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Factors influencing rural household food insecurity: The case of Babile district, East Hararghe Zone, Ethiopia

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The paper examines the status and factors affecting food insecurity of rural household in Babile Ethiopia. A two-stage random sampling procedure was used to select 150 sample households from four kebeles. Both primary and secondary methods of data collection were used. Descriptive statistics and binary logit model were used as methods of data analysis. Binary logit model identified five out of ten variables included in the model as significant factors of rural household food insecurity. Size of cultivated land, educational status of the household head, annual farm income, use of improved variety, and insect and pest infestation problem were found significant factors influencing household food insecurity. The results of econometric analysis made it clear that these factors were the major determinants of household food insecurity in the study area.

Key words: Food, factors, binary logit model, rural households, Babile district, Ethiopia.

INTRODUCTION

Food security has become a crucial agendum all over the world because food is a very fundamental human right that transcends cultural, political background, and religious beliefs. In addition, the right to food is acknowledged in universal declaration of human rights as well as the international covenant on economic, social and cultural rights (ICESCR) which bring consequences to the state to ensure right to food which consists of obligation to respect, protect and fulfill (Hadiprayitno, 2010). Despite progress witnessed in reducing poverty in some parts of the world over the past couple of decades, dealing with persistent rural poverty has continued to constitute the economic development agenda of sub-Saharan Africa (IFAD, 2010). The region is the most vulnerable region to food security, in which about half of its population in food insecurity (Shapouri et al., 2009). The region is highly dependent on food import and food assistance.

Ethiopia remains one of the poorest countries in the world with human development index ranking 157 out of 169 countries reported (UNDP, 2010). With US$ 350, the country's per capita income is much lower than the sub-Saharan Africa average of US$ 1,077 in the year 2009 (World Bank, 2011). Despite the effort from the Ethiopian government and farmers' community, Ethiopia remains highly vulnerable to severe and chronic food insecurity in

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a large extent (CSAE, 2010).

According to Ministry of Agriculture (2012), Ethiopia has experienced high economic growth in recent years which was 11%, however despite this, significant poverty and chronic food insecurity remains in the country. It was estimated that about 38.7% of households were food insecure. Most of these food insecure households are subsistence farmers, and vulnerable to weather fluctuations. High population growth has also contributed to decline in farm sizes, and environmental degradation remains a problem. Dramatic variations in rainfall and repeated environmental shocks further contribute to poverty and food insecurity.

Based on the joint government and humanitarian partners' requirement document released, about 3.2 million people required food assistance in the first half of 2012. The highest needs were identified in Somali and Oromia regions where 34% of the total population of each region is estimated to be in need. The net food requirement is reported to be around 158,000 metric tons (USAID, 2012).

Consider the agro-ecological zone and farming system of Babile district, there are high spatial variations of food insecurity. This might leads to raise a fundamental question about how this variation occurred among household living in the area. Besides, factors influencing household food insecurity in the area are not yet known and documented before. This indicates that there exist information gap on the factors influencing rural household food insecurity to implement different food security programs. The main objectives of the paper were to identify status of household food insecurity, and to examine factors influencing rural households' food insecurity in the area.

Assessing factors influencing rural household food insecurity is very crucial as it provides information regardless of food insecurity status of the household level that helps the policy makers for effective implementation of food security programs. Besides, the output of this research may help development practitioners and policy makers to acquire better knowledge to carry out development interventions at the right time and the right place in rural areas to decrease vulnerability to food insecurity. In addition to this, the study may help to know and document the factors influencing household food insecurity in the area.

Food security is defined in different ways by international organizations and researchers. 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 (FAO, 2002). Food insecurity exists when this condition is not met. Similarly, Caraher and Coveney (2004) defined as, food poverty and food insecurity signify the inability to consume an adequate quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so. According to Andersen (2009), food security is used to describe whether a country has access to sufficient food to meet citizen's dietary energy requirements. Some experts used the term national food security to refer to self-sufficiency, means that the country has the ability to produce the food demanded by its population. Thus, food security is a multidisciplinary concept which includes economic, political, demographic, social (discriminatory food access), cultural (eating habits) and technical aspects. Making food security a reality therefore also implies to take into consideration the role of non food factors.

