Determinants of Food Security in Tach Gayint District in Ethiopia

Fentaw Teshome[1] and Beneberu A Wondimagegnhu[2]

Abstract

An understanding of the determinants and causes of food insecurity is important for interventions aiming at minimizing food insecurity. Therefore, this study was conducted to measure the determinants of food security in the case of Tach Gayintworeda, Amhara regional state, Ethiopia. Interventions aimed at planning and reducing food insecurity at micro-level need information on the causes of food insecurity in that specific area and its determinants.The study was conducted mainly by collecting quantitative data from 200 respondents selected from three kebeles; primary and secondary data were collected from various sources. Kebeles were stratified first, then simple random sampling was employed to select the sample kebele, and systematic random sampling was used to select respondents. Semi-structured questionnaires and key informant interviews were conducted and analyzed using descriptive and inferential statistics such as T-test, Chi-square tests as well as logistic regression. The survey result shows that about 56.2 per cent of sample respondents were food insecure, while only 43.8 per cent were food secure. Variables such as land holdings, possession of oxen and farm production of households have been found significant in determining the food security status of households. The cultivated land size was also found to be significant. Intensified agriculture and livestock production have to be introduced and implemented in the area to combat the food insecurity situation of the study area.

Keywords: Food insecurity, land, oxen, production, education, technology, Ethiopia

---

[1] Lecturer, Department of Agricultural Economics, Injibara University, Ethiopia.
Email: fentawta@gmail.com
[2]Associate Professor, Department of Rural Development and Agricultural Extension, Bahir Dar University, Ethiopia
Article Received on: 05-06-2019 Accepted on: 17-07-2019

Introduction

Background and Justification

Over the last ten years, there has been increasing evidence that production and productivity are increasingly influenced by the changing frequency and intensity of extreme weather events (IPCC, 2007). It has been argued that unless more sustainable management of food production is adopted prices will rise and become increasingly volatile and the damage to the environment will continue to increase (Nellemann, et al. 2009).The development and widespread adoption of integrated, diversity-rich options for sustainable agriculture and food security will require a holistic, interdisciplinary, ecosystem and biologically-based approach that takes account of the social, economic and cultural aspects of agriculture (IAASTD, 2009). It acknowledges the interconnectedness of biodiversity, food security and human and ecosystem health and in so doing indicates the requirement to involve a range of stakeholders (farmers, consumers, agricultural and food industries and researchers) in interdisciplinary interventions.

More than one billion people suffer from food insecurity and malnutrition in the world (IAASTD, 2009).Out of this number, 900 million people are living in developing countries where 250 million of them reside in Sub-Saharan Africa (FAO, 2010). Ethiopia has about 20 million food-insecure people (ATA, 2010).About 83 per cent of the population of Ethiopia depends directly on agriculture for their livelihoods (WB, 2007) while many others depend on agriculture-related cottage industries such as textiles, leather, and food oil processing. Agriculture contributes 46.3 per cent of Gross Domestic Product (GDP) and up to 90 per cent of foreign export earnings. Ethiopia has ample resources for agriculture. It has 111.5 million hectares of land. While the country has 74 million ha of total arable land, only 13 million ha are being used. Agriculture is a key driver of Ethiopia's long-term growth and food security. Ethiopian economy is dominated by the agricultural sector accounting for 39.7 percent of the national GDP. The sector is a key supplier of inputs for food processing, beverage and textile industries. Ethiopian agricultural sub-sector

is dominated by cereal crop production constituting a significant proportion of the sub-sector (MoFED,2013).Although the agriculture sector plays a crucial role for the economy and livelihoods of the majority, its performance remained poor and could not feed the growing population which has an annual increment of two million people (FAO, 2012). In addition, rapid population growth challenged the achievement of food security and poverty reduction efforts in Ethiopia. This research would contribute to filling the gap and design solutions based on reality and felt needs of farmers, help policymakers design and implement more effective pro-poor food security policies and programs and thereby pave the way to improve agricultural productivity and food security. This research was also conducted to clearly identify common determinants of food insecurity and provide clear insight for development stakeholders in order to intervene and to find a remedy for the respective malady. This paper also aims in contributing to the literature on determinants of food security in Ethiopia, particularly in the Amhara region where 45 per cent of rural households have been reported to be food insecure. The study will assess the situation of food insecurity and the determinant factors that contribute to food insecurity of the research area.

Research Objectives

1. To asses food security status of households (HHs) in the study area
2. To identify determinants of food security in the study area

Research Methodology

Description of the study area

The research was conducted in Amhara region, South Gonder zone, Tach Gayint *woreda** located 761 kilometers away North West of the capital, Addis Ababa. TachGayint lies between 11° 22'11° 42' N Latitude and 28° 19' 28° 43' E Longitudes. It is delineated by North Wollo administrative zone in the North;

