in Dodota-Sire were under sever risk in one form or another and have adopted different coping mechanisms. Since household adopt different strategy at the same time the analysis may be difficult in terms of one strategy that they adopt thus it is better to analyze whether the mechanism was adopted or not and the extent of adoption.

Minimizing intake when there is food shortage happens or likely to happen is the first action taken by farm household. Majority of the population, minimize their intake of food and resort to low priced food item as compared to the normal time. The form of minimization was either to reduce the amount consumed on each mealtime, and/or just passing one mealtime. That is, eating morning and evening. Both of these were experienced in the study area.

Table 13: The coping mechanisms adopted by the farmer

Strategy	Adopted	Count household reporting
Minimize their intake,	FA	275
Participate in off-farm activities	FA	240
EU contribution	FA	213
Sale of livestock	FA	200
Sale of wood, leaves, handicraft petty trading	FA	200
Exchange labor for food	FA	120
Food aid	FA	80
Land rent	FA	90
Temporary migration for work	FA	50
Borrowing from social organization like iddir and help -help microfinance institution	FA	45
Transfer from relatives	A	40
Borrow grain	A	15

Source: survey data

Note: A= moderately adopted FA= frequently adopted strategy, RA= rarely adopted strategy

Participation in off-farm activities on other was the second coping mechanisms include (in order of their importance) Journata (working as daily laborer), firewood and charcoal selling, petty trading, women prepare and sale of Tella and Katikala (local drinks with different level of alcoholic content), as well as blocket (common local material made of soil and used for building local house as there is no wood) of preparing and selling, trashing and harvesting, and the like. These action of coping was consistence with the findings of Dessalgn Ramato(1991) from the 1984/85 drought and Eshete(1995) finding from 1984/5 ,1991 drought in wolita.

Peasant household make every effort to sacrifice many of their current consumption requirements not only for family survival, but also to preserve their key productive assets as they play a crucial role in determining both their current and future income and consumption. There is a gradual disposal of asset from more liquid to less liquid. Field survey result show that sale of livestock was frequently adopted strategy over the seasons or years they deplete their potential and reached the stage they were forced to sell their productive assets indicating distress sale of productive assets hence food insecurity. Such disposal of asset and vulnerability was exacerbated due to high price of grain and low price of livestock because of low quality of livestock coming to market. Such gradual disposal of asset is a widely practiced strategy among the insecured peasant in Wolita 1984/5, 1990/91(Eshet, 1995).

In addition to typical draught power, land can serve as coping mechanism for distress indicating extreme vulnerability of the household resorted to sell such asset. Survey data reveals that land rent among farm household in Dodota-Sire was common showing prevalence of the extremely vulnerability. Out of the sampled household in the study area more than a quarter of them rent out their land that range from 0.5 to 1 hectar per farm household for those who rent their land. The most miserable ever-aggravating part of this act was that, such insecured household sells their land

(though illegal) at low prices. Most of these households sell their land during summer when the risk was relatively severe. Moreover, they extend the contract for the following year as the situation getting worse. This action of household made them more vulnerable in the next subsequent years.

The other coping mechanism for the study area is the support of government and different multilateral donors and NGOs, in which 30 % report as means of coping strategy. This is usually in the form of replenishing resource base; creating off-farm activity, direct provision of food support of relative new for old age and disabled. In this regard EU project beneficiaries earn 15 % more off-farm income than non-beneficiaries. Such households earn income from notoriously risk activities that require more energy to dig and plant. Public safety net program of risk-reduction strategy were among the strategies used in different part of the world thought it has some crowding out effects (Dercon, 2000).

The key feature by the study area was that the choice of strategy showed some distinct variations according to the economic status of farm household. The survey finding indicates that, household in Dodota-Sire minimize their intake, sale their productive assets, like their livestock, exchange labor for food, participate in off-farm activities in order to sustain their livelihood. These were the coping mechanisms adopted in 1999/00 drought though the order of these mechanisms differs. In the case of the 1999/00 sale of animal product, sale of agricultural product, sale of forest product, money reserve, iqube and iddir, loan gift from relative and non-relative, sale of other household good in their descending order.

5.1.6. EU project and its impact on household food security

The documented shift in the HFS paradigm from food supply to food access has led many policy makers and development practitioners concerned with food and nutrition issue to emphasize the role of income as a determinant of food security (Osmanis, 2001). They increase the ability to cope with

the shocks as well as replenish the resources base of the households through diversifying the livelihood structure.

The survey data show striking differences both in total amount of income and in its compositions between beneficiaries and non-beneficiaries. Out of total 213 beneficiaries 75 (35%) has been provided with sheeps and/or goats for rearing and/or fattening the rest engage in labor-intensive fieldwork such as terracing and afforestation. As per the response of the sampled population such interventions were good despite its highly labor intensive work, which is not fairly paid as compared to work done. With regard to sheep and goats rearing and fattening about 70 % of those household respond that the mechanism were good way of replenishing resources base and have great influence on coping ability as they use the children for such animals disposal.

The agricultural development agent in the area and kebele administrator appreciated the contribution of EU project. They noted the importance of labor intensive, land management and conservation practices on hill land (afforestation) and terracing on some rugged terrains that are susceptible to high soil erosion. According to them agro-ecological as well as environmental perspective such activity was worth while, in restoring normal weather condition and reducing erosion. According to them experiences of the project in the last two years has been promising. For instances, the farmland productivity of those farmers on which terracing has been passing on has shown an increase as topsoil nutrient has not be easily eroded. Further more, the hill land on which traces are planted has environmentally good for the region even through its out come can not be judged in short run in relation to individual household.

The findings emerging from field work in Dodota-Sire show that household risk of food shortage and try to cope through different mechanism. As the severity of food shortage tend to increase, households were often forced to sell their productive assets to ensure current family food security at

expense of future security. Although the process involves gradual and selective divestment measure as their plight worsens, poor household reach an irreversible stage of vulnerability. The small number of sources of income combined with its low level reported for this community point to extreme vulnerability of many households to entitlement failure in the study area.

5.2 Econometric Analysis

5.2.1 Consumption poverty and its intensity

The idea of setting poverty line and measurement of poverty indices help to be informed of the sheer number of poor people, depth of poverty, the income or budget needed to bring out people out of the distress situation and evaluate the impact of program already in place (MOFED, 2002). Among several methods of setting food poverty line mentioned in the literature part, the concept and measurement of the method used for this study has already been articulated in the methodology section.

Accordingly, the allowance needed to secure based on the recommended daily energy intake, the food poverty line for the household in Dodota-Sire woreda was estimated at birr 990.7 per adult equivalent. This figure is greater than the poverty line calculated for the country and rural areas based on the 1999/2000 Household Income and Consumption Expenditure Survey (HICE) of Central Statistical Agency that is 647.81 and 620 respectively. The possible reasons for this are there has been many socio-economic changes such the prices of consumption goods increase in general, as well as study area drought made price to increase dramatically.

With regard to the proportion of insecured population based on the absolute head count ratio index stood at about 75%, indicating seventy -five percent of the total population under absolute poverty based on per adult equivalence. It is more than the 1999/00 HICE survey result (41 % are

insecured)⁸. The poverty gap indices were 0.45 and 0.23 for beneficiary and non-beneficiaries respectively. These means the average income gap was 445.5 for beneficiaries and 227.7 for non-beneficiaries when measured from the poverty line estimated above indicating high poverty in the study area. This figure is high as compared to 1999/00 HICE survey for the country as well as for rural Ethiopia that is 0.119 and 0.122 respectively. Furthermore, in comparison to HICE, the study area have 8% consumption expenditure shortfall at per adult equivalence. That is atypical, food insecure household in Dodota-Sire have 350 income/expenditure shortages to meet minimum calorie intake as compared to HICE survey that reveals 289.5 and 295.1 for the country and rural part of the country, respectively.

