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Analysis of Household Level Determinants of Food Security in Jimma Zone, Ethiopia

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Abstract
The study look for examining food security status of rural households in Gomma District in south western Ethiopia. Household caloric acquisition method was used to measure the status of food security. Household survey was conducted on 190 households and based on these households binary logistic regression model was estimated. Variables related like age, income from off farm/non-farm activities, size of cultivated land, livestock and oxen ownership were found to have positive impact for the attainment of household food security. Likewise use of chemical fertilizer and soil and water conservation practice were found to have positively affecting household food security in the study area. The finding indicated that development interventions that aimed to encourage older households to share their experience to younger households, diversify income of the households, improving productivity of land and livestock, improving the supply and access of chemical fertilizer, incentives to use soil and water conservation activities are found to improve the food security status of the households , thus concerned bodies need to do access and that aimed to diversify income of the households, improving the supply of chemical fertilizer , improving the productivity of land and livestock will have paramount importance for the attainment of household food security. Generally, this study has implication that attaining household food security in southwestern Ethiopia needs mixed adoption of policies and strategies.
Keywords: Correlates, Food insecurity, Ethiopia, Determinant

1. INTRODUCTION

The concept of food security was originated in the mid-1970s. The initial focus of food security was primarily on food availability and to some degree the price stability of basic food stuffs at the international and national level (Clay, 2002; FAO., 2005). Thus, in the 1970s the issue of food security was 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 (FANTA and FAM., 2003; Bedeke, 2012).

The term food security was introduced, evolved, developed and diversified by different researchers Since the World Food Conference in 1974. Food security is perceived at the global, national, household and individual levels. Food security at global level does not guarantee food security at the national level; and food security at the national level does not guarantee food security at the household (Duffuor, 2011).

Food insecurity is decreasing in the world where 925 million people are undernourished. Out of them, about 900 million people are living in developing countries (FAO., 2010). The majority of food insecure and hungry people in the global context live in Asia and the Pacific (16%), Sub-Saharan Africa (30%), North Africa (8%) and Latin America and the Caribbean (9%). On the other hand, about 870 million people are estimated to have been undernourished in the period 2010–12. Out of them, about 852 million people are living in developing countries. This figure represents 12.5% of the global population (FAO., 2012).Whereas, a total of 842 million people in 2011–13were estimated to be suffering from chronic hunger, regularly not getting food to conduct an active life. The total number of undernourished has fallen by 17% since 1990–92 (FAO., 2013).

The performance of agriculture in terms of feeding the country's population is poor. Currently in Ethiopia, there are more than 10 million people who have been affected by drought. Some 4.6 million people are threatened by hunger and malnutrition and require urgent food assistance. The deteriorating situation is compounded by high food prices (WFP., 2009).

Several studies indicated that, 41 % of the Ethiopian population lives below the poverty line and 31.6 million people are undernourished. The latest undernourishment numbers show a positive trend (1990-92:71% of the population; 1995-97: 64%; 2000-02: 50%; 2004-06: 44%) (FAO., 2010). 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 (Bill and Melinda Gates Foundation, 2010).

Different factors were identified in various studies that aggravate food insecurity problem in Ethiopia. These are: poor soil fertility, land shortage, occasional droughts and degradation of farm lands, frost attack and chronic shortage of cash income, poor farming technologies, weak extension services, high labor wastage and

poor social and infrastructural situation. The combinations of those factors have resulted in serious and growing problem of household level food insecurity in Ethiopia (Hussein, 2006; Gilligan et al., 2008).

Through time, poor and hungry populations become less flexible to stress and disasters as they rely a great deal on the natural environment and lack the capacity and the resources required recovering from disasters (Oluoko-Odingo, 2011). In Ethiopia, the seriousness of food shortage problem varies from one area to another, depending on the state of the natural resources and the extent of development of food shortage (Mitiku et al., 2012).

2. RESEARCH METHODOLOGY

2.1 Description of the Study Area

Gomma Woreda is one of the 17 Woreda in Jimma Zone known for predominantly growing coffee. It is located 403 km south west of Addis Ababa and about 50 km west of Jimma town. One of the coffee biodiversity centers in Ethiopia is found in this Woreda. There are 39 peasant associations and 3 urban peasant associations. The number of agricultural households in the Woreda was 45,567 (35,533 male headed (78%)) and 10,034 female headed (22%)) while the total population of the Woreda was 216,662 from which 110,448 are males and 106,174 females (CSA., 2009). Gomma is the second most densely populated Woreda in Jimma Zone with a size of 96,361.72 ha (94.4 km2) including the two coffee state farms which cover an area of 2704 ha (IPMS., 2007). Agriculture is the mainstay of the household economy, intensively practiced by those who have land and livestock. Mixed cropping system is mainly practiced in the District. Major cereals (Maize, teff, sorghum, barley, wheat), cash crops (coffee, coffee and chat), pulses (horse bean), Fruit (papaya, Mango, Avocado) are the most widely cultivated crops in the district. Chat and coffee are important cash crops. The households purchase cereals from the market through the income they generated from sale of coffee and chat produce (Oromia Coffee Cooperative Union, 2006).The landless are engaged in other income generating activities like petty trading and daily laboring. Crop production and animal husbandry are major activities where agricultural products are consumed at home and partly sold to earn cash to meet other household needs, educate children and contribute to social affairs (WoARD., 2014).

