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School of Business and Economics
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**Determinants of Household Food Insecurity:
The Case of Rural Kebeles in Dire Dawa City Administration**

**A Thesis submitted to Adama Science and Technology University for Partial
fulfillment of M.Sc. in Development Economics**

BY

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Adama, Ethiopia**

DEDICATION

I dedicate this thesis manuscript to all my Family.

STATEMENT OF THE AUTHOR

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BIOGRAPHY

The author was born in rural Dire Dawa City Administration, wahel kebele. He attended his elementary and junior school in Wahel and his Secondary School in Dire Dawa Compressive Secondary and Preparatory School. Upon his successful completion of his high school education, he joined Dire Dawa University and in the year 2008 and graduated with BA in Economics in the year 2011. After the graduation he served in Dire Dawa new secondary and preparatory school as economics teacher, and then in 2012 he attended the post graduate study in Development Economics at Adama Science and Technology University.

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LIST OF ACRONYMS AND ABBREVIATION

CSA	Central Statistical Authority
DPFSO	Disaster Prevention and Food Security Office
FAO	Food and Agricultural Organization
FGT	Foster-Greer-Thorbecke
GDP	Gross Domestic Product
IDP	Integrated Plan of Dire Dawa Administration
IMF	International Monetary Fund
MoFED	Ministry of Finance and Economic Development
TLU	Tropical Live Stock Unit
UNEP	United Nation Economic Program
USAID	United States Agency International Development
SSA	Sub Saharan Africa
WFP	World Food Program
VIF	Variance Inflating Factor

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ABSTRACT

The study attempts to examine the major Determinants of Food Insecurity among Rural Households using the survey data collected from kebeles randomly selected households from four Rural Kebeles of Dire Dawa City Administration of Ethiopia. To do so, both descriptive statistics and econometric model known as binary logistic regression analysis were employed. A two stage random sampling technique was employed to select sample households randomly from four Kebeles using probability proportional to size. Both primary and secondary data were used, and the data were collected primarily through interview schedule from 120 households. Household calorie acquisition was analyzed to measure household food security status. Out of 120 households, 19.16 percent and 80.83 percent were food secure and insecure, respectively. The model was fitted with eleven variables, of which six were found to be significant. Family size, livestock holding, access to credit, annual income, food aid and dependency ratio were significant variables that in determining influence house hold food insecurity in the study area. The econometric result revealed that the probability of being food secure increase with increase in livestock ownership, off farm income , use to credit and food aid received while large house hold size and dependency ratio reduce the probability of household to be food secure. The study findings suggest that in selecting priority intervention areas, the food security strategy should consider statistically significant variables as the most important areas.

Key words: Dire Dawa, Binary Logit model, determinants of food insecurity

1. INTRODUCTION

1.1. Back ground of the Study

Food is essential in human being's life. Enough food in terms of quantity and quality for all people is an important factor for a nation to continue its development. Lack of food in long terms will lead to hunger and starvation that can cause death. So that enough food is a necessity condition to be well nourished (Sila and Pellokila, 2007). However, worldwide 925 million people are chronically hungry due to extreme poverty consume less than 2 US \$ per day; they often lack opportunities to have meaningful access to food, whereas two billion people lack food security intermittently due to varying degrees of poverty (FAO, 2010).

Sub-Saharan Africa (SSA) has a bigger share with 239 million people lacking access to food. The greatest food security challenges over remain in Saharan Africa , which has seen particularly slow progress; improving access to food with slow moving income growth , high poverty level rates and poor infrastructure which hampers physical and distributional access and more over, food availability a remains low. The SSA region is still challenged with rapid population growth which affects the ability of countries to assure stable supply and access to food. The population in the region has grown annually by 2.7 percent increasing from 507 million in 1990 to about 936 million in 2013. The Domestic food production accounts for about 75 percent of the region's consumption nearly half of the region's population remains food-insecure (WFP, 2011). As one of the poorest countries in the world, the economy of Ethiopia suffers from the lowest per capita gross national income (220 US dollar), 21% below the average of low- income countries (1,174 US dollar) (Zerihun and Getachew, 2013).

Ethiopia is one of the food insecure countries in SSA with estimated 32.6 percent of the population food insecure.(FAO,2012).

The incidence of food insecurity in rural areas is high where more than 80 percent of the population lives (Tagel, 2008). The proportion of population in the rural area unable to attain their minimum nutritional requirement is estimated to 39.3 percent (MoFED, 2009). It is estimated that about 10 percent of Ethiopia's country population are chronically food insecure and this figure rises to more than 15 percent during frequent drought years; 2.7 million People

require emergency food assistance in 2014 and 238,761 children require treatment for severe and acute malnutrition in 2014.

According to IMF (2012), agricultural sector remains a key source of growth in Ethiopia but it continues to face major challenges. Rural livelihoods remain extremely vulnerable to climatic shocks as food production is mainly dependent of natural rainfall and irrigation supports only negligible portion of the country total cultivated land. Irrigation agriculture accounts for only 1 percent of the country's total cultivated land. Growth can raise incomes and reduce hunger, but higher economic growth may not reach everyone and may not lead to more and better jobs for all, unless policies specifically target the poor, especially those in rural areas (WFP, 2013).

In Ethiopia's agricultural sector, which is dominated by small scale, mixed crop, and livestock farming is the mainstay of the country's economy. It constitutes 45 percent the country gross domestic product (GDP), generates more than 85 percent of the foreign exchange earnings, and employs about 80 percent of the population and contributes 70 percent of raw material for industries(CSA ,2006). However the dependence of agriculture on rain fed makes the country suffers greatly from the risks associated with high rainfall variability and long term records indicate that there have been severe and repeated rainfall failure resulting in severe food insecurity, the frequency and severity of these natural shocks has increased in recent years (Mahoo et al.,2013).

According to USAID (2012) about 12 million people are chronically or periodically food insecure and about 8 million Ethiopians have received food assistance through the productive safety nets program on a regular basis . The country suffers from the lowest average per capita kilocalorie intake of 1,982 and a high incidence of poverty (Ramanaiah and Gowri, 2011; USAID, 2012). About 29 percent of the populations live below the poverty line (FSP, 2012) in which about 30 percent in rural and 26 percent in urban areas (MoFED, 2012).

Food insecurity is the most critical problem facing a large number of agro-pastoral households. Recurrent drought and chronic water shortage both for livestock and human; human and livestock diseases have contributed to food insecurity in the agro- pastoral area. In addition, low-income level and low per capita asset holding in terms of livestock number have aggravated the food insecurity situation. As a result the agro-pastoralist households are vulnerable to food insecurity (Yusuf, 2007).

Making their living on marginal and moisture stressed, and heavily degraded and less productive land, households in rural areas of Dire Dawa Administration are facing unrelenting food shortages. On top of these ever decreasing land holding size and increasing population, recurrent drought and resource (land, water, forest, range land) degradation have made the food insecurity situation worse (Abebaw, 2003).

1.2. Statement of the Problem

Now a day's food security issues become one of the critical concern and top priority area for developing countries. Food is a basic necessity of life but the importance of food at the household level cannot be overemphasized. Food accounts for a substantial part of a typical sub Saharan household budget and it has been established that the quantity and quality of food consumed by households affect their health and economic well being (FAO, 2006). Of the estimated 923 million undernourished people in the world, about 25.89 percent of them are in sub-Saharan Africa (FAO, 2009).

Ethiopia is one of the food insecure countries in SSA; they live in conditions of chronic food shortage with food availability being below requirements for the last two decades with per capital food grains availability during year 2010 around 168.8 kg /year/person which is 25 percent below the total nutritional requirement. In particular, people living in the drought prone areas are severely affected by lack of food (Tagel, 2008; MoFED, 2009; WFP, 2010; Girma 2013).

Ethiopia is one of the largest and most populous countries in Africa next to Nigeria, which has a tropical monsoon climate characterized by wide topographic induced variations which help to grow varieties of crops (von Braun and Olofinbiyi, 2007). This indicates that given the ecological diversity the country has a good potential to produce different varieties of crops and species of livestock. Despite this potential, however, Ethiopia is one of the poorest countries in the world with low annual per capita income (Fransen and Kuschminder, 2009). Inability to acquire sufficient food, lack of reasonable income and productive assets, insufficient access to health and education as well as poor governance are common indicators of chronic food insecurity in Ethiopia (Devereux,2006,Tagel,2008, Berlie,2013). The situations are aggravated by the fact that Ethiopia has been stricken by continuous occurrences of drought, famine and hunger, which are the root causes of chronic and transitory food insecurity.

Despite its importance and high potential, Ethiopian agricultural production remained low, The total production of major crops during 2004/2010 was 12.5 and 14.7 million tons respectively which indicate increasing trend; however, in the contrary the number of food insecure rural population has shown increasing trends number of people in need of food from year to year; food insecurity remained to be major issues for decades and still it is one of priority issue for the county's population (CSA, 2007, WFP, 2011).

