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## Assessment of Food Security Situation in Ethiopia: A Review

<sup>1</sup>Birara Endalew, <sup>2</sup>Mequanent Muche and <sup>3</sup>Samuel Tadesse

<sup>1</sup>Department of Agricultural Economics, College of Agriculture and Environmental Science, Bahir Dar University, Ethiopia

<sup>2</sup>Department of Agricultural Economics and Extension, College of Agriculture and Veterinary Medicine, Jimma University, Ethiopia

<sup>3</sup>Department of Rural Development and Agricultural Extension, College of Agriculture, Wollo University, Ethiopia

*Corresponding Author: Birara Endalew, Department of Agricultural Economics, College of Agriculture and Environmental Science, Bahir Dar University, Ethiopia*

### ABSTRACT

The study was mainly focused on assessing food security situation in Ethiopia, specifically aims to review cause of food insecurity, determinants of food security, food security situation in Ethiopia and coping strategies practiced in Ethiopia. However, its total population is more than 90 million; agriculture is the foundation of its economic growth. Poverty is still a big obstacle to overcome in Ethiopia. Consequently, chronic and acute food insecurity is prevalent. About 10% of Ethiopia's citizens are chronically food insecure and this figure rises to more than 15% 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. The deteriorating situation of food security in Ethiopia is caused by population pressure, drought, shortage of farmland, lack of oxen, deterioration of food production capacity, outbreak of plant and animal disease, poor soil fertility, frost attack, shortage of cash income, poor farming technologies, weak extension services, high labor wastage, poor social and infrastructural facility and pre and post harvest crop loss. Sale of wood or charcoal, small scale trading, income transfer systems, limiting size and frequency of meal, sale of livestock, agricultural employment and migration were major coping strategies. Depending on reviewed document, to address food security issue in Ethiopia, the household head and members of the household should engage in different income generating activities for means of living and coping mechanism; the government of Ethiopia should incorporate different research outputs to design programs to tackle food insecurity.

**Key words:** Food security, food insecurity, coping strategy

### INTRODUCTION

The latest FAO estimates indicate that global hunger reduction continues: About 805 million people are estimated to be chronically undernourished in 2012-14, down more than 100 million over the last decade and 209 million lower than in 1990-92. In the same period, the prevalence of undernourishment has fallen from 18.7-11.3% globally and from 23.4-13.5% for developing countries (FAO., 2014). The same source also indicated that, 791 million people in developing countries were estimated to be chronically hungry in 2012-14, down by 203 million since 1990-92. Despite this overall progress in developing countries as a whole, there is still considerable room to reduce undernourishment and improve food security.

In general, Africa is making slow progress in achieving international hunger targets. The region has been afflicted by conflict and natural disasters and one in four people remain undernourished in sub-Saharan Africa. Africa remains the region with highest prevalence of undernourishment with around one in four people out of about one billion estimated to be undernourished. While sub-Saharan Africa has the highest prevalence of undernourishment, there has been some improvement over the last two decades. The prevalence of undernourishment declining from 32.7-24.8% (AHHSDIS., 2014). The five African countries with the most number of people in a state of hunger/undernourishment have between 10 million and 32 million people each in a state of hunger/undernourishment (Ethiopia 32.1 million; Tanzania 15.7 million; Nigeria 12.1 million; Kenya 11 million and Uganda 10.7 million). Significantly 4 out of the 5 countries with the most number of people affected by hunger/undernourishment are in the Horn/East of Africa (Ethiopia, Tanzania, Kenya and Uganda).