2.2. Sampling Procedure

A multistage sampling procedure was employed to selected sample households. In the first and second stage Jimma zone and Gomma district were selected purposively. In the third stage four kebeles i.e Belfo Konche (26), Bulbulo (47), Koye Seja(52) and Beshasha(65) from Gomma district was selected. Finally a total of 190 households were obtained to address food security issues.

2.3 Method of data collection

Primary and secondary data were obtained from various sources including published and unpublished sources to identify important variable that affect household food security. Semi structured interview schedule was used to collect quantitative data involving 190 household heads and their spouses from four kebeles (Belfo Konche, Bulbulo, Koye Seja and Beshasha) .Data collected from households include demographic characteristics, land and livestock ownership, asset possession, income from off farm and non-farm activities, soil and water conservation activities, institutional factors such as access to market, access to extension service, access to credit , pest problems and type and amount of food consumed in the household in specific period(seven days). The remaining data were generated through qualitative methods such as focus group discussion in line with the survey.

2.4 Method of Data Analysis

Data consumed by the household within seven days were converted to kilocalorie using the nationally standardize (Hoddinott, 2001). Food composition table manual (EHNRI., 1997). Consequently the converted data were divided in to adult equivalent (AE) and energy available in the household were recorded. Consequently, the results obtained were compared with the minimum subsistence requirement per AE per day (2100 kcal). Following this household who consume less than the minimum requirement were categorized as food insecure where as those households who consumed greater than or equal to the minimum requirement (2100 kcal/AE/day) were regarded as food secure. After categorizing households as food secure and insecure, the next step was to identification variables that have association with food security at household level. The dependent variable is dichotomous in nature (food insecure and food secure households), among various models binary logistic regression model was used as the estimated probabilities lies between logical limit of 0 and 1 (Gujarati, 1995). Food security as dependent variable assumes, the value of Y=1 if the household is food secure and, o otherwise. Thus, the functional form of logistic regression model was specified as follows:

1) $$\pi = E\left(Y = \frac{1}{x}\right) = 1 / (1 + e)^{-(\beta 0 + \beta i x i)}$$

For ease exposition, we write (1) as

$$\pi(x) = {}^{1}/_{1 + e^{-zi}}$$

2)

Where

$\pi(x)$= is the probability of being food secure ranging from 0 to 1 and Zi=is a function of n explanatory variables(Xi) which is also expressed as:

$$Zi = \beta 0 + \beta 1X1 + \beta 2X2 + \cdots \beta nXn + Ui$$

3)

In other words, the probability for household to be insecure can be expressed as<

$$1 - \pi(x) = {}^{1}/_{1 + e^{-zi}}$$

4)

Thus,

$$\pi(x)/_{1 - \pi(x)} = {}^{1 + e^{zi}}/_{1 + e^{-zi}} = e^{zi}$$

5)

Then, the expression $\pi(x)/ (1-\pi(x))$ represent the odds ratio in favor of food security. It means the ratio of the probability that the household will be food secure to the probability that it will be food insecure. After checking the multicoliniarity among the continuous variables (Variance Inflation Factors (VIF) and the association (Contingency coefficient) among discrete variables, the regression model was estimated. A further correlation analysis of explanatory variables and multicoliniarity diagnostics was carried out to detect the presence of collinearity and the result shows absence of series multicollinearity.

2.5 Hypothesis

The dependent variable for this study is household food security. It is hypothesized to be a function of the following variables.

1) *Age of household head (AGEHHH)* : Age is a continuous explanatory variable measured in years. Older people have relatively richer experiences of the social and physical environments and greater experience of farming activities. Older household heads are expected to have better access to land than younger heads, because younger men either have to wait for land redistribution, or have to share land with their families (Kidane et al., 2005). Thus, it is hypothesized that age of the household head and household food security are positively correlated.

2) *Family size (FAMSIZ):* It refers to the total number of household members who lived and eat with household at least for six months. It is an important variable which determines the state of household food security and expected to have negative effect on household food security (Beyene and Muche, 2010; Mequanent, 2009). According to reviewed literatures, increasing family size tends to exert more pressure on consumption than contribution to production (Tsegay, 2009).

3) *Dependency ratio (DEPRAT*): is measured as total household size divided by the number of individuals working to support the household. Due to the scarcity of resources, an increase in household size especially the non-working members put pressure on consumption than production (Beyene and Muche, 2010; Feleke et al., 2005). An increase in the number of non-working member of household or dependency ratio increases the food insecurity level of household (Feleke et al., 2005).

4) *Off-farm/non-farm income (OFF/NONFARINC):* Various researches revealed that income from the agricultural production may not be the only source of income for the rural household. The success of households and their members in managing food insecurity is largely dependent on their ability to get access to off-farm/non-farm job opportunities which could serve as livelihood diversification strategies (Reardon, 1997; Beyene and Muche, 2010). Hence, it is hypothesized that the availability of off-farm/non-farm income is positively associated with household food security.

5) *Size of cultivated land (SIZLAND):* Size of cultivated land is a continuous variable measured in hectare. Cultivated land is prominent resource expected to be associated with food security status. Size of xcultivated land is associated with food security (Grootaert and Narayan, 2004). As the cultivated land size increases, provided other associated production factors remain the same, the possibility that the household gets more output is high as it remains basic resource for food production. Therefore, it is hypothesized that households with large cultivated land would have less likelihood to be food insecure.

6) *Asset possession (ASSETPOSSET*): Asset possessions continuous variable and refers to the amount of asset a household possesses (which was estimated in Birr). Comparing with households who do not possess assets, those who possess asset assumed to have better chance to escape temporary food shortage and thereby becoming food secure.Thus, it is hypothesized that hypothesized that asset possession and food insecurity negatively correlated

(Yilma, 2005).