*Woreda is an administrative unit lower than zone and higher than kebele(smallest administrative unit in Ethiopia)

in the South by Simada *woreda*, East by South Wollo administrative zone and in the west by*Lay Gayint woreda*. The total area of the *Woreda* is 994.84 Sq. Km. There are three agro-ecological zones in the *Woreda*, namely warm low land (*kola*) that covers 23 per cent of the total area, warm and humid mid-high land (*Woinadega*) which covers 61 per cent and wet high land (*Dega*) covering 16 per cent of the total area. The topography of the *Woreda* is characterized as 23 per cent mountainous, 22 per cent plain with gentle slope, 28 per cent rough terrain and 27 per cent rugged and gorge. It has an altitude range of 1500-2800m above sea level, the temperature ranges from13c to 27c and rainfall is from 900mm to 1000mm per annum and the forest coverage reached 13.85 per cent (GTP Report December 2014, Bahir Dar. The population of the study area is 109, 109 (CSA, 2008). Fifty two per cent of the population of the region is between 15 and 64 years old age which is a very productive age. The average family size in the study area is 5 people per house hold (TGWoA, 2012).

Study Design and Sampling Procedure

The choice of the methods of a particular study depends on the purpose of the research to pursue. In a given research, the choice of methods influences the way in which the researcher collects and analyzes the data. However, there are no strict rules as such for the choice of the method but a researcher needs to strike a balance between the cost and time available for the research, and depth and breadth of information needed to be analyzed by a qualitative and quantitative method. Taking this into consideration, the researchers employed both qualitative and quantitative research methods. Regarding the sampling techniques, both probability and probability sampling techniques were applied. Non-probability sampling techniques such as purposive sampling was used to select the key informants, probability sampling techniques such as stratified random sampling was used to classify *kebele*s based on agro ecological zone, simple random sampling was used for selection of *kebele*s and systematic random sampling was applied for the selection of HHs. Quantitative data such as age, sex, and household size, landholding, soil erosion, livestock holding, education, and supporting services and institutions such as marketing, extension,

health, and education. The status of HHs food security and its determinants in the *woreda* are studied in this paper. The data collected for this study was mainly quantitative while some qualitative data was also collected. To know the status of food security seven days food consumption data which includes the number of meals, type of dish and type and quantity of food consumed per week per household was collected and converted to energy consumption per day per Adult Equivalent (AE) in kcal. Demographic and socio-economic data collected from rural HHs was used to study the determinants of food security and coping strategies. These data include age, sex, size of HHs in age group, educational status, size of landholding, land cultivated and the amount produced, livestock holding, sources and amount of income for food including own production, off-farm income, remittances.

Sampling Design

The degree of precision, desired methods of analysis, objectives of the research, cost and time determine the type of sampling design to be adopted. The study *woreda* (*TachGayint)* was selected purposively. The researcher observed the persistent and deep-rooted food insecurity problems, despite efforts made both by the government and NGOs. Considering this the study area was selected and then *kebele*s were stratified into *dega* (highland) *Weinadega* (mid-land) and *kola* (low land) based on agro-ecological zone. From each agro-ecological zone, three *kebele*s were selected randomly by a simple random sampling method, one from each agro-climatic condition. Out of 1800 HHs in all *kebeles*, 200 householdswere selected proportionally by systematic sampling method proportionate to each agro-ecology.

Data Collection Method

Before conducting the actual survey, semi-structured and structured interview schedules were prepared. Permission was sought from all participating households before proceeding with interviews. The survey was conducted in two rounds to avoid a long time interviewing and keep the recommended schedule for collecting consumption data. In the first round, socioeconomic and

demographic data were collected through interviewing and observation techniques. Food consumption data which includes the number of meals consumed, type of dish consumed at each meal and type and amount of food consumed per week was collected in the second round. The second-round survey was conducted in July second week up to August fourth week as food consumption data for studying food security status has to be conducted 5-6 weeks after the main harvesting season. Interviewing the women responsible for preparing food and using a balance measuring the amount consumed in the last seven days in each HH was the technique used to collect the data.

Interview for Household Heads

To know the status of food security, seven days food consumption data which includes the number of meals, type of dish and type and quantity of food consumed per week per household were collected through interview and converted to energy consumption per day per AE in kcal. Demographic and socio-economic data were collected from rural households to study the determinants of food security in the district.

Secondary Data Collection

Secondary sources contributed much for the preliminary knowledge essential to supporting the findings reported in the study. Secondary data both published and unpublished were reviewed from various sources, including regional, zonal and *woreda* sector bureaus and offices (agriculture and rural development, health, education, food security and disaster prevention, CSA and local NGOs). The data includes information on physical and demographic characteristics, systems, procedures, food aid, Productive Safety Net Program(PSNP), availability, and accessibility of food.

Description of variables and expected signs

1. **Household Size:** Theoretically size of the HHs can have a positive or negative relationship with food security status depending on the age of the HHs. With increasing number of members in the HHs who are actively

involved in providing labor for production, the relation could be positive or negative otherwise. This is the total family size who live together under the same household adjusted to AE.The expectation is that as the family size increases the probability of the household to be food insecure increases. This is because the household head will be burdened to feed members of the family and face shortage of food. Therefore, family size is expected to have a negative relationship with the food security status of the households.