To address food insecurity problem, the government of Ethiopia is taking a strong leadership role with programs that meet the varying needs of vulnerable households. It is making significant investments and strides, particularly through its productive safety net program and agriculture-led economic growth that is tied to improved livelihoods and nutrition can become a long-lasting solution to Ethiopia's chronic poverty and food insecurity. Although it is a country with significant agricultural potential because of its water resources, its fertile land areas and its large labor pool, this potential goes largely undeveloped (US., 2010). Ethiopian agriculture is incredibly sensitive to shifts in weather. When rainfall is erratic or insufficient for even a few successive rainy seasons, the entire country is prone to falling into famine. According to an early 2010 report, 5.2 million people in Ethiopia face an uncertain food security situation. The worsening food security situation is attributed primarily to poor rainfall (UN., 2010). A series of successive droughts had already weakened Ethiopia's food situation, with "poor and erratic rainfall over the last two years. Global conditions such as the high food and fuel prices that have persisted in the country since 2008 and the global financial crisis have also contributed to Ethiopia's failing food security. Ethiopia is considered a least developed country ranked 171 out of 182 countries in the UNDP Human Development Index for 2009 (WFP, 2010). In the 2010 Global Hunger Index, which ranks developing countries and countries in transition based on proportion of undernourished people, proportion of underweight children under five and child mortality rate, Ethiopia was given a 29.8, on a scale of 0-100, with 0 being the best and 100 the worst possible score. Ethiopia is one of the countries that made the most absolute progress improving its score between 1990 and 2010; in 1990 it had a score of 43.7 and now it's down to 29.8. However, this score is still highly troubling it's currently ranked 80th out of 84 countries (IFPRI., 2009).

Further, the problem of food insecurity has continued to persist in the country as many rural households have already lost their means of livelihood due to recurrent drought and crop failures (Bogale, 2002). Empirical evidence of food security in Ethiopia indicates the prevalence of a high level of food insecurity, with significant individual and spatial characteristics. The specific food security studies by Hailu (2012).

The objective of the study is to review food security situation in Ethiopia, determinants of food security, cause of food insecurity and coping strategies practiced in the country at the time of food shortage.

## **FOOD SECURITY CONCEPT AND DEFINITION**

Food security is a 'Flexible Concept' as reflected in the many attempts at definition in research and policy usage. The continuing evolution of food security as an operational concept in public policy has reflected the wider recognition of the complexities of the technical and policy issues involved (Clay, 2002).

Food security concept originated in the mid 1970s during the international discussion on global food crisis. The initial focus of food security attention was primarily on food supply problems of assuring the availability and to some degree the price stability of basic food stuffs at the international and national level (FAO., 2005). Thus, in the 1970s the issue of food security referred to the national food supply's capacity to meet the population's energy and nutrient needs. The concept of household food security has been understood by many development workers as the availability of food in the world market place and on the food production systems of developing countries (Bedeke, 2012).

Since the World Food Conference in 1974 due to food crises and major famines in the world, the term "Food Security" was introduced, evolved, developed and diversified by different researchers. Food security and insecurity are terms used to describe whether or not households have access to sufficient quality and quantity of food. Food security issues gained prominence in the 1970s and have since been given considerable attention. It is perceived at the global, national, household and individual levels. Food security at global level does not guarantee food security at the national level. Moreover, food security at the national level does not guarantee food security at the household or even the individual level (Duffour, 2010).

Different organizations defined food security in different ways. According to Clay (2002), food security is a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. On the other hand, in the present study, food security is defined as adequate availability of and access to food for households to meet the minimum energy requirements as recommended for an active and healthy life (Hussein and Janekarnkij, 2013).

**Dimensions of food security:** Jrad *et al.* (2010) elaborated on four dimensions of food security as food availability, food accessibility, food utilization and stability.

**Food availability:** Refers to the physical presence of food which may come from own production, purchases from internal market or import from overseas. Similarly, Gregory *et al.* (2005) explained that food availability refers to the physical existence of food stocks for consumption be it from own production or on the markets. On national level food availability is a function of the combination of domestic food stocks, commercial food imports, food aid and domestic food production, as well as the underlying determinants of each of these factors.

**Food access:** Household food access is the ability to obtain sufficient food of guaranteed quality and quantity to meet nutritional requirements of all household members. Here, the food should be at right place at the right time and people should have economic freedom or purchasing power to buy adequate and nutritious food (Jrad *et al.*, 2010). On the other hand, Kuwornu *et al.* (2011) explained that food access is determined by physical and financial resources as well as by social and political factors. Access depends normally on; income available to the household, the distribution of income within the household, the price of food and other factors worth mentioning are individual's access to market, social and institutional entitlement/rights.