Even in years with adequate rainfall and good weather, there have always been millions of Ethiopians vulnerable to the threat of starvation, more than seven million people are classified as chronically food insecure and receive regular support from the cash-and food-for-work Productive Safety Net Programmed.”The FAO agricultural stress index system assess crop growing condition in El-Nino incidents from 1986 to 2013 and in particular, detects agricultural areas with a high likelihood of water stress or drought. During the period of El-Nino 1987, 1991, 2002, and 2009 coincide with intense and or extended drought conditions which cover the main cropping season. Review of the 1997-1998 El Niño effects in Ethiopia reported a 25 percent decrease in production compared to the previous year and that, yields were low because of reduced land preparation and planting and poor and early cessation of rainfall. Heavy rain and pest infestation also reduced output. Prices of agriculture commodities also increased by between 13 and 53 percent from those of 1996. UNOCHA reports that 4.2 million people in Ethiopia received more than 560,000 metric tone of food aid in 1998, indicating that the 1997-1998 harvest was well below normal.

The Ethiopian Ministry of Agriculture (MoA, 2011) indicated that the arid and semi arid climate in the lowlands of Ethiopia is characterized by periodic droughts that may be increasing frequently, with the period 1997-2008 subject to successive drought years. Large number of people remains food insecure, having failed to recover from loss of livestock assets and income opportunities. A substantial portion of the rural populations is food insecure even in normal rainfall years. The problem of food shortage in these areas due to recurrent drought is still a major issue. A data of Federal Disaster Prevention and Preparedness Agency (DPPA, 2012) indicated that, in 2012 about 2.8 million people are estimated to be in need of food aid.

Making their living on marginal and moisture stressed, and heavily degraded and less productive land, households in rural areas of Dire Dawa City Administration are facing unrelenting food shortages; on top of these, the ever decreasing land holding size and

increasing population, recurrent drought and resource (land, water, forest, range land) degradation have made the food insecurity situation worse (Ayalneh, 2002, Abebaw, 2003, Girma, 2013). According to DPFSO ,2011), more than 50,567 people in rural Dire Dawa were chronically food insecure and others are acutely affected in bad production years.

Researches assessed the food security of urban and rural kebeles of Dire Dawa City Administration more than ten years ago (example Abebaw, 2003; Aschelaw, 2006). However, the socio-cultural, political and economic feature has changed the resource base of the area over time in rural setting. This research is context specific to rural livelihood that makes their living on arid and semi arid severely moisture stressed area and frequently vulnerable to hazards of drought and seasonal migration and susceptible to spectacular resource depletion. Food insecurity and its associated problems will continue in this area unless appropriate developmental policies and interventions are backed by research findings. Aware of these facts, this study aims to find location and production system specific factors that contributed to household's food security and identifying major determinants of food insecurity in the study area to suggest appropriate intervention options.

Furthermore, the diverse, complex and interrelated cause of household food insecurity and local responses during crisis situation are not studied in detail, especially at a household level. Therefore, this study attempts to fill the gap by conducting an empirical research on identifying and understanding those elements that are responsible for variation in household food security that are needed to guide policy decisions, device appropriate interventions and integrated efforts to combat food insecurity.

1.3. Research Questions

1. What is the current status of food insecurity in rural households of the study area?
2. What are the determinants of food insecurity of rural households in the study area?

1.4. Objective of the Study

The main objective of the study is to identify the determinants of food insecurity in households of study area.

The specific objectives of the study are;

1. To assess current status of food security of rural households of the study area
2. To identify the major determinants of food insecurity of rural households in the study area

1.5. Scope and Limitations of Study

The study was conducted in rural kebeles of Dire Dawa Administration. The study area covers 4 rural kebeles out of the 38 rural kebeles of the Administration. The scope of the study was limited to identify the major determinants of food insecurity household's in the study area. The data generated out of the field survey was a cross sectional data. Hence it lacks longitudinal perspective of the problem under study. Since, the unit of analysis of this study was household level and intra-household food situation was not assessed. This study has also limitations that future studies need to address. The household survey was collected at one-shot (collected only one time). However, rural livelihoods and the factors affecting household food security are dynamic that need to have longitudinal survey.

1.6. Significance of the Study

A study was to identify major determinants of rural household food insecurity is crucial since it provides information that will enable effective measures to be undertaken so as to improve food security status and bring the success of food security development programs. It was also enable development practitioners and policy makers to have better knowledge as to where and how to intervene areas to manage the major factors that affect food security of the households in the study area. The study was also help as an input for further study in the area with related subject. In addition, the findings of this research will have valuable practical relevance in designing food insecurity policy at local, regional and national level.

1.7. Organization of Thesis

The thesis is organized into five chapters. The first chapter presents the background of the study, statement of the problem, significance, objectives, scope and limitations of the study. The second chapter present review of literature that includes definitions and concepts of food insecurity, the food security Situation in Ethiopia, measurements and indicators of food security, and determinates of households food insecurity. Chapter three presents the description of the study area, and methodology of the study. The fourth and fifth chapter presents the results and discussion of the research outcomes and draws conclusions as well as policy implications of the findings of the study respectively.

2. LITERATURE REVIEW

2.1. Definition and Concepts of Food Insecurity

Food Security: Food security is defined in different ways by international organizations and researchers without much change in basic concept. According to FAO (2002) food security is defined as ensuring that all people at all times have both physical and economic access to the food they need. World Bank defined as access by all people at all times to sufficient food for an active and healthy life. In 1996, the World Food Summit defines food security as ‘Food security exists 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.

In contrast to food security **food insecurity** is a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life; or food insecurity is defined as lack of access to enough food both in quantity and quality on sustainable bases. Accordingly, household food insecurity takes different forms, which requires different responses or actions. The approaches may be different depending on whether food insecurity is chronic with household almost always short of food or transitory resulting from temporary adverse circumstance. Food insecurity may be seasonal; a family may have insufficient food perhaps each year, but only in certain seasons (Getahun, 2003, Tefera, 2009, WFP, 2010).

According to food security strategy of Ethiopia (2002), food insecurity is divided into categories of the chronic and acute. Chronic food insecurity is commonly perceived as a result of over whelming poverty indicated by lack of assets. Acute food insecurity is viewed as more of a transitory phenomena related to man-made, and unusual shocks, such as drought. While the chronically food insecure population may be experience food deficit relative to need in any given year, irrespective of the impact of shocks, the acutely food insecure are assumed to require short-term assistance to help them cope with unusual circumstance that impact temporarily on their livelihood.

Any analysis of food security will examine whether a change from security to insecurity or insecurity to security actually takes place and also the probability of such a change happening. Factors that may lead to a situation of food insecurity include non-availability of food, lack of access, improper utilization and instability over a certain time period (FAO, 1996). The four dimensions of food have linkages with different impacts of climate change which considered as vulnerable when one or more of these components is uncertain or insecure. Factors such as poverty unavailability of employment, lack of education, increase in food prices, climate and environment conditions and poor access to market are identified to have a direct correlation with food security.

2.2. Food Security Situation in Ethiopia

Ethiopia is mainly dependent on the agriculture sector especially in subsistence and rain-fed farming and livestock production. Food availability, supply and access, demand are strongly affected by seasonality. Many households are only able to produce sufficient food to meet their food requirement for less than six months of the year, facing acute food shortages during the hunger season. According to the medium variant of the national population projections, the population will pass the 100 million mark by the year 2017, implying an average growth rate of 2.43 percent. Even under this favorable scenario that assumes a steep decline in fertility to 3.32 by 2030, the population growth will continue to exert serious pressure on the environment and the provision of basic social services will remain an enormous challenge to the country for the foreseeable future.

According to FAO (2010), more than 31 million of Ethiopian population were food insecure. However, the latest food insecure number shows positive trends 1999-2001; 55 percent 2004-2006 48 percent; 2007- 2009, 44 percent 2010- 2014, 40 percent and number of people food insecure during 2014 is 32.9 with per capita food supply availability 6 kcal per capita per day and the food deficit is 261 kcal per capital per day during the same time (FAO, 2015).

The FAO agricultural stress index system assess crop growing condition in El-Nino incidents from 1986 to 2013 and in particular, detects agricultural areas with a high likelihood of water Stress or drought.

Review of the 1997-1998 El Niño effects in Ethiopia reported a 25 percent decrease in production compared to the previous year and that, yields were low because of reduced land

preparation and planting and poor and early cessation of rainfall. Heavy rain and pest infestation also reduced output.

Ethiopia is currently experiencing its worst drought in over 30 years. Net cereal production from the main 2015/16 harvest currently underway may fall by 10-20 percent (1.9 to 3 million tons) relative to the 2014/15 harvest. Households in regions hit particularly hard, including the eastern highlands and pastoralist areas, are expected to suffer especially severe crop and livestock losses. According to UN estimates, about 10.1 million people, approximately 10 percent of Ethiopia's population, are in need of food assistance (Ethiopia Humanizations Overview, 2016)

WFP estimates reveal similar results over 41 percent of the population is considered to be undernourished (WFP, 2010). In addition, an estimated 7.6 million (or 11 per cent of the rural population) are currently considered chronically food insecure, meaning each year they are relying on resource transfers to meet their minimal food requirements. Over the past four years between 2.2 and 6.4 million additional people were food-insecure or not able to meet their food needs in the short term due to transitional factors. They are temporarily dependent on relief food assistance (WFP, 2012).

