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The Determinants and Status of Household Food Security: The Case of Bule Hora Woreda, West Guji Zone Southern Ethiopia

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ABSTRACT

The changes within the global food availability and production create remarkable challenges for human beings around the world. Majority of the world population, especially sub Saharan countries including Ethiopia are in food uncertain. Though, this study focuses to identify the determinants and status of household food security in Bule Hora Woreda. The major objectives of the study were to assess the status and sightsee determinants of household food security in Bule Hora Woreda. Three stage random sampling technique was employed to select the eight kebeles, while systematic random sampling technique was employed to select the 385 representative sample household. Caloric acquisition per adult equivalent per day is used to measure the food security status of households. The descriptive analysis revealed that 67.3% of the sample households were food secure and 32.7% were food insecure. Based on the survey of 385 households the binary logistic regression model was fitted to analyze the potential variables determining household food security in the study area. Among 14 explanatory variables employed in the model land size, livestock ownership, credit service, agricultural extension service, and irrigation service influence food security positively and statistically significant, whereas, family size and infestation (insect, pest and (disease) influence food security negatively) and was statistically significant. The estimated model correctly predicted 82.26% and different recommendations were made based on the findings of the study.

Key words: *Food Security, Access, Availability, Utilization and Household Head*

1. Introduction

1.1 Background of the Study

Food security and insecurity are terms used to describe whether households have access to sufficient quality and quantity food or not. The concept of food security was originated in the mid1970s during the international discussion on global food crisis. The initial focus of food security was primarily on food supply problems of assuring the availability and to some degree the price stability of basic food stuffs at the international and national level (FAO, 2002). Food security is perceived at the global, national, household, and individual levels. However, food security at global level does not guarantee food security at the national level. Similarly, food security at the national level does not guarantee food security at the household or even the individual level (Duffour, 2010).

The major causes of food insecurity in Africa are numerous. These are extreme rain fall, intolerable temperature (climatic hazard), severe environmental degradation, rapid population growth, low purchasing power of the people and recumbent brought (Fews Net, 2011). Furthermore, Ethiopia is one of the developing countries which characterized by low Per Capita Income (PCI) and faced problem of food insecurity. The most important ones are the challenging environment (erratic and volatile type of rain fall which differs from place to place), population pressure, diminishing landholding size, lack of farm technology and innovation, lack of agricultural product diversification and market integration, lack of access to credit, limited rural infrastructure and few opportunities for off-farm employment. All these factors affect the production and productivity of the household and erode the productive assets of the community and households (World Bank, 2010).

The Ethiopian government has tried different policy strategies to overcome the problem of food insecurity by forming responsible follow-up. For instance the Relief and Rehabilitation Commission (RRC) in 1974 to monitor the incidence of food insecurity and coordinate food aid activities throughout the country was notable one (Girma, 2012). Following this the Disaster Prevention and Preparedness Commission was established with the objective of preventing food insecurity by tackling the root cause, building capacity to reduce the impact of disaster and giving emergency response(Mulugeta, 2010). But the problem is still not under control. In 1993, the government strengthens its disaster preparedness capacities by adopting the National Program for Disaster and Management (NPDM) with the objective of ensuring relief assistance to address the root cause of food

insecurity. In 1994 the Ethiopian Peoples Republic Democratic Front (EPRDF) implements Agricultural Development Led Industrialization (ADLI) hopping that improving the production and productivity in agriculture leads to the development of industrial sector at the national level. Under this policy the food security strategy is designed in a way that tackles the challenges of food security throughout the country (Transitional Government of Ethiopia, 1993). But most of the efforts and resources were towards post disaster responses, recovery and rehabilitation (Mulugeta, 2010).

The relatively favorable policy framework, institutional establishments, and the commitments to integrate disaster prevention and preparedness plans with long -term development policies show a snap shot in the improvement of risk management and management of food security problems. Hence it transforms from the traditional thinking of relief to sustainability and rehabilitation thinking (Mulugeta, 2010). Households also undertake different coping strategies during crop failure. Animal sell, non-agricultural income earning, reduction of expenditure, grain purchase, grain loan, and agricultural labor are the main ones (Yared, 1999). As researchers mentioned above, similar to other food insecure areas of the country, Bule Hora Woreda which is situated in West Guji Zone, Oromia region, has a trouble of food insecurity. Having this in mind this study would be tried to identify the core factors affecting food security at household level and described the status of household food security in Bule Hora Woreda.