**Food utilization:** Refers to ingestion and digestion of adequate and quality food for maintenance of good health. This means proper biological use of food, requiring a diet that contains sufficient energy and essential nutrients as well as knowledge of food storage, processing, basic nutrition, child care and illness management (Jrad *et al.*, 2010).

**Stability of food:** Refers to the continuous supply of adequate food all year round without shortages (Jrad *et al.*, 2010). To be food secure a population, household, or individual must have access to adequate food at all times. They should not be at risk of losing access to food as a consequence of a shock (e.g., an economic or climatic crisis), or cyclically (e.g., during a particular period of the year, seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

**Food security situation in Ethiopia:** The National Food Security Strategy (FDRE., 1996) reports that as the Ethiopian population grew from 15 million in 1951-55 million during early the 1990s, the production of cereals dropped on per capita basis by more than 25% from around 200 kg in early 1950s to 150 kg in 1992. The proportion of population unable to attain their minimum nutritional requirements is estimated at 52% of the rural population and 36% of the urban population (MEDAC., 1999).

Drought and famine have become an everyday reality in Ethiopia. The country has faced three major famines and numerous famines like situations in the past three decades. The recurrent of famine in 1970s, 80s and 90s has affected significantly the country's food production. During the period between 1958 and 1977 over 25 million people were directly affected by famine and drought. The number of death was estimated between three and five million people. The 1984/85 famine alone had taken the lives of 300,000 people. It was estimated that close to 58 million were affected by famine between 1973 and 1986 (Berhanu, 2001).

Many factors are contributing to trap Ethiopia in the current state of food insecurity and poverty. These include production fluctuations, low non-farm employment, low income, regional fragmentation of markets, high rate of natural degradation, low level of farm technology, high level of illiteracy and inadequate quality of basic education, poor health and sanitation, high population growth, poor governance and inter-state, intra-state military conflicts and wars. These factors impede the achievement of food security and sustainable economic development. It has one of the lowest per capita incomes in the world and high incidence of absolute poverty with 50% of the population below the poverty line (Asefa and Zegeye, 2003).

According to the FAO (2010), 41% of the Ethiopian population lives below the poverty line and more than 31 million people are undernourished. However, the latest undernourishment numbers show a positive trend (1990-92: 71% of the population; 1995-97: 64%; 2000-02: 50%; 2004-06: 44%). The concentrations of food insecurity and malnutrition are prevalent in rural areas with a population of six to seven million chronically food insecure and up to 13 million seasonally food insecure.

With more than 90 million people, Ethiopia is the second most populous country in sub-Saharan Africa and has one of the fastest-growing economies in the world. The foundation of its economic growth is agriculture, which employs 80% of the population. Ethiopia could potentially reach middle-income status by 2025 with an emphasis on boosting domestic savings rates, private sector development and improving the trade logistics, according to the World Bank (CARE., 2014). However, poverty is still a big obstacle to overcome in Ethiopia. Nearly one third of the population lives below the poverty line and a vast majority depends on subsistence agriculture. Consequently,

chronic and acute food insecurity is prevalent, especially among rural populations and smallholder farmers. About 10% of Ethiopia's citizens are chronically food insecure and this figure rises to more than 15% during frequent drought years. 2.7 million People will require emergency food assistance in 2014 and 238,761 children require treatment for severe acute malnutrition in 2014 (UNICEF., 2014).

The overall food security is deteriorating following poor rains, both in livestock keeping and farming areas, swarms of locust have affected food production in eastern parts of the country. Ethiopia is a disaster prone country. Around 12 million people in the country are regularly exposed to droughts, floods, landslides, epidemics and earthquakes. These regular shocks have many negative consequences such as forced internal displacements of population, destruction of assets and livelihoods, extreme poverty, under nutrition and extreme food insecurity (ECHO., 2014).