The international human rights approach then has critical potential to highlight food insecurity as symptoms of a system which fails both to ensure individuals and households have adequate income, and to ensure that what is available to purchase or consume, at affordable cost (that is, physically and economically accessible for all), is appropriate for health. There is a clear interdependence and indivisibility between the right to food and the right to health, as articulated throughout United Nations general comment 14 on the right to the highest attainable standard of health. This embraces a wide range of socio-economic factors promoting conditions under which people can lead a healthy life, as well as the underlying determinants of health including food and nutrition (CESCR, 2000).

Food security is commonly conceptualized as resting on three pillars: availability, access, and utilization. As Webb et al (2006) noted, these concepts are inherently hierarchical, with food availability is necessary but not sufficient to ensure access, which is in turn necessary but not sufficient for effective utilization. Availability reflects the supply side of the food security concept. In order for all people to have sufficient food, there must be adequate availability. But adequate supplies do not ensure universal access to sufficient, safe and nutritious food, nor do they ensure that the food to which people has access is used to its full potential to advance human health and well-being (Webb et al., 2006). Food availability solely does not assure access to food and enough calories do not necessarily guarantee a healthy and nutritional diet (Andersen, 2009).

Hence, the second pillar of the food security concept is access. Access is most closely related to social science concepts of individual or household well-being: what is the range of food choices open to the person(s)? It reflects the demand side of food security, especially as manifest in the role food preferences plays in the definition of food security. This is meant to capture cultural limitations on what foods are consistent with a population's prevailing values. Two people from different traditions with access to exactly the same diet might not consider themselves equally food secure given variation in religiously or culturally determined food tastes. Inter and intra household distributional questions also influence access (Webb et al., 2006). According to

Stamoulis and Zezza (2003), food access is access by individuals to adequate resources (entitlements) to acquire appropriate foods for a nutritious diet.

The third pillar of food security is food utilization. Utilization reflects concerns about whether individuals and households make good use of their food access. Do they acquire nutritionally essential foods that they can afford or do they forgo nutrient intake in favor of consumption of an inadequately varied diet, of non-food goods and services, or of investment in their future livelihoods? Are the foods they purchase safe and properly prepared, under sanitary conditions, so as to enjoy their full nutritional value? Do individuals have adequate access to preventive and curative health care so as to be free of diseases that can limit their ability to absorb and metabolize essential nutrients? In particular, over the past generation, widespread concerns have arisen about micronutrient deficiencies associated with inadequate intake of essential minerals such as iodine, iron or zinc, and vitamins, in particular A and D (Webb et al., 2006).

Some agencies, such as the United Nations Food and Agriculture Organization (FAO), consider stability to be a fourth dimension of food security. Stability captures the susceptibility of individuals to food security due to interruptions in access, availability or utilization. Certain individuals within communities or households may be more vulnerable to instability and are at greater risk of food insecurity. This matter for targeting of interventions and the design of safety nets intended to safeguard food security for vulnerable subpopulations (Christopher and Erin, 2009).

According to Renzaho and Mellor (2010), food security should be based on four inter-related pillars of food availability, food access, food utilization and asset creation. Asset creation is concerned with putting in place structures and systems that sustain a household's or individuals' ability to overcome sudden shocks which threaten their access to food including economic and climatic crises. Their conception of food security is not highly different from the general food security concept. They, for instance, explain that food availability is about the amount of food which is available through domestic production or import, including from food aid. Furthermore, Renzaho and Mellor explain that access to food means distribution nutritious food which can be accessed by all household members.

Renzaho and Mellor (2010), explain that food utilization comprises of physical utilization and biological utilization. Physical utilization is concerned with household's entitlement on physical means that can be used to utilize food, whereas biological utilization involved the ability of human body to absorb the nutrients from the food effectively. Therefore, food security is highly related with public health matters such as access to clean water, housing condition and sanitation. The last pillar is asset creation according to Renzaho and Mellor (2010) which is concerned with creating an enabling environment that able to protect individuals from a sudden shock that harms their access to food. It is built through certain structures and system that comprises of five different capital assets: human, natural, financial, social and physical. Examples of these capital assets for instance roads, water supplies, schools, food production, food processing and packaging, food marketing or market regulation, income transfer, affordable credits, trust, reciprocity, and social networks. In line with this concept, Braun (2009) stated that ensuring food security does not only require appropriate agricultural management and utilization of natural resources and eco-systems, but good governance and sustainable political system. This is obvious since food secures life and because the mission of national security is to secure society and defend its existence. This implies that food also an essential element of national security (Fullbrook, 2010). In addition, Fullbrook states that to secure food supply, it must be universally viewed not only as a commodity but as a security good. Food must be put as a priority above other activities and its positions must be recognized as an inviolable foundation of human existence and security.