Table14: The summary statistics and food security index

Variable	value		
Cost of calorie function	$\ln x_j = a + bC_j$		
R ²	0.13		
a	6.381464		
b	0.000235		
Poverty line in birr (Z)	990.7		
Food security indices	food secure	beneficiaries	non beneficiaries
Percent	25%	56	18
Calorie availability	3000	1380	1852
Head count ratio (H)	0.25	0.56	0.18
Shortfall or surplus index (P ₁)	0.49	0.45	0.23
Severity of poverty (P ₂)	--	0.230	0.16

⁸ Comparing the results of this survey result of 1999/2000 household income and consumption expenditure survey is reasonable as the circumstances during this period were more or less similar to the situation in Dodota-Sire. Because, first sporadic drought incidence were recorded in Somale, Tigray and some parts of Oromiya regional states, second, the 1999/00 survey follow two years of consecutive droughts which had affected agricultural output particularly crop production. Third the country has experienced sever shock in its terms of trade.

As can be seen from the table12, beneficiaries of European Union are highly food insecure than non-beneficiaries in terms of caloric and expenditure per adult equivalences. Severity measure shows relatively the beneficiaries were more insecure than non-beneficiaries that i.e. .23 as compared to .16. In line with the theoretical underpinning, empirical findings 1999/00 HICE survey, Tulu (2001) and others, the proportion share of food budget out of total expenditure is high. It accounts about 70 % of total expenditure for the household in Dodota-Sire as compared 61 % and 68 % for HICE and Tulu (2001) respectively.

In relation to expenditure, other important variables are the expenditure efficiency, which shows the quantity of caloric purchased per birr and the unit value index that indicates the welfare situation of consumer. Survey data indicate, on average, the expenditure efficiency is found to be 875.67 calorie per birr and 10.5 unit value indexes. The result of unit value index tells as the price of food price increase by more than three times than that of normal situation.

All the above finding and analysis boils down to show extreme food insecurity in the study area in comparison to other studies and from theoretical perspective. All the above circumstance (high short fall, high price, large food percentage of food expenditure and others are attributed to crop failure, low distribution of agricultural food production, frequent drought and so on.

5.2.2. Econometric Estimation

Assessment of factors influencing food insecurity requires moving beyond descriptive analysis and employing econometric techniques to model the behavior of household and their status in livelihood security in order to prioritize and respond accordingly. The first and the most important stage that econometrician has to take in an attempting to study any relationship between variables is specification of the model and formulation of hypothesis. This was briefly presented in methodology section. This section presents the model estimation and interpretation of the data.

Under model estimation the first task to be performed is testing the validity of the assumption imposed on the model. This tells us the adequacy of the specification. As we have used maximum likelihood estimation technique that rests upon the distributional assumption consistent and asymptotically normality.

The post estimation, test using likelihood ratio test has shown no distributional violation. That is, we reject the null hypotheses that the selected variables chosen to have determined the probability of food insecurity are not significantly different from zero. This test implies that the demographic characteristics, farm endowments and production, net wealth and others determine household food security. This is supported from different theoretical and empirical works in many developing countries.

The problem of multicollinearity can be expressed, as the violation of the assumption of covariance between variable should equal to zero. Thus, the avoidance of such problem enable the explanatory variable can separately contribute to the variation in the dependent variable. In this study the result of test of multicollinearity assure the problem does not exist. As a rule of thumb if the coefficients of correlation between the two explanatory variables are greater or equal to 0.8 one can conclude that there exists a problem of multicollinearity between these variables. But the test shows the maximum correlation coefficient exists between the two variable is 0.5 in the two equation variable (see annex -5)

Following the problem, theoretical and empirical review of literatures, and methodology of study, and setting food poverty line, tobit model was estimated to see the factor influencing food insecurity in the study area for beneficiaries and non- beneficiaries of European Union food security program. The results are presented in table 14. The magnitude of the coefficient obtained from the model show the marginal effect of each explanatory variable on the probability of being food insecure.

Most of the tobit results were found to be significant and have expected sign which are consistent with theoretical underpinning.

Table15: Tobit estimation result of both groups

Explanatory variable	Dependent variable (index of food security)	
	Beneficiaries	Non -beneficiaries
Sex of household head (male=1, female= 0)	-0.0027275 (-0.19)	-0.0440527(-0.86)
Age of household heads	0.0009782(2.16)**	0.0017115(1.37)
Household size	0.0324504 (10.31)*	0.0865334(11.30)*
Dependency ratio	0.0252753(3.34)*	-0.0368176 (-2.14)**
Education of head	-0.0008968 (-0.42)	0.0040032 (0.81)
Farm size	-0.0050401(-0.82)	-0.0056613(-0.37)
Net wealth	-0.0000376 (-4.46)*	-0.0000483 (-3.29)*
Off- farm activities	-0.0000458 (-2.68)*	-0.0000837 (-2.02)*
Diversification extent	-0.090357 (-1.25)	-0.1370839 (-0.95)
Total value of production	-0.0000302(-3.21)*	-0.0000551 (-2.39)*
Seeds	-0.0000371(1.42)***	0.0000215(0.71)***
Fertilizers	-0.0000502(-1.18)	-0.0000364 (0.38)
Total expenditure	-0.0000514 (-6.41)*	-0.0000609 (-3.65)*
Share of food expenditure	-0.1832054 (-5.09)*	-0.5325086(-3.41) *
Contribution of EU	-0.000079(-2.4)**	-----
Constant	27275	0.1172574
	LR chi2(15)	289.49
	Prob > chi2	0.0000
	Log likelihood	231.16008
		23.561984

Note: a) *significance at 1%, **significant at 5%, *** significance at 10%

b) Figure in brackets are t-values.

In contrast with the widely held view that female-headed household have higher probability of being insecure than their male counterparts, the result obtained reveals no differences between the two group for both beneficiaries and non beneficiaries. The possible reasons for these are: most female-headed household in rural area own land that they can plough or rent out at the time of shocks. Furthermore, under stress condition female-headed household can engaged in off-farm income generating activities such as petty trading in grain and preparing and selling local drinks. Such petty trading, even through low paying activities compared with normal circumstances, it is comparable in return with the payment that male gets from participating in off-farm activities under common shocks. This is consistence with our descriptive findings and empirical work of Glewwe and Hall (1998) that found using data of vulnerable households following economic shocks during the adjustment programme (i.e.between 1985-1998) in Peru. Furthermore, the result confirm poverty incidence analysis based on 1999/00 household income and consumption expenditure survey of central Statistical Agency which was typical year when the country was affected by drought.

Regarding the age of the household in contrary to our expectation, in terms of sign and size, the result show positive influence on food insecurity for both groups. The direct relationship couldn't pass test of significances for non-beneficiaries, which imply that we can't conclude the result is differing from theoretical economic prediction. In the case of beneficiaries, the result show, positive and significant result. It tells us as an increase age by one-year lead to the probability of insecurity to increase by 0.0324504.