2.3. Indicators and Measurements of Food security

Measuring the required food for an active and healthy life and the degree of food security attained is a question to be addressed in a food security study. Given the multiple dimensions of food security there can be no single indicators for measuring it. For this purpose different indicators are needed to capture the various dimension at the country, household and individual level (Tefera, 2009).

2.3.1. Indicators of food security

Assessment of food security is often a difficult issue as there are no universally accepted indicators that serve as measuring tools. Given the multiple dimensions of food security there can be no single indicators for measuring it (Debebe, 1995, Yilma, 2005, Girma 2013). Maxwell and Frankenberger (1992) classified the different types of food security indicators in to two main categories, process and outcome indicators. The process indicators provide estimates of food supply and food access situations. Food supply indicators (meteorological and agricultural production data, information on natural resources and market are known to provide

information on the livelihood of shocks or disaster events that affects household food insecurity. Food access indicators (diversification of income and change of food source, access to credit, sale of production assets and migration) are relatively quite effective to monitor food security situation at household level.

Outcome indicators (household budget expenditure, food consumption frequency, nutritional status and food shortage estimates) include all direct and indirect indicators of household food consumption which shows the level and changes in food and the amount of food in store serve as proxy estimate for measuring household food situation. These indicators are very important to make decisions on the possible interventions and timely responses (Debebe, 1995, Yilma, 2005). Direct indicators of food consumption include those indicators, which are closest to actual food consumption rather than marketing channel information or medical status. Indirect indicators are generally used when direct indicators are either unavailable or too costly (in terms of time and money) to collect. The problem of outcome indicators is that some of the indicators like anthropometrics results may not exactly indicate the level of food crises since nutritional intake is affected by a number of factors like health care (Maxwell and Frankenberger, 1992).

Food security indicators often measure attributes of one or more of the food security dimension (availability, access, utilization, and stability). Some of the capture “objective” information (e.g., dietary, economic, and health indicators), while others capture “experiential” information (e.g., perceived adequacy of consumption, exposure to risk, and cultural acceptability of foods) (Barrett 2010). Temporal aspects also differ in the measurement of food security. These are usually expressed in terms of “acute food insecurity,” often associated with the impact of a particular idiosyncratic or covariate shock, or “chronic food insecurity,” usually associated with a persistent condition of poverty or marginalization (Headey ,2012).

In practice, acute food insecurity is often used to label emergency situations in which short-term fluctuations in access are critical to monitor and respond to, while chronic food insecurity is ascribed to longer-term situations or protracted constraints to access that may not be subject to short-term fluctuations of large magnitude.

2.3.2. Measurement of Food security

At national level, food insecurity can be measured in terms of food demand (requirement) and supply indicators that is; the quantity of available food versus needs, and net imports needed versus imports capacity (Von-Braun, 1992). Food security is such complex notion that is virtually impossible to measure directly and a variety of proxy measures have been suggested. The most frequently used measures include consumption and expenditure, nutritional status, coping strategies and resources related correlates (Maxwell, 1998). Food supply was measured as dietary energy supply and issues of distribution and quality of the food supply were generally not considered (Eden, Nigatu and Ansha, 2009).

Income and consumption have been used as measures of material deprivation. Consumption is typically preferred over income as it captures long run welfare, and may also better reflect household's ability to meet their basic needs, reflects a household's access to credit and saving at times when their income is low. Hence, consumption is a better measure of a household's welfare than income. Several methods have been used to measure food consumption, the first method is to estimate both total household production and purchase over a period of time and growth or depletion of food stocks held over that period of time. Food entering the household possession and disappearing is presumed to have been consumed; and the second estimate is to undertake 24 hours recalls of food consumption for individual member of a household and analyze each type of food mentioned for caloric content (Bouis, 1993; Aschalew, 2006).

To measure food insecurity outcomes, Hoddinott (2001) has come up with what was relatively better than any other findings obtained in past studies, and this resolves the measurement problem to a certain extent. He outlined four vital ways of measuring household and individual food insecurity outcomes: individual intakes; household caloric acquisition, dietary diversity, and indices of household coping strategies. Thus according to Hoddinott (2001), at household level food insecurity is best measured by individual intakes, household caloric acquisition, dietary diversity, and coping indices.

Individual food intake data: This is a measure of the amount of calories, or nutrients, consumed by an individual in a given time period, usually 24 hours. This can be done by measuring the amount food served to each person the quantity and type of food eaten as snacks between meals as well as food consumed outside the household and is the recall, in the

enumerator interviews each household member concerning the food they consumed in the previous 24 hours period.

Household calorie acquisition: This is the number of calories, or nutrients, available for consumption by household members over a defined period of time. Individual calorie requirements reflect individual characteristics such as age, sex, weight, body composition, disease states, genetic traits, pregnancy, and lactation status, and activity levels as well as climate. Here the person responsible for preparing meals (the most knowledgeable person in the household) is asked a set of questions regarding food prepared for meals over specific period of time usually 7 or 14 days. This measure produces a crude estimate of number of calories available for consumption in the household.

Dietary diversity: This is the sum of the number of different foods consumed by an individual over a specified time period. The method for generating dietary diversity data is one or more persons within the household are asked about different items they have consumed in a specified period. This is done by calculating a simple sum of the number of different foods eaten by that person over the specified time period.

Indices of household coping strategies: This is an index based on how households adopt to the presence or threat of food shortage. The person within the household who has primary responsibility for preparing and serving meals is asked a series of questions regarding how households are responding to food shortages.

Food security at the household level is best measured by direct survey of dietary intake in comparison with appropriate adequacy norms. The level of changes in socioeconomic and demographic variables can be properly analyzed and can serve as proxies to indicate the status of changes in food security. This study made use of Household caloric acquisition to see the major determinants of household food insecurity, as the level of skill required by enumerators is less than that needed to obtain information on individual intake.

2.4. Empirical Findings on Determinants of household Food Insecurity

Having clear picture on food security status and its major determinants helps policy makers and planners to devise new policies that enhance food security. With a predominantly rain-fed agricultural system, rainfall is one of the main climatic determinants of food production in

Ethiopia. Wetter years are generally associated with higher food production; conversely dry years are linked to lower production

A number of studies have analyzed factors that determine food security at different levels global, national, regional, household and individual levels. Identifying the major determinants of food security requires examining the determinants of dimensions of food security. Food security is generally affected by two major determinants, availability of food and accessibility to it (Andersen, 1997, Abebaw, 2003). Factors that determine food availability work on the demand side while those determining access to food work on the supply side, consequently factors that cause changes in the demand and supply of food would also bring changes in the availability and access to food respectively, ultimately influencing food security (Jemal, 2012).

The majority of poor in developing country are engaged in subsistence farming. They also depend on agriculture both for their incomes and food entitlements. So agriculture production is the main determinants of food security of the household and that the role of agriculture is crucial to the eradication of poverty and food insecurity in the rural households. The leading determinants of food insecurity in the Horn of Africa are low levels of per capita food production. Food insecurity can be tackled most effectively through policies that promote agricultural productivity, rural income and food production (Benjamin , 2012).

The study conducted in Nigeria by Oluwatayo (2008) using probit model found out that sex of household head, educational level, age and income have positive influence on food insecurity whereas household size has negative influence on household food insecurity.

Study by Sikwela (2008) in South Africa using logistic regression model showed that per aggregate production, fertilizer application, cattle ownership and access to irrigation have positive

effect on household food security whereas farm size and household size have negative effect on household food security.

Tefera (2009) in his study, used ordered logit mode to identify the major determinants of food security among the rural household. The result indicated that age of household head, family size per adult equivalent, dependency ratio, distance from the market, total cultivated land, Livestock holding (TLU), total irrigable land, sex of household head, educational status of household head, fertilizer use, improved seed, soil fertility status, development agent contact and nonfarm income major determinants of food security in his study.

The study conducted by Solomon (2014) This study was conducted to assess rural households' food security, its determinants and coping strategies in Harari Region at household level using data was collected from 140 selected sample and analyzed binary logit model showed that Agro-ecological zone, Soil fertility, number of livestock owned, family size, size of cultivated land, cultivated land size under irrigation and Productive Safety Net Program/food aid/ were found to be important determinants identified to influence household food security in the study area. The headcount ratio computed by using FGT revealed that 66.4 percent of sample households were food insecure. The food insecurity gap and severity were 12 and 2.9 percent, respectively.

A study conducted by Bogale and Shimelis (2009) using binary logit model revealed that age of the household head, cultivated land size, live stock owner ship, total income of the household,, irrigation and amount of credit received have negative and significant effect on household food insecurity and family size has positive significant effect. On the other hand the study conducted by Woldeamanuel (2009) in rural Gedeo indicated that population growth and scarcity resources , small land holding, farmers skill and level of education, inappropriate production system and market services drought and availability of rain fall , urban expansion, in and off farm unemployment and traditional , social and cultural factors were major causes of food insecurity in the study area.