MATERIALS AND METHODS

Location of the study district

The East Hararghe zone has 17 districts from which Babile is the one. It is located 35 km away from the city of Harar and about 555 km East of Addis Ababa. It lies between 8°, 9'- 9°, 23' N latitude and 42°, 15'- 42°, 53' E longitude. It shares its border with Gursum from the North, Fedis from the West, Harari National Regional State from the North West, and Somali National Regional State in the East, South, and South West (DARDO, 2011) (Figure 1).

Sampling techniques and methods of data collection

A two-stage random sampling procedure was used to select 150 sample rural households. Firstly, 4 kebeles were randomly selected from 21 kebeles of arid and semi-arid agro-ecological zones of the district. Secondly, based on probability proportional to size technique 150 sample rural households were randomly selected from the corresponding 4 kebeles of both arid and semi-arid agro-ecological zones. Both secondary and primary data collection methods were employed. The primary data required for this study was collected from sample respondents using structured questionnaire; data like Caloric intake and factors affecting food insecurity were the major once. Data collection was started after pretest was conducted and modifications were made.

Methods of data analysis

Measuring food insecurity status

The major food types used are sorghum, maize, ground nut and sweet potato. Animal products, fruits and vegetables are rarely consumed by rural households in this area. The common ways of acquiring food were own-farm production and purchase from markets. Other ways of acquiring food include gifts, food loans and

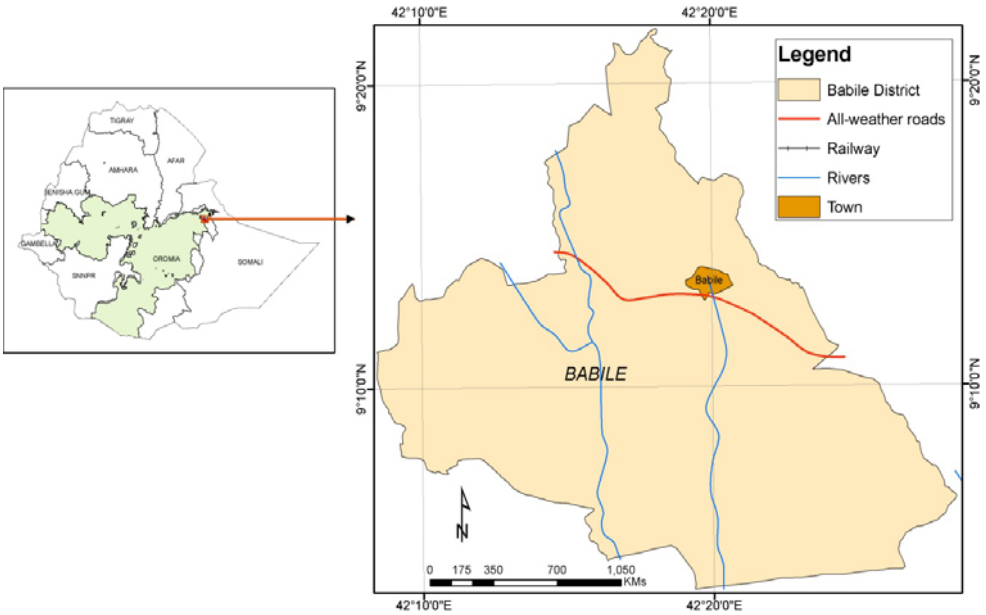

Figure 1. Map of Babile district, East Hararghe zone, Ethiopia.

Table 1. Conversion factor to calculate adult equivalent (AE).

Sex	Age	Adult equivalent (AE)
Boys	<13	0.4-0.80
Girls	<13	0.4-0.88
Male youth	13-18	1.0-1.20
Female youth	13-18	1.0
Male	19-59	1.0
Female	19-59	0.88
Old Male	>59	1.0
Old Female	>59	0.80

Source: Gassmann and Behrendt (2006).

food aid from governmental or nongovernmental Organizations.