The possible reasons are in subsistence agriculture the household aged after certain limits are very poor as they transfer their land resources and other entitlement to their family (children) on marriage. Moreover, they could not participate in off-farm activities, as they have no capacity to do labor incentive activities provided by environment. They also rented out their land at low value, which has concomitant adverse affect on their future livelihood and food security. As an example, in the study

area some of the poor old household were identified and provided with monthly assistances by project under consideration especially sheep rearing and also provided with free relief assistance.

The third variable considered is household size. Household size have positive and significant influences on food insecurity for both groups, through its influences on non-beneficiaries are relatively larger. The result tells as a one person increase in the household member lead to 0.0916411 and 0.034 6378 marginal effect on food insecurity for non-beneficiary and beneficiary respectively. It indicates larger families are more likely to be food insecure than small families. These results are consistent with our theoretical expectation and empirical works of IKPI et al (2004) from Nigeria with coefficient (i.e. 0.086). Ramakrishna et al (2002) from Ethiopia more specifically North Wollo using logit model (1.5735330) as well as Hailu et al (2005) using logit model from Kore dagaga farmers association. Relative to the other the coefficients of this variable is high implying due attention should be given.

This next variable of interest is dependency ratio that is linked to household size. Dependency ratio found to be significant influences on household food security for each class of households. However, this variable is strongly significant for non-beneficiaries (1%) as compared to beneficiaries (5%). From this one can infer the beneficiaries are these early married with high level of dependency ratio as compared to non-beneficiaries. The coefficient is interpreted as an additional individual between the age of 1-14 and above 65 years increases the marginal effect on household to be food insecure by 0.0252753 for beneficiary and 0.0368176 for non-beneficiary. The result obtained is consistent with the theoretical underpinning that tells us household composition play great role on the probability of household being food secure. The empirical work of Osmanis (2001) from rural Asia also confirm with this result.

Education is an additional factor, which is through to, influences the status of household food security. Educational externality that makes possible advantage of modernization agriculture by

means of technological input utilization and diversification of household income. Educations cultivate individual capacity for problem solving and adaptability to environments by developing necessary knowledge and ability, skill and attitude (TGE; 1994). In contrast to these and other theoretical framework, the result obtained was insignificant for both groups. This is consistent with the findings of IKPI et al (2004) from food insecure farm household of rural Nigeria. This may be because of level of educational attainment level required and the option available for educated farmers in their environment.

The impact of education on technology adoption and diffusion, bring a reasonable influence on household after four years formal education (i.e. grade four). The mean level of education was below 4 years (below 3 years) the mean educational attainment level is below this as indicated in the literature part (i.e. grade four). Furthermore, some people like Wier et al (2000) argue educated head generally tend to be more influenced by older people than uneducated one. There is also an argument that farmers follow a role model.

The second reason is that, education influences the behavior of household with the economic status/capacity and the potential available for educated person in the environment in which they live. For arid and semi-arid area that has been affected by frequent drought and is at low level of income, as well as where there is little option to participate in off- farm activities different from those of illiterate, the impact of education is low. In the study area, there was no option for educated household to participate in, rather every body engage in similar low paying labor-intensive off-farm activities found. The above contrasting result of educational attainment and food security from expectation can perhaps be due to the nature of subsistence agriculture and the high importance of local experiences that matter to predict the variability and reacting accordingly. The spill over affect of family education at it renders lighter information within the family.

Farm size is another variable, which are proposed to have significant influence on household food security. However, the result indicates the variable is insignificant for both groups. Similar result was obtained by Ramashkrina et al (2002) based on the survey on North Wollo using logit model and IKPI et al (2004) from Nigeria. The reason for these that appropriate utilization of farmland can better increase productivity than large farm and with tradition crops. Furthermore, the productivity of land is directly influenced by the availability of rain. Since there was no rain and weed affect the plant the crop obtained from it was low and not related to its size.

Diversification extent is another proposed variable that influence food insecurity at household level. This variable was found to be insignificant influences on food security of both groups. The reason for these anomalies is that, household in developing countries are under risk threatening their livelihood. Among the strategy available for them income diversifications are limited because of entry constraint in to profitable activity. Dercon (2000) noted in the extreme situation, farm household tend to allocate resources towards low risk-low return activities that will not show up as diversification. Stated differently, in practice relatively little income smoothing (via income portfolio adjustments) is achieved by the poor households. Furthermore, income diversification for the poor household is at a cost, as the poor cannot enter in to those activities in which return is high because of their economic capacity. From our study area, the option for risk diversification was low, even that was high risky labor intensive and low paying such as firewood, connecting drug cakes, and charcoals activities as indicted in the deceptive part.

The net wealth coefficient for the entire sample is significant and has negative sign for each group. It tells us an additional wealth or livestock is associated with a 0.0000483 and 0.00037 marginal effect of reducing the odds of food insecurity for beneficiaries and non-beneficiaries. These effects of wealth on household is evident in the fact that low level of initial wealth is detrimental to food production and agricultural development leading to inescapable burden or cycle of poverty. This



result is consistent with economic theory of livestock wealth in peasant agriculture, which can be used as means of financing and sustaining production process as well as insurances against emergency. This is also supported by empirical evidences of IKPI et al (2004) and Osmanis(2001) and Ramakrishna et al (2002).

Total value of production coefficients is consistent with theoretical expectation for both groups. The estimate suggests that a unit change in total value of production increase marginally the effect of being food secure by 0.000551 for non-beneficiary and 0.0000302 for beneficiary. The influence of this factor is relatively higher for non-beneficiaries as compared with beneficiaries. The estimate found here consistent but higher than what was found by IKPI (2004) (i.e. -0.00000410) and lower than Hailu et al (2005) from the study in Koredagaga farmer association (i.e-. 0.0058238).

Total expenditure was used as proxy for income. Income level determines the quantity and composition of diet, and access to social services, which have some link with the nutritional condition of the household. The change in income leads to constant change in expenditure. For both groups the result show marginally significant negative impact of expenditure on the food insecurity status of by -0.000609 and, -0.000502 for non-beneficiaries and beneficiary respectively. The result reveals for every birr increase in income, the probability of food insecurity decrease by the figure stated above for each group. This confirm with priory expectation.

Food allocation as a percentage of total expenditure has a coefficient of -0.5325086 and -0.1832054 for non-beneficiary and beneficiary respectively. It indicates a one percent increase in amount of income allocated to food will reduces the food insecurity status of individual by the indicated amount. This is so as share of food to total income/expenditure is high for low-income household. This result is consistent with the theoretical under pinning. Further more it is in line with the finding of IKPI et al (2004) in Nigeria rural

Another variable of interest is off-farm activities that this household is participating in as a means of coping mechanisms. This variable is significant and has expected sign. However there are minor differences in magnitude between beneficiaries and non-beneficiaries (-0.000837 and -0.000458 respectively). This finding confirms the Osmanis (2001) result from rural Asia.

Input usage is considered to be determinants for household food security. Input usage mainly seed significant result obtained for both groups at 10% level of significance. The possible explanation for this relatively lower level of significance is farmer use more traditional crop variety coupled with traditional method (low utilization of modern technologies) that result in low output. These finding confirms different empirical studies under stress conditions that under risk condition household devoted a larger share of their land to safer traditional varieties than riskier but high-return varieties. Empirical study by Morduch (1990) using ICRISAT village in India show that the poor households do what is stated. From study area perspective, the reports of extension agent show that the participation in extension package. Furthermore, due to frequent drought seed stock were eaten and hence many of them do not have seed and they were waiting for the support from government and donors in the study area.