The study by Girma (2013) attempts to measure the Extent and Determinants of Food Insecurity among Agro-pastoral Households using the survey data randomly selected households from six

Kebeles Rural Kebeles of Dire Dawa Administration by using Foster-Greer-Thorbecke (FGT) and econometric model known as binary logistic regression analysis showed the head count index shows that 25.33 percent of the total households below the food insecurity line. The food insecurity gap and severity were 34.55 and 18.17 percent, respectively. Family size, dependency ratio, cultivated land size, annual income, livestock ownership and food aid were significant variables to influence agro-pastoral household food insecurity of households in the study area.

The study by Lemma (2014) analyzed the food security status of households and its determinant factors, vulnerability to food insecurity and coping strategies. Using the data gathered from rural households in east Hararghe zone of Kersa, Fedis and Babile districts analyzed this data by using probit model and value at Risk approach to measure vulnerability to food insecurity in the study area. Vulnerability analysis revealed that more households are to be food insecure in the future (40.5%) than present (37.3%), the case will be severe in Fedis district that changes from present (54%) to future (64%).

3. RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was conducted in rural kebeles of Dire Dawa Administration where 26% (342,827) of total population lives. Dire Dawa Administration is located in the eastern part of Ethiopia, 515 km away from Addis Ababa, the capital city. It is bordered by Shinile Zone of the Somali National Regional State, on the northwest and northeast, by eastern Hararghe Zone of the Oromia National Regional State on the northwest, south, south east and east. The administration has 38 rural and 9 urban kebeles; the total area of the region is about 128,802 ha out of which urban accounts for 2684 ha (2%) and the remaining 98% is for rural (IDP, 2004, IDP, 2006).

Topography and climate: The topography of the administration varies from very high steep mountains to flat plains where altitude ranges from 950-2260 masl. The climate is classified as arid and semi-arid and the seasonal rainfall has a bimodal distribution with peak in April and August with mean annual rainfall 657 mm, which varies between 5.7mm (December) and 119mm (April), indicates poor temporal distribution of rainfall. The two seasons are “Meher” and “Belg” and they receive about 80% of the annual rainfall separated by a short dry spell in June. The average maximum temperature of the Administration is 31.4⁰C, while its minimum temperature is about 18.2⁰C. The mean annual average air temperature is 25.3⁰C and June is the warmest month of the year while December and January are coldest. Dire Dawa enjoys as sunny climate with mean annual daily value of bright sunshine equal 8 hour (IDP, 2009).

Economy: Livelihood of rural households of Dire Dawa Administration depends on survival way of farming. The production system is traditional and subsistence with limited types of annual crops and perennial crops are grown in the study area, namely sorghum, maize, groundnut, vegetables and chat. Livelihood strategies rely more on livestock subsector due to the pastoral lifestyle of the local community in the rural parts of the study area (Derba, 2008). The total livestock population in Administration is 183,440 or 49,113 TLU. The survey results of the population of the study area, showed that goats comprise the heights proportion, 51% of the total livestock, followed by cattle 22%, sheep 21%, donkey 4%, and camel 2 % and some poultry and honeybees (Anbes, 2003).

Population: The total population of Dire Dawa was estimated to be 342,827 out of which 74% (253,692) live in urban while the rest 26% (89,135) live in rural areas. According to CSA (2007), the total projected households are 75,693 of which 47,998 households are male headed and the rest 27,695 female headed. Out of the total population 49.8 % (170,897) were female and the remaining 50.2% (171,930) male. The administration organized under 38 rural and 9 urban kebeles.

Water Supply: Regarding the water supply system in the rural areas consists of few protected springs with on- point distribution site where cattle trough and washing basin installed unprotected springs and surface water harvesting ponds were widely used both for livestock and human consumption. Shallow and hand dug wells were used as an alternative source but this schemes are not reliable during the dry season. Boreholes which install motorized diesel generator are found in some agro-pastoral kebeles where the community used especially during dry spell months.

Roads: Relatively speaking Dire Dawa rural kebeles were accessible to the main all weather road. In most kebeles RR1 standard roads constructed and linkage and interaction between rural kebeles were established. This is part of government rural road access program designed to make the rural set up more comfortable and smooth interaction to the urban

Education: According to the integrated development plan of Dire Dawa all rural kebeles accessed primary schools and some with junior secondary school. Student school enrollment increase to 81.2% the ratio of male student to female student prevail ratio 3 to 2 which shows significant increment from year to year.

Health Facilities: Primary health posts found nearly in all kebeles where the referral system installed to health centers of the nearby Kebeles. Besides health extension workers which equipped with health preventive packages and move to every village and in association with health development army to execute the program.

Marketing Facilities: Dire Dawa is the primary market center for all kebeles. Some distant kebeles are about 90 km away. Local secondary markets were situated in nearby kebeles where petty traders supplies crop and livestock products for local assemblers and in turn purchase

consumable products. Marketing for livestock is mostly in Dire Dawa where they are to walk for long distance and loss their stock weight market information.

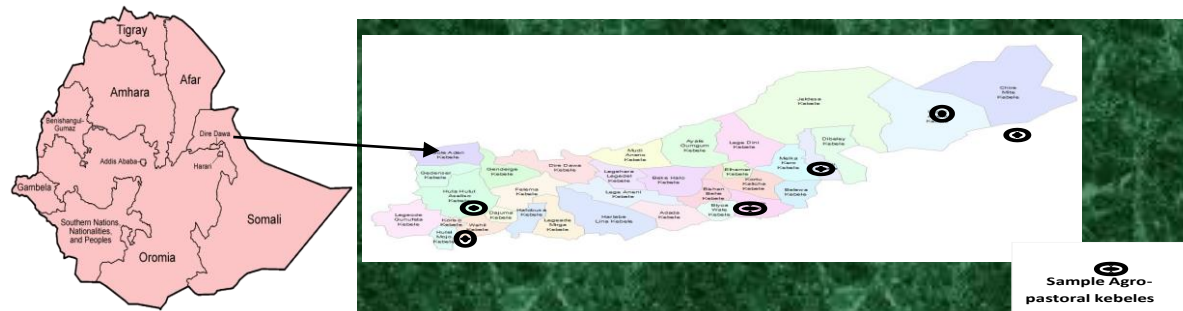


Figure1. Map of Dire Dawa Administration

3.2. Data Sources and Methods of Data Collection

The data for this study was collected from primary and secondary sources. The data collected is qualitative and quantitative in nature. The primary data needed for the study was obtained from randomly selected cross-section of sample households. The primary data was collected through structured questionnaire prepared for the study. Information pertaining to respondent's socio-economic characteristic was obtained directly through the interview schedule which was conducted at the household level. Moreover, informal discussions were made with sample households to generate primary information. Secondary data was collected from published and unpublished relevant sources such as food security and disaster prevention and preparedness bureau reports, government policy document, research reports and NGOs working in the study area and CSA abstracts. Data was Collected one time from sample house hold during year is 2014/15 on month June by structured survey questionnaire.

A structured survey questionnaire was designed and pre-tested before the collection of the actual primary data. For this purpose, 5 enumerators who had experience in data collection techniques and who are fluent in speaking local language of the community were recruited; training was given to enumerators on the content of the questionnaires and of interview techniques before the actual survey begins. The questionnaire encompass information on demographic characteristics,

crop and livestock production, farming systems and productive resources, land use, access to services, as well as coping strategies employed by the households during time of food shortage.

3.3. Sampling Method and Sample Size

The data for this study was collected from rural households in four kebeles of the Dire Dawa City Administration. To do this a two stage sampling procedure was employed. In the first stage, the rural Dire Dawa was stratified into two, arid and semi arid based on their livelihood option. Then two kebeles from arid and two from semi arid kebeles were selected based on simple random sampling techniques out of 38 of the administration. In the second stage, 120 samples household heads was drawn using simple random sampling method proportional to the size of the population.

The sample size was determined using sample size formula given by Yemane Taro (1967).

$$n = \frac{N}{1 + N(e)^2}$$

$$= \frac{4285}{1 + 4285(0.09)^2}$$

$$= 120$$

Where, n is sample size, N is total population of 4 kebele and e is the level of precision (assumed to be 0.09).

3.4. Methods of Data Analysis

Data collected was analyzed using descriptive statistics such as frequency distribution, percentage and mean, standard deviation is used to assess the socioeconomic characteristics of sample households, and the binary logistic regression model was employed to identify determinants of food insecurity at household level in the study area.