Data on a household's caloric acquisition per adult equivalent per day were obtained on available food consumption from purchase and stock for two periods (before and after harvest) to the households. This is because measuring food insecurity status at the household level by direct surveys of dietary intake in a single period doesn't take in to account the down ward risks that rural households might face. The down ward risk might be resulted in the level of, and changes in, socioeconomic and demographic variables such as real wage rates, employment, production, price ratios and migration, etc. Thus, to taken in to consider these downward risks that rural households might face, collecting the amount food that rural households consumed in two periods (that is, before harvest season as first period for seven days and after harvest season as second period for 7 days) and calculating average calorie intake per adult equivalent of each sample households in both period is better way of measuring food insecurity status.

The information was obtained from the household member that is knowledgeable in the preparation and consumption of the commonly used instead of kilogram and/or liter were converted in to a standard metric system and to do that conversion factor were calculated between metric units and local units. Firstly, the amount of food consumed was converted in to calorie for the periods of one (before harvest season in the month October for the seven days) and period of two (after harvest season in the month of January for the seven days) with the aid of standard nutrient composition table, then divide the calorie intakes of each sampled household in to seven in order to obtain daily calorie intake of each selected households for both periods. Secondly, the household's daily calorie intakes per adult equivalent (calorie per AE per day) for both periods were calculated by dividing the daily caloric intakes by the family size after adjusting for adult equivalent using the consumption factors for age-sex categories. Thirdly, the average households' daily calorie intake per adult equivalent was calculated. In order to calculate the average household's daily calorie intake per adult equivalent (calorie per AE per day) for two periods, the sum of each household's calorie intakes per adult equivalent (calorie per AE per day) for the two periods were divided by two. The calculation of AE for food consumption takes into account the household through recall. The local units that rural households

Table 2. Descriptive statistics of dummy variables.

Food Insecurity status						
Variable	**Description**	**Food insecure**	**%**	**Food secured**	**%**	**Chi-square (χ^2)**
Eduhhh	Illiterate	66	44	38	25.3	6.376**
	Literate	19	12.7	27	18	
Improvvari	User	18	12	42	28	29***
	Non user	67	44.7	23	15.3	
Pestinfes	Yes	62	41.3	22	14.7	22.84***
	No	23	15.3	43	28.7	
Off/Nonfarm	Yes	30	20	40	26.7	10.20***
	No	55	36.7	25	16.7	
Irrigatscheme	Yes	2	1.4	5	3.3	2.36*
	No	83	55.3	60	40	

*, ** and*** significant at less than10, 5 and 1%, respectively (Source: Own computation result, 2012).

Table 3. Descriptive statistics of continuous variables.

Variable	**Food insecurity status**				**t-value**
	Food insecure HHS		**Food secure HHs**		
	Mean	**Standard deviation**	**Mean**	**Standard deviation**	
Age	36.25	7.51	39.09	7.80	2.32**
Famesize	5.29	1.63	4.80	1.52	-1.82*
Sizecult	1.17	0.67	1.45	0.88	-2.13**
Totfarin	4,474	2,978	6,965	4,504	4.06***
Hhexpend	6,822	3,337	7,972	3,162	2.14**

*, ** and*** significant at less than10, 5 and 1%, respectively; (Source: Own computation result, 2012).

age and sex of the household members, as described by Gassmann and Behrendt (2006) (Table 1).

To identify food insecure households and analyze the contributing factors of food insecurity an international minimum calorie requirement was used as cutoff point between food insecure and secure households. Thus, households whose average daily per capita intake higher than or equal to 2200 Kcal per adult equivalent per day (recommended per capita daily calorie intake), were considered as food secure where as those whose average consumption is below 2200 kcal per AE per day were considered as food insecure households.

Analytical models

The food insecure status of sample households was determined using descriptive statistics. Factors influencing household food insecurity were analyzed using Descriptive statistics and Binary Logit Model (Tables 2 and 3). The results of significant variables using descriptive statistics are follows:

Following Gujarati (1995); Aldrich and Nelson (1984); Hosmer and Lemeshow (1989); the functional form of logistic model is specified as follows:

$$P_i = E(Y=f/x) = 1$$

$$P_i = E\ (y = 1/x) = \frac{1}{1+e^{-(B_0+B_1X_1)}} \quad (1)$$

For ease of exposition, we write (1) as:

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

The probability that a given household is food insecure is expressed by (2), while the probability for food secure is:-

$$1-P_i = \frac{1}{1+e^{z_i}} \quad (3)$$

Therefore, we can write as:

$$\frac{P_i}{1-P_i}=\frac{1+e^{Z_i}}{1+e^{-Z_i}} \quad (4)$$

Now $\left(\frac{P_i}{1-P_i}\right)$ is simply the odds ratio in favor of food insecurity. The ratio of the probability that a household will be food insecure to the probability of that it will be food secure. Finally, taking of the natural log of equation (4) we obtain:

$$\text{Li}=\ln\left[\frac{P_i}{1-P_i}\right]=Z_i=\beta_0+\beta_1X_1+\beta_2X_2+....+\beta_nX_n \quad (5)$$

Where P_i = is the probability of the household to be food insecure; $1-P_i=$ is the probability of the household to be food secure; $Z_i=$ is a function of n explanatory variables (x) which is also expressed as:

$$Z_i=\beta_0+\beta_1X_1+\beta_2X_2+.....\beta_nX_n \quad (6)$$

$\beta_0=$ is an intercept; $\beta_1,\beta_2,....\beta_n$ are slopes of the equation in the model; Li = is log of the odds ratio, which is not only linear in X_i but also linear in the parameters; X_i is vector of relevant household characteristics If the disturbance term (U_i) is introduced, the logit model becomes:

$$Z_i=\beta_0+\beta_1X_1+\beta_2X_2+.....\beta_nX_n+U_i \quad (7)$$

The dependant variable in this study is food insecurity which is dichotomous dependent variable in the model taking value of 1 if a household is food insecure and 0 otherwise.

Explanatory variables

Family size (FAMESIZE): This refers to the total number of family members of the household in adult equivalent (AE). It was expected that family size and household food insecurity associated negatively.

Age of household head: It was measured in number of years. Rural households devote most of their time or base their livelihoods on agriculture. The older the households head the better he/she has social network as well as the more experience on farming and weather forecasting. Thus, it was hypothesized that household head age has negatively related to household food insecurity.

Educational status of the household Head (EDUSTATUS): This is a dummy independent variable taking the value 1 if the household head is literate, 0 otherwise. It was expected that education status of the household head will have negative association with household food insecurity.

Size of cultivated land (SIZECULT): This is a continuous variable representing the total landholding of the household measured in hectares. It was expected that size of cultivated land will have negative association with household food insecurity.

Access to improved variety (IMPRVAR): This is a dummy independent variable taking the value 1 if the household uses improved variety, 0 otherwise. It was expected that access to improved variety negatively associated with household food insecurity.

Off-farm/Nonfarm income (OFFNONFI): This is a dummy independent variable taking the value 1 if the household participate in off/none farm income sources, 0 otherwise. Participation in non/off-farm activities was expected to be negatively associated with household food insecurity.

Annual farm income (TOTFARIN): Farm income can be defined as the total annual income earned from farm produces i.e. livestock and crop production in Birr. It was hypothesized that farm income and food insecurity status of a household will have negative association.

Annual household expenditure (HHEXPEND): The proportion of income spent on food expenditure matters the status of household food insecurity. The proportion of income spent on food expenditure matters the status of household food insecurity. It was hypothesized that proportion of food expenditure and food insecurity are related negatively.

Insect and pest infestation (PESTINFEST): Insect and pest infestations are important biological factors restraining crop production and causes of food deficit in the study area. In light of this, it was hypothesized that insect and pest infestations will have positive association with food insecurity status of the households.

Use of irrigation scheme (IRRIGSCME): is a dummy variable in the model taking value of 1 if the household uses irrigation and 0, otherwise. It was expected that use of irrigation scheme and household food insecurity are negatively related**.**

RESULTS AND DISCUSSION

Descriptive results

Food Insecurity status of the households

Using 2200 kcal per AE per day as a benchmark to classify food insecure and secured sample households, 85 sample households were found to be unable to meet the minimum subsistence requirement and 65 sample households met the minimum subsistence requirement. In other words, 57 and 43% of the sample households were food insecure and food secure, respectively.

Econometric results

The econometric results of hypothesized variables were presented using binary logit model. This model was used to identify potential explanatory variables affecting household food insecurity through maximum likelihood (ML) estimates. Before running the analysis, it was necessary to check for the existence of multicollinearity among continuous variables and verify the degree of

Table 4. Maximum likelihood estimates of binary logit model.