2. Materials and Methods

2.1 Location

This study was conducted in West Guji zone of Oromia Regional State. The Zone lies between $3^0$26'-$5^0$32'N latitude and $36^0$43'-$40^0$46'E longitude. The Zone has 10administrative Woreda, of which three of them are classified as pastoralists and the rest are classified as Agro pastoralist. West Guji Zone shares common boundaries with different regional and woreda as below figures.The Bule Hora Woreda has 40 kebeles of which seven of them are classified under pastoralists and the rest are classified under Agro pastoralist (WRDAO, 2017/18).

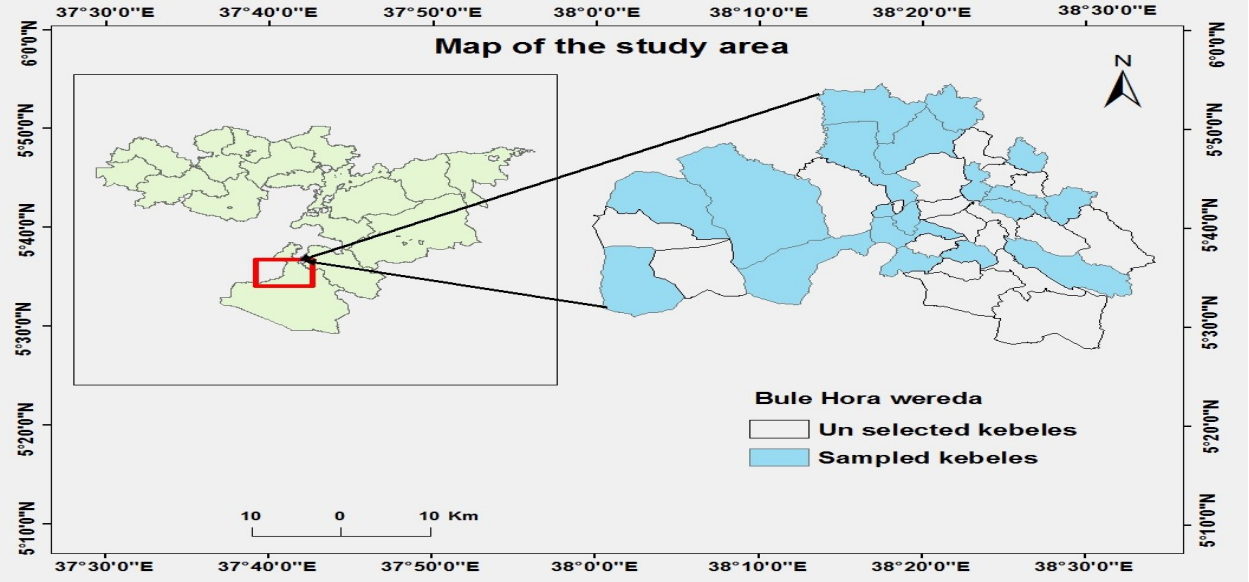

Figure: 1 Location Map of Bule Hora Woreda Selected Kebele (Source: authors, 2018/19)

2.2 Research Methodology

In this study the researchers used mixed approach and also selected survey method to collect quantitative data, while for the qualitative data interview was employed (Muijs, 2004). A survey, according to Kothari (2004), is a method of securing information concerning an existing phenomenon from all or selected number of households who are included in sampling to give information on food security determinants and status of food security at the household level, while interview was facilitated to have or to get in-depth data on the determinants and status of food security at the household level in study areas. In-line with this, the qualitative technique was incorporated in the study to validate and associate the quantitative data.

In this study the researchers employed descriptive survey research design because the major goal of this study was to identify the determinants and described the status of food security at the household level exists at present. In-line with this, Jose & Gonzales (1993) state that descriptive research gives a better and deeper understanding of a phenomenon which helps as a fact-finding method with adequate and accurate interpretation of the findings. Similarly, Cohen (2007) describes that descriptive survey research design as it helps to gather data at a particular point in time with the intention of describing the nature of existing condition or identifying standards against which existing conditions can be compared or determined the relationship that exist between specific events.

2.2.1 Data Sources and Method of Data Collection

Both primary and secondary data were employed. The primary data were collected from the sample households using structured interviews for quantitative data on demographic and socioeconomic characteristics of the households like basic social service, production system, livestock holding, and questionnaires were distributed to respondents accordingly. In the process of primary data collection, the enumerators and the Kebeles Development Agents were helped to translate into Afaan Oromo (the participants' local language). For qualitative data eight key informants were interviewed to support the information which was obtained from the primary and secondary sources. The reason that interview was selected than other methods of obtaining information; thus, to identify the determinants and status of household food security at the local areas (kebeles leader, administrative officials, farmers) were planned to interview as key informants. The main reason that only the key informants were selected for this interview than other social group, it was supposed that they have lived long periods of time and have a chance to observe the factors which determine household food security in the study area. Secondary data were collected from different governmental offices, NGOs, library books and other published and unpublished documents.