3.4.1. Current status of food insecurity

Food insecurity at household level was measured by direct survey of consumption of nutrients available for consumption by the household members over the defined period of time based on data collected at household level on available food for consumption from home production, purchase and/or gift/loan / wage in kind for the last seven days before the survey. This data was converted to kilocalorie using the food composition table manual Ethiopia Health and Nutrition Research Institute and then divided by the household Adult equivalent (EHNRI, 1998). Then the result was compared with the minimum subsistence requirement per AE per day (i.e., 2200 kcal) for Ethiopia. This value of minimum amount of energy is used as a threshold beyond which the household is said to be food secure and if below, food insecure. In line with this, a household who's per calorie intake is found to be greater than or equal to the demand is regarded as food secure and while households experiencing a deficit is regarded as food insecure.

3.4 .2. Econometric model for determinants of food insecurity

Most previous studies on determinants of food insecurity employed logit model and probit models; multivariate models and other regression models such as interval regression model (mazbahul and razai, 2010). Logit and probit are appropriate model is used to analyze the determinants of food insecurity status of house hold to see the influence of the set of explanatory variables on food insecurity status of households in the study area. The binary logit model was used to investigate the determinants of household food insecurity among the rural households and It models the influence of the set of explanatory variables on food insecurity status of households in the study area.

The dependent variable in this case, food security, was a binary variable which took a value of one if a household was found to be food insecure, and zero if otherwise.

A variety of models can be used to establish the relationship between the potential determinants and food security.

3.4.2.1. Specification of the model

The binary logit model was applied to estimate the effects of explanatory variables on rural households' food insecurity status in the study area. In this model the dependent variable is household food insecurity that is dichotomous taking a value of 1 if the household is food insecure; 0 otherwise. Then information, which identifies the food insecure from the food secure, was obtained by comparing the total food calorie available for consumption in the household per Adult Equivalent (AE) to the minimum level of subsistence requirement per AE (2200 kcal).

Following Gujarati (2004), the logit model is specified as follows

$$P_i = F(Z_i) = F(\alpha + \sum \beta_i X_i) = \frac{1}{1 + e^{-(\alpha + \sum \beta_i X_i)}} \quad (1)$$

Where P_i is the probability that an individual is being food insecure given X_i

$$Z_i = \alpha + \sum \beta_i X_i ;$$

x_i represents vector of the i^{th} explanatory variables; α is a constant term; β_i is vector of coefficients to be estimated, $i = 1, 2 \dots 11$. And e is the base of the natural logarithm. The odds ratio is ratio of the probability that a household is food insecure (P_i) to the probability that a household is not food insecure ($1-P_i$).

$$(1-P_i) = \frac{1}{1 + e^{Z_i}} \quad (2)$$

$$\left[\frac{P_i}{1 - P_i} \right] = \left[\frac{1 + e^{Z_i}}{1 + e^{-Z_i}} \right] = e^{(\alpha + \sum \beta_i X_i)} \quad (3)$$

Since equation (3) is the exponential function, it is possible to change it into natural logarithmic function, and after doing so, by considering the error term it will become

$$L_i = \ln\left(\frac{P_i}{1 - P_i}\right) = Z_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m \text{ or} \quad (4)$$

$$L_i = \ln\left(\frac{P_i}{1 - P_i}\right) = Z_i = \alpha + \sum_{i=1}^m \beta_i X_i + U_i \quad i = 1, 2, \dots \quad (5)$$

The parameter is estimated by maximum likelihood technique by Stata software packages version 10.

Since the existence of strong multicollinearity seriously affects the parameter estimates of the regression models, it is necessary to check its occurrence among the explanatory variables. Accordingly, Variance Inflation Factor (VIF) technique was employed to detect the problem of multicollinearity for the continuous variables (Gujarati, 2004). Each selected variable is regressed on all the other variables, the coefficient of determination R_i^2 being constructed in each case. R_i^2 is the square of the multiple correlation coefficients that results when one explanatory variable (X_i) is regressed against all the other explanatory variables. According to Gujarati (2004), VIF can be defined as:

$$VIF(x_i) = \frac{1}{1 - R_i^2}$$

If a strong linear relationship exists among the explanatory variables then this would result in large VIF value. A VIF value greater than 10 is used as a signal for the existence of a severe multicollinearity among explanatory variables. The data was analyzed using STATA 10 software.

3.5. Operational definition of variable and working hypothesis

Dependent variable

Household Food Insecurity Status (HFIS) is a dichotomous dependent variable in the model represented by 1, if the household is food insecure, 0, if food secure. This variable is used for logit analysis. The information, which identifies the food insecure from the food secure, was

obtained by comparing the total food calorie available for consumption in the household per AE to the minimum level of subsistence requirement per AE (2200 kcal). Household beyond this threshold is said to be food secured, otherwise not.

Independent variables

Age of the household head: It is a continuous variable measured in number of years. Rural households devote most of their time or base their livelihoods on agriculture. The households' head that is older in age has better social system as well as the more experience on farming and change of climate. As a result, the chance for such household to be food secure is high (Abebaw, 2003, Tesfaye, 2005, Yilma, 2005, Genene, 2006). Thus, age of the household will be expected to have negative relationship with food insecurity status.

House hold size: This is the total numbers of the family that live together under the same household head in adult equivalent (AE). It is an important variable which determines the household food insecurity status in the study area. As family size increases, the number of mouths to be fed evidently increases which shares the available food in the household (Abebaw, 2003, Tefera, 2009). Therefore, this variable will be hypothesized to have a positive relationship with food insecurity of households.

Sex of household head: It is a dummy variable taking value of 1 if the household head is male, 0 otherwise. As male is directly engaged in crop and livestock production, he contributes more labor. Labor factor plays a great role in rural areas. Moreover, with regard to farming experience, it is assumed that males are better than the female farmer (Abebaw, 2003). Hence, this variable will be expected to have negative relationship with food insecurity status of the households.

Dependency ratio: This refers to the number of the non-productive age groups, individuals whose ages are less than 15 years and greater than 64 years, in relation to the number of productive age groups in the household. The high the dependence ratio is the higher on the probability of the household to be food insecure. Most individuals share what the few productive age groups produce. Accordingly households with large dependent individuals are deemed to be food insecure (Genene, 2006). Therefore, this variable will be expected to have positive relationship with food insecurity status of households.

Education Level of the Head: Education of household head is continuous variable measured in year of schooling. Education equips individuals with the necessary knowledge of how to make living. Literate individuals are very ambitious to get information and use it. As agriculture is a dynamic occupation the conservation practices and agricultural production technologies are always coming up with better knowledge. So if the household head is literate he will be very prone to accept extension services and soil and water conservation practices including any other income generating activities. As a result this variable will be expected to have negative impact on food insecurity.

Use to credit: access to credit is an important source of income. Those households who access to credit have better possibility to spent on activities they want, they purchase agricultural input (improved seed, fertilizer, etc.,) or they purchase livestock for resale after they fattened them and those households who were willing to participate in credit scheme and managed to earn higher amount became capable to improve their income position through performing different activities and succeeded to secure better access to food than those who were not, in addition, households who have easy access to credit at times of food shortage coped the risk by using the credit they got directly for food consumption. Hence this variable will be expected to have a negative impact on food insecurity status of households.

Cultivated land size: This variable represents the total landholding of the household measured in hectares. Total cultivated land owned by household is important resource for food production and is negatively associated with food insecurity status (Mulugeta, 2002; Abebaw, 2003; Tesfaye, 2005). Thus, this variable will has negative impact on food insecurity status of the households.

Distance from market center: It is the distance of rural households to Dire Dawa city measured in kilometer. Access to market and other public infrastructure may create opportunities for more income by providing opportunity for diversifying livelihood strategies through on/off farm employment, easy access to input and transport facilities. Households nearer to market centre have better chance to increase diversification and intern will improve food security (Yilima, 2005). Hence, this variable will be expected have positive relationship with food insecurity status of the household.

Livestock holding: This represents the livestock holding of the households measured in Tropical livestock unit (TLU). Livestock have an essential part in the livelihood of low land households and plays a great role in improving food security. Livestock are major source of income for sample farming households. Households who have better possession of livestock are expected to be less vulnerable to food insecurity. Empirical findings show that livestock holding has negative effect on food insecurity (Ayalneh, 2002; Mulugeta, 2002 and Abebaw, 2003). Therefore, this variable will be expected to have negative relationship with household food insecurity.

Off farm income: It is a continuous variable measured in birr. It refers to total income that a household has earned in the twelve months from sales of livestock, crops and from petty trade activities in the study area during the survey year. It is obvious that income earned from any source improves the food security status of the household. High-income families are less likely to be food insecure. Yilma (2005), Abebaw (2003) and Ayalneh (2002) found that income variable has significant negative effect on food insecurity. Hence it is expected that households who have large income, are better in their food security status. Therefore this variable will be expected to have negative relationship with household food insecurity.

Food aid received: Since the study area is marginalized and its productive resources especially land is less productive, it is mostly in short of food at least for four months of the year. Hence households in the study area are vulnerable for food insecurity and mostly cover their food shortfalls through emergency food aid. So the amount food aid received by the household is good indicator of household food insecurity in the study area. Households who are receiving food aid are more likely to escape the risk of food insecurity. Hence, this variable will be expected negative relation with household food insecurity status.