Favorable food security conditions prevail in most parts; however, over 7.1 million people were estimated to live in conditions of crisis and emergency in November 2013. These populations are in North Eastern Amhara, Eastern Tigray and Eastern Oromia in Ethiopia (WFP., 2014). The number of children with severe acute malnutrition in Afar, Amhara, Oromia, Southern Nation Nationality Peoples region, Somali and Tigray regions showed a slight decrease from 21,566 (86.2% reporting rate) to 21,105 in 2014 (84.4% reporting rate). As compared to 2013, this year's rate is lower by 10.7%, indicating an improved food security situation in 2014 (UNICEF., 2014). The survey results of Goal Ethiopia and concern worldwide in two Woreda (Jikawo and Lare) of Gambella region indicated that the global acute malnutrition was 19.2 and 18.2%, respectively. In Oromiya region, deteriorating food security situation is prevailed in Arsi zone. The affected woredas are Jeju, Diksis, Sude, Robe, Bilbilo, Sire and Guna. Poor performance of the belg seasonal rains led to shortage of pasture and water and poor development of planted crops.

**Determinants of food security:** Factors that affect household food security in various developing countries especially in Africa have been documented in some literature and these factors or determinants are most often than not location-specific (i.e. different study areas were found to have variant attributes as food security determinants with some attributes recurring) (Aidoo *et al.*, 2013).

The study conducted in Nigeria by Oluyole *et al.* (2009) using probit model found out that sex of household head, educational level, age and income have positive influence on food security; whereas, household size has negative influence on household food security. However, study by Sikwela (2008) in South Africa using binary logit 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.

Several studies revealed that different factors affect both household food security and insecurity in Ethiopia because of difference in resource availability, topography, time dimension and other factors. The study by Tilaye (2004) using binary logit model indicated that farmland size, small ruminant holding in TLU and oxen holding in TLU affect household food security positively; whereas, family size has negative effect on it.

Alem (2007) in a study of food security using Household food balance model and discriminant analysis showed that family size, low annual production, small farm size, attitude on food aid and poor wealth status significantly affect food security status. On the other hand, Fekadu (2008) using multivariate logistic regression analysis indicated that age household heads, labor and market accessibility have shown significant and negative effect on food security; whereas, cultivable land size, fertilizer utilization, engagement in rain water harvesting have shown significant and positive role for food security.

The study conducted by Bogale and Shimelis (2009) using binary logit model revealed that age of the household head, cultivated land size, livestock ownership, total income of the household, irrigation and amount of credit received have negative and significant effect on household food insecurity; on the other hand, family size has positive and significant effect. Similarly, As studied by Beyene and Muche (2010) using binary logit model showed that age of the household head, size of land cultivated, use of fertilizer, livestock ownership, soil and water conservation practices and oxen ownership have positive and significant relationship with household food security; where as, education of household head, household size (AE) and off-farm/non-farm income have a negative and significant influence on household food security.

According to studies conducted in Ethiopia, ownership of livestock, farmland size, family labor, off farm income, market access, use of improved technology, education, health, amount of rainfall and distribution, crop diseases, number of livestock and family size are identified as major determinants of household food security (Bedeke, 2012; Eden *et al.*, 2009; Regassa, 2011).

The study by Gebre (2012) using binary logit model indicated that household size and age of the household head have positive and significant effect on household food insecurity; whereas, educational status of the household head, asset possession, credit access and access to employment have negative effect.

According to Hussein and Janekarnkij (2013) conducted in Jigjiga District of Ethiopia, use of fertilizer by farming households, total household income, access to veterinary services and access to extension services was found to have a positive and significant impact on household food security; where as, the agro-ecology stratum in which the household's farmland was located found to have a negative and statistically significant impact on food security. On the other hand, the studies of Kahsay and Mulugeta (2014) using multiple linear regression indicated that age of the household head, use of improved seed and adult equivalent have negative effect and statistically significant factor for calorie intake; where as, land size in hectare and number of livestock in TLU positively affect calorie intake of households.