Variable	Coefficient	Z	Significance
Constant	.3973121	0.25	0.801
Age	.0099781	0.29	0.775
Famsize	-.2173352	-1.23	0.219
Educstatu	-1.091609	-2.05**	0.040
Sizecultilan	-.7317101	-1.95*	0.051
Annfarmin	-.0001918	-2.71***	0.007
Annexpend	.0000834	1.02	0.306
Offnon	-.16031	-0.32	0.747
Imrvari	-.4256152	-0.64	0.521
Irrgschme	-2.466635	-2.10**	0.035
Pesinfest	1.495444	3.20***	0.001

Log likelihood = -48.743881; Number of Observation (N) =150; Log likelihood ratio value: $\left(\chi^2_{df=18}\right)$ = 86.10 *** Pseudo R^2 = 0.8229; *, ** and*** significant at less than10%, 5% and 1%, respectively; (Source: model output, 2012).

association among dummy variables. Variance inflation factor and contingency coefficient were computed to detect multicollinearity for continuous variables and high degree of association for dummy variables respectively.
It is possible to conclude that there were no multicollinearity and association problems between set of continuous and dummy variables as the respective coefficients were very low. This shows that for all continuous explanatory variables the VIF was less than 10 (Table 6). For dummy explanatory variables CC was less than 0.75, which revealed the absence of a severe multicollinearity problem among potential explanatory variables (Table 7).

Factors affecting household food insecurity

With the exception of Linear Probability Model, estimation of binary choice models usually makes use of the method of maximum likelihood (Table 4).

Explanation of significant explanatory variables

Size of cultivated land: Production or output can increased either by intensification or by using higher size of cultivated land. As the cultivated land size increases, the likelihood that the holder gets more output is high. Size of cultivated land negatively and significantly affected the household food insecurity at less than ten percent probability level. The negative sign of size of cultivated land indicates that the size of cultivated land increases, the likelihood of the household to be food insecure will decline. This result coincides with the findings of (Frehiwot, 2007).

Annual farm income: Availability of farm income helps the farmers to purchase agricultural inputs like fertilizers and improved varieties. Therefore, the more rural households use improved technologies, the higher the probability to increase production and productivity, and consequently achievement of food security. The result of the regression analysis indicates that annual farm income negatively and significantly influences household food insecurity at less than one percent probability level. The negative sign of annual farm income indicates that annual farm income increases the likelihood of the household to be food insecure will decrease. Similar study was reported by (Belayneh, 2005).

Irrigation scheme: It was hypothesized that use of irrigation scheme negatively associated with the household food insecurity. The result of the regression analysis supports this hypothesis. Use of irrigation scheme negatively and significantly affected the household food insecurity at less than five percent probability level. The negative sign of use of irrigation scheme indicates that when the households continue in use of irrigation scheme, the likelihood of the household to be food insecure will decrease.

Insect and pest infestation: Pests are one of the constraints of food security in the rural society (Ehrlich, 1991). It was hypothesized that insect and pest infestation have a positive association with household food insecurity. The result of the regression analysis supports this hypothesis. The result of the analysis indicates that insect and pest infestation problem positively and significantly affected the household food insecurity at less than one percent probability level. The positive sign of insect and pest infestation indicates that insect and pest infestation problem persists in the area, the likelihood of the household to be food insecure will

Table 5. Marginal effect of significant explanatory variables.

Variable	Change in the probability of food insecurity	Z	P>|z|
Educatio	-.2603695	-2.07	0.039
Annfarmin	-.0000448	-2.69	0.007
Irrgschme	-.5158117	-3.39	0.001
Pesinfest	.3435646	3.40	0.001
Sizecultil	-.1710421	-1.98	0.048

Change in the probability of food insecurity is calculated at the mean values of Xs.

Table 6. Variance inflation factor test for continuous variables.

Factor	Variable	1/VIF
Age	1.19	0.84
Family size	1.47	0.68
Dependency ratio	1.17	0.85
Farm Income	1.14	0.87
HH expenditure	1.37	0.73
Size of cultivated land	1.05	0.95
TLU	1.12	0.89
Asset possession	1.13	0.88
Mean VIF	1.21	

increase.

Educational status of the household head: Education may help rural people to be easily equipped with new ideas, thinking, and technology that help them to change their negative attitude in to positive once. The result of the regression analysis indicates that educational status of the household head negatively and significantly influences the household food insecurity at less than five percent probability level. The negative sign of educational status indicates that as rural households' continue in upgrading their educational status, the likelihood of the household to be food insecure will decrease. This result coincides with the findings of (Frehiwot, 2007).