Use of fertilizer is another factor, which has significant impact household on food security. However, the coefficient of fertilizer were found to be insignificant but with expected sign. There are two possible reasons for these. One is that fertilizer is among the purchased or credited inputs that can have high return but also high risk. Under normal circumstances utilization of these input boost the production, but when the climatic condition were not favorable or in bad year high prices of the inputs coupled with the risk of drought made their resources to deplete even faster, lead to more risky condition. The second reason is fertilizers productivity under the low rain and frequent drought, utilization of fertilized harms the seedling rather than making comfortable as the it does not dilute in to the soil with the other nutrient so that it provide the required mineral for the seedlings. Hence, using an amount comparable to the normal situation can retard the crop by making the soil

more acidic. In relation to this in the horn of Africa modern technologies designed for highland where there is sufficient rain fall was utilized in the low land and hence it effect on productivity was low (FAO,,2000). This is confirmed by Buss and Stern (1982) study in palanpur, India where fertilizer is under utilized because of its risky inputs.

European Union food security project /program were found to be statistically significant result in reducing odds ratio of food insecurity. The coefficient of the variable is interpreted as any additional allocations of fund by project to the household reduce stress by 0.000782. This is consistent with the theoretical as well as the rational for the project interventions in off farm activities, and replanting the poor by providing animals for rearing and fattening. This finding is also in line with Doland et al (1975) finding that food stamp and free lunch program increase value of food consumed by Washington households. Osmanis (2001) evaluation study of DFID project on women household food security rural Asia and Oball (2000) IFAD program a valuation study in Guatemala found to provide significantly helped the poor household in improving the ability to cope during the lean seasons, contribute to higher level of food consumptions.

Chapter six

6. Conclusion and policy implications

The study has attempted to identify factors influencing deprivation (food insecurity) among rural farm household in Dodota-Sire woreda. To this end, composite indicators of food insecurity have been used see the problem and intensity to confirm the identification criteria used by official in the study area works well. Further more, in more scientific method food poverty line has been and related food insecurity index have been constructed. After identification process the proposed determinants or factors have been studied using both descriptive and econometric (tobit model) technique at household level.

The analysis reveals that there has been frequent drought (shocks) in the study area. The composite indicators used to see the prevalence of insecurity show that there was chronic food insecurity. Accordingly, as a result of shortage in rainfall that led to low production, own production only last for on average for seven months for the majority of population (75%). Different coping mechanisms have been adopted depending on common and idiosyncratic shocks happened to the household at their respective level. Some of these were: minimizing consumption, participating in low paying off-farm activities (such as petty trading, collecting and selling firewood, charcoal, dung cakes), sale of productive assets (such as land, oxen, seed stocks), temporary migration in search of work, participating European Union Food security projects (doing labor intensive off- farm activities), relying on relief assistances. These are the second stage deprivation criteria put forward by WFP and the access and outcome indicators of Maxwell and Frankenber (1992).

Such food insecurity was further examined and confirmed using more biological method of the food energy intake. More specifically the cost of calorie method for setting the cost (allowances) needed recommended minimum calorie intake. Accordingly, yearly food poverty line for an individual in Dodota-Sire was estimated at 990.7 Birr per adult equitant and about 75% of the population as under

such line with an average shortfall of 0.45. These results are consistent with the national poverty line set based on 1999/00 National Household Income and Consumption Expenditure survey but higher in the amount money to maintain the intake required. There was variation in short fall of food insecurity between beneficiary and non beneficiaries in which case the former was more deprived of minimum daily recommended calorie.

Hence, different model was estimated for the non-beneficiaries and beneficiaries. The model was fitted with 15 and 14 explanatory variables for beneficiaries and non-beneficiaries and then estimated for each group. The results of a regression analysis reveals off-farm activities, total value of production, input usage, household size, dependency ratio, net wealth, share of food expenditure in the total expenditure, total expenditure were found to have significant impact on household food security for both groups. Furthermore, project participation appears to have positive correlation with food security. Age of household head for beneficiaries was found to be significant and reversed sign. However, sex of household heads, educational level of head of the household, farm size, diversification extent, utilization of fertilizer were found to be insignificant for both classes.

Though there is a difference in the relative extent of impact of each independent variable, this result confirms our primary hypothesis and support earlier researches that show their respective relationship with household food security for each group.

The preliminary finding of this paper endorse the use of either composite indicators or food energy intake in locating the most vulnerable group from food security standpoint and identifying cause /factors that influence the problem in order to prioritize and act accordingly for that specific class.

The above findings the some of policy implications for Dodot-Sire woreda Food Security and agricultural Development Bureau in as well as European Union Food Security Project in the study area.

- High dependency ratio and household size indicating the importance's of household composition for the purpose of food security targeting. To this end, technical assistance should be made to enhances the level of awareness rural women in using family planning to reduce fertility and hence the impact of high family size and dependency ratio.
- Strategy should be aim at self-sufficiency at the household level through increasing its production and productivity. As horizontal expansion in production in not possible due to the problem of land, vertical production increase should be focused through providing these chronically food in secured farmers with modern agricultural inputs (seed) and productive asset (oxen and other related farm assets) on subsidy base until they recover.
- Effort should be given in the introduction and expansion of dairy farming which can substantiate their food consumption and income to purchase another food items. Furthermore, profitable off-farm activities such as cattle fattening should be promoted on credit base.
- Construction of small irrigation schemes that can substantiate the life of poor household. In this regard promotion of family vegetable gardens through micro-irrigation systems can contribute substantially to the household agricultural diversification strategy and reduce the risk of food entitlement failure on the part of the most vulnerable households. Furthermore, vegetable gardens represent a viable instrument for coping with food insecurity because of the relatively short cycle of the crops in question, and thus help improve household resilience in the event of food entitlement failure. Limited capital required to cover the initial fixed costs and low level of loan needed to get involved. These systems have been used by small fraction of farmers and they appreciate its contribution to household food security (these is base on an informal interview that I had with three farm household). These areas have not

been given adequate attention by the concerned bodies.

- Continuous monitoring of food situation, changes on household across time with intervention should be made to see the impact of interventions and design an effective mechanism more relevant depending up on experiences. Furthermore, effective early warning system to inform the people about the livelihood of crop failures and knowledge of disaster induced food shortage, and among the possible coping mechanism the one relatively better.
- The contribution of the program is good at encourage poor household. The lesson is that their intervention should include a component of which the objective is to safeguard a minimum level of subsistence's production. Measures must be taken to improve access of households to better food production technologies and to more complementary inputs (fertilizer) so that the amount of food produced by the household does not drop to a precariously low level.

We have seen among the objective of the project intervention are reducing the danger of risk and the importance of insurance against food entitlement failure in the assessment of household vulnerability to food insecurity as well as replenishing the resource base of these farm household. Our analyses show that the projects may have been instrumental in reducing household vulnerability to food shortages in household. However, the effect is often the result exclusively of improvements in a household's food access via income enhancement. In spite of remarkable project efforts, a large number of households (in all household get benefited) are still indicate high levels of vulnerability to the risk of food entitlement failure, resulting from poorly diversified coping strategies. The proper choice of alternative income sources represents an entry point for EU projects to enhance the food security of the most vulnerable households. In order to reduce the risk of food entitlement failure among poor households; the project should take a more active role in promoting risk management schemes, focused on specific group rather than community wide with low payment..