**NB:** For further review please see the appendix.

**Cause of food insecurity in Ethiopia:** The study of Berhanu (2001) conducted in Ethiopia, identified different factors that cause food insecurity. These are deterioration of food production capacity (due to drought and land degradation), population pressure and instability and armed conflict. Similarly, Tilaye (2004) conducted in Amhara region identified the following factors that cause food insecurity. These are drought (erratic rainfall, shortage of farmland due to population pressure, soil erosion, lack of oxen, low price of sheep and sheep diseases, frost, water logging and problem of pests and plant diseases).

Poor soil fertility, land shortage, frost attack, chronic shortage of cash income, poor farming technologies, weak extension services, high labor wastage, poor social and infrastructural situation have caused the problem of food insecurity. Hence, a combination of factors has resulted in serious and growing problem of food insecurity in Ethiopia (Hussein, 2006). These will have cumulative effects on household level food security status.

Food insecurity emerged as a key problem and development challenge in Ethiopia in the early 1970s and became pervasive in the subsequent decades. More importantly, since the mid 1980s the images of severe drought and large-scale starvation have become inexorably linked to Ethiopia. Combinations of natural and man-made factors have resulted in this serious and growing food

insecurity problem in many parts of the country. The immediate causes of food insecurity include frequently recurring droughts and erratic rainfall patterns, ecosystems degradation, rapid population growth, the low levels of technology employed in agriculture and the resulting low productivity of the sector, poor rural infrastructure and legacies of the past policy constraints are also considered as basic causes of food insecurity and widespread poverty in the country (MoARD., 2007).

Several studies in the past have indicated that people of Ethiopia have experienced long periods of food insecurity which may be ascribed to several factors which include occasional droughts and also degradation of farm lands. These factors have limited the “physical, social and economic access to sufficient, safe and nutritious food necessary to meet the dietary needs and food preferences for leading an active and healthy life” for majority of the residents (Gilligan *et al.*, 2008).

The study conducted by Woldeamanuel (2009) in rural Gedeo indicated that population growth and scarcity of resources, small landholding, farmers skills and low level of education, inappropriate production systems and marketing services, drought and variability of rainfall, urban expansion, in-and off-farm unemployment and traditional, social and cultural factors were major causes of food insecurity in the study area.

In this regard, different researchers agree that the causes of the existing food insecurity problem in Ethiopia are numerous and interrelated. These includes rainfall variability, soil degradation, inappropriate storage facility, pre and post harvest crop loss, inability of the households to purchase food, small and fragmented land size, lack of off-farm income opportunity, the under development of livestock sub- sector, inadequate credit and extension services and tenure insecurity (Bewket, 2009).

Similarly, land degradation coupled with unpredictable rainfall and drought cause a serious threat on households’ food security in Ethiopia. Besides, overgrazing, improper cultivation practices, mismanagement of land resource are the main causes for food insecurity (ATA., 2010).

The majority of the severest food crises after the second half of the 20th century were caused by a combination of several factors. The most common causes of food insecurity in African and other third world countries were; drought and other extreme weather events, pests, livestock diseases and other agricultural problems, climate change, military conflicts, lack of emergency plans, corruption and political instability, cash crops dependence, aids and rapid population growth (AFI., 2012).

**Coping strategies practiced in Ethiopia:** Maxwell (1996) classified household responses to food insecurity into two: Coping strategies and Adaptive strategies. Coping strategies are responses made by households to improve the declining situation of households food security while adaptive strategies involve a permanent change in the mix of ways in which food is required, irrespective of the year in question and it refer to long term adjustment. The most commonly practiced coping strategies during abnormal season include short term dietary change, changing intra household food distribution like skipping adults to feed children, limiting size and frequency of food, borrowing and gifts from relative and friends, mutual support mechanism, selling of livestock and fire wood, cash for work and relief assistance, etc., while the commonly used adaptive strategies include risk minimization, food and income diversification mechanism, planting damage resistance crop, cultivating marginal soils, etc.