7) *Livestock ownership (LIVOWN)*: It is a continuous variable and measured in TLU. Farm households accumulate their wealth in terms of livestock as they are prominent sources of wealth to them. Households with large livestock size are expected to **be** less vulnerable to food insecurity. Therefore, it is hypothesized that possession of large size of livestock (higher value of TLU) increases the likelihood of the household to be food secure and vice versa (Yilma, 2005; Guled, 2006).

8) *Number of oxen owned*: Oxen are the most important means of land cultivation and basic factors of production and it is continuous variable which is measured in numbers. Households who own more oxen have better chance to escape food shortages since it allows effective utilization of the land and labor resources of the farm households (Getinet, 2011; Guled, 2006; Tesfaye, 2005).Thus, positive correlation is expected between number of ox/oxen owned and household food security.

9) *Sex of household head (SEXHHH)*: Household head is person who economically supports or manages the household or for some reason of age or respect is considered as head by other members of the household. It could be male or a female. Male-headed households have more access to agricultural technologies, more labor power and farmland as compared to female-headed households. Women farmer may need a long adjustment period to diversify their income sources fully and become food secure (Christina et al., 2001; Beyene and Muche, 2010). As most female headed- households lack labor, they often rent their land on a share cropping basis. Hence, male-headed households are in a better position to pull labor force than the female-headed ones. Moreover, with regard to farming experience and access to technology males are better than female farmers. So sex of household head is an important determinant of food security and it is represented in the model by dummy variable (i.e. 1 if the household head is male and 0 otherwise). Therefore, it is hypothesized male headed households are more likely to be food secure than female headed households.

10) *Educational status of household head (EDUHHH)*: Educational status of the household head is dummy variable measured in whether the household head can read and write in language and vice versa. Educated households have a better chance of adopting technologies that lead to better production and productivity (Tadesse and Belay, 2004).Likewise educated household head has the capacity to innovate and to adopt timely technology and has better understanding of the cash crops that can help them to have a better income than the non-educated households (Fekadu, 2008; Amaza et al., 2009). Thus, education status is hypothesized to have a positive effect on household food security.

11) *Insect and pest infestation (PESTPROB)*: It is a dummy variable that assumes the value of1 if a household does not face insect pest problem and 0, otherwise. *Crop production at farm household level can be affected by various problems including* of resistant pests to pesticides. Pests are one of the constraints offood security in the rural society (Ehrlich and Ehrlich, 1991). Therefore, it is hypothesized that insect and pest infestations have negative correlations with food security status.

12) *Chemical fertilizer uses (CHEMFERT)*: *Use of chemical fertilizer* is a dummy variable taking value of 1,if a farmer uses chemical fertilizers and 0 otherwise. Fertilizer use enhances productivity per unit of cultivated area. Households using fertilizer are expected to have better food production capacity and thereby better food security status than the non-users (Babu and Tashmatov, 1999).Therefore, it is hypothesized that households who use chemical fertilizer for their crop production have better food security status than the non-users.

13) *Use of improved seed (IMRVSEED)*: It is a dummy variable taking value of 1, if a farmer used improved seeds and 0 otherwise. Seed is an essential agricultural input, which affects production. Improved seeds may withstand drought and erratic rainfall distribution when they are resistant to moisture stress. They can increase agricultural productivity by boosting overall production, which in turn contributes to attaining food security at the household level (Lipton, 2005; Dorward et al., 2003). Thus, using improved seeds has positive association with household food security.

14) *Access to nearest market (ACCESMART)*: Closeness to market centers creates access to additional income via off-farm/non-farm employment opportunities, easy access to information on inputs and transportation (Dorward et al., 2003). It is dummy variable that takes value of 1if a household has market access and 0 otherwise. It is thus, expected that a household having better access to market has better opportunity to be food secure than the one which does not have access. Therefore, it is hypothesized that there is positive association between access to the nearest market center and household food security.

15) *Access to credit (CREDRECIVED)*: It is a dummy variable taking the value 1, if the household takes credit 0 otherwise. Credit serves as a means to boost production and expand income generating activities (Diagne, 1998; Devereux, 2001). Thus, a household which has access to credit does initiate investment in farm and non-farm activities and achieve food security (Beyene and Muche, 2010). Thus, it is hypothesized that a household which has access to credit is more likely to be food secure.

16) *Soil and water conservation measures (SWCPRACTICE)*: A soil conservation measure is a dummy variable taking value 1 if a household is practicing soil and water conservation activities and 0 otherwise. The long-run objective to achieve food security is determined by whether there are some programs and activities on

soil conservations or not. In Ethiopia, erosion and soil degradation are constraints to food production since unsustainable management of soils, upon which agriculture depends, considerably affects food security (Brown and Wolf, 1984; (Gray and Paddock, 1993; Von Braun et al., 2005). Therefore, a household which practices any type of soil and water conservation measures has more chance to be to be food secure.

17) ***Landrentedout (LNDRENTOUT)***: Land rent out is renting own land in terms of fixed cash or sharecropping for agricultural purpose (Yared, 1999). This is a dummy variable that takes value of 1 if household rent out land and 0 other wise.. This arrangement is hypothesized to be correlated positively with the household food security.