Evidences of support programs have made significant contribution in HFS in the survey area. This is pleasing confirmation that European Union interventions have been effective in improving HFS, but understanding the precise mechanisms through which this effect operates, looking at the effectiveness of each specific mechanism as well as the benefits of those projects that does not render output till now, the environmental as well as productivity impacts requires further investigations.

The finding reported in this study is subjected to several important caveats. The variables used in the study area in monetary term and aggregate form, that does not show the extent of each particular output/type and amount in relative to the other). Households own judgment about their wealth value, household's perception of food assistances and their tendency to hide some information to get benefits, pre adult equivalence used and the mechanism of setting poverty line which is sensitive to changes are variable that can be treated cautiously at disaggregate level that need more information and analysis. All these end up being suggesting the need for, further research to confirm or can further explore the central hypothesis posed in this study.

Bibliography

- Andersen,P.and Piazw.1985. The impact of the Green Revolution and proposed for future in Gittinger j .P. et al (ed) Food policy , integrating supply distribution and consumption, John Hopkins university press.
- Appleton.S. Simon and Arsen ,(1995) Education and Agricultural productivity and food security: Evidence from Uganda, Kampala
- Appleton, S. (1995) Women- Headed households and poverty: An empirical Deconstruction for Uganda, Working paper series / WPS/95-14/, center for the study of Africa Economies, C.S.A.E., Oxford, University of Oxford
- Aredo.D. (1995) "Transforming Peasant agriculture: conceptual Framework," in Demek.M. and Aredo.D.(ed)problems and transformation ,proceeding of the Fourth Annual conference on the Ethiopian economy
- (1994). 'Female-headed farm household in two contrasting regions in Ethiopia" access and management of resources, Ethiopian Journal of Development research , Vol.16.no.1
- .1997.'The link between farm and off-farm: A conceptual framework', Ethiopian Journal of Economics, Vol.No.2, Addis Ababa
- Asenso-Okyere,W.K., Benneh, G.& Tims, W., eds, (1997) Sustainable food security in West Africa. Dordr echo;dluwer Academic publishers.
- Astake,A. and Gebersenbet,G.(1998). Draft Animal power and its research in Ethiopia, Agricultura Mechmization in Asia, Africa and Latin America. , 295. 15-5
- Aune,J;Buss, M.T;Asfaw, F,G. and Ayele, A.A (2000) The ox ploughing system in Ethiopia: can it be sustained? Outlook on Agriculure
- Bahiigwa B.A 1999), Household food security in Uganda: An empirical analysis. Kampala, Uganda
- Bonger. T. Ayele. G. and Kuma;T; (2004) Agricultural extension Adoption and Diffusion in Ethiopia : Research Report I , Ethiopian Development research Institute ,Artistic printing Enterprise, Addis Ababa, Ethiopia
- Brawn J. V, and Pavilion. L. (1990). Food is sub-Saharan Africa; trends and policy challenges for the 1995, IFPR, Washington, D.C

- Breslin. E.D, (1994) U.S. Aid, the state, and food insecurity in rural Zimbabwe: The case of Gokwe, *The Journal of modern African studies*, Vol, 32. No.1
- Chackravarty, S.and Dand.S.A (2005). *Food insecurity in India: Causes and Dimensions*.
Vastrapur,Ahmeda bad.
- Christiaensen, L.J and Boisvert, R.N. (2000). *On measuring household food vulnerability: Case Evidence from Northern. Mali*,
- CSA(Central statistical Agency)(1998), *The 1994 Population and Housing Census of Ethiopia,.country report*
- (2003) *Ethiopia Agricultural sample Enumeration, 2001/02) results for Oromyia Region Part, Socio-economic characteristics of the populatio, Report A.*
- (2003), *Ethiopia Agricultural sample Enumeration, 2001/02), socio economic characteristics of the population in agriculture Country level report B.*
- (2003) *Farm Management Practices, livestock and farming implements, Country Report part II.*
- Davies, S.(1993)., *Are the coping strategies a cop out*”,*Institute of Development studies Bulletin*,Vol.24,no.4,
- Dessalegh Ramato(1991),*famine and Survival statuaries ,A Case Study from Northeast Ethiopia, Nordics African institute, Uppsala*
- DPPA (Disaster prevention and Preparedness Agency)(2000), *2000 Food supply prospect: Early Warning system report. Addis Ababa. Ethiopia*
- (2001). *Food supply prospect in 2001, Early Warning system report. Addis Ababa,*
- (2002). *Food supply prospect in 2001, Early Warning system report. Addis Ababa,*
- (2003). *Food supply prospect in 2001, Early Warning system report. Addis Ababa,*
- (2004). *Food supply prospect in 2001, Early Warning system report. Addis Ababa,*
- (2005). *Food supply prospect in 2001, Early Warning system report. Addis Ababa,*
- (2003). *Food supply prospect in 2001, Early Warning system report. Addis Ababa,*

- (2006). Food supply prospect in 2001, Early Warning system report. Addis Ababa, Dercons, (2000), Income risk, coping strategies and safety nets, center for the study of African Economics WPS/2000-26/ C.S.A.E. Publishing, Oxford University.
- DSFSADW(Dodota- Sire Food Security and Agricultural Development Bureau)(2000). Yearly Evaluation report. Unpublished
- .(2001). Yearly Evaluation report, Unpublished
- .(2002). Yearly Evaluation report, unpublished
- .(2003). Yearly Evaluation report, unpublished
- .(2004). Yearly Evaluation report, unpublished
- .(2005). Yearly Evaluation report, unpublished
- Ellis.F. (1993) Peasant economics, Farm household and Agrarian development, 2nd eds, school of development studies, Cambridge university press, university of east Angli
- Eshete,D. (1995). Food shortage and household coping strategies income group: A case Study of Wolita District in Southern Ethiopia in Dejen Aredo-----
- FAM (Food Aid Management), (2004). Guide for measuring food access, IFPRI, Washington .DC
- FANTA(Food and Nutrition Technical Assistance) (2004). Food Accesses indicators, IFPRI, Washington .DC.
- FAO (1996a). "Food, Agriculture, and Food Security: Developments Since the World Food Conference and Prospect." World Food Summit Technical Background Document I.Rome: FAO
- .(1996b), Roma declaration on World Food Security and World Summit Plan for Action Roma;FAO
- .(2000) The elimination of food insecurity in the horn of Africa: A strategy for concerned Government sand UN agency action. Final Report, Roma .
- .(2003) Trade reforms and Food security: conceptualizing the linkage, Roma.
- Fieldstein H.G. Floral C. and Poats, S. (1989) working together Gender Analysis in Agriculture, Connecticut; Kumar and Press
- Gebeyehu.Y.(1995) " population pressure on agricultural land fragmentation and land use: A Case study of Dela and Shashemene woredas, Southern Ethiopia", in Aredo.D. and