2.2.2 Sampling Techniques and Size Determination

The three stage sampling procedures were used to select sample size for this study. First, Bule Hora Woreda was selected purposively from Nine Woreda and One town administrative of West Guji Zone(the district covered by the productive safety net program are considered as food insecure because of drought, environmental degradation, poverty, conflict, population growth, land fragmentation and stagnating agricultural development (FAO, 2002). Second, eight kebeles from the 40 kebeles were selected randomly. Third, a total of 385 representatives' households were selected using the formula developed in C.R.Kothari (2004). Finally, the sample was distributed to each Kebele based on their population size and the number of male headed and female headed household's proportions. According to the formula developed by Cochran (1963) to determine the sample size for population the large the following formula would employ.

$$n_o = \frac{Z^2 pq}{e^2} = \frac{(1.96)^2 (.5)^2}{(.5)^2} = 385 \text{ Farmers}$$

Where n_0: sample size

Z^2: the abscissa of the normal curve that cuts off an area α at the tails (1 – α equals the desired confidence level, 95%),

e: the desired level of precision (±5% precision),

p: the estimated proportion of an attribute that is present in the population, q:1-p.

Finally, after identifying the sampling frame which contains the list of all household within the selected kebele; 385 sample representative households of 17139 populations of eight participant kebeles. Before starting the actual data collection a pre-test was conducted and the necessary adjustment was made on the questioners.

Then to collect the seven day recall on the food items consumed by the household members, each enumerator in each kebele was called for the man who was responsible in preparing the food for the households and then asks the food items consumed by the household members in the last seven days of the study period. After that the collected food items were converted into its caloric equivalent using the conversion factors.

2.2.3 Method of Data Analysis

To describe the demographic and socioeconomic variables, the researchers used descriptive method of analysis. Before any data analysis the necessary arrangements were made, to fit the data for analysis; local units of measurements were converted to appropriate units which fits the analysis. Land size which was measured by local unit called "timad" which was converted to hectare; all the local measurements which were used to measure food items "tasa, hidha, fe'insa, etc" were converted to kilogram. All the food items were converted to caloric equivalent using conversion factor; Livestock owned was converted to Tropical Livestock Unit (TLU) using conversion factor; the number of family members was converted to adult equivalents using conversion factor.

Descriptive statistics and Correlation were used to analyze the data with regard to the objectives of the study. Descriptive statistics such as frequency, percentage, mean, cross tabulation and standard deviation were used to determine demographic characteristics of the household and discuss the results of the study. The different categories, in the sample were compared using t-test. Different list of items used to collect the types of coping

strategies and households were ranked based on the priority of strategies practiced by the household and descriptively analyzed using the respondents reply.

Depending on the theoretical background, empirical evidence, and based on the objective of the study the caloric acquisition was used to measure the food security status of the household in the study area; because it showed probability of getting food from diversified sources because of its convenience and advantage in measuring the quantity of food consumed and its caloric content.

On the other hand, the data obtained from the document analysis, and unstructured interview were qualitatively analyzed. The qualitative analysis was done as follows. Grouping and Organizing the data collected from different instruments based on the themes to answer the research questions. Then, transcribed and codified the data to make the analysis easy. Also the result was triangulated with the quantitative findings.

The researchers used computer software of statistical package for social science version 20 (SPSS 20.0) for analysis. For this study, a five percent (0.05) level is determined as the accepted level of significance for statistical analysis.

2.3 Model Specification

Food security status of households is dummy variable which takes the value one for food secure and zero for food insecure households. Three approaches can be used to develop model for binary response variable; these are linear probability model (LPM), logit model and probit model. Because of its weakness (assuming that the probability of something increases linearly with the level of regressor) linear probability model (LPM) is not appropriate for this study. In most cases the logit and probit model give a similar result, their difference lies on that the logistic distribution has slightly flatter tail (Gujarati, 2004) this means the conditional probability Pi approaches zero or one at a slower rate in logit than in probit.

To probe the mathematical relationship between the dependent variable and independent variables that are expected to influence food security at the household level in that specific area the Binary Logit model was used. Logistic distribution is preferred than other models because it is more flexible, relatively simple from mathematical point of view and leads to meaningful interpretation (Gujarati, 2004). Further in logistic distribution (Logit model) the coefficients of the explanatory variables are not affected by the unequal sampling rates;

so that it can be used without any change even with unequal sampling (Maddala, 1992). Before estimating the logistic regression model, the explanatory variables is checked for the existence of multi-collinearity by using Variance Inflation Factor (VIF) for the association among continuous variables and Contingency Coefficient for dummy variables. VIF measures the degree of linear relationships among the continuous explanatory variable by regressing each explanatory variable on all the other continuous explanatory variables.