2.6 EMPIRICAL RESULTS AND DISCUSSION

Table 1 below shows summary of statittics and scores of sample households on energy consumption. The result indicated there is siginificant difference between food secure and insecure housheolds with respect to food consumption. This variable was measured using seven day recall method where total calorie consumed by the household for the past seven days were compared with the minimum recommended calorie, i.e., 2100 kcal per AE per day.

2.6.1. Result of Descriptive statistics of continuous variables

of the total sample 123(65%) of the households were found to be food insecure.Energy consumed among sample respondents ranges from1000kcal/AE/Day to 3292 Kcal/AE/Day. The mean value energy available for food insecure and secure households was 1824.62 Kcal/AE/Day and 2890.36 Kcal/AE/day, respectively. The minimum and maximum energy available for food insecure and secure households was 1043 Kcal and 2098 Kcal, respectively; and that of food secure households was found to be 2205 Kcal and 3292 Kcal, respectively. The mean energy intake of all sample/ households was 2216 kcal. The t value (21.68) confirmed that there is significant mean difference between food insecure and secure households (Table 1).

Table 1. Distribution of households by their energy consumption

Energy available per AE in (kcal)	Food insecure(123)	Food secure(67)	Total (N=190)
Minimum	1000	2205	1000
Maximum	2085	3292	3292
Mean	1824.62 2890.36		2200.43
Mean difference	1065.74		
(SD)	276.97368.41		597.97
t-value	-22.486***		

Table 2 below indicated that distribution of sample respondents with respect to continuous variables that were included in the model. The results of this analysis shows that there is significant difference with respect to mean of continuous variables such as Age, Off farm /non-farm income, land size, asset possession, livestock ownership and number of oxen(Table 1).

2.6.2 Discussion on Continuous variables

The minimum and maximum age recorded among sample respondents was 23 and 91, respectively. Similarly the mean age of food insecure and secure household heads was 51.8 and 46.8, respectively. The t-value associated with this variable was 2.12 and it shows significance association at ($p<0.05$).Income obtained from off farm and non-farm activities was calculated and compared among food secure and insecure households. Accordingly the average income food insecure and secure households obtain in a month was found to be Birr 99 and Birr 176, respectively. The t-value revealed that there is significant income difference between food secure and insecure households.

Land ownership which was measured in amount of land a household possess was considered as one of the variables that was assumed to have association with household food security. The land holding among the sample respondents ranges from 0 to 11.minimum and maximum land holding in the study area was recorded as 0 and 11. 5 ha. The mean land size among food insecure and secure households was 2.2 ha and 4.1 ha, respectively. The t-value for this variable was 6.6341, which is significant (at $p<0.01$).

Data on household asset(which was estimated in Birr) wa collected from each household.Accordingly the minimum and maximum asset owned by households was 5500 and 39,0000, respectively. On average,the food insecure and secure households own as asset of TheHouseholds possess various assets which was estimated in birr. The average asset owned by food insecure and food secure housheolds was estimated in birr as 5230 and 7296, respectively.

Land is prominent resource for the farm hpuseholds and it was measured in hactares. Food insecure and food secure households were compared with respect to this variable and it was found that the average land holding in food insecure and food secure households was 2.2 ha and 4.2 ha, respectively.The t-value revealed that there is significant diffence in mean land holding among food insecure and food secure households.

Livestock is key resource in farm hosuehols where the farming households support their livelihood. Data on this varible was recorded to compare food secure and and food insecure hosueholds. Accodringly, the

mean holding of livestock in food insecure and food secure hosueholds was 2.7 TLU and 8.2 TLU respectively. The t-value for this value (10.52) revealed that there is significant difference between food secure and insecure houeholds(at $p<0.01$).

Farmers in the study use their oxen to till there land and this is found to be cu=rucial in farm activities. This variable was recoreded from sample respendents and it was considered for analysis. Food insecure and food secure households were compared in sizeof ox/oxen they possess. Accoringly the mean oxen ownership among food insecure hosholds was found to be 0.86 and that of food secure hosueholds was 2.4. The t- value(8.14) associated with this variable revealed that there is siginificant difference (at $p<0.01$) between the food insecure and food secure hosueholds.

Table2. Discriptive statistics of Continous variables

	Total HHs(196)		Food insecure HHs	Food secure HHs	t-value
Variables	Min/Max	Mean (SD)	Mean(SD)	Mean(SD)	
Age	23(91)	48.6(16.01)	46.8(16.25)	51.8(15.2)	2.12**
Family size (AE)	1.32(9.71)	5.2(1.76)	5.11(1.78)	5.3(1.7)	-0.709
Dependency ratio	0(0.8)	0.47(0.18)	0.48(0.18)	0.470.18)	0.116
Off-farm /non-farm income per anum(Birr)	0(1200)	126.14(184.03)	99(190.23)	176(161.71)	2.81***
Land Size(ha)	0(11.5)	2.86(2.08)	2.2(1.76)	4.1(2.1)	6.6341***
Asset possession in (Birr)	550(39000)	5959(5699)	5230(5881.66)	7296(5126)	2.42**
Livestock ownership (TLU)	0(25)	4.71(4.29)	2.78(2.39)	8.2(4.77)	10.52***
Number of Oxen)	0(9)	1.40(1.43)	0.86(0.96)	2.40(1.62)	8.14***

2.6.3 Results of descriptive analysis of categorical variables

Table 3 below refers descriptive analysis of categorical variables that were assumed to have association with household food security status of sample respondents. In this analysis the two group of households, I.e. food insecure and food secure households were compared with respect to various categorical variables like sex of households(SEXHHH in and household), Education status of the household head(EDUHHH), use of chemical fertilizer(USEFERT),use of improved seed(IMPRVSEED), Pest infestation problem (PESTPROB),access to nearest market,(ACCESSMART) and Access to credit service(CREDITACCESS).Chi-square(X^2) value was calculated to identify important variables that show significant difference among food insecure and food insecure households (table 3).

