

The Determinants of Household Food Insecurity in Rural Areas: (In Case of Amhara Region East Gojjam Bichena District)

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Abstract

Improving food security was closely related with the elimination and reduction of poverty at local and individual level. Most of the rural household in Bichena district were suffered by food insecurity therefore this study would be investigate to the problem of food insecurity in the study area through using extend primary data. The descriptive and Logistic regression model was employed and estimate based on the primary data collected from 94 representative sampled rural households of the study area. Among the explanatory variables age of the head, level of education, status of technology adaption, ceremonial expense and accessibility of credit service found to be statically significant factor which influence the rural house hold food insecurity. Therefore, the policy which creates affordable micro and small credit institution, expand adult and formal education and expand rural infrastructure believed to minimize the rural food insecurity problems.

Keywords: Rural food insecurity, Bichena District, *Logistic* regression

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1. Introduction

People need access of enough food at all times for an active and healthy life. The world food situation has never been better, yet more than 700 million people in the developing world did not have access to sufficient food to lead healthy and productive live, more than 180 million children are under weight, diseases of hanger and malnutrition's are wide spread (M.L. Narasaiah, 2005). Rising food price contributed to significance in food insecurity worldwide particularly among poorer nation. Approximately one billion or one sixth of the world population subsists on less than \$1 per day. At household level increasing food price have the greatest effects of on the poor and food insecure population who spends 50 to 60% or more their income on food (USAID, 2009). Currently despite an improved global cereal supply resulting from increased cereal production in 2008 and associated decline international prices, foods remain high in most developing countries (FAO, 2008/9). Increased food price continue to negatively affect access for significant number of low income vulnerable population; Contributing ongoing food emergencies in 31 countries worldwide, including 20 African Countries (USAID, 2009).

Ethiopia has experienced a worsening trending in level of poverty during the 1990's. Food production failed to keep pace with population growth rate in the last 30 years. The food gaps widened in the 1980's ranging between one and two million metric tons of cereal in 1985 and continued through 1995 (Sereena Singh and Shuhan Hu, 2011). Ethiopia is the largest recipient of food aid in Africa, food to Ethiopia between 1984 and 2000 amounted to 10 million tons equivalent to 10 percent of annual national food grain supply (AREE, 2007/2008).

The government of Ethiopia set strategy for sustainable economic growth through Agricultural Development Led Industry (ADLI) strategy. This strategy focus on maximizing Agricultural growth in the initial stage of economic development and which at the end believed to address food insecurity problem. Within the context of ADLI the government of Ethiopia launched its food security strategy in November 1996. The food security strategy identified arrange of causes of inadequate growth in food production and increasing food insecurity, thus include inadequate and variable rains falls, soil degradation, conflict, poor development infrastructure, insecurity of land tenure, insufficient strategy capacity, heavy load of work for women and special problem related to pastoralist (Amaha Wolday, 2004).

One of the consequence of the poor performance of Ethiopian agriculture is wide spread food insecurity. An estimated 50 to 60 percent of the country's population is food insecure. For this reason, Ethiopia is still listed among the low income and food insecure countries in the world (WBR, 2007). According to World Bank Report in 2000, the main causes of food insecurity in Ethiopia includes adverse climate change, declining land holding per household, drought, war, flood, lack of diversity of item, inefficient and lack of credit institution, administration problem, socio-economic problems, at the same time the accessibility is limited due to weak subsistence agricultural economy, depletion of assets, absence of income and wide spread of illiteracy in rural population in Ethiopia (WB, 2000).

Most of the researchers such as (Melese, 2015; Adugna, 2012), conducted in related topic, but they had not incorporated the important variables like ceremonial expense, which has great influence on rural house hold food insecurity. On the other hand most of the studies have done using descriptive analysis. Hence, this study including these important variables which excluded in prior work and apply econometrics model especially binary logistic

regression.