3. Data Analysis and Interpretation

3.1 Food Security Status

In the context of the study as shown in Table1, households were considered as food secure when the amount of energy available for them compared with the national minimum requirement level per adult equivalent per day (2200kcal) is met, otherwise the household is considered as food insecure. As the result of the survey have showed that out of total 385 sample households; 259(67.3 %) and 126(32.7%) were food secure and insecure households respectively. The mean value of energy available for both food secure and insecure sample households was 2360.23kilo calories, with a minimum of 1363.46 kilo calories and maximum of 3397.16 kilo calories. In a similar fashion, the minimum and maximum energy available for food secure households was found to be 2203.79 and 3397.16 kilo calories respectively. Moreover, for households those are food insecure the minimum and maximum energy available were found to be1363.46 and 2174.33 kilo calories respectively.

Table: 1 Food Security Statuses of the Sample Households

Variables		Observation	Percent	Mean	Standard deviation	Minimum	Maximum
Energy available in kilo calories	Secure	259	67.3	2656.35	325.90	2203.79	3397.16
	Insecure	126	32.7	1903.06	188.96	1363.46	2174.33
	Total	385	100	2360.23	463.00	1363.46	3397.16

Source: own survey result (2019).

3.2 Household Food Security Status Difference Based on Agro Ecological Factors

On behave of the result of the survey shows that 126 (32.7%) and 259 (67.3%) of the total sample households are food secure and food insecure respectively, indicating that those households who were differ by their areas of living or kebeles were again differ in food security and food insecurity as shown on table 2. This may probably indicate the presence of positive relationship the kebeles or agro ecological difference and food security status of sample households. In other words, the results on Table 2 shows us when there was the difference of agro ecological, we observed there was less land suitability and potential productivity was made in relation to a specific type of land use under certain production conditions.

Table: 2 Kebeles of Household Head * Food Security Status of Household

		Food Security Status of Household				Total	
Kebeles of Household Head		Insecure		Secure			
		Frequency	percent	frequency	percent	frequency	percent
	Bule Kegna	14	3.6	36	9.35	50	13.0
	Kuya	21	5.45	27	7.02	48	12.5
	Mirgo	18	4.67	24	6.24	42	10.9
	Bule Ano	9	2.34	41	10.7	50	13.0
	Sakicha	12	3.11	27	7.02	39	10.1
	Hera Kuta	10	2.6	35	9.09	45	11.7
	Gerba	23	5.97	35	9.09	58	15.1
	Oda Muda	19	4.93	34	8.8	53	13.8
Total		126	32.7	259	67.3	385	100.0

Source: Own survey result (2019).

In this study 385 household heads of which 236 male and 149 female household heads were selected randomly from the total population of 17,139 to collect the necessary information for this purpose and the analysis was conducted based on the information collected from these sample respondents from Bule Hora Woreda selected kebeles.

Table: 3 Sex and Education level by food security status of sample households

Household heads' sex and education level		Food Secure Households		Food Insecure Households		Total Households		Chi^2– value p-value
Sex		Number	Percentage	Number	Percentage	Number	Percentage	4.487 (0.034)
	Male	152	58.7	84	66.7	236	61.3	
	Female	107	41.3	42	33.3	149	38.7	
	Total	259	67.3	126	32.7	385	100	
Educational level	Literate	170	65.6	68	54	224	58.2	29.212 (0.000)
	not able to read & write	89	34.3	58	46.03	147	38.2	
	Total	259	67.3	126	32.7	385	100	

Source: own survey result (2019).

Sex: In most parts especially in rural parts of Ethiopia the head of the household have an influential power on determining the livelihood and food security status of the total household members, because the head of the household has a power to make decision on all stuffs. This turn may affect the type and amount of food availability. Female headed households, in developing countries like Ethiopia are more likely to be food insecure as compared to their counter parts (Frehiwot, 2007). In this specific study, even if their number is small out of 149 female respondents 42 (33.3%) of the respondents are food insecure and 107(41.3%) of the respondents are food secure indicating that the probability to be food insecure is higher in female headed households. On the other hand, out of 236 male headed households 152(58.7%) and 84(66.7%) were food secure and insecure respectively indicating that the probability to be food insecurity is higher for male headed households. The survey indicating that the probability to be more food secured were male head households (58.7%) than female headed households (41.3%).

Educational Background: Table 3 shows, out of 259 food secure household heads 170(65.6%) and 89(34.3%) of the sample households were found to be literate and not able to read and write respectively and out of 126 food insecure households 68(54%) and 58(46.03%) of the household heads were literate and not able to read and write respectively, showing that those households having better educational background and experience have higher to be food secure. The test shows that there is a significant association between educational background and food security status of the household heads.