Table 3. Descriptive statistics of Categorical variables

		Food security status		
Description of variables	Categories	Insecure (%)	Secure (%)	Chi square
SEXHHH	Male	84	91	1.96(NS)
	Female	16	7	
EDUHHH	illiterate	68	23	34.32***
	Literate	32	77	
USEFSEERT	Users	31	85	52.48***
	Non users	69	15	
IMPROVSEED	Users	17	29	3.89**
	Non users	83	71	
PESTPROB	Yes	48	47	0.01(NS)
	No	52	53	
ACCESSMART	Yes	76	88	3.75(NS)
	No	34	12	
CREDITACCESS	Yes	26	36	1.67NS)
	No	74	64	
SWCPRACTICE	Users	43	84	29.079***
	Non users	57	16	
LANDRENTOUT	Yes	17	21	0.256(NS)
	No	83	79	

2.6.4 Discussion on categorical variables

Educational status of the household heads among food insecure and food insecure households were found to be

categorical variable that have association with status of household food security. The data obtained from the sample respondents revealed that 68% food insecure and 32% of food secure households were found to be illiterate (who can't read and write in Amharic and Oromifa languages). On the other hand 77% of foods secure and 32% of food insecure households were literate (who can read and write in Amharic and Oromifa languages). The chi-square value for this variable shows that there significant association (at $p<0.01$) between educational level of the household head and food security status at household level. This finding coincides with various literatures.

Use of fertilizer was one of important variable assumed to have association with household food security status. Data recorded from sample respondents revealed that there is significant difference between users and non-users (at $p< 0.01$). The data obtained from households revealed that 31% and 85% of food insecure and secure households, respectively were found to be users of chemical fertilizer where as 69% of food insecure and 15% of food secure households are non-users of chemical fertilizer.

Improved seed was one of important agricultural input used by the farmers of the study area. It was one of the variables that are assumed to have association with the level of household food security. Accordingly it was found that 31% of food insecure and 85% of food secure households use improved seed to increase production and productivity. The chi-square test for this variable shows that there is significant difference (At $p< 0.05$)in the level of food security by using or not using improved seed for the major crops.

Soil and water conservation practice: Conserving limited resources like soil and water improved production and productivity. This variable was considered as important variable that have association with the attainment of household food security. It was found that 43% of food insecure and 84% of food secure households apply soil and water conservation practices on their farm land. Whereas 57% of food insecure and 16% of food secure households don't practice soil and water conservation practices on their land. The probable reason for not applying the practice is due to good condition of their land.

2.7 Logistic regression Model

Logistic regression model was used to identify determinants of food security in the study area. Accordingly, among many 17 variables assumed to have association with household food security in different contexts were tested in the model and nine of them (Age of household head, Family size, off-farm-non-farm income, size of land, TLU of livestock, educational level of household head, Use of chemical fertilizer and application of soil and water conservation practices were found to be significant.

Age is a continuous explanatory variable peculiar to the head of the household and that matters in occupation related with agriculture and allied activities. The result of this the logit output revealed that age of the household head has positive and significant relationship (at $p<0.1$) with household food security (Table 4). Keeping other variables constant, the logit increases by a factor of 1.04 as the age increases by one year. This finding coincides with finding of Beyene and Muche (2010).

Family size (AE) was hypothesized to have negative influence on household food security. It is significant (at 5 % probability level) and has negative association with household food security. The negative sign in the model output is an indication of probability of being food insecure with an increase in family size. The odds ratio in favor of food security decreases with increasing family size and was found to be 0.614.This implies, cetris paribus, the odds ratio in favoring food security decreases by 0.614 as family size increases by one AE (Table 4). Households with large family size, when composed mainly of nonproductive population could face the probability to be food insecure due to high burden imposed on active labor. This result coincides with findings of Beyene and Muche (2010), Ayalew (2003), Tesfaye (2005) and Guled (2006).

Households mostly depend on farm activities to obtain their income. However, in most cases they diversify their livelihood by engaging in various non-farm and off farm activities. The finding of this result showed that households obtain their income from non-farm and off farm sources (Table 4). It was hypothesized that off farm and non-farm income have positive association with household food security. The logit result confirmed that this variable is significantly affected household food security (at $p<0.05$). The possible explanation is that households who are engaged in various off farm and non-farm source that will be used to purchase of agricultural technologies like improved seed, chemical fertilizer and agri-tools and this in turn will help the household to attain food security. This finding coincides with (Beyene and Muche, 2010; Mequanent et al., 2014).

The model output and various researches that had been undertaken in the area of food security showed that land is prominent factor that affect the level of food security at household level. As it was hypothesized, land size was found to be one of the determinants of household food security at $P<0.1$.The odds ratio (1.322) shows that, keeping other factors constant the odds ratio in favor of food security increased by a factor of 1.322 as the household own one additional hectare of land (Table 4).

Farmers in the study area are engaged in mixed farming, i.e. crop production and livestock rearing. Livestock are prominent resources that are employed as means of living and coping strategies during hard times

like crop failer. In this study, it was hypothesized that livestock ownership and food security would have positive association. The result of logit model confirms the significance association between livestock ownership (measured in TLU) and household food security(at p>0.05). As it can be depicted from table 4, the odds ratio in favor of food security increased by a factor of 1.29 when the household have additional TLU.