Coping mechanisms used by farm households in rural Ethiopia include livestock sales, agricultural employment and certain types of off-farm employment and migration to other areas, requesting grain loans, sale of wood or charcoal, small scale trading, selling cow dung (in central



Ethiopia) and crop residues, reduction of food consumption, consumption of meat from their livestock, consumption of wild plants, reliance on relief assistance, relying on remittance from relatives, selling of clothes and dismantling of parts of their houses for sale. Some of them are likely to be implemented only after the possibilities of certain other options have been pursued. In addition, households who have diversified source of income are often able to cope with crisis than others as cited in Frehiwot (2007).

Coping strategies practiced by food insecure households are different depending on the degree of food shortage. Coping strategies practiced at the moderate stage of food shortage include, sale small ruminants and buy grain, sale fire wood and buy grain, engage in wage labor, cultivate and sale vegetable crops, sale chicken and eggs and buy grain, engage in petty trading, sale oxen/cows and buy grain, sale wool and carpets and buy grain, reduce the number, amount and type of meals and borrow some money or grain from acquaintances (relatives, neighbors); whereas, eat wild foods, sale property, eat crops reserved for seed, borrow some money or grain from acquaintances (relatives, neighbors), request for food aid, reduce the number of meals, go hungry for up to two days, sale cattle, move to other places in search of temporary employment, migrate to other area permanently and temporarily were practiced at the severe stage (Tilaye, 2004).

Farm households respond to the problems caused by seasonal and disaster related food insecurity in different ways. Food availability can be affected by climatic fluctuations, depletion of soil fertility, or the loss of household productive assets or some other related problems. In that case farmers' try to reduce this problem by taking actions that result in trade-offs between current and future consumption. The range of coping and adaptive strategies is large and differs according to the particular conditions. It includes expansion of production and improving productivity, food grain purchase through sales of livestock and institutional and societal income transfer systems such as gift and relief food distribution (Frehiwot, 2007).

According to Woldeamanuel (2009) the following coping strategies were identified in his study at Rural Gedeo. These are; daily wage labor, firewood gathering and charcoal burning, handicrafts and petty trade.

## **CONCLUSION**

Drought and famine have become an everyday reality in Ethiopia. With more than 90 million people, the foundation of its economic growth is agriculture, which employs 80% of the population; however, poverty is still a big obstacle to overcome in Ethiopia. Nearly one third of the population lives below the poverty line. Consequently, chronic and acute food insecurity is prevalent, especially among rural populations and smallholder farmers. About 10% of Ethiopia's citizens are chronically food insecure and this figure rises to more than 15% during frequent drought years.

Several factors were identified by different studies for the deteriorating situation of food security in Ethiopia. These are population pressure, drought, shortage of farmland, soil erosion, lack of oxen, deterioration of food production capacity, outbreak of plant and animal disease, poor soil fertility, frost attack, chronic shortage of cash income, poor farming technologies, weak extension services, high labor wastage and poor social and infrastructural facility and pre and post harvest crop loss. To cope the problem, the households respond to the problems caused by seasonal and disaster related food insecurity through sale of livestock, agricultural employment, migration to other areas, requesting grain loans, sale of wood or charcoal, small scale trading, institutional and societal income transfer systems, limiting size and frequency of meal.

To improve food security situation in Ethiopia, the following action should be taken. The household head and members of the household should engage in different income generating activities for means of living, coping mechanism and to escape from hunger and undernourishment; the government of Ethiopia should incorporate different research outputs to design programs for food insecurity intervention; the farmers should develop soil conservation measures to reduce soil erosion and the habit of using rain water harvesting to alleviate problems caused by shortage of rain fall and awareness creation on family planning (to limit population growth), adoption of technologies, pre and post harvest management and education of household heads are also crucial activities.