Table: 4Age and Family Size of the Respondents and Food Security Status

Variables	Observation		Mean	Standard deviation	Minimum	Maximum	t-value
Family Size	Secure	259	4.91	2.544	0	14	4.3959
	Insecure	126	5.02	2.868	0	12	
	Total	385	4.97	2.652	0	14	
Age	Secure	259	59.93	1753.33	22	79	0.787
	Insecure	126	41.3	27.703	22	78	
	Total	385	50	1438.34	22	61	

Source: own survey result (2019).

Family Size: In this specific study the family size of household indicates the number of family members living under one roof in adult equivalent. Table 4 shows that the average family size of the respondents was found to be 4.97. The selective family size for food secure and food insecure households were 4.91 and 5.02 respectively. The survey indicates the smallest and the largest family size in adult equivalent was found to be 0 and 14respectively. The mean difference between the food secure and insecure household is 0.11 and it is statistically significant with a t-value of 4.3959.

Age: The age structure of the sample respondents shows that the average age was 50 years with a minimum 22 years and maximum of 61 years. The mean age for food insecure households were 41 and for food secure were 59. The t-test was used to see the mean difference between food secure and insecure households. The independent t-test with 0.787 shows there is no significant difference between the mean age of food secure and food insecure household heads (see table 4).

3.3 Resource Endowment

Table: 5 Livestock Ownership and Land size by Food Security Status

Variables	Observation		Mean	Standard deviation	Minimum	Maximum	t-value p-value
Households 'Land size in Ha	Secure	259	4.85	7.05	3	12	-4.058 (0.000)
	Insecure	126	4.06	2.63	1	8	
	Total	385	4.455	5.98	1.25	5.75	
Livestock	Secure	259	6.58	4.622	0	30	-9.800 (0.000)
	Insecure	126	6.75	4.553	4	25	
	Total	385	6.665	4.5875	0	30	

Source: own survey result (2019).

Land size: As shown on table 5the average land size is found to be 4.59hectares with a minimum and maximum of 1.25hectares and 5.75 hectares respectively. The mean land size for food secure and food insecure households is 4.85 and 4.06 hectare respectively.

The mean difference in the households land ownership is statistically significant at 1% probability levels indicating that there is a significant association in the households land size owner ship for food secured and food insecure households. The food secured households have relatively larger farm land size than the food insecure households.

Livestock: Table 5 shows that the number of livestock owned per household on average are 6.665TLUwith the minimum being 0 and maximum of 30 TLU (see Appendix 1**)**. The average livestock ownership for food secure and food insecure households was found to be 6.58 and 6.75 TLU respectively. The minimum and maximum for food secure is found to be 0 and 30 TLU, similarly, the minimum and maximum for food insecure is found to be 0 and 4 TLU. The t-test result indicates that there is a statistically significant mean difference in household's livestock ownership for food secure and insecure sample households at 1% probability levels, indicating that the number of livestock per household is relatively higher for food secure households than food insecure households and this may have its own impact on the food security status of the households in the study area. The farmers who have higher number of livestock have higher probability to be food secure than their counter parts and the reverse is true for households who have relatively lower livestock.

3.4 Socio-Economic and Institutional Factors

Input use (fertilizer): From the total sample taken for this study 221(57.4%) and 163 (42.6%) are users and non-users of fertilizer respectively. Of these food secure households, 142(54.8%) and 117 (45.1%) are users and non-users respectively. Similarly, from the total of food insecure households, 79(63.2%) are Users, and 46(36.5%) are non-users. The independent Chi^2-test shows that there is significant association between input (Fertilizer) and food security at 1% probability level, indicating that fertilizer users have a better opportunity to increase their production and Productivity, and have a greater opportunity to be food secure (See table 6).

Land Fertility: the sample households were asked whether their farm land is fertile or infertile; about 278(72.2%) are found to have fertile farm land and 107 (27.8%) were found to have infertile farm land. About 100 (79.4) and 26(20.6%) of the total food insecure sample households have fertile and infertile farm land respectively. Similarly out of the total food secure households 178 (68.7%) have fertile farm land, and 81(31.7%) have infertile farm land (see table 6). It is hypothesized that those households who have fertile farm land have a high probability to be food secure than their counter parts. Pearson chi-square test revels that there is statistically insignificant association in farm land fertility and food security status of sample households at 5% probability level.