For the developing world farmers like Ethiopia, ox/oxen are prominent resource that is engaged in farming tilling their land. In this study it was hypothesized that oxen ownership and household food security has positive association. The model result also confirmed that that there is significant relationship between oxen ownership and household food security. The findings in table 4 reveals odds ratio in favor of food security increased by a factor of 1.973 for each additional ox ownership by the household.

Educational status of the household head was hypothesized to have positive association with household food security. The model result in table 4 confirms that educated farmers have better chance to be food secure than illiterate household heads. The possible explanation for this finding may be educated households apply their knowledge and skill gained from various sources on they apply in their farm activities and thereby increase production and productivity and achievement of household food security. The odds ratio in favor of household foods security increases by a factor of 0.287 when the household becomes educated.

Use of fertilizer is a variable which was found to have positive and significant impact on household food security (at p<1%). The odds ratio to attain food security for this variable was found to be huge number, which is 5.74. It was also found most households in the study are employ soil and water conservation practices. It was hypothesized that practice of soil and water conservation practices have positive association with hosuehold level food security. The model result confirms that this variable has positive and significant impact with household food security (at p< 10%).This finding coincides with other findings (Babu and Tashmatov, 1999; Holden and Shiferaw, 2004; Beyene and Muche, 2010).

Soil and water conservation practice by the household was hypothesized to have positive association with household food security. The result if the logit analysis confirms that there is significant association between practicing soil and water conservation and attaining household food security (at p<10%). The odds ratio in favor of food security increased by a factor of 3.559 when the household practice soil and water conservation in various forms.

Table 4. Results of Logistic regression model

Variable	Coefficients	Wald statistics	Sig.	Odds ratio
Constant	-5.366	8.276	.004	.005
AgeHHH	.039*	3.508	.061	1.040
Famsiz	-.487*	5.351	.021	.614
Depenratio	-1.395	.715	.398	.248
Off_nonfarminc	.003**	5.184	.023	1.003
Assetposse	.002	.135	.713	1.000
Landhold	.279*	2.736	.098	1.322
Livestok	.254**	3.999	.046	1.290
Oxen	.680*	3.569	.059	1.973
SexHHH(cat)	-.174	.043	.836	.840
EduHHH(cat)	1.249*	3.738	.053	.287
pestprob(cat)	-.013	.000	.984	.987
fertil(cat)	1.757**	8.785	.003	5.794
Imprsed(cat)	.445	.443	.506	1.560
Acsmart(cat)	.819	.789	.374	2.268
Acscredit(cat)	.558	.968	.325	1.747
Swcpract(cat)	1.269*	3.787	.052	3.559
Landrentout(cat)	.149	.046	.829	1.161

2.8. Conclusions and Recommendations

This study examines factors affecting food security at household level. Among seventeen variables fitted to the logistic regression model nine variables (Age of household head, Family size, income from off farm and nonfarm source, size of cultivated land, TLU of livestock, oxen ownership, literacy level of the household head, application of chemical fertilizer and practice of soil and water activities).

The findings clearly indicated that the role of household asset in terms of land, oxen, livestock and

income from nonfarm and off farm sources have paramount importance to attain food security at household level. Thus, livelihood diversification schemes that enable the farming community diversify their income sources need be devised.

The study finds out that age of household head has positive and significant association with attainment of household food security. Keeping other factors constant elderly households are less prone to food insecurity than younger household heads. Long experience often matters to exploit indigenous practices and incorporate into development interventions to make agriculture moving forward. Thus, interventions that enable aged households to share their lifelong experiences to younger household heads need to be devised and implemented.

Likewise large family size was found significant among the major factors that lead households more vulnerable to food insecurity. Most related studies indicate that the level of food and agricultural production couldn't often meet the growing demand of farming community. The rate of food and agricultural production often grows slowly compared to the rate of growth in population. In this regard proper attention should be given to limit the rapid population growth in the study area. Activities that lead to boost agricultural production on one hand and limiting the fast growing population on the other hand are crucial to meet the demand of food. Government and non-government organizations working in the area are supposed to focus on intensive agriculture, integrated health and education services and family planning to equate food supply and demand equation in the long term.

Off-farm and non-farm incomes are among the major socio economic variables that influence the state of household food security. Promoting and expanding non-farm activities are essential especially for those who have little or no land for cultivation. Indigenous skills associated with wood-work, metal-work, poetry, etc. should be given prior attention in the study area. Trainings and credit facilities should be geared towards raising their skills so as to meet increased farm income and improved food security. People of similar interest and skill can be organized into cooperatives to enhance access to trainings and credit facilities. In this regard the role of NGOs working in the area will be paramount.

Size of cultivated land was found to have positive influence on household food security. Agricultural strategies should be designed and implemented that would have effect on maintaining the existing land size on one hand and promoting intensive agriculture and livestock production on the other hand. Measures such as appropriate land use, improved technologies and proper extension services should be in place to raise land productivity. Rural development plans should include government and nongovernmental organization in promoting biophysical conservation activities.

Both livestock ownership and food security have positive association. Despite its prominent role in household food security, this sector has received less attention as compared to crop production. Thus, besides physical availability of animal health services, trained health personnel and necessary medical equipments and supplies should be fulfilled in the study area. Moreover, the introduction and distribution of crossbreed animals should be widely implemented to increase the productivity of livestock.

