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Econometric Analysis of Household Food Security in some Pepper Livelihoods of Shashogo Woreda, Hadiya Zone, Ethiopia

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Abstract
The economic significance of pepper livelihoods is not appropriately quantified. Thus, this paper was initiated to carryout econometric analysis of household food security in some pepper livelihoods of shashogo woreda, hadiya zone, Ethiopia. The study employed cross sectional survey design which incorporates both quantitative and qualitative survey method. The data were collected from primary and secondary sources. Primary data were gathered by using structured household survey questioners, key informant interview and focus group discussions. For this study, data from 322 sample households were collected from three rural kebeles namely: kemacho borara, shaymbe wanchikota and alage. The data were analyzed by using spss software version 20. Based on the finding of the study recommendation of the following issues are forwarded as recommendation to enhance rural households' food security situation in the study area. As study results showed one of the major problems of the households to ensure food security. Therefore, based on the researcher finding the following recommendations were forwarded: population number increase from time to time whereas land holding size and soil infertility are declining. Therefore, to alleviate this problem providing training regarding to family planning is essential. To reduce the problem of more sever land scarcity in the shashogo woreda to where there is available land within the region. Hence, shashogo woreda's government bodies should take this action into consideration. Enhancing the indigenous knowledge on preservation and storage of food, post-harvest period saving, and diversifying income sources. To maximize agricultural production government should facilitate access of agricultural inputs in credit basis.

Keywords: econometric analysis, household, food security, pepper livelihood

Introduction
Pepper plays a key role in food security in many small scale poor farmers in Ethiopia (Abinet, 2011). However, production was hampered by a multitude of factors. Among these problems, shortage of varieties, type of cultivar, traditional and backward production methods, lack of proper and adequate inputs (fertilizers, improved seeds, pesticides, etc,), lack of research outputs and lack of extension services on production techniques, and many other problems are the main constraints that contributed for lower productivity in Ethiopia (Alemu *et al*., 2000). Moreover, the problem was shortage of improved varieties, water logging condition, lack of skill and knowledge management, traditional production methods and, pest and diseases. Shashogo *Woreda* is one of the most flood affected area. From the Shashogo *woreda* Agricultural and Natural Resource office information, this area is not self-sufficient in crop and livestock production. As a result, to improve the *woreda* food security status; governmental and non-governmental organizations supplied wheat, maize, millet and oil provided for chronic food insecure households by accomplishing development activities.

This indicates that, significant numbers of populations are vulnerable to food insecurity (SWANRO, 2016). The *Woreda* is mostly affected by frequent flooding of Boyo Lake. Consequently livestock and human causality, damage to flora, damage to crop farms, famine and malaria infection are the major problems reported from (SWANRO, 2016). The residents suffer from frequent flood that originating from highlands of neighboring zones during the rainy seasons (USAID, 2000). According to report of SWANRO (2016), that the *woreda* agricultural productivity decreases from through the year at different reasons such as physical, demographic, and

socio-economic factors. This source also explains about the factor that reduces agricultural productivity like erratic rainfall, soil infertility, pest infestation and population pressure the *woreda* food security situation.

However, required level of farmers produce enough pepper but as a SWANRO (2016), revealed that the household's food security status didn't ensured still now. These problems include traditional production methods, disease, and absence of pesticide and usage seed retained. Smallholder farmers suffer from low incomes and living standards, poor nutrition, poor housing and health (FAO, 1997). Only very few case research have been done in the area and households level. Abinet (2011), had done the research on the impact of area enclosure on soil quality and farmers' perception in Hadiya zone, Shashogo *Woreda*. Besides, limited scientific document are not available on the pepper production and household food security nexus in the study area. This study to fill the gap by household farmers with income of pepper production for alleviating rural household insecurity remains uninvestigated in the study area.

In Shashogo *Woreda* of south Ethiopia, information on the contribution of pepper in providing support for households with low food security status that often lack of the improved seeds, suffer from shortage of land access, and weak financial supports is not sufficient. The overall economic conditions that characterize households with high food security status are not adequately supported through empirical research. Poor, pepper producing households' challenges on inadequate or limited access to community resources that promote and support technology development and research center are not appropriately identified in the study area. Thus, this study attempts to explore the major demographic and environmental factors that affect the pepper production by the households in the study area.