Credit Use: Analysis was taken to see the association between credit and food security status of sample households. Table 6 shows that 213(55.3%) of the sample households are have access of credit. Out of which 128 (48.2%) are food secure and 85 (67.5%) are food insecure households. In a similar fashion, 172(44.7%) of the sample households are have no access to credit. Of which 131(50.6%) are food secure and 41(32.5%) are food insecure. The Pearson chi-square test shows that there is a statistically significant association in credit utilization and food security status.

Table: 6 Input Uses, Land Fertility and Credit by Food Security Status of the Sample Households

Households Input Use, Land Fertility& Credit		Food Secure Households		Food Insecure Households		Total Households		Chi^2-value p-value
		Frequency	Percentage	Frequency	percentage	Frequency	percentage	
Input use	User	142	54.8	79	63.2	221	57.4	19.281 (0.000)
	Non-user	117	45.1	46	36.5	163	42.6	
	total	259	67.2	126	32.8	385	100	
Land Fertility	Fertile	178	68.7	100	79.4	278	72.2	1.616 (0.204)
	Infertile	81	31.7	26	20.6	107	27.8	
	total	259	67.3	126	32.7	385	100	
Credit	Have access	128	48.2	85	67.5	213	55.3	16.771 (0.000)
	Don't have access	131	50.6	41	32.5	172	44.7	
	total	259	67.3	126	32.7	385	100	

Source: own survey result (2019).

Irrigation Service: Table 7 shows that 102(26.5%) of the sample household have access 283 to use irrigation service (user), (73.5%) of the sample household do not have access to irrigation service (non-user). Out of irrigation user 61(23.6%) and 41(32.5%) are food secure and food insecure households respectively. Similarly, out of irrigation non-users 198(76.4%) are found to be food secure and 85(67.5%) are found to be food insecure households. The test statistics indicates that there is a significant statistical association in irrigation utilization and food security status of sample households. It shows that households who have access to irrigation have a higher probability to be food secure than their counter parts and who have not access to irrigation service have a higher chance to be food insecure.

Market Access: The analysis was carried out to see the statistical association between market accessibility and food security status of sample households in the study area. The result of the survey shows that 289(75.1%) and 96 (24.9%) of the total households have access to market and do not have access to market respectively. From households who have access to market 190 (78.8%) and 99 (68.8%) are food secure and food insecure respectively indicating that households who have access to market have higher probability

to be food secure than their counterparts. Similarly, out of the total households who do not have market access, 51 (21.2%) are food secure and 45 (31.3%) are food insecure.

Person chi-square test: indicates that there is a significant statistical association in the accessibility of market and food security of sample households at 5% probability level.

Table: 7Irrigation Service and Market Access by Food Security Status of the Sample Households

Households Irrigation Service & Market access		Food Secure Households		Food Insecure Households		Total Households		Chi^2-value p- value
		frequency	percentage	frequency	percentage	frequency	percentage	
Irrigation Service	User	61	23.6	41	32.5	102	26.5	17.332(0.000)
	Non-user	198	76.4	85	67.5	283	73.5	
	total	259	67.3	126	32.7	385	100	
Market access	Have access	190	78.8	99	68.8	289	75.1	18.252(0.000)
	Don't have access	51	21.2	45	31.3	96	24.9	
	total	241	62.6	144	37.4	385	100	

Source: own survey result (2019).

Extension Services: Test made to see statistical association in provision of extension service and food security status of sample households. Table 8 shows that 173 (44.9%) of the total sample households have access to extension service and 212(55.06%) of the total sample households do not have any access to extension service. From households who have access to extension service 112(51.11%) and 61(28.6%) are found to be food secure and food insecure respectively. 60 (34.9%) and 152 (71.4%) of households who do not have access to extension service are food secure and food insecure respectively. The number of households who have access to extension service are lower than those who do not have access to extension service, indicating that households who have access to extension service have better opportunity to be food secure than households who do not have access to extension service. The Pearson chi-square test shows that there is a significant statistical association in access to extension service and food security at 1% probability level.

Off-farm Income: The result of the survey shows that 180(46.7%) and 205(53.3%) of the total sample households have access to off-farm income and have not access to off-farm income respectively. Table 8 shows that from sample households those who have access

to off-farm income 122(61.0%) and 58 (31.4%) of the households are food secure and food insecure respectively, indicating that households who have access to off-farm income have higher probability to be food secure than their counterparts. In other way, the households who do not have access to off-farm income have higher probability to be food insecure. Similarly, out of the total households who doesn't have access to off-farm income, 78 (39.0%) are food secure and 127 (68.6%) are food insecure this implies that more percentage of food insecure households have access to off-farm income. Person chi-square test indicates that there is a significant statistical association in the accessibility of off-farm income and food security of sample households at 5% probability level.