Oxen power is the main source of traditional means to cultivate land in the study area. It allows effective utilization of land and labor resources and evenly spread labor over peak and slack periods. Thus, consideration in this regard should be made to undertake development activities and proper interventions towards improving oxen ownership and animal health services through provision of farm credits and appropriate extension services.

Literacy level of the household head and food security was found to have significant and positive association. Educated households have advantage over non educated households in adoption and use of improved agricultural inputs and related agronomic practices. Thus, action that enables the households to get access to education should be devised and implemented.

It was found that use of chemical fertilizer improves household food security status via boosting food and agricultural production. Activities should be carried out so as to promote timely supply of chemical fertilizer coupled with appropriate credit services. The role of agricultural extension service in this respect is prominent. Thus, adequate technical support regarding application of fertilizer and use of organic fertilizer should be encouraged. It is obvious that the agricultural system in the woreda is heavily dependent on the natural resources. Thus, enhancing conservation of soils, water and other natural resources is among priority areas that need emphasis in order to maintain sustainable agricultural development. Biological conservation methods such as agro-forestry, inter-cropping, crop-rotation and relay-cropping should be given emphasis to compete with scare resources. Cut-off drains check dams, farm land terracing, soil-bands in steep slopes are to be given emphasis to improve the physical structure of the natural resources.

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REFERENCES

Amaza, P., T. Abdoulaye, P. Kwaghe and A. Tegbaru, 2009. Changes in household food security and poverty status in PROSAB area of Southern Borno State, Nigeria. International Institute of Tropical Agriculture (IITA), Promoting Sustainable Agriculture in Borno State (PROSAB), Ibadan, Nigeria, pp: 1-40.

Ayalew, Y., 2003. Identification and intensity of food insecurity and coping strategies of rural households in North Shoa: The case of Lalomama. M.Sc. Thesis, School of Graduate Studies of Alemaya University, Alemaya, Ethiopia.

Babu, S.C. and A. Tashmatov, 1999. Attaining food security in central Asia: Emerging issues and challenges for policy research. Food Policy, 24: 357-362.

Bedeke, S.B., 2012. Food insecurity and copping strategies: A perspective from Kersa District. Food Sci. Qual. Manage., 5: 19-27.

Beyene, F. and M. Muche, 2010. Determinants of food security among rural households of central Ethiopia: An empirical analysis. Q. J. Int. Agric., 49: 299-318.

Bill and Melinda Gates Foundation, 2010. Accelerating Ethiopian agriculture development for growth, food security and equity. Bill and Melinda Gates Foundation, Addis Ababa, Ethiopia, July 2010, pp: 1-116.

Brown, L.R. and E.C. Wolf, 1984. Soil Erosion: Quiet Crisis in the World Economy. Worldwatch Institute, Washington, DC., USA., ISBN-13: 9780916468606, Pages: 49.

Christina H. Gladwin, et al., 2001, Addressing food security in Africa via multiple livelihood strategies of women farmers, Food Policy, Volume 26, Issue 2, Pages 177-207

Clay, E., 2002. Food security: Concepts and measurements. Paper for FAO Expert Consultation on Trade and Food Security: Conceptualising the linkages, Food and Agriculture Organization, July 2002, Rome, Italy.

CSA., 2009. Area and production of major crops. A Sample Enumeration Survey, Central Statistical Authority., Addis Ababa, Ethiopia.

Devereux, S., 2001. Livelihood insecurity and social protection: A re-emerging issue in rural development. Dev. Policy Rev., 19: 507-519.

Diagne, A., 1998. Impact of access to credit on income and food security in Malawi. IFPRI Discussion Paper No. 46, International Food Policy Research Institute, Washington, DC., USA.

Dorward, A., N. Poole, J. Morrison, J. Kydd and I. Urey, 2003. Markets, institutions and technology: Missing links in livelihoods analysis. Dev. Policy Rev., 21: 319-332.

Duffuor, K., 2011. Budget speech: Budget statement and economic policy of the Government of Ghana for the fiscal year 2011. Minister of Finance and Economic Planning, Accra, Ghana, pp: 1-49.

EHNRI., 1997. Food composition table for use in Ethiopia. Part III, from 1968-1997. Ethiopian Health and Nutrition Research Institute, Government of Ethiopia, Addis Ababa, 1-34.

Ehrlich, P.R. and A.N. Ehrlich, 1991. Healing the Planet: Strategies for Resolving the Environmental Crisis. 1st Edn., Perseus Books, Boston, Massachusetts, ISBN-13: 978-0201550467, Pages: 366.

FANTA and FAM., 2003. Food access indicator review. Food and Nutrition Technical Assistance, Academy for Educational Development, Washington, DC., USA., July 2003.

FAO., 2005. Assessment of the world food security situation. Committee on World Food Security, Thirty-First Session, May 23-26, 2005, Food and Agricultural Organization, Rome, Italy.

FAO., 2010. The State of Food Insecurity in the World 2010: Addressing Food Insecurity in Protracted Crises. Food and Agriculture Organization of the United Nations, Rome, Italy, ISBN-13: 9789251066102, Pages: 57.

FAO., 2012. The State of Food Insecurity in the World 2012: Economic Growth is Necessary but not Sufficient to Accelerate Reduction of Hunger and Malnutrition. FAO Inter-Departmental Working Group, Rome, Italy, ISBN-13: 9789251073162, Pages: 60.

FAO., 2013. The State of Food Insecurity in the World 2013: The Multiple Dimensions of Food Security. Food and Agricultural Organization, Rome, Italy, ISBN-13: 9789251079164, Pages: 52.