2. **Age:** Age of Household Head measured in years is expected to have a positive correlation as experience and knowledge increases with age. Age is a continuous explanatory variable peculiar to the household head. In most rural households, food production and animal rearing are carried out by the head of the household. This is because of the fact that once his/ her children reach marriageable age, they leave the house making their own house. So that age of the head of the household is important with regard to the availability of the required food for the survival of the family. As the age of the head of the household increases, there is a more probability of that household to be food insecure, since the older aged HHs are unable to work hard for the survival of their family members. In light of this, the age of the head of the household and food security is negatively correlated.

3. **Educational level:** Household head's educational level measured in numbers of years in schooling is expected to have a positive correlation as experience and knowledge increases with education level. The better the educational level of the household head, the higher the chance to maintain the food security status of his family with for instance diverting to other income-generating activities besides farm operation in the study area. The level of education of the household head has a significant effect on food security. Thus, this variable is expected to have a positive relationship with the food security status of the HHs.

4. **Sex:** Access to different resources and role in productive activities varies with sex. Male headed households have better access to resources and are engaged in productive roles than female counterparts. Therefore gender is expected to affect HHs food security either negatively or positively depending on whether the household head is male or female. Male headed HHs can be more food secure relative to female-headed.

5. **Number of Oxen Owned:** Oxen is used as a draught power and the most important means of cultivating land. Therefore, HHs owning more oxen are able to cultivate and produce more land and produce more crop output and hence have a better chance to be food secure than those who possess none or fewer oxen.

6. **Landholding:** landholding is a major socio-economic asset determining food security status. Access to agricultural land plays an important role in reducing food insecurity. Some better-off and landless farm households cultivate more land than they own, acquiring land by sharecropping plots on a seasonal basis from other HHs. In addition, farmers who have land but lack labor, oxen and inputs such as seed, fertilizer did cultivate smaller proportion of their land. Therefore, the amount of land cultivated is expected to have a positive correlation with food security.

7. **Farm Production:** Farm production is consistent with farm income, which is spent to improve the food security situation of households. HHs depend on sources of income to purchase food and agricultural inputs. Therefore it is expected that HHs with better production will have better income and are less insecure as compared to those with lower production and income.

8. **Technology (fertilizer and improved seed use):** Chemical fertilizer increases crop production through increasing nutrient availability to plants. Therefore, the amount of fertilizer use is expected to increase the probability of a HH to be food secure. Improved seeds are released for one or more characters as high yielding potential, disease or pest resistance, high response to input use and adaptation.

9. **Distance to Nearest Market:**Proximity to market centers creates access to additional income by providing off-farm/non-farm employment opportunities, easy access to inputs and transportation. It was, therefore, expected that households nearer to the market center have a better chance to improve household food security status than those who do not have proximity to market centers. Proximity to market centers was measured in kilometers and it was reported that market distance has a significant effect on food security.

Methods of Data Analysis

Both descriptive and inferential analysis methods were employed. Food security status of the district was computed through the analysis of quantitative and qualitative data that were collected on food consumption pattern of households. The households' food security status was measured by a direct survey of consumption. Household caloric acquisition is a measure of the number of calories, or nutrients available for consumption by household members over a defined period of time. The principal person responsible for preparing meals was asked how much food was prepared for consumption over a period of time for a day.

The daily wage rate of the cash transfer is calculated on the basis of the cost of buying 3 kg of cereals and 0.8 kg of pulses per day (15kg of cereal and 4kg of pulses per person per month) in the market (TGWOA, 2012).Food security status at a household level can be measured quantitatively by a survey of income, expenditure, and consumption. In this study, calorie consumption per day per adult equivalent was used to measure whether a household is food secure or food insecure. A household was categorized as food secure if consumption per AE is equal to or greater than 2200 kilocalorie (kcal) and insecure if consumption was less than 2200 kcal per day per adult. The household food consumption in calories was calculated from the data collected through a survey on the type and amount of food consumed within seven days prior to data collection. Data on available food for consumption, from home production, purchase and /or gift/loan/wage in kind for the last seven (7) days before the survey day to the household was collected. This seven days recall period was selected due to the fact that it is appropriate for exact recall of the food items served in the household within that week. If the time exceeds a week for instance 14 days, the respondent may not recall properly what he or she has been served two weeks earlier. This method was also applied in the poverty and livelihood studies conducted at the national level byAddis Ababa University in collaboration with the International Food Policy Research Institute (IFPRI) and other international organizations.

The amount and type of food consumed per week per household were converted to the amount of energy in kcal consumed per AE per household in the following steps.

A) The amount of food consumed per week per household was converted to the amount of energy in kcal consumed per week using household food composition table for use in Ethiopia.

B) The size of the HHs was converted to adult equivalent using AE conversion factor.

C) The amount of energy consumed per week per HH was divided into seven to know the amount of energy consumed per day per household.

D) Fourthly, the amount of energy in kcal consumed per day per household was divided to the size of household in AE to find energy consumption per AE per day. After calculating the amount of energy consumed per day per AE for each household, the result was compared with the standard recommendation for use in Ethiopia i.e. 2200 kcal so as to sort food secured and insecure HHs. Accordingly, 95 households found to consume less than the cut-off, 2200 kcal per day per adult equivalent were rated as food insecure. Seventy four Households whose consumption equal to and above 2200 kcal were rated as food secure.