- Demek.M.(ed) Ethiopian agriculture: problems of transformation, proceedings of the Fourth annual Conference the Ethiopian Economy, Addis Ababa,. Ethiopia.
- Glawwe, p. and G. Hall. "Are some group more vulnerable to macro economic shocks than others? thypothes is tests based on panel data from Peru" Journal of Development Economics, Vol, 56, 181-206.
- Greer.J. and Thorbecke(1986) "A Methodology for measuring food poverty Applied to Kenya" Journal of Development Economics Vol.24, No.1
- Gundersen. C. and Gruber.J. (1998) "The Dynamic Determinates of food insufficiency", Economics Research Services/USDA, Vol .2, No.4
- Gundersen.G. and Riber.D.C.(2005), Food insecurity and insufficiency at low levels of food Expenditure, IZA, Discussion paper series No.1594. Washington, D.C, The George Washington University, USA
- Haan, N, Majid.N and Darcy. D. (2005). A Review of Emergency food, security Assessment Practice in Ethiopia humanitarian policy & group World food program, Roma.
- Haile, H.K, Alemu, Z.G and KUDH land G. (2005), causes of household food in security In Kcoredagaga peas and Association, Dromilya zone, Ethiopia, University of free state
- Hoddinott . J. (1999) Operationaizing Household food security In development projects: An Introduction, Technical Guide # 1 , IFPRI. Washington D.C.
- Hoddinott.J. (1999), Choosing out come indicators of Household Food Security, Technical Guide #7, IFPRI, Washington D.C. USA (1999)
- IFAD (1992) the state of world rural poverty: technical paper, Roma.
- IKPI, A.E. and Kormawa P.M (2004), Factors influencing food insecurity among rural farming Households in Africa: Results of analysis from Nigeria; Ibadan, Nigeria.
- Immin.,D.C and Alarcon J. A. (1993) " Household Income, Food Availability, and commercial crop production by small holders Farmers in the Western Highlands of Guatemala", Economic development and cultural change, Vo. 41, No.2 Chicago: University of
- Jownsend, R. M., (1996), " Fanatical structures in Northern Theory villages," quarterly Journal of Economics Chicago.

- Kabbani. N. and wehelie. Y. (2005). Survey Results on Hunger and Food Insecurity in Yemen, Beirut,
- Lim, y, and R. rownsend (1994), "currency, transaction patterns, and consumption Smoothing: theory and measurement in ICRISAT villages", mime
- Machine.S. (1998) Food storage, multiple equilibria and stability: why stable markets may Become unstable during food crises, Wps/99-1(working paper series/ CSAE, center For the study of African Economics, Institute of Economics and statistics, University Of Oxford.
- Mackinnon, J. Food shortage, multiple Equilibria, and stability why stable market may become unstable during food rise working paper series center for study of African Economics
- McDonald.J.F. and Moffit.R.A.((1980), "The use of Tobit analysis "Review of Economic and statistics vol.62
- MDGs(Millelimum Development Goals). Agriculture and achieving the millennium web.worldbank.org./website
- Maxwell, Simon, (1989) "Food insecurity in Northern Sudan", IDS discussion paper 262, Brighton, institute of development studies.
- Maxwell.S.and Frankekberger.T. (1992)Household food security:concepts, indicators, measurement.A Technical Review .UNICEF/IFAD
- Mekonnen, F. and T Adno,(2005) Socio- economic characteristics of Agricultural household and their relation to value of crop production and food availability in west Showa Zone, Oromia Region in Mottoama, James, Robinsor, Zekars, Taddess(ed)The Ethiopian Agricultural Sample Enumeration ration In depth analysis proceeding of a working shop 6th June 2005, Addis Ababa Ethiopia
- Meindertma.J.D(1997).Income Diversity and Farming Systems: Modelling of Farming householde in Lomboko, Indonesia, Royar Tropical Institute. The Netherlkands
- MOFED (Mintery of Finance and Economic Development)(1999). Survey of the Ethiopian Economy: Review of post reform developments (1992/93- 1997-98/, Addis Ababa , Ethiopia.

- (2002) Ethiopian: Sustainable Development and Poverty reduction, Program, MDFED,
Addis Ababa Ethiopia.
- (2002), Development and poverty profile of Ethiopia (Analysis based on the
--- --- (2002)1999/00 household income consumption and expenditure and welfare
Monitoring survey) FDRE. 2002, A. A
- Morries, (1999) Nutritional Measure of Food Security, IFPRI, Washington. D.C. USA
- Morduch, J. (1991), "consumption smoothing across space: tests for village- level
responses to Risk, Harvard University
- Murduch, J., (1990), Risk Reduction and saving: theory and Evidences from India
Households" Harvard University manuscript
- Mwalukasa, E.E., Kaihura , F.B.S and kahembe .E. (1999). "Socio-Economic factors
Influencing small scale farmers livelihood and agro diversity". East Africa PLEC
General Meeting, Arusha, Tanzania
- Ndivo, and Urassa () . Gender Imbalance in agricultural and non- agricultural activities and
impact on household food security: A case study of MoroGoro rural. Morogoro:
Sokoine University of agriculture, Project at [http:// www. twc. Org /iaup/sap/](http://www.twc.Org/iaup/sap/)
- Negatu W. (2004) Reasons for food insecurity of farm households in South Wollo, Ethiopia;
Explanations at grassroots, collaborative research program, Basis, Department of agriculture
and applied Economics, University Wisconsin Madison.
- Obamiro.E.O., Doppler.W., Kormawa.P..M (2003) .Pillars of food security in rural area of
Nigeria, [http:// food africa. nri. Security/ Internal Papers/ Ombamiro EUNCE.pdf](http://food.africa.nri.Security/InternalPapers/OmbamiroEUNCE.pdf)
- Obamiro. G. ,Doppler, W, Koramaw 'P' (2003). Farming systems and Policy options for food
security in Southwestern Nigeria.[http:// www.Rapentag.de/2003/abstracts/ Full/ 134.Pdf](http://www.Rapentag.de/2003/abstracts/Full/134.Pdf)
- Osmanis .R. (2001) Food security, Poverty and Women; Lessons from rural Asia, IFAD
- Sen.A.(1981) poverty and Famine: An essay on entitlement and Deprivation, oxford, Oxford
- 'O' Brien – Place and Franken Berger (1989), Food availability and consumption indicators,
Nutrition in Agriculture cooperative agreement, report No.5 Tucson, Arson, USA
University of Arzon, Office of arid land studies.

- OFSDPPCC(Oromiya Food security disaster prevention preparedness Commission)
- (2005) Report of on going food security project. A.A
- Paarlberg, R.L. (1999) " Politics and Food insecurity in Africa" Review of Agricultural Economics.Vol, 21. No. 2, America, American Agricultural Economic association.
- Per pintrup- Anderson and Rajul Pandya-Lorch (1997) "world Food needs to ward 2020". American agricultural Economics association No. 79.
- Rahji. M.A. (1995) Gender Aspects of Farm Household Resources and Time Allocation and the impacts on Agricultural Commercialization in South Western, Nigeria, University of Ibadan, Department of agricultural Economics.
- Ramakcishna. G. and Demeke. A. (2002). "An Empirical analysis of food insecurity in Ethiopia: The case of North Wollo" African Development, Vol. XXVII, No, 142
- Ravallion (1998). Poverty line in theory and practice. LSML working paper, No.133, World Bank, Washington .D.C
- Riber. D. (2005) Food Insecurity and Insufficiency at Low Levels of Food Expenditures. IZA, Discussion paper No. 159 & Washington, DC. US.
- Sjim.J.(1999), Food insecurity in ACP countries: From policy and programme interventions on to Vulnerable Group; summary report and recommendation of a CTA seminar, CTA, Wageningen, the Nether lands.
- Scanlen J.S. (2001) "Food Availability and access in less-industrialized societies; societies: A test and interpreted of Neo-Malthusian and technological theories" Sociological forum. Vol. 16,No.2.
- Staatz, J. M. Agostino, V, C.D and SundBerg. S. (1990). " Measuring Food security in Africa: Conceptual, Empirical, and policy Issue," America Journal of Agricultural Economics, Vol. 72. No .5 USA; American Agricultural Association.
- Stefan, D and Pramila, K. (1998) changes in povery in rural Ethiopia 1989 – 1995; measurements, robnstness Tests and Decomposition, Working Paper Series, Center for Africa, Economics, Oxford University, Oxford.
- Swift .J. (1989). Why a rural people vulnerable to famine? " IDS Bulletin, vol.20 No, 1&2.
- TGE (Transitional Government of Ethiopia)(1994). Educational sector strategy, Education. A. A.