Moreover, the present study area, Bichena district, is one of the food insecure district of Eastern Gojjam administrative zone in Amhara regional state. The district is food insecure due to different causes like education level, family size, small landholding size, drought, administration problem, socio-economic problem, income constraint, absence of oxen, market problem, absence of credit service, etc (BARD,2007). However, there was no research have been done in identifying the major responsible factors that is responsible for household food insecurity in study area. Therefore, this study aimed to investigate the level of food insecurity and the main determinants of farm household food insecurity in Bichena district.

2. Literature Review

Since the World Food conference in 1974 due to food crises and major famines in the world, the term food insecurity was introduced, evolved, developed and diversified by different researchers. Food insecurity is defined in different ways by international organization and researchers without much change in basic concept. According to World Bank, food insecurity can be defined as the lack of capability to produce food and to provide access to all people at all time; enough food for an active and healthy life. Hamilton defined food insecurity as limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways. In 1996, the World Food Summit held in Rome declared and broadly set the definition of food security as “all people at all times have physical and economic access to sufficient, safe and nutritious foods to meet their dietary needs and food preferences for an active and health life”. Although there were agreements on some aspects of food security, controversies also existed. Food insecurity exists when people do not have adequate physical, social or economic access to food (FAO, 2003).

Food insecurity is limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (USDA, 2006). Food insecure Households that report three or more conditions that indicate food insecurity is classified as “food insecure.” The three least severe conditions that would result in a household being classified as foods insecure include if they worried whether their food would run out before they got money to buy more; if the food they bought didn’t last, and they didn’t have money to get more and if they couldn’t afford to eat balanced meals.

In theory household food insecurity is often classified in to two types, which is chronic and transitory food insecurity. Chronic food insecurity refers to persistently inadequate diet caused by the continual inability of household to acquire needed food either through market purchase or production. The main factors such as the household are landless, shortages of draft animal, elderly, disabled of household head and poor pastoral. While, transitory food insecurity on the other hand temporarily food decline in household access to needed food. The main factor such as instability food price, instability of income and production in its worst form of transitory food insecurity can results in famine (Wolday Amaha, 2001).

According to empirical analysis of Ramakrishna *et al* (2002) in North Wello Zone, cereal production, educational status of the household head, fertilizer consumption, household size, land size, and livestock were found to be the most determining factors of household food security. On the other hand, Kidane *et. al* (2005), identified the determinants of households’ food insecurity using a logistic regression procedure in Koredegaga peasant association, Oromia regional state, Ethiopia. The result show that, farm land size, ownership of oxen, fertilizer application, education level of household heads, house hold size, and per capita production were found to be significantly influence the household food insecurity. Bimerew (2014), used binary logistic model to examined the status and factors affecting food insecurity of rural household in Babile, Ethiopia. Accordingly, Size of cultivated land, education 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 descriptive analysis result by Melese(2015), show that shortage of arable land, lack of modern agricultural farming, lack of advice on how to use improved seeds and fertilizer ,dependence on single method harvest per year are major environmental problem hindering household from being self-sufficient in food production.

3. Methodology and Data

3.1. Description of the study area

This study was take place in Bichena district, which found in Amhara regional state, Ethiopia. It is one of the moderate climates in east Gojjam zone with 30 Kebeles and located east of Debay Telat gin, north of Dejen woreda, west of shebelberenta woreda and south of Enarij Enawoga Woreda. The agro-ecology of this area classified in to three zones including dega, woynadega and kola. Based on 2007 causes conducted by CSA, this district has total population of 84,967 of whom 47,444 are male and 37,523 are women, 7.8% its population are urban dwellers. In this district more than 90% population depends on agricultural sector and the total area is 760,265 hectare from this 94.6 is rural area and 5.4% is urban area from the total area 2462 hectare is used for agriculture cultivated area (MAWWRDO-2008).

3.2. Research Design and Source of Data

The cross-sectional (survey) research design was applied in this study. Accordingly, demographic, socio-economic and institutional data related to household food insecurity was collected from 94 household as a sample from the total households of representative kebele using structured and unstructured questionnaire. In addition to quantitative data through structured questionnaire, the qualitative research strategy used to analyze data that was collected using the unstructured interviews with rural experts; kebele administrative body; and consumers to capture supplementary information and to observe the validity of information's from household survey. All required data was collected from three selected kebele households. These kebele include yetmen, zebeche and yemerite and the selection under taken in the following approach.