Table: 8 Extension Service and Off-farm Income by Food Security Status of the Sample Households

Households Extension service &Off-farm income		Food Secure Households		Food Insecure Households		Total Households		Chi^2-value p- value
		Frequ e.	Perce.	frequen cy	percentage	frequen cy	percenta ge	
Extens ion service	Have access	112	51.11	61	28.6	173	44.9	26.991(0 .000)
	Don't have access	60	34.9	152	71.4	212	55.06	
	total	172	44.7	213	55.3	385	100	
Off-farm income	Have access	122	61.0	58	31.4	180	46.7	6.298 (0.012)
	Don't have access	78	39.0	127	68.6	205	53.3	
	total	200	51.9	185	48.05	385	100	

Source: own survey result (2019).

Insect, Pest and Disease: The table 9 show that 132 (34.3%) and 253 (65.7%) of the total sample households are affected and are not affected by insect, pest and disease respectively. From the total sample households affected by insect, pest and disease, 78 (32.6%) are food secure and 54(36.99%) are food insecure. In addition, from the total sample households who are not affected by infestation of insect, pest and disease, 161 (67.4%) are food secure and 92 (63.01%) are food insecure. The result portrays that there is an association between insect, pest and disease infestation and food security status of sample households. These indicate the presence of negative relationship between insect, pest and disease infestation and food security status of sample households.

Table: 9 Pest and Disease and Food Security Status of the Sample Households

Households Off-farm income & Pest and Disease		Food Secure Households		Food Insecure Households		Total Households		Chi^2-value p- value
		frequency	percentage	frequency	percentage	frequency	percentage	
Pest and Disease	Affected	78	32.6	54	36.99	132	34.3	17.520(0.000)
	Not affected	161	67.4	92	63.01	253	65.7	
	Total	239	62.1	146	37.92	385	100	

Source: own survey result (2019).

3.5 Coping Strategies

The coping strategies that have high cost to the household in terms of asset that take away possessions, or lost future income, or loss of social status tend to be practiced after other responses to food insecurity have been exhausted (Alemnesh Bedo, (2012) the same result was observed in the study area. A survey was conducted to see the coping strategy that the sample household practices during some food shock in their order of importance. The result of the survey shows that both groups of the household prioritize the coping strategies they practiced during food shortage according to their order of importance. Accordingly, reducing size of meals, reducing the number of meals per day per week or month, sale of livestock, credit from different sources, seasonal migration, sale of fire wood, wage employment, renting land and sale of asset are found to be the coping strategies. But, the order of importance for individual groups that is for food secure (25.95%, 18.3%, 14.5%, 12.6%, 8.4%, 6.5%, 6.1, 4.2, 3.4, 0) and food insecure (2.11%, 1.9%, 1.7%, 1.22%, 1.06%, 0.89%, 0.49%, 0.40%, 0.24%, 0%) respectively shows some variation (see the table10)

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Table: 10 Types of Coping Strategies Practiced by Households during Food Shortages

Practiced Strategies	Food secure(262)		Food insecure (123)		Total(385)	
	frequency	percent	frequency	percent	frequency	percent
1. Sale of livestock	68	25.95	26	2.11	94	24.4
2.Reduce number of meals	48	18.3	23	1.9	71	18.44
3. Reduce size of meals	33	12.6	15	1.22	48	12.5
4. credit	38	14.5	21	1.7	59	15.3
5. Sale of fire wood	22	8.4	13	1.06	35	9.09
6. Wage employment	16	6.1	11	0.89	27	7.01
7. Eating wild fruit	0	0	0	0	0	0
8. Sale (rent) asset	9	3.4	5	0.40	14	3.64
9. Rent land	11	4.2	3	0.24	14	3.64
10. Seasonal Migration	17	6.5	6	0.49	23	5.97

Source: own survey result (2019).

3.6 Econometric Results

Logit regression model was used to estimate the effect of explanatory variables on the food security status of households in the study area. Variables assumed to have influence on food security status of households in the study area were tested accordingly. After the necessary tests had made logistic regression were conducted to see the effect of explanatory variables on food security status. In this sub section major test conducted results and logistic regression analysis results were discussed in detail.

Diagnostic Tests Multi-collinearity: before estimating the logistic regression model, the explanatory variables were checked for the existence of multi-collinearity by using Variance Inflation Factor (VIF) for the association among continuous variables and Contingency Coefficient for dummy variables. Multi-collinearity refers to the existence of perfect or exact linear relationship among some or all explanatory variables of the regression model (Gujarati, 2004). It is the result of inclusion of redundant variables (variables that give the same information). The existence of multi-collinearity among explanatory variables of the regression model may result in wrong sign, large variance, high R^2, few significant coefficients and smaller z-ratio that may lead to wrong conclusion. As described above Variance Inflation Factor (VIF) and Contingency Coefficient were conducted to test the existence of multi-collinearity for both continuous and dummy variables. Variance

Inflation Factor (VIF) measures the degree of linear relationships among the continuous explanatory variable by regressing each explanatory variable on all the other continuous explanatory variables. The result of the analysis depicts that there is no serious multi-collinearity problem among the continuous explanatory variables as all variance inflation factor (VIF) values are less than10 (see appendix, Table: 4-A).