Appendix: Review of different studies on determinants of food security

Study	Dependent variable	Independent variable	Model
Mulugeta (2002)	House hold food security	Family size, number of oxen owned, use of fertilizer, food expenditure pattern, number of livestock owned, cultivated area, off-farm income per AE, income per adult equivalent	Multivariate logistic regression
Tesfaye (2003)	Household food security	Family size, land size, herd size, agro-ecology, use of fertilizer, use of irrigation, food aid and income from crop produce	Multiple regression analysis
Abebaw (2003)	Food insecurity	Family size, annual income, amount of credit received, irrigation use, age of household head, status of education, cultivated land size, livestock ownership and number of oxen	Binary logit
Shiferaw <i>et al.</i> (2003)	Household food security	Technological adoption, farming system, farm size, land quality, household, size and access to market	Logistic regression model
Wondimsiamregn (2004)	Child malnutrition	Family size, livestock units, duration of breast-feeding, status of ecology, type of cropping, fertilizer usage, food shortage	Logistic regression model
Tesfaye (2005)	Household food insecurity	Family size, number of oxen owned, use of chemical fertilizer, size of cultivated land, farm credit use, total annual income per adult equivalent, food consumption expenditure, livestock owned and off-farm income per adult equivalent	Binary logit
Yilma (2005)	Household food security status	Family size, age of household head, use chemical fertilizers, market distance, off-farm/non-farm income and total farm income	Core food security of module, binary logit
Feleke (2006)	Household food insecurity	Household size, daily income per adult equivalent, proportion of food expenditure, household head education, sex of household head, access to credit and marital status of the household head	Binary logit

Appendix: Continue

Study	Dependent variable	Independent variable	Model
Gebrehiwot (2006)	Household food security status	Family size, dependency ratio, education, soil conservation measures, livestock owned, farm income	Binary logit Core food security module
Alem (2007)	Food security status	Family size, low annual production, small farm size, attitude on food aid and poor wealth status	Household food balance model discriminant analysis
Frehiwot (2007)	Household food insecurity	Sex, education, house hold size, off farm activity, food aid, share of food expenditure	Tobit FGT
Fekadu (2008)	Food security	Age of HHH, labor and market accessibility, land size, fertilizer utilization. Rain water harvesting	Multivariate logistic regression
Gebrehiwot (2008)	Food security status	Land holding, rain fall, per capita production, agricultural production	Probit
Bogale and Shimelis (2009)	House hold level food insecurity	Family size, annual income, age of HHH, access to irrigation, farm size, live stock owned, credit access	Binary logit
Tsegay (2009)	Rural house hold food security source,	House hold size, gender, age, education, distance to input fertilizer use, number of livestock owned, dependency ratio, farm land size	Binary logit
Eden <i>et al.</i> (2009)	House hold food security status	House hold size, marital status, crop produced, livestock owned, literacy	Multivariate analysis
Faridi and Wadood (2010)	House hold food security	Age, education, land employment, sex and infrastructure	Binary logit
Getinet (2011)	Household food security	Household size, educational status of HHH, number of farm oxen, land size, non-farm activity, access to irrigation, credit service	Binary logit
Regassa (2011)	House hold food insecurity	Age, education, family size, access to social service	Multivariate analysis
Ejigayhu (2011)	Food insecurity	Household size, household income, household head age, Household head education, ownership of bank account and income from remittance and Gift	FGT Tobit
Mitiku <i>et al.</i> (2012)	Food security	Total farm income, off-farm income, livestock holding, family size	Binary logit FGT model
Gebre (2012)	Food insecurity	House hold size, age, education, access to credit, employment	Binary logit FGT
Terefe (2013)	House hold food security	House hold size, livestock ownership, farm size, access to market, technology adoption	Probit
Asenso-Okyere <i>et al.</i> (2013)	House hold food security	Educational status of HHH, farm land size, availability of household asset	Binary logit
Kahsay and Mulugeta (2014)	Calorie availability/ adult equivalent/ day in kcal	Age of household head Use of improved seeds Number of TLU/household Adult equivalent Land size in hectare	Multiple linear analysis regression
Muche <i>et al.</i> (2014)	Household food security	Educational status of HHH, family size, number of oxen owned, use of farm input	Binary logit FGT

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