Table 3.1. The list of selected Kebeles and Sample size in each study site

Name of kebele	No. of house hold	Sample size
Yetmen	714	43
Zebeche	417	25
Yemrite	424	26
Total	1555	94

Source; own survey, 2019

3.3. Methods of Data Analysis

3.3.1. Descriptive Statistics

In this study the descriptive statistics such as mean, percentages, tabulation, frequency and graphs were used in analyzing the data. Descriptive statistics are important tools to present research results clearly and concisely. For example they help to compare and contrast different categories of sample units with respect to the desired characteristics so as to draw some important conclusions.

3.3.2. Econometric Model Specification

The dependent variable of this study is dichotomous taking two variables, 1 if the household is food insecure and 0 if secure. Therefore, the dependent variable in this model is discrete consisting of two outcomes, yes or no. In this case, the use of Ordinary Least Square technique for such variables poses inference problems, and thus not appropriate for investigating dichotomous or limited dependent variables. In such circumstances, maximum likelihood estimation procedures such as logit or probit models are generally more efficient (Gujarati, 1988).

The econometric models, that enable to analyses a yes or no type dependent variable, are called dichotomous or dummy variable regression models in which determinants of an event happening or not happening can be identified. The logistic distribution function (logit), and normal distribution function (probit) are the most important models used in this case. These models are different from that of conditional regression models in that the outcome variable in these functions is binary or dichotomous (Hosmer and Lemeshow, 1989). The logit and probit models are comparable, the main difference being that the logistic function has slightly flatter tails that is, the normal curve under logit function approaches the axes more quickly than in the case of probit function. Due to the fact that the binomial logit model is either to estimate and simple to interpret, this regression model is used in this study.

The mathematical formulation of logit model is:

$$\gamma_i = E \left(Y = \frac{1}{X_i} \right) = \frac{1}{1 + e^{\beta_0 + \beta_1 X_i}} \text{----- (1)}$$

Where γ_i is the respondent variable, x_i is a vector of explanatory variable shown in table 3.2 and β is a vector parameter to be estimated. If $\gamma_i = 1$ household is food insecure and $\hat{Y} = 0$ otherwise.

The probability that an individual household food insecure set as:

$$\gamma_i = \frac{1}{1 + e^{-z_i}}$$

The probability that an individual household food secured expressed by:

$$1 - \gamma_i = \frac{1}{1 + e^{z_i}}$$

The ratio of the probability that the household food insecure to the probability of food secured can be as follows:

$$\frac{\gamma_i}{1 - \gamma_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}}$$

Taking the ratio of the above equation and transferring it into logarithm, it can be:

$$L_i = \ln \left(\frac{\gamma_i}{1 - \gamma_i} \right) = Z_i = \beta_0 + \beta_i X_i + U_i \text{----- (2)}$$

Where: - X_i - the explanatory variable described and hypothesized in table 3.2 below; Z_i represent a function of explanatory variables; L_i - a logit model; β_0 - the intercept; U_i - the stochastic disturbance and β_i - coefficient/parameters to be estimated.

3.4. Hypotheses and Justification of explanatory Variables

One of the important parts in this section is to specify and hypothesize the dependent and explanatory variables that was used in the model. The definition, measurement and hypotheses of variables was summarized in the following table.