Table. 1: Summary of Variable, Definition, Measurement and Expected Sign

Variable code	Type	Definition	Measurement	Effect
Dependent variable				
FINS	Dummy	Household Food Insecurity Status	1 if the households food-insecure and 0 for food secure	
Explanatory variables				
Age	Continuous	Age of household head	Years	Negative
Education level	Continuous	Education level of head	Years	Negative
Use to Credit	Dummy	Use to Credit	1 if has use to Credit, 0 otherwise	Negative
Sex	Dummy	Sex of the head	1 if a head is male 0 otherwise	Negative
Distance to market	Continuous	Distance to market	Kilometer	Positive
House hold size	Continuous	House hold size	Number	Positive
Cultivated land size	Continuous	Cultivated land size	Hectare	Negative
Annual income	Continuous,	Annual Income	Birr	Negative
Dependency Ratio	Continuous,	Dependency Ratio	Number	Positive
Total live stock	Continuous	Live stock holding	TLU	Negative
Food aid	Continuous	Food aid	Kilogram	Negative

4. RESULTS AND DISCUSSIONS

This section presents the findings of descriptive statistics and econometric models analysis in line to identify major determinants of households' food insecurity in rural kebeles Dire Dawa City Administration.

4.1. Descriptive Statistics Results

In this sub-chapter, by employing some statistical tools such as mean, percentage, standard deviation and frequency distributions the results of the descriptive analysis made on the survey data, and their interpretation are discussed as follows:

4.1.1. Demographic and Socio-economic Characteristics of the Sample households

Table 2 and 3 below presents the descriptive results of sample food insecure and food secure household's characteristics in the study area. Accordingly, the two groups were found to be significantly different with respect to age of the household, family size, cultivated land size, dependency ratio, total live stock holding, annual income, access of credit, sex of the household head and food aid received. The difference between the two groups with respect to age of household head, family size, access to credit, food aid received, cultivated land size, dependency ratio and total live stock holding were significant at less than 1 percent probability level where as annual income and sex of the household head were statistical significant at less than 5 percent probability level .

Age of the household head: The survey result showed that the mean age of sample households was 41.68 with minimum age 20 and maximum age was 70 years, and the mean age for food insecure and food secure households was found to be 40. 29 and 47.52 years respectively; The t test showed that there are statistical significance difference between mean age the food secured and food secured house hold at less than 1 percent probability level(Tabe,2).

Education level of head: household heads with relatively better education are more likely to be food secure than those headed by illiterate household heads. The survey result showed that the mean year of schooling of sample households was 0.658 with large number sample population is unable to read and write. The mean year of schooling by food insecure and food secure sample households were 0.711 and 0.434 with no statistical significance mean difference between the two groups of household in year of schooling (Table, 2).

House hold size: The survey result showed that the mean house hold size in adult equivalent (AE) of sample households was 4.352. The mean house hold size of food-insecure and food secure sampled households were 4.641 and 3.132 respectively. The range of the house hold size was found to be very large; falling between 1 and 10 persons per household. The statistical result revealed that a household who have large family size is more likely to be food insecure as compared to households with less family size. This is in line with the priori expectations household with large family size tends to be food insecure than those with small numbers. The t test showed that there are statistical significant difference between the mean of food insecure and food secure households at less than 1 percent probability level (Table, 2).

Dependency ratio: The survey result indicated that the average dependency ratio of sample household was 1.010 and standard deviation of sample house hold was 0.751. Hence, each economically active individual should support one economically inactive household member. The average dependency ratio of food secure and food insecure households was 0.497 and 1.132 respectively with statistical significant mean difference between food insecure and food secure sample households at less than 1 percent of probability level. This implies that increases in family size, whose members are more of inactive labor force increases the number of dependent family members, and decrease the availability of enough food for a household (Table, 2).

Cultivated land size: The survey result showed that mean cultivated land size holding by the sample household was stand at 0.303; and the mean cultivated land size owned by food-insecure and food secure households were 0. 260 and 0.486 hectors respectively. The t- test shows that there are statistical a significant difference between the mean of cultivated land size of food insecure and food secure sample households at less than 1 percent probability level. This implies

that having cultivated land size may increase the availability of enough food for a household, hence decrease the food insecurity status of the households (Table, 2).

Total Live stock holding of households: Livestock has been the most important capital asset of the rural households of the study area. Livestock provides a variety of purposes such as an indicator of wealth, source of income to purchase food and non food items, sources of draft power which in turn increases crop production, as coping mechanisms for food insecurity and for source of food. The survey result indicated that the mean livestock holding, in TLU, for the food secure and insecure sampled households of the study area was 6.008 and 3.580 TLU, respectively, and the mean live stock holding in TLU of sample households was 4.045. The t test showed that there are a statistically significant mean difference in TLU between the food secure and food insecure households at less than 1 percent probability level (Table, 2)

Off farm Income of sample households: Household income has a paramount importance in achieving household food security for all segments of rural population. It is important to buy food and non-food items. The finding revealed that the major income sources for the households include cash crops chat, sale livestock and their products, off-farm activities and no farm incomes. The mean annual income of sample households was birr 10351.23. The mean annual income of food secure and food insecure household were birr 12623.70 and 9812.39 respectively. The survey result depicted a significant mean difference in annual income at less than 5 percent probability level between the two groups. This suggests that having better income to purchase food and non food items increases production and productivity of households and has decrease food insecurity status of the households (Table, 2).

Food aid received by sample households: The households in the study area are susceptible for food insecurity and frequently cover their food shortfall through emergency food aid. The survey result revealed that the mean food aid received by food secure and insecure sampled households was 533.739 and 406.705 Kg, respectively. The t-test showed that there are statistically significant mean differences in food aid received between the two groups of households (Table,2).

Distance to the nearest market: proximity to market center creates access to additional income by providing off-farm employment opportunities and easy access to inputs and transportation. It was, therefore, expected that households nearer to market center have better chance to improve household food security than who do not have proximity to market centers. The result revealed that the average market distance of food secure and food insecure households were 30.260 and 33.190 km, respectively; but the result of t- test shows that there are no statically significance differences between the mean market distances between the two group of households (Table, 2).

Table.2 Descriptive statistics of Continuous Variable of the sample households characteristics

Cont. variable	Total sample (=120)		Food Insecure (N=97)		Food Secure (N=23)		T –value
	Mean	SD	Mean	SD	Mean	SD	
Age of head	41.68	11.23	40.29	10.74	47.52	11.58	2.854***
Household size	4.352	1.674	4.641	1.615	3.132	1.361	4.141***
year schooling	0.658	1.595	0.711	1.626	0.434	1.471	-0.745
Dis. Market	32.629	15.730	33.190	15.992	30.260	14.666	-0.802
Annual income	10351.23	5629.93	9812.39	5167.24	12623.70	6946.78	2.187**
Dep. Ratio	1.010	0.751	1.132	0.732	0.497	0.610	3.851***
land size	0.303	0.218	0.260	0.182	0.486	0.266	4.857***
Food aid	431.053	191.90	406.70	188.90	533.73	172.75	2.944**
TLU	4.045	2.994	3.580	2.882	6.008	2.693	3.736***

Source: Own survey result. *, **, and ***, means Significant at less than 10%, 5% and 1%

Probability level respectively.

Use to credit: is a fundamental tool to build productive capacity of households, to normalize consumption of households when cash inflows are erratic, including during seasonality of crops failure. The survey result showed that of sample respondents 28 percent or 34 household has

access to credit services while 72 percent or 86 sample households have no credit access. The result also revealed that 18 percent of food insecure and 69 percent of food secure have access to credit, but 81 percent of the food insecure and 30 percent of the food secure households have no credit access. The chi-square test showed that there are statistical significant percentage differences between the food insecure and food secure households at less than 1 percent probability level($\chi^2=23.592$).

Sex of the household head: The survey result indicated that of total sample respondents 72 percent or 87 sampled households head were male and 28 percent or 33 households heads were female; whereas 47 percent of foods secure and 78 percent food insecure households were male headed while 21 percent of food insecure and 52 percent of food secure households were female headed (Table3). The chi-square test indicated that there are statistical significant percentage difference between the food insecure and food secure households at less than 5 percent probability level ($\chi^2=5.154$).

Table .3. Descriptive statistics of Categorical Variable of the sample households

Categorical variable	Total sample	Food Insecure	Food secured	χ^2 - value
Variable	% Freq	% Freq	% Freq	χ^2
Sex				5.154**
Male	0.72(87)	0.78 (76)	0.47 (11)	
Female	0.28(33)	0.21(21)	0.52(12)	
Use of credit				23.592***
User	0.28(34)	0.18(18)	0.69 (16)	
No user	0.72(86)	0.81(79)	0.30 (7)	

Source; own survey result.

4.2. Econometric Model Results

4.2.1. Analysis of Determinants of Household Food-insecurity

Table.4 shows the result of the determinants of household food insecurity. Logit model was employed to assess determinants of food insecurity.