A binary logistic regression model was applied as the dependent variables of the study in a regression model are dichotomous and measured as a dummy (food secure (1) and food insecure (0)). The model measures the effect of different socio-economic and demographic independent variables on the status of food security. Chi-square and T-test were also used to compare the differences and associations between food secure and insecure groups on the socio-economic and demographic variables.

Results and Discussion

Food Security Status of the Households

The households' food security status can be measured by a direct survey of income, expenditure, and consumption. In this study, households' food or calorie acquisition/consumption per adult per day was used to identify the food secure and food-insecure households. The calorie consumed by the household is compared with the minimum recommended calorie of 2200 kcal per adult per day. If the consumption/acquisition is less than the recommended amount then, the household is categorized as food insecure and if greater than the recommended amount, as food secure. The reason for the use of this measure was that it produces a crude estimate of the amount of calories available for consumption in the household. Moreover, it is not obvious to respondents how they could manipulate their answers. As the questions are retrospective, rather than prospective, the possibility that individuals or households will change their behavior as a consequence of being observed is lessened (Hoddinott, 1999). In addition, the reliability of income data in subsistence farming where record-keeping is limited is always questionable.

The households' food security status was measured by a direct survey of consumption. Data on the available food for consumption, from home production, purchase and /or gift or aid/loan/wage in kind for the previous seven (7) days before the survey day by the household was collected. Then the data were converted to a kilocalorie and then divided into household size measured in AE. Following this, the amount of energy in kilocalorie available for the household is compared with the minimum subsistence requirement per adult per day (i.e. 2200 kcal). As a result, of all respondent households, 95 households were found to be food insecure and 74 were food secure. It means that (56.2%) of the respondent households were food insecure and (43.8%) of them were food secure. The socio-economic characteristics of the household heads are briefly described in terms of their age, sex, education, landholding, livestock possession and access to credit. The distribution of the age of the household heads indicated that about one-fourth of them are of ages between 20 and 39

years. Over half were aged between 39-60 years and the remaining one fourth was more than 60 years. The size of the HHs in number varies from one to eleven with an average of 5.68 HHs members living in a household. Of the total sample, 9.2 per cent; 58.8 per cent and 32 per cent of HHs had 1-4; 4-6 and 6-11 household members. The landholding of a household took into account all types of land (homestead, farmland, fallow and pond) that a household owns either through gift, long year rented and tenured. While 55.7 per cent had less than one ha, the remaining 44.3 per cent of HHs possess more than 1 ha of land. The average landholding of the sample respondents is 0.84 ha. Living in the mixed farming system, the main sources of income of sample HHs are crops, livestock and off-farm income. By 2014/15 the average contribution of crops, livestock and off-farm income to the gross income were 70, 22 and 8 percent, respectively. The main crops grown in its order of area coverage in the specified crop year were wheat, *teff*, potato, barley, maize. Depending on the HHs livestock possession the contribution of livestock to the gross income varies from zero to 22 percent. The livestock possession also varies from zero to 12 with an average holding of 2 in TLU.

The type of crops used to prepare food recipe consumed in its order of caloric contribution, as the survey result reveals, include cereal (triticale, teff, wheat, barley, maize, sorghum and millet) 34 per cent maize 37 per cent wheat, 10 per cent teff, 10 per cent sorghum, 3 per cent potato and 4.14 per cent pulses. Animal products (milk and milk products, butter, eggs) contribute one per cent, sugar, alcoholic drinks, and others to the calories consumed. Food composition receipt table prepared for use in Ethiopia used to convert food consumed into a calorie, and the size of each household is changed to its adult equivalent using a conversion factor to know kcal/AE/day. On these bases, the status of food security for 170 households was assessed. Only 74 (43.8%) HHs are food secure and the rest 95 (56.2%) consuming less than 2200 kcal are chronically and/or seasonally food insecure. The amount of calories consumed per AE varies from 925 kcal /AE per adult from food-insecure category to 3180 kcal from food secure category and 78 (82.3%) consume less than 1650 kcal and are chronically food insecure. The average energy consumption of the

sample is 2052.5 kcal per day per AE (Table 1) lower than both the recommended daily allowance (2200kcal) and the average consumption of Amhara region i.e., 2058 kcal (CSA, 2007).

Table 1. Energy consumption in kcal per AE per day per sample household

Energy available in kcal	Food secure		Food Insecure		Total	
	No	%	No	%	No	%
‹1500			29	30.5	29	30.5
1500-1799			48	50.5	48	50.5
1800-2199			18	18.9	18	18.5
2200-2399	47	63.5	—	-	47	63.5
›2400	27	36.5	—	-	27	36.5
Mean	2052.5					
Maximum	3180					
Minimum	925					

Source: Own survey, 2017

Association of independent variables between groups of food secured and insecure households

T-Test and chi-square test were used to find the association between the independent variables across the groups of food security and insecurity.