Table-3.2 Hypothesized Effect of Explanatory Variables on rural household food insecurity

Dependent variable	Nature of variable	Variable definition and measurement	Expected effect
Food insecurity	Dummy	1- if household is food insecured and 0 if other way	
Independent variable			
Age of the farm household head	Continuous	Age of the household head in year	-
Techuse	Dummy	1- if house hold use tech. 0 if not	-
size of family	Continuous	number of family members	+
Educational level	Continuous	Education of the household in years of schooling	-
Inframktinfo	Dummy	1 if household Access of infrastructure market information.0 if not	-
Access to credit	Dummy	1 if housholdAccess of credit 0 if not	-
Ceremexp	Continuous	Ceremonial expense in birr	+

Source: Authors Hypothesis (2019)

Compared to the younger one older people have relatively richer of the social and physical environments and greater experience of farming activities. Older householdhead's are expected to have better access to land than younger heads, because men either have to wait for land redistribution, or have to share land with their families(Felekeet.al 2005). Hence, age of household head are positively correlated with food security or negatively with food insecurity.

Moreover, 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-income educated households (Degye, 2014). Thus, education status is hypothesized to have a positive effect on household food security. However, large family size tends to exert more pressure on consumption than the labor it contributes to production, then it has negative correlation with food security (Zegeye, 2012).

Adopting productive agricultural technology can contribute to increase food production (food availability), increased agricultural and rural income (better access to food), and entails positive spillovers to other sector and contribute to economy wide growth (Kidane et al., 2006). Likewise, access to infrastructure and market information such as adequate energy and irrigation supplies, high-speed communications, and seamless transportation systems connecting areas of high production with centers of high consumption, all play a crucial role in safeguarding food security. Hence, these variable have negative correlation with insecurity.

Credit serves as a means to boost production and expand income generating activities (Degye, 2014). Thus, a household which has access to credit does initiate investment in farm and nonfarm activities and achieve food security. While, households who adore frequent ceremonial expense like weddings, funerals, and religious festivals, such as meskel, ester, remedan likely to mislay the adoptive capacity of family food security. Thus, it has negative relation with family food security.

4. Results and discussion

4.1. Descriptive Analysis

The descriptive statistics were employed to describe the demographic and socio-economic characteristics of sampled householders. This study was Proceed on total sample size of 94 respondent's selected from target population in study area. Table 4.1 presents summary statistics of sampled household's socio-demographic features

Table 4.1 Socio-economic and demographic characteristics of sampled householders

Household characters	Food insecurity level of household		Cumulative Percentage
	Above food insecurity line	Below food insecurity line	
Age			
25-35	13	22	35%
36-45	24	24	48%
46-56	14	3	17%
Above 54	0	0	0%
Sex			
Female	11	14	25%
Male	40	35	75%
Level of Education			
Illiterate	8	37	45%
1-4	10	3	13%
5-8	33	9	42%
> 9	0	0	0
Household Size			
1-3	6	3	9%
4-7	29	28	57%
8-10	16	18	34%
> 10	0	0	0%
Technology adoption			
Adaptor	31	11	51%
Non-adaptor	11	29	49%
Access to infrastructure			
With access	21	20	50%
Without access	20	21	50%
Access to Credit			
With access	22	16	46%
Without access	20	24	54%

Source: own survey, 2019

The older the household head, the more experience s/he has in farming and weather forecasting. Moreover, older persons are more risk averters, and mostly they tend to diversify their production activities. For instance out of 35 respondents under age 25 to 35, 22 are below food insecurity line but only 13 are above the line. However, on age 36 to 45 five 50% were above and the some number is blow the line. Table 4.1 realize this fact that when the age of house hold head increase the probability to be food insecure decline. According to table 4.1, educated individuals are more food secured than illiterate one. As it can be understood from the table 4.1., individuals who have better access to infrastructural facility, credit service and more family to new technology are less food insecure compared with their contrary one.

4.2. An econometric estimation results and Interpretation

In this sub-section, binary logistic regression model, was employed to identify the causes of household's food insecurity in study area using STATA software package. However, before running the regression analysis, the diagnostic tests, such that, the existence of multicollinearity and the problem of heteroscedasticity of variables included in the model are needed to be checked both for the continuous and discrete explanatory variables. An important property of R^2 is that it is a non-decreasing function of the number of explanatory variables present in the model; as the number of explanatory variables increases, R^2 almost invariably increases. Thus, as R^2 is the measure of goodness of fit of a model, almost 81.40% variation in the dependent variable is explained by the joint explanatory variables incorporated in the model.