A country could be food secure because it has the resource to provide sufficient food for its whole people, but could still have food insecure households who may not access to the food. In extreme cases, it may even be the reality that food insecure people could live in food secure households due to inequalities in intra- household distribution. Thus, genuine food security is achieved only when the concept is functional at the individual level (World Bank, 2000). In a given country, food security can be viewed from nationwide or household or individual perspectives. National food security is viewed as the ability of the country to produce, secure, and maintain adequate levels of supply to meet demand throughout the year, both through domestic production and imports. Food supply insecurity, also called national aggregate insecurity, arises when a country is unable to supply its aggregate food requirement either through domestic production, imports and reserves (World Bank, 2000).

There is no single indicator to measure food security. Many different indicators are needed to capture the various dimensions at country, household and individual levels (Hoddinnot, 1999). Since food security is influenced by different interrelated socio economic, physical, institutional and political factors, it requires understanding of multidimensional contexts of the target area. Hence, combining both qualitative and quantitative household data sources in studying of food security activities allows knowing holistic nature of the study area comprehensively as argued by (Degefa, 2006) since some indicators only appropriate for assessing the process while others monitoring of the outcomes of certain project goals.

It is up to the researcher to select a combination of indicators that suit the objectives of the investigation, the level of aggregation and specific circumstance of the study and study area (Carletto & Morris, 1999). Generally, the most common indicators to household food security are food availability, food consumption or access and composite food security.
 Measuring food security in terms of food availability focuses on national or household agro food output or supply (Jacobs, 2009).

Thus, this paper was initiated to carryout econometric analysis of household food security in some pepper livelihoods of Shashogo Woreda, Hadiya Zone, Ethiopia.

Materials and methods
Methodology
The purpose of this study was to investigate the pepper production and household food security in Shashogo *Woreda,* Hadiya Zone, SNNPR, and Ethiopia. The research design employed in this study was cross sectional survey design which incorporates both quantitative and qualitative survey method. The data were collected from primary and secondary sources. Primary data were gathered by using structured household survey questioners, key informant interview and focus group discussions. For this study, data from 322 sample households were collected from three rural *kebeles* namely: Kemacho Borara, Shaymbe Wanchikota and Alage. The data were analyzed by using SPSS software version 20 employing descriptive statistics, logistic regression model and food security measuring models household food balance model, household food insecurity access scale, and household dietary diversity model were used to analyze food security status of households.

Results
Econometric Analysis
Factors of Household Food Security by using Binary Logistic Regression: Based on the contribution of pepper production on household food security, the study revealed information concerning the contribution of the pepper factors to household food security

using binary logistic regression analysis, using binary indicators food security which is: 1-household food security, 2-household food insecurity. Binary logistic regression model was used to identify factors which affect food security in Shashogo *Woreda*. The systematic association between each predictor variables and household food security situation was conducted by cross tabulating each predictor variables against the outcome variables. The selection process was beginning with a careful analysis of each variable. Therefore, the previous section dealt mainly with a description of the sample population and test of the existence of association between the dependent and explanatory variables to identify the factors that affecting pepper production and their affecting households' food security situations using descriptive statistic. Nevertheless identification of factors by these descriptive analysis alone is, not enough unless the relative influence of each factor is known for priority based intervention.

Before running the binary logistic regression model multicollinearity diagnostics test was done with all hypothesized explanatory variables to check the degree of multic between each independent variables. Coefficient of contingency (CC) was computed using SPSS version 20 software which used to check correlation between independent variables. For this reason, all of the explanatory variables were included in the final binary logistic model analysis.