Discrete variables

Sex: The number of female respondents account for 12.5 per cent (15) and male respondents were 87.5 per cent (155) and the number of male respondents is 11 times greater than female respondents (Table 2). The proportion of food insecure women is much greater than their counterpart that is food secure women. From the total female sample HHs only 21 per cent of them are food

secure. The other 79 per cent of women are food insecure. Pearson chi-square test was conducted to examine whether there was a relationship between sex and food insecurity. The results revealed that there was a significant relationship between the two variables (Chi-square value = 4.295, p = 0.038) (see the Table). This indicates that there is significant relationship between sexes in terms of food security status of households.

Education: Educational level was categorized as literate and illiterate. From the total sample HHs, 118 respondents (70.4%) were illiterate and 50 respondents (29.6%) were literate. In addition to these, 56 (63.6 %) food insecured are illiterate and 32 (36.36%) were literate. Chi-square test was appropriated to measure the relationship between education and food insecurity. The test was conducted to examine whether there was a relationship between education and food insecurity (Chi-square value =4.853). The results revealed that there was a 5 per cent significant relationship between the two variables.

Marital status: Regarding marital status of the sample HHs in the study area, 153 (90.5%) HHs are married, 10 (5.8 %) are widowed and 5 (3 %) are divorced. The correlation of the two dependent and independent variables were tested. The result indicates that there was 7.4 per cent significant relationship between the two variables. The households explained that widowed households and divorced HH heads shouldered more responsibility than married household heads, which leads to the reduction of capacity and increases vulnerability to shocks. Thus, from the total widowed and divorced HHs 11 of 15 or (73%) are food insecure.

Landholding size*:*Out of the total sample HHs in the study area 83(49.1%) respondents had less than 0.5 ha, 74 (43.7%) had greater than 0.5 and less than 1 ha of farmland and the rest 12 (6.35) had greater than 1 ha of farmland. The Chi-square value test was conducted and the results were indicated as chi-square =25.057 and the association of land size and food insecurity are significant in the study area; as the land parcel increases, food insecurity decreases. The size of landholding is the determinant factor that limits the food insecurity situation of the HHs. Farmland is the major productive asset in the rural community in

general and in the study area in particular. Households that own a larger plot of land can produce more crops and possibly diversify their crop enterprises and income sources. The land is perhaps the single most important resource, as it is a base for any economic activity especially in the rural and agricultural sector. Farm size influences farmers' decision to use or generate new technologies. 92.8 per cent of the respondents in the study area had less than one ha.

***Oxen and other livestock possession*:** In the district 66.4 per cent of the sample HHs had oxen, 18.8 had two oxen, 34.6 per cent had no oxen, 82.4 per cent had domestic animals and 17.6 per cent had no domestic animal. Like the other parts of Ethiopia, animal resources play a great role in improving HHs food security in the study area. Animals provide milk, cheese, eggs, and other products.In addition, animals especially sheep, mule and cattle are sold directly in the market and are the swift sources of income to purchase food, agricultural inputs such as fertilizer, seed, etc. Cow dung and other animal faeces are inputs for preparation of compost and manure to increase fertility of the soil which has positive contribution to improve food security status. For some farmers, animals are the main sources of income. In the study area, from the total sampled HHs, 33.2 had no oxen, 48.2 per cent had only one ox per HH, 18.45 per cent had two and more. Only 6.5 per cent of food insecure households had 2 oxen. The relationship between the two variables was tested through chi-square test. The result showed that there is less than 5 per cent significant relationship between food security status and oxen possession (chi-square value = 8.063); the possession of oxen determines the capacity of HHHs to produce. The households cited that in addition to providing draught power, livestock also helps households by providing a source of farmyard manure, fuel, food and an asset against shocks. Thus, the possession of livestock and oxen is a key determinant of household capacity and which reduced food insecurity in the study area. The sample respondents also reported commonly used livestock ownership as a key criterion for wealth ranking among sample households. In the districts livestock production is equally important as crop production in terms of achieving household food security. Moreover, 47.3 per cent of the

Table 2. Chi-Square test for discrete variables

Discrete Variables		Food security		Chi-square value	Signi-ficance
		Food in secure	Food secure		
Sex	Male	77	78	4.295	
	Female	11	3		0.038**
	Total	88	81		
Education	Literate	32	18	4.853	0.05**
	Illiterate	56	62		
	Total	88	80		
Marital status	Married	76	77	5.199	0.074*
	Divorced	5	0		
	Widowed	6	4		
	Total	87	81		
Land holding size in ha	<=.0.5	32	51	25.057	0.000***
	>0.5-1	54	20		
	>1	2	10		
	Total	88	81		
No. of oxen	One	51	30	8.063	0.018**
	Two	11	20		
	Total	62	51		
Production	1—3ql	28	34	8.625	0.035**
	4—8ql	53	36		
	9-10ql	6	6		
	>10	0	5		
	Total	87	81		
Technology	Yes	37	30	1.454	0.483
	No	51	50		
	Total	88	81		
Market access	Yes	17	25	3.039	0.219
	No	70	55		
	Total	88	81		

Source: Own Analysis, 2017 ***,**,* significant at 1%, 5%, and 10%, respectively

households have proposed livestock as a primary source of income and thus as a coping mechanism during the critical period of food insecurity. Almost all sampled households noted that a pair of oxen is a requisite input for ploughing during crop production .