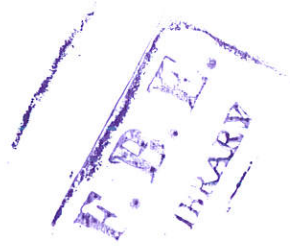
- Tarasuk, V. (2001). Discussion Paper on household and individual food insecurity. [http:// www.hc-sc, ca/fn –an/alt-formats/ hptl- dgpsa /pdf/ nutrition/ food –insecurity–aliments –e- pdf](http://www.hc-sc.ca/fn-an/alt-formats/hptl-dgpsa/pdf/nutrition/food-insecurity-aliments-e-pdf)
- Tekolla .Y. (1999) The Pazzling Paradox of the African Food Crisis: searching for the truth and facing the challenge. UNECA. Addis Ababa. Ethiopion
- Teshoma Mergia & Amare Legess: - The effect of ownership of oxen, method of cultivation and gender on crop area and yield in Oromiya Region Region in Mottoama, James, Robinsor, Zekars Taddess(ed)The Ethiopian Agricultural sample Enumeration ration In depth analysis proceeding of a working shop 6th June 2005, Addis Ababa
- Todaro, M. (1994). Development Economics, 3rd ed, Mac million
- Tully, J. (2003) Ethiopia's recurring crisis: a problem of food insecurity: country report.A.A
- Udry. Ch.(1993) “ Credit Marketing in Northern Nigeria; Credit as Insurance in Rural Economy” in The Economics of rural organizations. Theory, Practices and Policy, A World Bank.
- Weber, Mt. Staatz. J.M, Holtzman, J.S. Crawford E.W. and Berasten R.H, (1988). “ Informing Food Security Decisions in Africa; Empirical analysis and policies dialogue, “American agricultural Economics Association
- Weir.S. and Knghit .J. (2000) Adoption and diffusion of agricultural innovation in Ethiopia; The role of education, center for African studies
- WFP (World Food Program) (2006) world Hunger- Ethiopia overview : [hppt//www.org. wb](http://www.org.wb)
- World Bank (1986) Poverty and Hanger; issues and options for food security in developing countries, a World Bank Policy Study Washington, D.C.
- Zakirias,S. and Beyene,H. Multivariate discriminate analysis propagation in the now extension package programmed it is effectiveness on crop productively in oromya Region in Mottoama James Robinsor Zekars Taddess (ed) The Ethiopian Agricultural sample Enumeration In depth analysis proceeding of a working shop 6th June 2005, Addis Ababa

Annex-1

Drought/Disaster Affected Population in Ethiopia, 1981-2005

Year	Total Population (Million)	Disaster/Drought Affected Population (Million)	Proportion Affected %
1981	36.67	2.82	7.7
1982	37.77	3.70	9.8
1983	38.90	3.30	8.5
1984	40.07	4.21	10.5
1985	41.21	6.99	17.0
1986	42.39	6.14	14.5
1987	43.40	2.53	5.8
1988	44.84	4.16	9.3
1989	46.12	5.35	11.6
1990	47.44	3.21	6.8
1991	48.79	7.22	14.8
1992	50.18	7.85	15.6
1993	51.61	4.97	9.6
1994	53.09	6.70	12.6
1995	54.65	3.99	7.3
1996	56.37	2.78	4.9
1997	58.12	3.36	5.8
1998	59.88	4.10	6.8
1999	61.67	7.19	11.7
2000	63.50	10.56	16.6
2001	65.34	6.24	9.6
Average	63.2	5.2	7

Source: Affected Population from Disaster Prevention and Preparedness Commission (DPPC) and Total Population from Projections of National Office of Population 1994 Population and Housing Census Projection



Annex 3: Nutritional composition of commonly eaten food in Dodota-Sire

Food item	Kcal per 100gram
Wheat	339
Maize	356
Barley	334
teff	339
Pea	345
Readbeans	344
Chic bean	347
Sorghum	338
Soybean	405
Sugar	375
Linseed (telba)	490
Lentil	344
Milk	356
Meat	187
Potato	126
Egg	88
coffe	96
Oil	880
Onion	57
karot	42
chilli	40
Banana	79

Food insecurity Questionnaire –Sire Woreda (No. Dodota –Sire Woreda)

I am going to ask you about your families: the characteristics of your family, your livelihood situation and about your food situation for the one-year, please tell me the situations.

Part I. General information / identification peculiarities

1. Address : Kebele or site name----- Goth ----- Date of interview-----

2. Are you beneficiaries of European Union project on food security?

1. Yes

2.No.

Part II. Demographic characteristics of each member of the agricultural household (starting with the head of household)

2	3	4	5	6	7	8	9	10	11	12	13	
For All House hold member							5 Years and above	10 Years and above				
4 10 FULL NAME	Is member of the household a holder Yes = 1 No = 2 Code	If column 3, code 1 Type of holding crop 1. Livestock 2 both = 3 Code	Sex male = 1 Female = 2 Code	Relation of the head of household Code	Age in completed years	Educational attainment (highest grade completed) Code	Marital status: never married = 1 Currently married = 2 Divorced = 3 Widowed = 4 Code	Were you engaged in economic activity during the last 12 months? Yes = 1 No = 2 code	If not engaged in col. 11 cod. " economic activity what was the main reason? Student = 1 Home maker = 2 Handicap = 3 Old age pension = 4 Others = 5 code	If engaged in economic activity what was the major activity? Fully agriculture = 1 Partly agriculture = 2 Fully in others = 3 Code	If in column 13 code 1 or 2, employment status Employer = 1 Own=account worker =2 Employee = 3 Unpaid family worker =4 Others = 5 Code	

- Head = 1
- Spouse = 2
- Son/daughter of head & spouse = 3
- son/daughter of head = 4
- son/daughter of spouse = 5
- Mother/father of head/spouses = 6
- sister/brother of head/spouse = 6
- other relatives = 8
- non relative = 9

- Illiterates = 1
- Informal education = 2
- Grade 1 Completed = 3
- Grade 2 Completed = 4
- Grade 2 Completed = 5
- Grade 3 Completed = 6
- Grade 4 Completed = 7
- Grade 5 Completed = 8
- Grade 6 Completed = 9
- Grade 7 Completed = 10
- Grade 8 Completed = 11
- Grade 9 Completed = 12
- Grade 10 Completed = 13
- Grade 11 Completed = 14
- Grade 12 Completed = 15

III. Land related information and production

1. How much is your total land holding (number of hectares of land you owned and used for different activities) in hectare?

(Note that this includes the land you have rented and others?)

2. What were types of your holdings and their size?

A. Private (code =1) ----- B. Rented/contracted (code =2) ----- C. Other (specify-----)(code=3)-----

3. How did you allocate such holding among different agricultural production (what is the size and allocation of your land)?