The likelihood ratio has a chi-square distribution and it is used for assessing the significance of logistic regression. It tests the null hypothesis that none of the independent variables are linearly related to the log odds of the dependent. The likelihood ratio has a chi-square distribution, was significant at less than one percent probability indicating that the hypothesis that the coefficient except the intercept are equal to zero is rejected. Additionally, goodness of fit in logistic regression analysis is measured by count R^2 . The count R^2 is based on the principle that if the estimated probability of the event is less than 0.5, the event will not occur and if it is greater than 0.5 the event will occur (Maddala, 1989). The observation is grouped as a food insecure if the computed probability is greater than or equal to 0.5, and as a food secure otherwise. The model results show the logistic regression model correctly predicted 105 of 120, (87.5) percent of the sample households. The sensitivity (correctly predicted food insecure) and the specificity

(correctly predicted food secure) households of the logit model are 86 percent and 64.3 percent, respectively. Thus, the model predicts both groups accurately.

Before model analysis was commenced, to check the problem of the multicollinearity the Variance Inflation Factor (VIF) for continuous explanatory variables and dummy variables were used in this study.

Following Gujarati (1995), VIF is defined as:

$$\text{VIF (X}_j\text{)} = \frac{1}{1 - R_j^2}.$$

Where R^2 is the coefficient of determination

A VIF value greater than 10 is used as the existence of a severe multicollinearity among explanatory variables. As see from the table below the variance inflation factor is far from 10 indicating that there is no serious multi co linearity between explanatory variables.

Table.4: Variance inflation factor for continuous and categorical variables

Variable	Vif	1/vif
House hold size	1.27	0.788
Age	1.30,	0.771
Dependency ratio	1.21	0.827
Sex of the head	1.20	0.833
year of Schooling	1.15	0.87
Cultivated land size	1.32	0.755
Food aid	1.28	0.779
TLU	1.23	0.810
Distance to market	1.23	0.810
Off farm Income	1.15	0.866
Use to credit	1.22	1.40

Source: own Survey result.

Table below shows that out of eleven variables entered in to the binary logit model six variables were found to have a significant influence on the probability of food insecurity. These variables include family size, dependency ratio, food aid, annual income, total live stock holding and access to credit.

House hold size was found to be highly significant at less than ten percent probability level and positively related to household food insecurity of the study area which is in line with a priori expectation. The result indicated that smaller household size tends to be food secure as compared to larger family size. The marginal effect of house hold size is 0.0104 implying that a household head whose has large house hold size is 0.0104 times as likely to be food insecure relative to those who have small house hold size. The possible explanation is as house hold size increases, the amount of food for consumption in one's household increases and that additional household member shares the limited food resources in the household. This result is supported by the findings of (Abebaw, 2003; and Aschalew, 2006, Girma, 2013).

Off farm income of the household has negative influence food insecurity status of the household and significant at less than 10 percent probability level. In agreement with the hypothesis. The possible explanation is that those households who have better access to different income sources are less likely to become food insecure than those households who have little. That is, households with higher off farm income have strong purchasing power so that they can accomplish their food requirements. The marginal effect of household head who have better off farm income is 2.04 implying that household heads who have less off farm income are almost 2.04 times as likely to be food insecure than those having better off farm income. This result is in conformity with the findings of Abebaw (2003) Frehiwot, (2007) and Girma,(2013).

The coefficient of dependency ratio was positive and significant at less than 5 percent probability level. The marginal effect of dependency ratio is 0.021 implying that household heads who have larger number of dependents are almost 0.021 times as likely to be food insecure than those small dependents. This is because the larger the number of children in a household, the heavier the burden of the active members in meeting the cost of minimum household food and, hence, the higher the level of the probability of food insecurity. This finding is in conformity with the findings Abebaw, 2003 and Girma 2013.

Food aid received by the household has negative influence on food insecurity status household and significant at less than 10 percent probability level which is in line with a priori expectation. This result is against the findings of many studies. The reason is that study area is structural food deficient area with low agricultural productivity do not enough feed for their livestock; they extremely rely on food aid for many years. The marginal effect of food aid is 0.00001 implying that household heads who have received small amount of food aid are almost 0.00001 times as likely to be food insecure than those who received greater amount of food aid. The possible explanation is that the amount food aid received by the sample households is indicator of coping strategies employed by households of the study area.

Livestock holding had a significant effect at less than 10 percent probability level and negative impact on food insecurity status of the rural household of the study area which is in line with a priori expectation. This indicates that households with more livestock produce more milk, milk products and meat for direct consumption. Besides, livestock enables the farm households to have better chance to earn more income from selling livestock which enables them by increasing purchasing power of stable food during food shortage and could invest in purchasing of farm inputs that increase food production, and able in ensuring household food security. The tropical livestock unit, which was used as a proxy to measure wealth status of household has marginal effect of 0.004 implying that a household head whose less TLU is 0.004 times as likely to be food insecure relative to those whose have more TLU. The result suggests that food insecurity is more severe among those households with little or no livestock. The possible explanation is that livestock have many socio-economic benefits to rural households. This finding is consistent with the result of other studies (Mulugeta; 2002 Abebaw, 2003; Tesfaye, 2005; Genene, 2006).

The coefficient of use to credit was positive and significant at less than 1 percent probability level and has a significant negative influence on food insecurity in the study area. This result is completely in agreement with the prior expectation. The marginal effect shows in favor of food insecurity increasing by a factor of 0.164 implying that household heads who have less use to credit are 0.016 times as likely to be food insecure than those having better access to credit. This might be due to the fact that households who have access to credit would build their capacity to produce more through purchase and use of agricultural inputs. It would also be possible for the households to spend the credit on some other income generating activities so that the income

from these activities puts households in a better status to escape from being vulnerable to food insecurity.

Table 5: Logit Results of Determinants of household food Insecurity

Variables	Estimate coefficient	Marginal effect	Odd ratio
Age	-0.0140	-0.002	0.986
Sex	1.0631	0.02	2.895
household size	0.8272*	-0.01	2.286
Dependency ratio	1.6667**	0.02	5.295
Cultivated land size	-1.6802	-0.02	0.186
Education level	-0.4042	0.01	1.498
Distance to market	0.0316	-0.0003	0.968
TLU	-0.3073*	-0.004	0.735
Food aid	-0.0041*	-0.00001	0.995
Use to credit	-4.1677***	-0.254	0.015
Off farm Income	-0.0045*	-2.04	0.999
Constant	6.4380**		
Pearson Chi-square	78.59		
Prob>Chi2	0.000***		
Pseudo- R ²	0.6701		
Count R ²	0.8001		
Log likelihood	-19.3428		
Observation	120		

Source: Own Survey Result

5. SUMMARY AND CONCLUSION

5.1 Summary and Conclusion

Identifying the factors affecting households' food insecurity status in the study area has been studied using cross sectional data collected from 4 rural kebeles of Dire Dawa City Administration. The primary data for this study are collected from 120 randomly selected sample households using a semi-structured questionnaire. The data collected were analyzed using descriptive statistics and econometric model binary logit model.

The study revealed that 97 households 80.83 percent of the sample households of the study area were not able to meet the daily recommended caloric requirement (food insecure) only 23 households 19.17 percent of the sample households were food secure. Further, the study has shown as the major factor affecting food insecurity of the households in the study area were, family size, dependency ratio, annual income, food aid, total live stock holding and access to credit were found to be significant determinants household food insecurity in the study area. Dependency ratio and family size have a significant and positive influence on the state of household food insecurity while annual income total live stock holding, food aid and access to credit were negatively related to food insecurity status of the rural households of the study area. Family size, annual income, food aid and total live stock holding were statistically significant at less than 10 percent probability level. Access to credit was statistically significant at less than 1 percent probability level, while dependency ratio was found to be statistically significant at less than 5 percent probability level.

Based on the findings and conclusion of the study, the following policy recommendations are forward.

5.2. Policy Recommendations

Based on the research result the following policy recommendations are forwarded. Therefore, based on the findings of the study, both short term and long term actions to be undertaken by government bodies, donors and households themselves to ensure household food security have been recommended.

1. Off farm income has a negative influence on food insecurity. Therefore, household's total off farm income should be improved through promotion of services sector, improved petty trade with full management practices, small scale irrigation schemes, commercialization and diversification of farm products (value addition and strengthening market linkages).

2. Use to credit: use to credit can create an opportunity to be involved in economic activity that generates revenue to households. Recently established small and micro business agency in the region has started activity of organizing and training of every business community who are interested. Development partners operating in the study area should implement provision of credit to eligible households using targeting criterion that reflects actual characteristics of food insecure households

3. House hold size and Dependency ratio: Finding of this study showed that house hold size and dependency ratio appears to have positive impact on rural households' food insecurity status in the study area. Therefore; policy measures directed towards the provision of better family planning should be given adequate attention and priority by the Administration and federal government.