Farm production: Among the total sample HHs 151 (89.9%) of the HHs produce annual crop production that ranges from 1-8 q/ HH/yr, 14 (8.2%) of the HHs had got 9-10 q/HHs/yr and the other 5(2.9%) produce more than10 q/ HHs/yr. In addition the average mean of crop production in the study area was 5.5 q /HHs /year. However the average adult equivalent family size of the sample HHs in the study area was 5.68. The projected national and international food grain requirement for the person per year was 2.29 q/ yr/person USAID (2009). The actual mean grain available for the sample of households in the study area is 0.98q/L per year per person, which is much less than the national and international average by 44.6 per cent. This, implies that there was a relation between production and food security status and was less than 5 per cent significant and the result of the chi square test equals to 8.625.

Technology: In the study area, 37(42%) of respondents who are food insecured and 30 (37%) of food secure respondents applied agricultural technologies. However, the proportion or the rate and the method were not as per the standard. The correlation between dependent and independent variables were tested through chi-square test. The result of the test implies that there is strong correlation between variables (chi-square=1.454) and the result is insignificant.

Market access and Food insecurity:73.9 per cent of the respondents in the study area did not have enough market access. Only 26.1 per cent had enough access to a Market information system, marketing facilities, and marketing organizations. Distance from the market is among the few marketing features influencing household economy in general and food security in particular. Where markets are too far to sell agricultural out puts and purchase inputs, the price is inefficient giving less incentive to farm producers. Where markets are near,

market information is available to both sellers and consumers' price incentives are better. In highlands, access to major food items was found higher in immediate post months than during planting time and pre-harvest months. About 90 per cent of HHs reported that Output from crop production was not enough to feed all the year round. Therefore, farm HHs purchase maize, millet, sugar, common salt for consumption in addition to agricultural inputs and non-food items throughout the year. Local markets must stock needed food and make it available at prices that surrounding customers including farmers can afford. These customers must have cash or tradable assets, including labor. To get cash income for purchasing these goods and for other social expenses farm HHs sell animals and animal products, crops such as potato, teff, wheat and labor, sheep and goat are mainly kept for cash income.

Continuous Variables

***Age*:** The age of respondents ranges from 20 to 77 years and the mean age is 48.5 years. The majority of the respondents were between 39-60 years old. When age increases, food insecurity increased due to two reasons: as the age increases the number in the family also increases without increasing the farm land; and as the age increases even the available land is fragmented as land continues to be shared among members of the growing family (Table 3).

Family Size: It is supported by relevant literature that the size and composition of a family is associated with household income and food insecurity. This variable directly affects the dependency ratio of the household. The data revealed that the mean sample household size is 5.68 individuals, while some families were as small as two or as large as 11. When family size increases, the level of food insecurity increases.

Table 3. T-Test for continuous variables

		Sig.	T	df	Mean Difference	Std. Error Difference
AGE	Equal variances assumed	.778	-1.267	166	-.10795	.08521
	Equal variances not assumed		-1.270	165.705	-.10795	.08499
FAMILYSIZE	Equal variances assumed	.074*	1.385	166	.30105	.21743
	Equal variances not assumed		1.373	154.410	.30105	.21931

Source: Own Analysis, 2017 ***,**,* significant at 1%, 5%, and 10%, respectively

Estimation Result of the Logistic Regression Model for Determinant of Food insecurity in the Study Area

The binary logistic regression model is used to estimate and identify socio-economic determinants of food security in the area. While food security status that is being food secure (1) or being insecure (0) is treated as a dependent variable, socio-economic factors are used as explanatory variables in the model, as some of the socio-economic variables can explain other variables. Gross income per AE either explains or is explained by gross farm and off-farm income, therefore it is not important to use all the three variables to identify the determinants; rather using either gross income per AE or gross farm income is important. Out of 10 variables expected to affect food security status at the household level using the binary logit model, only 3 variables are estimated to affect food security status significantly (Table 4). Landholding size, draught power possession, and production are found to affect food security in the area.

Table 4. Binary Logistics Regression Model Output

Variables	B	Exp(B)	S.E.	Sig.
SEX	-1.229	0.293	1.969	0.532
AGE	0.652	1.919	0.445	0.143
EDUCATION	0.220	1.246	0.512	0.667
MARITALSTATUS	0.505	1.657	1.102	0.646
FAMILYSIZE	-0.180	0.835	0.159	0.255
LANDSIZE (in ha)	-1.278	0.279	0.488	0.009***
PRODUCTION	0.627	1.872	0.362	0 .083*
NO. OF OXEN	1.777	5.912	0.598	0.003***
TECHNOLOGY	0.113	1.120	0.452	0 .803
MARKETACCESS	-0.378	0.685	0.515	0.462
Constant	-1.200	0.301	2.153	0.577

Log Likelihood = 149.720; Pseudo R^2 = 0.194, Wald test= 1.328
***,**,* significant at 1%, 5%, and 10%, respectively
Source: Own Survey Result, 2017

Educational level of the household head: The educational level of the household head had insignificant impact on the food security status of the HHs in the study area. Unfortunately, the result of the logit model revealed that the sign was negative and insignificant. This was due to the unfavorable environment to benefit from the qualities of education. This means that even if the household head was educated, there were no opportunities to be benefited from. Insecure access to food may influence school attendance and achievement, reproductive decisions, migration strategies, employment options, and overall health and well-being. Schooling by itself is not a sufficient engine of growth for food security and also because farm households who are food insecure look for labor employment for their children to secure some cash or crop in order to increase access to food in their family. This leads to low quality education and school interruption due to which the effects of education on

food security is not sound. This means that even if the household head was educated, there were no opportunities to benefit from.