Fekadu, N., 2008. Determinants of household food security the case of Bulbula in Adami-Tulu Jido Kombolcha, Oromia Region. M.Sc. Thesis, Addis Ababa University, Ethiopia.

Feleke, S.T., R.L. Kilmer and C.H. Gladwin, 2005. Determinants of food security in Southern Ethiopia at the household level. Agric. Econ., 33: 351-363.

Getinet, K.A., 2011. Linking small-scale irrigation and household food security in drought prone area of north east Ethiopia: A case of Guba Lafto Woreda. M.Sc. Thesis, Addis Ababa University, Addis Ababa, Ethiopia.

Gilligan, D.O., J. Hoddinott and A.S. Taffesse, 2008. An analysis of Ethiopia's productive safety net program and its linkages. International Food Policy Research Institute, Washington, DC., USA., February 15, 2008, pp: 1-42.

Gray, R. and R. Paddock, 1993. Land set aside: Is it food security? Canadian J. Agric. Econ., 41: 441-451.
Grootaert, C. and D. Narayan, 2004. Local institutions, poverty and household welfare in Bolivia. World Dev., 32: 1179-1198.
Gujarati, D.N., 1995. Basic Econometrics. 3rd Edn., McGraw-Hill Inc., New York, USA., ISBN-13: 9780070252141, Pages: 838.
Guled, A., 2006. Food insecurity and copping strategies of agro-pastoral households in Somali region, Ethiopia. M.Sc. Thesis, Haramaya University, Dire Dawa, Ethiopia.
Hoddinott, J., 2001. Method for Rural Development Projects: Food Security in Practice. IFPRI, Washington, DC., USA., pp: 80-100.
Holden, S. and B. Shiferaw, 2004. Land degradation, drought and food security in a less-favoured area in the Ethiopian highlands: A bio-economic model with market imperfections. Agric. Econ., 30: 31-49.
Hussein, B., 2006. Major causes of household food insecurity in Wuchale-Jidda Woreda, Oromiya National Regional State. M.A. Thesis, Addis Ababa University, Ethiopia.
IPMS., 2007. Goma pilot learning Wereda diagnosis and program design. Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project, Addis Ababa, Ethiopia, May 25, 2007, pp: 1-87. http://www.ipms-ethiopia.org/content/files/documents/pls-dpd/goma.pdf
Kidane, H., Z.G. Alemu and G. Kundhlande, 2005. Causes of household food insecurity in Koredegaga peasant association, Oromiya zone, Ethiopia. Agrekon, 44: 543-560.
Lipton, M., 2005. The Family Farm in a Globalizing World: The Role of Crop Science in Alleviating Poverty. International Food Policy Research Institute, Washington, DC., USA., ISBN-13: 9780896296541, Pages: 29.
Mequanent Muche, Birara Endalew and Tesfalem Koricho, 2014. Detrminants of Household Food Security among Southwest Ethiopia Rural Households. Asian Journal of Agricultural Research, 8: 248-258.
Mequanent, M., 2009. Determinants of household food security and coping strategy: The case Adaberga Woreda, Ethiopia. Master's Thesis, Haramaya University, Dire Dawa, Ethiopia.
Mitiku, A., B. Fufa and B. Tadesse, 2012. Empirical analysis of the determinants of rural households food security in Southern Ethiopia: The case of Shashemene district. Basic Res. J. Agric. Sci. Rev., 1: 132-138.
Oluoko-Odingo, A.A., 2011. Vulnerability and adaptation to food insecurity and poverty in Kenya. Ann. Assoc. Am. Geogr., 101: 1-20.
Oromia Coffee Cooperative Union, 2006. Socio-economic profile of the East Wellega Zone. Oromia Coffee Cooperative Union, Government of Oromia Region, Ethiopia.
Reardon, T., 1997. Using evidence of household income diversification to inform study of the rural nonfarm labor market in Africa. World Dev., 25: 735-747.
Tadesse, M. and K. Belay, 2004. Factors influencing adoption of soil conservation measures in Southern Ethiopia: The case of Gununo area. J. Agric. Rural Dev. Tropics Subtropics, 105: 49-62.
Tesfaye, K., 2005. Household food insecurity in Dodotasire district, Arsi zone: coping strategies and policy options. M.Sc. Thesis, Alemaya University, Alemaya, Ethiopia.
Tsegay, G., 2009. Determinants of food security in rural households of the Tigray region. M.Sc. Thesis, Addis Ababa University, Addis Ababa, Ethiopia.
Von Braun, J., M.W. Rosegrant, R. Pandya-Lorch, M.J. Cohen, S.A. Cline, M.A. Brown and M.S. Bos, 2005. New Risks and Opportunities for Food Security: Scenario Analyses for 2015 and 2050. International Food Policy Research Institute, Washington, DC., ISBN: 13-9780896296527, Pages: 32.
WFP., 2009. Food security and vulnerability in Addis Ababa, Ethiopia. World Food Programme (WFP), Addis Ababa, Ethiopia, September 2009. http://www.alnap.org/pool/files/wfp221390.pdf.
Yared, A., 1999. Household Resources, Strategies and Food Security in Ethiopia: A Study of Amhara Household in Wagda, North Shewa. Addis Ababa University Press, Ethiopia.
Yilma, M., 2005. Measuring rural household food security status and its determinants in the Benishangul Gumuz region. Master's Thesis, Alemaya University, Alemaya, Ethiopia.

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