4. Food aid: Finding of this study showed that food aid have negative impact on rural households' food insecurity status in the study area by mitigating the impact of shocks and relaxing the liquidity constraint. Hence, such public interventions linking PSNP natural resource management intervention, public investments in social infrastructural development, markets linkage and income generating activities community investment in small scale irrigation should be emphasized as a way of helping people to reduce food insecurity. In the short run it protects household asset depletion and in the long term, this could enhance domestic production, thereby minimizing the food gap, which currently is being filled with food aid.

5.Livestock holding: The findings of the study showed that live stock holding was significant negative effect on rural households' food insecurity status of households in study area. Therefore, households should be encouraged to engage in livestock husbandry through providing with improved livestock production technologies (health service, improved breeds and feeds) to improve production and productivity of the sector, this will ultimately decrease food insecurity.

This study is important in providing information that can serve as an input for the smooth development process of both crop and livestock sectors in lowland agro-pastoral areas of the country. Moreover, the information can be used as a valuable component to other similar areas having similar situations. The study could also help as an input for further study in the area with related subject. In addition, the findings of this research will have valuable practical relevance in designing food security policy at local regional and national level.

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7. APPENDIX

Appendix. Conversion factors used for some variables in the survey data

Appendix I: Conversion Factors Used to Compute TLU	
Tropical Livestock Unit (TLU)	Animal category
Calf	0.25
Heifer	0.75
Cow/Ox	1.00
Camel	1.00
Donkey	0.70
Sheep/Goat	0.13
Chicken	0.013

Source: Stork, et al, 1991.

Appendix II: Conversion Factors to			Male	Female
Drive	Man-Equivalent	Age		
group(yrs)				
<10			0.0	0.0
10-13			0.2	0.2
14-16			0.5	0.4
17-50			1.0	0.8
>50			0.7	0.5

Source: Stork, et al, 1991.

Appendix Table. III. Calorie value of food items consumed by sample households

Food item	Unit	kilo caloric
Teff	1Kg	3589
Wheat	1Kg	3623
Sorghum	1Kg	3805
Maize	1Kg	3751
Barley	1Kg	3723
Oat	1Kg	3599
Peas	1Kg	3553
Lentils	1Kg	3522
Fenugreek	1Kg	3824
Irish potato	1Kg	1037
Sweet potato	1Kg	1360
Onion	1Kg	713
Meat	1Kg	1148
Milk	1Lt	737
Egg	Each	61
Butter	1Kg	7364
Edible oil	1Lt	8964
Coffee	1Kg	1103
Sugar	1Kg	3850
Rice	1Kg	3330

Source: EHNRI, 1998

Appendix. IV. Survey Questionnaire

This Questionnaire is prepared by the graduate student of Adama science and Technology University, in partial fulfillment of the requirement of master's science degree in development Economics. The purpose of the research is to identify the major determinants of rural households' food insecurity, in case of in rural areas of Dire Dawa city Administration. Therefore, I kindly, request the respondent to fill the questionnaire

I. Demographic Characteristics of households

A. Identification particular

1. Fill the following back ground information

- a. Interviewer name_____ Household code_____
- b. Interview date_____ Checked by_____
- c. Name Keblele_____
- d. Name of enumerator_____ Signature_____

A. Households Demographic Information

S/r	Name of family members	Sex	Age	Relation to head	Education	Marital Status
	A	B	C	D	E	F
1						
2						
3						
4						

Codes b: 1. Male 2. Female

Code d: 1. Head 2. Wife/ husband 3. Son/ daughter 4. Specify

Code e: 1. Illiterate 2. Read and write 3. Informal education 4. Formal Education (grade)

Code f: 1. Single 2. Married 3. Divorced 4. Widowed

2. Main occupation of the household head: 1. Farmer 2. Student 3. Off farm/ non-farm

Activities 4. 1 and 3, 5. Other/ Specify

B. Crop and Livestock Enterprises

3. Would you please tell us crop produced last year

S/N	Unit	Quantity	Unit market price	Total value
1	Maize			
2	Sorghum			
3	Chat			
4	Coffee			
5	Tomato			
6	Banana			
7	Other/ specify			

4. Live Stock and related Information

	Live stock Type	No of live stock	Current unit price	Cost per head	For the Last year	ETB	Other
				Feeding	Labor	Veterinary	
1	Ox						
2	Cow						
3	Heifer						
4	Sheep						
5	Goat						
6	Hen						
7	Donkey						
8	Camel						
9	Honey Colony						

5. Income and related information

5.1. What is your annual educational expenditure in ETB_____?

5.2. Would you please state the house hold income for the last year from stated sources?

No	Source	Unit	Amount	Unit Market Price	Total income
1	Farm Income				
	Selling livestock and products				
2	Off Farm				
	Selling of Charcoal				
	Fuel wood selling				
3	Trade				
	Shop				
	Crops				
	Live stock				
4	Transfer				
	Help from other				
	Aid				

	Credit taking				
	Others				

6. Please indicate your other asset in ETB

a.	House	Unit price	Current cost
b.	Radio/Tape		
c.	Farm equip.		
d.	Other		

7. Income, Consumption and Expenditure

7.1. What are the main sources of your income?

a. Sales of livestock b .Sales of livestock products and bi- products c. Sale of crops d. Trade e .Off farm/ non-farm activities

7.2. What was your annual income in Birr _____

7.3. Did you have other source of income other than your activity? 1. Yes 2. No

7.4. If yes, to specify the source and level of income, source of income _____

8. Land Use Information

8.1. Do you have your own land? 1. Yes 2. No _____

8.2. If your answer is yes what is the total area your cultivated land in hector_____?

8.3. Do you think that your piece of land is enough to support your family? 1. Yes 2.No

8.4. If your answer is no how do you cover the deficit?

1. Buy from the market 2. Food aid 3. Help from others 4. 1 and2. 5. Other(specify)

9. Non-Farm Income

9.1. Do you or any member of your family have off-farm income? 1. Yes 2. No

9.2 If yes, indicate the type of work and annual income?

s/r	Family member	Type of job	Annual income	Season	Duration
1					
2					

1. Livestock, trade, agricultural employment, wage work, 3. Pity trade (grain, vegetables, fruits, etc.) 4. Sell of firewood and Grass 5. Sale of wood 6 .others (specify)-----

10. Marketing and Credit Services

10.1. Have you received any type of credit in 2014/2015? __1/ yes 2/ No

10.2. If yes, for what purpose(s)? (Multiple answers possible)

1/ purchase of seeds 2. Purchase of farm implements 3.For family consumption 4..for social obligation.

10.3. What are the sources of credit? (In order of importance)____

1. Service cooperatives 2.Micro Finance 3. Friends and relatives /local money lenders 4. NGOs 5. others

10.4. Amount of credit received in 2014/15 was _____ birr.

10.5. If no why? ____ (multiple answers possible)

1/ fear of inability to pay 2/ lack of asset for collateral 3/No one to give credit 4/ high

Interest rate 5/ no need for credit 6/ others (specify)

11. What is the nearest distance to the main market? _____

12. Do you use any irrigation scheme? 1/ yes 2/ No

13. Has your household received any type of extension service from any government and
No-government organizations? ____ 1) Yes 2) No

14. For how long DA has visited your farm? ____ since 2014/2015/years.

15. Do you saving account? 1. Yes 2. No

16. If your answer in the above question is yes, what is your amount saved Birr_____

17. Productive safety net program (Food Aid)

17.1. If you (your household) have ever received cash material in PSNP or food aid during
the last 12 months (in 2014/2015), please indicate the type and amount received.

S/r	Values of money or type of food aid, item received per household per year	Amount received	Amount in birr	Season received		
1	Cash					
2	Grain(wheat, specify)					
3	Edible oil					

18. Household Consumption Expenditure

Please, tell about all the food that was prepared in the home, bought outside the house

and receive from other people for consumption and/or consumed for the last 7 days (Total

Food Consumptions in the last 7 days

Food Item	Total food consumed in the last 7 days		Food items prepared in the home and consumed in the last 7 days (How much did you eat from your own production?)		food items consumed by the HHs outside the house in the last 7 days (How much did you buy?)		Consumed from gift/food aid (How much did you receive from other people?) in 7 days		
	Amount (kg)	Value (Birr)	Amount (kg)	Value (Birr)	Amount(kg)	Value (Birr)	Amount kg	Value Birr	
Sorghum									
Wheat									
Maize									
Teff									
Rice									
Chickpeas									
Soybean									
Cabbage									
Onion									
Mango									
Banana									
Other(specify									
Milk products									
Meat products									
Eggs									
Coffee									
Edible									
Sugar									
Salt									

Bread									
Soft drink									

19. Household home prepared Food Consumptions summary

List the food items prepared and consumed by the HHs in the last 7days in the house	The food items are prepared/made from	Amount in Kg/Liter/piece/cup/spoon	Value in (Br)
1 st day			
2 nd day			
3 rd day			
4 th day			
5 ^h day			
6 th day			
7 th day			

20. Do you have information on change temperature? 1. Yes 2. No

21. Do you have information change on pattern of Rainfall? 1. Yes 2. No

22. Do you have information failure crops? 1. Yes 2. No

23. Do you have information on occurrence of drought? 1. Yes 2. No

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