Technology: It is the collection of techniques, skills, methods and process used in production of commodities which is not significant in the study area because of two reasons; 1: majority of HHs in the study area are food insecure and unable to afford the cost of applyng agricultural technology and afraid of risks.2: Farmers did not apply the technology as per the standard and the way they used the technology is not right. For instance fertilizer application is not based upon the recommendation.

***Distance to nearest market*:** Proximity to market centers creates access to additional income by providing off-farm and farm employment opportunities, easy access to inputs and transportation. It was, therefore, expected that households nearer to the market center have better chance to improve household food security status than those who do not have a proximity to market centers. Proximity to market centers was measured in kilometers. Market information system, marketing facilities, marketing organizations and distance from the market are among the few marketing features influencing household economy in general and food security in particular. Where markets are too far to sell agricultural outputs and purchase inputs, price is inefficient giving less incentive to farm producers. Where markets are near, market information is available to both sellers and consumers and price incentives are better. However, the market did not have significant effect on food security in the study area. Since the study area is small in size and has an all weather road, the impact of distance is not strong on the variables affecting the living condition of farmers of the study area, as farmers at far distances are in a better condition as compared to those at middle distances regarding the above mentioned price of grain and fertilizer. However, the probable reason for this finding is that they are at a distance when compared to the center of the district.

Age: In the study area, age is not a significant variable for food security because HHs at different age groups are affected by food insecurity. Land distribution in the study area was conducted in the study area 25 years ago in 1983. During

that time age was the first criteria to get land; youth whose age was above 25 years had got land. Individuals below this age did not, and due to this reason majority of productive HHHs whose age ranges from 20-50 are landless today and exposed to food insecurity. Majority of the land holders are above 65, old and less capable of producing and sharing for/with their young and adults and practice share cropping and are prone to food insecurity which exacerbates food insecurity. Besides, older people have more access to land than younger people as young people have to wait for land redistribution or they have to share with families. Food insecurity is found in all age strata. Owing to this the researchers inferred that age is insignificant for food insecurity in the study area. Mishra (2015) found that gender of the household head and age are statistically insignificant.

Marital status: The primary data shows that 90.6 per cent of sampled household heads were married, 5.9 were widowed, and 3.5 per cent were divorced. Since widowed and divorced sample HHs were very limited in number, there was insignificant variation in marital status of the sample household heads across study districts. However, married HHs have large families which requires high food consumption expenditure and leads to food insecurity in one way and in another way marriage could have accelerated change in status of food security or reduced level of food insecurity.

Sex of household head: is related to household food security in many ways. Culture, access to different assets and resources, multiple roles of women are some of the factors attached to sex in determining food security status of HHs. In this study, out of 170 sample HHs, 15 (8.8%) are female and 155 sample HHs or 91.8 per cent are male headed. The number of food secure female HHs varies from food secure male headed HH. Of the total 95 food insecure farm HHs 10 (11%) are female and the remaining 85 (89%) are males., This maybe simply due to high sample size of male headed HHs. 66.7 per cent of female headed HHs are food insecure. The proportion of food secure female headed HHs to total female headed sample is 33 per cent. The proportion of food secure male HHHs, in the same way equals to 45.16 per cent. These values shows that not only more proportion of male HHHs are food secure but also

male headed HHs have higher probability to get more calorie per day per AE for its HHs members related to female headed ones. 54.8 per cent of male HHHs are food insecure which is based on food consumption survey. However, the model result shows that sex has insignificant effect on food insecurity.

Drought*:* In the past few years, Ethiopia has been particularly afflicted by both manmade and natural disasters. Drought, flooding, war and conflict, epidemics, and pestilence have been the major disaster risks. Drought is the leading cause of disaster in Ethiopia and almost all drought periods were recorded as famine periods. Both droughts and the resultant famines have been the major causes of social and economic crisis in the country in general and in the study area in particular. Famine has also contributed to the death of millions of people and animals over the last half century. The impact of drought is different throughout the country and depends on the vulnerability factors of the households. The populations of Wollo in Amhara Regional State, Tigray Regional State, and Hararge in Oromiya Regional State have historically been most affected by drought. Research has revealed that the recurrence of drought and famine is due to the country's economic structure, which is highly dependent on subsistence rain-fed agriculture. As the agricultural sector is dependent on erratic rainfall and traditional management, it is highly vulnerable to the occurrences of drought . In the study area, 85.29 per cent of the respondents reported that drought is one of the major causes of food insecurity.