Assessment of Goodness of Fit of the Model
To determine the significance of logistic regression model or goodness of fit there are several techniques involved to assessing the appropriateness, adequacy, and usefulness of the model. The person's Chi-square, the likelihood ratio test, Hosmer and Lemeshow goodness-of-Fit test (assesses the fit of the model by comparing the observed and expected frequencies); and Nagelkerke R-square are the most commonly used measures of goodness of fit for categorical data (Hosmer and Lemeshow, 1989).

Likelihood Ratio Test
The likelihood ratio test is commonly used for assessing the overall fit of the logistic regression model. The likelihood ratio test uses the ratio of maximized value of the likelihood function for the full model over maximized value of the likelihood function for the restricted (smaller). That means, which is defined as $(L_0 - L_1)$ where L_0 and L_1 are the maximized log-likelihoods under the null and alternative hypothesis, respectively (Menard, 2002). In this study, the result of likelihood test statistic (LR= 411.836) significant at 1% level.

Hosmer and Lemeshow Goodness of Fit Test
Hosmer and Lemeshow goodness of fit statistic measures the correspondence between the actual and predicted values of the dependent variable. Hosmer and Lemeshow person Chi-square statistic is used to test the overall model of goodness-of-fit test of the null hypothesis that the model adequacy fit the data. The result presented in Table 1 shows that Hosmer and Lemeshow goodness-of-fit test statistic is not significant.

Table 1: Hosmer and Lemeshow Goodness of Fit Test

Chi-square	df	Sig.
6.278	8	0.616

The null hypothesis that the model fits the data against the alternative that the model does not fit was tested using Hosmer-Lemeshow test. A non-significant Hosmer and Lemeshow means that the observed and predicted counts are close to each other and the model describes the data well. The measures of goodness-of- fit indicated in Table 2 are R-square indices defined by Cox and Snell and Nagelkerke. Nagelkerke R square is 0.126 (13%) and the Cox and Snell R square are 0.95 (95%).

Table 2: Model Summary

Cox and Snell R square	Nagelkerke R square
0.95	0.126

In binary logistic regression analysis, 12 variables were hypothesized as factors that affects household food security situation, of which 7 variables were found to be statistically significant at different levels (1% and 5%) significance level. The maximum likelihood estimates of binary logistic regression model shows that the variables that are found to be significant are age of household heads, family size, farm land size, tropical livestock unit (TLU), drought, storage facilities and access to credit found to be significant to affect the households food security situation in the study area at 1% and 5% significant level (see Table 3). While the remaining five variables sex of household head, educational status of household head, shortage of improved seed, disease and price fluctuation were not significant in explaining the variations in the dependent variable at 1% and 5% significant level.

Out of the variables that significantly affect the households' food security situation in the study area, tropical livestock unit (TLU), farm land size and storage facilities have a positive and significant influence on the households' food security situation. On the contrary, age of households, family size, access to credit and drought has a negative significant influence on the households' food security situation. A positive estimated coefficient in the model indicates food security increases with an increased in the value of the

explanatory variables. However, negative estimated coefficient in the model implies households' food insecurity with a decrease in the value of the explanatory variables.

Table 3: Logistic model result of factors affecting household food security

Variables	B	S.E.	Wald	Df	Sig.	Exp(B)
Sex of the HH	-1.127	.816	1.910	1	.167	.324
Age of the HH	-1.326	0.408	10.580	1	0.001***	0.266
Family size	-1.095	0.350	9.427	1	0.002***	0.258
Education status	-.219	.650	.114	1	.736	.803
Farm land size	0.688	0.412	2.794	1	0.095*	1.990
TLU	0.247	0.078	10.124	1	0.001***	1.280
Drought	-0.752	0.361	4.343	1	0.037**	0.472
Storage facilities	.983	.439	5.001	1	.025**	2.672
Shortage of improved seed	-1.127	.816	1.910	1	.167	.324
Disease	0.123	0.342	0.130	1	0.719	1. 131
Access to credit	1.456	.662	4.847	1	.028**	4.291
Price fluctuation	.083	.263	.098	1	.754	1.086

Pearson chi-square	6.278;
-2Loglikelihood	411.836
Correctly predicted food secure	15.8
Correctly predicted food insecure	91.5
Overall prediction	63.1
Sample size	322

*Note: *** and ** are significant at 1% and 5% significance level, respectively.*

Analysis of the Significant Explanatory Variables

Age of household head: the result of the logistic model output revealed that age of household has negative and strong significant association with households' food security situation. This variable refers to the sequential age of the respondent at the time of the survey, measured in years. Age of a farmer can enhance or prevent the retention of food production scheme. The effect of age of the farmer on food security is found at significant level.