Marginal effect of significant explanatory variables

In binary logit model, the changes in probabilities (slopes) can be computed, though not constant, and are termed as marginal effects or the change in log-odds ratio for a unit change in a covariate. In this study the changes in probabilities (slopes) computed by using marginal effects (Table 5).

Size of cultivated land: The marginal change in the size of cultivated land influenced negatively to the probability of food insecurity. The computed result indicates that if the size of cultivated land increases by one hectare, then decreases by 0. 171 when all other variables held at their mean values. With increasing population land size per household member will not increase. So when land size /person decreases, the food insecurity increases.

Annual farm income: The marginal change in annual farm income influenced negatively to the probability of food insecurity. The computed result indicates that if the annual farm income of the households increases by 1000 unit, then the probability of the households to be food insecure decrease by 0. 0448 when all other variables held at their mean values.

Use of irrigation scheme: The marginal change in use of irrigation scheme influenced negatively to the probability of food insecurity. The computed result indicates that if the sample households keep using irrigation scheme, then the probability of the household to be food insecure decreases by 0.516 when all other variables held at their mean values.

Insect and pest infestation: The marginal change in insect and pest infestation problem influenced positively to the probability of food insecurity. The computed result indicates that if insect and pest infestation problem persists in the area, then the probability of the household to be food insecure increases by 0.346 when all other the probability of the households to be food insecure variables held at their mean values.

Table 7. Contingency coefficient test for dummy variables.

Variable	EDUS	IRSE	IRRIC	EXTE	CRE	OFFN	PEST
Edus	1.000						
Irsee	-0.165	1.000					
Irric	0.010	0.012	1.000				
Exte	-0.089	0.238	0.076	1.000			
Cred	0.081	-0.028	0.089	0.076	1.000		
Offn	-0.102	0.300	-0.016	0.150	0.066	1.000	
Pesti	0.022	-0.180	-0.122	-0.045	-0.028	-0.059	1.000

Educational status of the household head: The marginal change in educational status of the households influenced negatively to the probability of food insecurity. Educational status of the household favor the probability of the household to be food secure. The computed result indicates that if the sample households keep in upgrading their educational status, then the probability of the households to be food insecure decreases by 0.260 when all other variables held at their mean values.

Conclusions

The finding of the study indicates that 57% of samplehouseholds were unable to meet the minimum average daily calorie intake per adult equivalent. These food insecure households couldn't obtain the required average daily minimum calorie requirement from their production, purchase, or stock they had. Moreover, their participation in off/nonfarm activity, utilization of irrigation scheme, utilization of improved variety, and their educational status couldn't take out of them from food insecurity status. In addition to this, the existence of insect and pest infestation was significant in the district that inhibits their effort to be out of food insecurity.

The results of econometric analysis for the factors of household food insecurity have shown that the direction and influence of various factors on household food insecurity has varied. Educational status of the household head, annual farm income, use of irrigation scheme, and size of cultivated land associated negatively. Whereas, insect and pest infestation demonstrates positive and significant association with household food insecurity. Finally, the results of econometric analysis made it clear that these factors were the major factors of household food insecurity.

RECOMMENDATIONS

1. Size of cultivated land and household food insecurity associated negatively. However, population increases beyond the carrying capacity of land which fastens the vulnerability of rural households towards food insecurity. Therefore, measures such as appropriate land use, improved technologies and proper extension services should be in place to raise existing land productivity.
2. As annual household farm income and food insecurity are associated negatively on the model result, searching and providing productive technical skill that make farmers competitive on the current farming system and generate income should be sought and promoted. Farm income-food insecurity relationship leads to propose high value of cropping pattern.
3. It was found that insect and pest infestation and household food insecurity associated positively. Thus, provision and awareness creation about different biological and chemical conservation measures should be provided so as to reduce the problem. Therefore, governmental and nongovernmental organizations that are working in the area should give due attention to reduce the problem.
4. The result of the analysis indicates that the use of irrigation scheme and household food insecurity associated negatively. Therefore, the agricultural and rural development office and nongovernmental organization that are working in the area should encourage, facilitate and strengthen the farmers to use small scale ground water irrigation activities so as to increase food production and reduce food insecurity.
5. Educational status of the household head in relation to food insecurity confirms that negative and significant. Therefore, farmer training centers should give due attention in strengthening the already provided training to the farmers to change their attitude and upgrade their production potential. In addition to this, strengthening informal education and vocational or skill training should be promoted.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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