Pest infestation **:** Pest is a plant or animal detrimental to humans or human concerns such as agriculture or livestock production. According to the data of the United Nations Food and Agriculture Organization (FAO), annual worldwide losses amount to approximately 20-25 per cent of the potential worldwide yield of food crops. In the study area pest is one of the dominant factors that negatively affects the food security status of the HHs. About 88.2 per cent of the respondents reported that pest is the most common reason for reduction of agricultural production. Some crops such as faba bean, which were commonly grown in the study area, are going out of production.

Household size: This is explained in the negative correlation that, as household size increases food security decreases. This is due to the fact that a greater number of the family tends to share and compute for existing production and yield. This suggests that there is a pressure in terms of resource allocation from a given entitlement in this area. FAO (2012) pointed out that food security is challenged by rapid population growth in Ethiopia. Without a change in production change in increasing population growth could be the central reason for problems of food insecurity. However, the negative effect of family size is not well understood by the majority of the HHs in the study area. Still, now large families or children are considered as an asset.

Land size: The logistic regression estimation shows that a unit increase in the size of land significantly increases the food security of households by a factor of 0.279.The findings are in line with the findings of Abafita and Kim (2014).

Production: The result depicts that a unit increase in farm production, significantly increases the food security of households by 1.871 factors. The findings are in line with the results of Doroch and Rashid (2013) and CARE (2014).

Number of oxen: According to the logistic estimation result, a unit increase in the number of oxen significantly enhances the food security of households by a factor of 5.912. The findings are consistent with the findings of Astemir (2014) and Muche (2015).

Concluding Remarks

Food insecurity is normal and regular for majority of HHs in the study area, appearing every year and extends from April up to November to pre-harvest time for three to six months. The descriptive statistics show that sex, size of cultivated land, education, technology, animal resource holdings, draught power possession, access to market, improved seed use, participation in extension packages are correlated with food security status. However the result of logistic regression model revealed that among these socio economic variables only three namely, possession of oxen, total cultivated land, and

production are found to be significant in determining food security status of households. The study also indicated that annual production, oxen/ livestock possession, size of farm land have a significant and positive influence on the state of household food security. Farmers do not produce enough food even in good rainfall years to meet consumption requirements. Given the fragile natural resource base and climatic uncertainty, current policy emphases on agricultural intensification are misguided because of limited understanding of the problems, lack of resources, lack of motivation, conflicting policies and inefficient institutional arrangements. Food insecurity in the study area is seriously limiting agricultural production. Despite many efforts by the government and non-government organizations to ensuring food security in the study area, it has been a challenge over the years. This suggests that there are still plenty of problems that call for action. Identifying and examining the determinants of food security in rural farm households can be taken as a step towards the solution to the problems. In general, it is concluded that strategies should be designed in a way that would focus on and address the identified determinants as well as other factors that are useful to achieve household food security. However, it is also believed that this is not a conclusive study to come up with a solid recommendation to address the food security situation in the district under this study.

References

Abafita and Kim (2014). *Determinants of Household Food security in Rural Ethiopia: An empirical Analysis*. Journal of Rural development 37 (2):129-129

Astemir, HY. (2014). *Determinants of Food Security in Rural Farm households in Ethiopia*. International Institute of Social Studies, Netherlands

ATA (2010). *Food Security in Ethiopia and the Role of ATA and the Gates Foundation.* Addis Ababa, Ethiopia

CARE (2014).*Achieving Food and Nutrition security in Ethiopia: Findings from CARE Learning Tour to Ethiopia*, Addis Ababa, Ethiopia

Central Statistical Authority (CSA) (2008). *The 2007 Population and Housing Census of Ethiopia*, Country report. Addis Ababa: CSA printing press.

Dorosh, P.A and Rashid S. (2013).*Food and Agriculture in Ethiopia. Programs and policy challenges*. IFPRI, Issue Brief 74

FAO (2010). *The State of Food Insecurity in the World*. Rome, Italy

FAO (2012). *The State of Food Insecurity in the World,* Rome, Italy

Hoddinott, J. **(**1999). *Choosing outcome indicators of Household Food Security*. Technical Guide #7, IFPRI, Washington D.C. USA.

IAASTD (2009). *Agriculture at a Crossroads: Food for Survival*. Greenpeace International, Amsterdam.

IPCC ((The Intergovernmental Panel on Climate Change) (2007). *Climate Change Synthesis Report. United Nations*

Mishra, K (2015).*Gender and dynamics of technology evidence from Uganda*: The Ohio State University, USA

Muche, M (2015).*Assessment of Food Security in Ethiopia: A review.* Asian Journal of Agricultural Research (12):55-68

MoFED (2013) *Development and Poverty in Ethiopia*. Addis Ababa, Ethiopia: Ministry of Finance and Economic Development, Federal Democratic Republic of Ethiopia.

Nellemann, C., MacDevette, M., Manders, T., Eickhout, B., Svihus, B., Prins, A. and Kaltenborn, B. (2009).*The Environmental Food Crisis. The environment's role in averting future food crises*. A UNEP rapid response assessment.

TGWOA (TAchGayintWoreda Office of Agriculture) **(**2014).*Woreda food security report*, TachGayintWoreda, Ethiopia

USAID (2009).*Productive safety net working guidelines*. Ethiopia program, Addis Ababa, Ethiopia

World Bank (2007). *Report on food security*, Washington, D.C, USA