Family size: The logistic regression model analysis result shows that household size was found to be strongly significant and negatively related with households' food security at significance level. Large family size creates more pressure on household food security because more food and nonfood expenditure is spent for them increases.

Farm land size: was positively related to households' food security situation similar to the hypothesized effect and it has significance level. The logistic model result suggests the larger the land size, the better food secure state of the household. Moreover, the result implies that the smaller the farm size, the more likely is the household to be food insecure and also those households have no enough land to obtain enough production.

Tropical livestock unit (TLU): It is the total number of livestock holding of the households measured in tropical livestock unit (TLU). The model result indicates it has positive and significant relation to households' food security at significance level. This implies that an increase in livestock number increases the households' food security status. Livestock serves as food, draft power, manure source, cash income source and live animals in times of food shortage to buy grains, which ultimately helps farmers not to lose productive assets which will have significant impact on subsequent year production and productivities. The household having larger size of livestock can have better food security status.

Drought: It has highly significant influence on household food security situation at significance level. Thus, the model results show that those farmers with relatively drought are more food insecure in area. The result implies that hypothesis was drought problem is one of the physical factors affecting crop production and productivity.

Access to credit: It was also found the source of credit in the study area is (OMFI) Omo Micro Finance Institution. The study revealed that some households said that they don't want credit and the rest complained about high interest rate but others said the availability of agricultural credit to the subsistence farmers who have little or no capital to invest in farming is a paramount important. The possible explanation is that assumption was access to credit service helps the farmers to purchase agricultural inputs such as fertilizers, improved seeds and oxen, and which in turn increases production and contributes to food security. If farmers perceive they have access to credit, they can get more production from a given plot of many.

Price fluctuation: The result of binary logistic regression reveals that input cost has significantly affect household food security at significance level. Thus, it demonstrates a negative relationship with household food security similar to the hypothesized effect. This reveals that, if the price fluctuation decrease, the food insecurity probability also increases. The result of price fluctuation that high input cost, as a problem was significantly affect household food security.

Conclusion
The study revealed that less proportion of the sampled households suffer from transitory and chronic food insecurity problems. Furthermore, the logistic regression model study has shown that the major factors affecting the food security situation of rural households were sex of the households, age of the households, family size, total farm land size, drought, disease and pest condition, livestock holding condition and shortage of improved seed were identified as a major rural households' food security problem in the study area. Study also indicated, livestock holding, land holding size and disease and pest condition have a significant and positive influence on the state of household food security. In conclusion, food security models relate to food availability identified by using household food balance model, food accessibility by using household food insecurity access scale model and food utilization through using household dietary diversity score models are addresses the rural household food insecurity level of the study area.

Recommendations
To alleviate the problem of econometric quantification of the different factors of pepper production providing training regarding to family planning is essential. To reduce the problem of more sever land scarcity in the Shashogo *Woreda* to where there is available land within the region. Hence, Shashogo *woreda's* government bodies should take this action into consideration. Enhancing the indigenous knowledge on preservation and storage of food, post-harvest period saving, and diversifying income sources. To maximize agricultural production government should facilitate access of agricultural inputs in credit basis. In addition to that, to alleviate input cost problem, using compost instead of chemical fertilizers support poor households. Government should give high emphasis to increase food production and productivity of the farmers through improving better access and availability to improved agricultural technologies: promoting strategies such as crop diversification, providing of subsidized farm inputs to enhance households' food production and productivity. Livestock holding is one of the factors affecting the food security status of households in the study area. Therefore, based on the results of this study to improve production and productivity of the livestock, this will eventually increase food security situation of the rural households.

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