According to Gujarat (2004), when the values of VIF approach to infinitive there is serious problem of multicollinearity, while if VIF is below 10 there is no much problem. In this study all the computed value of VIF for explanatory variables were blow five. Therefore, there is no evidence of multicollinearity problem in our model. The data were tested for heteroscedasticity using the Breusch-Pagan test (Wooldridge, 2012). The Breusch-Pagan test evaluates the null hypothesis of a constant variance in the data. Accordingly, the null hypothesis of a constant variance was not rejected implying absence of heteroscedasticity in survey data.

Table 4.2: The maximum likelihood estimates of the logistic model

Variables	Coefficient	Odds ratio	Wald Statistics	P-Value
Age	-.3033729	.7383237	-2.05**	0.040
Edu	-.8082826	.4456227	-1.97**	0.049
Fsize	.4200453	1.522031	1.05	0.292
Techuse	-6.918449	.0009894	-2.17**	0.030
Cexp	.0020088	1.002011	2.41**	0.016
Mktinfo	3.691744	.0249285	-1.64	0.101
Credit	-5.522683	.0039951	-2.28**	0.022
_cons	12.83888	376576.2	1.92*	0.055

Log likelihood = -10.565676; LR chi2(7)= 92.5;

Prob > chi2=0.0000; Pseudo R2=0.8140.

Note: ***, ** and * is significant at 1%, 5% and 10% probability level, respectively.

As indicated in table 4.2, among explanatory variables age of house hold head, level of education; adaption status of technology; ceremonial expense and access to credit service significantly affect the house hold food insecurity.

The coefficient of age variable was negatively influenced to food insecurity and it was significant at 5% level of significance. As the age of the households increased, they become more experienced in farming activities to reduce food insecurity and they become more aware about saving and investment. The households who were more age's lesser by 0.4456 times odds of being food insecured, than the households who has less ages, other things remains the same.

Education level of the households has the significant role in adaption of new technology, and how to fight the food insecurity. With the lack of education (traditional norms), it is difficult to accept the new technology and how to earn income which directly related with the expenditure for food items. Therefore, as the education level of the household increase by 1 year, the households who were food insecured are lesser by 0.4456 times odds of being food insecured, than the households who were not educated.

The adaption of new technology like chemical fertilizer, improved seeds, irrigation, plugging machinery, etc has the vital role in improving of the production of the land. This variable significantly influence the house hold feeding. The improvement of land production leads to increase consumption and reduces food insecurity. Ceremonial Expense has significant effect on the causes of household food insecurity. Access to credit has significant effect on the dependent variable. According to the logistic regression, this variable influenced food insecurity negatively and significant 5% level of significance.

5. Conclusion

The food insecurity issues in Ethiopia should be viewed at different level, such as national, regional, household and intra-household level. The bichena woreda farmers were obstacle by different factors not to access enough food throughout the year. Socio-economic factors such as low level of income, low level of education, low level of access to new technology such as improved seeds, chemical fertilizer, irrigation, high expenditure for social ceremonies and celebrations. In addition to this, the weakness of institutional factors also one of the hindered for food self-sufficiency to rural household, such as absence of enough rural financial institutions, poor market integration and problem of land distribution by local leaders were the main challenges of the study area farmers not to have sufficient cereal production to their family members.

Demographic factors such as low family planning and low land holding size compared to family size, due to weakness of rural administration, low rural infrastructure. In addition, the adaption of new technology such as improved seeds, chemical fertilizer, irrigation, pesticides are very low due to the reasons of high input price, income constraint, and not given based on the capacity of the farmers. There is low habit of loan (credit) use due to high interest rate in the study area. Due to all the above factors, the agricultural productivity is very low in the study area and the households suffered by food insecurity. Hence, the policy which creates affordable for micro and small credit institution, expand adult and formal education and expand rural infrastructure believed to minimize the rural food insecurity problems

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