1	3	4	5	6	7	8
	Grazing land=1	Food crop land=2(Teff, grain, etc)	Commercial land=3(chat, vegetables, etc)	Communal land=4	Irrigated land=4	Other(specify)
size						

IV. Wealth and income indicators

1	2	3	4	5	6	7	8		
A. Livestock's									
N. o.	I. Name of Livestock code	Number owned	Average age of animal? (Years)	Replacement value cost per animal		Total value		Do you rent work animals?	
				Birr	Ct	Birr	Ct	Yes =1	No =2
								Birr	Ct
01	Oxen								
02	Cow								
03	Calf								
04	Sheep's								
05	Goats								

V. Types of crop produced the input used, yields (food crop and commercial crops)

1 No	2 Name of crops	3 Type of tenure owned =1 Rented =2 Other =3	size (in hect or)	Use of agricultural input										4 Production				
				Types of seed used			Chemical fertilizers				Chemicals			In quintal (Kg)	Price per unit	Total price		
				Improved =1 Indigenou s 2	Quantity	Price(e stimate d)	Did you used Yes= 1 No=2	If Yes in column 6 type used Urea =1 Dap=2 Both =3	Quantity in quintal (kg)	Price paid(co st)	Did you used chemicals Yes= 1 No =2	If yes in column above type used insecticide =1 herbicide =2 Fungicide =3 1&2 &1&3 =5 2&3=6 all =7	quantity in tube				price	
	Food crop =1																	
	wheat																	
	Barly																	
	Lentil																	
	Teff																	
	House bean																	
	Commercial crop=2																	
	Vegetables =3																	

VIII. Problems and food security issue

1. What are your critical problems in making your livelihoods (farm size, low soil fertility hence low productivity, policy problems, etc)?

2. In the last 12-month or year, did it happen that your family could not afford to eat what you normally eat (for instance lesser or no food consumed in your family?

Yes No

3. If the answer for above question is yes how often did that happen?

1. one month 2. 2-3 month 3. 3-4month 4. 4-5 month 5. Almost every month

4. What were the reasons behind such problem of food insecurity?

(Drought =1 , Pest and diseases =2 crop failure=3 insufficient production = 4, price fluctuation =5, other (specify))

5. What were your coping strategies and/or on what did you rely to get food in such situation (problems). Please tell us the amount, price, terms and conditions under which you do each of them.

	<u>amount (in quntal/kg/birr)</u>	<u>quantity you manage to buy</u>	<u>for how long it will serve you</u>
A. Borrow money			
-From friend	-----	-----	-----
- From money lender	-----	-----	-----
-credit association	-----	-----	-----
- Other(specify)	-----	-----	-----

Annex-5

. correlate fin sexmale1female2 baghh hhszize depratio eduhead farmsize netweal

> th offfarm divextent tvaluep seeds ferch texp shareoff

(obs=165)

| fin sexmal~2 baghh hhszize depratio eduhead farmsize

```
-----+-----
fin | 1.0000
sexmale1fe~2 | -0.0047 1.0000
baghh | -0.0411 0.0216 1.0000
hhszize | 0.3592 0.0282 0.1644 1.0000
depratio | 0.1597 0.0177 -0.3541 0.2678 1.0000
eduhead | 0.1108 -0.0612 -0.3979 0.0786 0.1140 1.0000
farmsize | -0.2054 0.1067 0.4149 0.3202 -0.1678 -0.0322 1.0000
netwealth | -0.3680 0.1373 0.1225 0.1576 -0.0720 -0.0451 0.2442
offfarm | -0.0836 -0.0254 -0.1779 0.0931 0.0316 -0.0533 -0.0695
divextent | 0.0155 0.0052 -0.0537 0.0741 -0.0103 -0.0588 0.0512
tvaluep | -0.3459 0.0558 0.3676 0.2453 -0.1766 0.0126 0.7245
seeds | -0.1032 0.0806 0.2152 0.1496 -0.0866 0.1300 0.6048
ferch | -0.1005 -0.0948 0.1972 0.1494 -0.1233 0.2066 0.4305
texp | -0.4361 0.0921 0.2927 0.3546 -0.1179 -0.0195 0.6016
shareoff | -0.2021 -0.0169 -0.0386 -0.1088 -0.0940 -0.0792 0.0828
```

| netwea~h offfarm divext~t tvaluep seeds ferch texp

```
-----+-----
netwealth | 1.0000
offfarm | 0.0000 1.0000
divextent | -0.0249 0.4432 1.0000
tvaluep | 0.1911 -0.0668 -0.0883 1.0000
seeds | 0.0789 -0.0652 -0.0304 0.5058 1.0000
ferch | 0.1613 0.0149 0.0509 0.3352 0.4762 1.0000
texp | 0.7413 0.0718 0.0248 0.7076 0.3327 0.3025 1.0000
shareoff | -0.1477 -0.0356 -0.3965 0.1401 0.0041 -0.0110 -0.0374
```

| shareoff

```
-----+-----
shareoff | 1.0000
```

Annex- 5

correlate fin sexmale1 female2 agehh hsize depyratoi eduhead farmsize netwea

> lth offfarm divextent tvp seeds fertilizer eus texp

(obs=210)

| fin sexmal~2 agehh hsize depyra~i eduhead farmsize

```
-----+-----
fin | 1.0000
sexmale1 fe~2 | -0.0201 1.0000
agehh | -0.0788 -0.0541 1.0000
hsize | 0.1039 0.2744 0.1628 1.0000
depyratoi | 0.4903 0.0034 -0.0495 0.1470 1.0000
eduhead | 0.0293 0.2989 -0.3406 -0.0422 0.0570 1.0000
farmsize | -0.2335 0.0049 0.3830 0.2199 -0.1287 -0.2458 1.0000
netwealth | -0.5331 0.0388 0.1692 0.2703 -0.1984 -0.0134 0.1005
offfarm | -0.2184 0.1043 -0.1665 0.0335 -0.1771 -0.0444 -0.0217
divextent | -0.0921 -0.0440 -0.1441 -0.0957 -0.1063 0.0078 -0.0964
tvp | -0.4904 0.0853 0.2857 0.2903 -0.2441 -0.1208 0.4328
seeds | -0.3851 0.0313 0.3292 0.2155 -0.2159 -0.1848 0.4461
fertilizer | -0.1784 0.0077 0.1255 0.1144 -0.0289 -0.0292 0.2109
eus | -0.1193 0.1371 -0.0627 -0.0235 -0.0481 0.1713 -0.0998
texp | -0.6483 0.1129 0.2425 0.3609 -0.2242 -0.1556 0.3902
```

| netwea~h offfarm divext~t tvp seeds fertil~r eus

```
-----+-----
netwealth | 1.0000
offfarm | -0.0540 1.0000
divextent | 0.1762 0.2713 1.0000
tvp | 0.2131 0.0112 -0.4353 1.0000
seeds | 0.2115 0.0191 -0.2414 0.6399 1.0000
fertilizer | 0.1360 0.0530 -0.1656 0.2591 0.1997 1.0000
eus | 0.0289 -0.0732 0.3037 -0.0676 -0.1746 -0.1168 1.0000
texp | 0.6167 0.1654 -0.0595 0.6685 0.4835 0.2411 0.0062
```


| texp

```
-----+-----
texp | 1.0000
```


Declaration

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

Declared by:

Name: Mohammed Bestir Hammela
Signature: 
Date: Aug, 7, 2006

Confirmed by Advisor:

Name: Dejene Aredo
Signature: 
Date: 17/08/06

Place and date of submission: _____