Contingency Coefficient (CC): measures the existence of multi-collinearity problem among the discrete explanatory variables. The contingency coefficient test result shows that there is no serious multicollinearity problem as all the values are less than 0.5.

Hetroscedasticity: In regression analysis when the error terms do not have constant variance the error terms are hetroscedastic (Maddala, 1992). In this analysis among other hetroscedasticity tests Breusch-Pagan / Cook-Weisberg test was used in stata 12 software, and the result shows chi-square is 1.37and prob>chi^2=0.2047, indicating that the null hypothesis which says there is constant variance, should be accepted. Meaning that, there is no problem of hetroscedasticity in the model (see appendix 1).

Out of 385 households included in the analysis, 371 (96.55%) are correctly classified on the bases of their characteristics. The sensitivity (correctly predicted food secure) and specificity (correctly predicted food insecure) are 97.73% and 94.74% respectively, implying that the model predicts both groups accurately. The goodness of fit measures tells us that the model fits the data well. Hosmer and leme show test was used to show the fitness of the model. The test result show that the chi-square test statistics was insignificant (0.4669) showing that the model fits the data well (see appendix 1).

Table: 11Logistic Regression Results for the Determinants of Food Security

Variables	Coefficient	Significance level	Odd Ratio
AGE	1.01040	0.375	2.7466
SEX	0.0468	0.810	5.5922
EDUC	1.7214	0.045	2.0146
FSIZE	-0.8287	0.037**	0.4366
LLSIZE	2.4261	0.199	11.3144
LFERT	0.7004	0.543	10.3505
IPDIS	2.337	0.050**	0.0801
CRED	-2.5250	0.008*	53.0713
ESER	3.9716	0.010*	38.9823
AGIN	3.6631	0.097	0.61972
IRRIG	-0.4785	0.008*	26.4381
MARK	3.2748	0.954	2.2517
OFFIN	1.1533	0.578	3.1687
CSTRTGY	-9.9521	0.029	0.00005

Pseudo R^2 = 0.8226

Log Likelihood = -17.2335

Prob> chi^2 = 0.0000

Sample size = 385

*and** significant at 1 and 5 percent significance level respectively.

Source: survey result output (2019).

3.7Analysis of Qualitative Data Regarding Household Food Security Status

The key informants or interviewee answer the questions which mentioned at appendix as their life experience and know the all determinants of household food security, the following analysis was made.

> One key informant of Gerba kebeles (Gemechu Oddo, 42 years), expresses the highlights of their and nearby household challenges as follows. '*Yes, we are so worry because of different difficulties which come to my household as well as the areas that I live. From those problems the poverty is one of the enormous determinants or immediate cause to our food security. More of the household along with their family were unable to access balanced diets.*

People mainly consume the staple food, injera[1] or kocho and bread with limited access to other foods. Very few households could afford to provide meat, eggs, fruits, vegetables or sweet foodstuffs.'

Another key informant from Bule Anno kebeles(Gamada Boru, 39 years), expresses the highlights of their challenges and responding the answer as follows. *' YesI and my near neighborhood see predict uncertain due to the difficulties which related with limited resource, extra income that we can't get from others source, limited agricultural inputs and training. I don't look forward because there's nothing to look forward to including our food status which we can't get the things that we need. So we can't afford anything to change. Everything what we get is something that someone else buys it for us. I don't think my family will achieve what the other rich families at urban or rural afford because I can't pass the difficulties resulted from the limited resources. I owe like small land, large family, accessibility of credit service, absence of any remittance from my children and so on.*

One of Agriculture Office Experts of Bule Kagna kebele explains *'the difficulties or determinants of household food security are related to lack of basic access to food, clothing and proper housing. Experts also explained the factors which affect the household food security in terms of lack of basic resources such as privately owned houses, regular income, lack of information and productive assets like livestock, irrigable land and enough farmland.'*

Another expert from Oda Muda kebele explained *'household food statuses in terms of having nothing or lack everything necessary for life. These are manifested in being destitute or being dependent on others. Largely, expert's responses are similar suggestion that they have given in some respects experience household food determinants collectively when living in the same environment.'*

In general, households and experts individually illustrate the above questionnaires with relating the determinants and statuses of household food security, which is pertinent to their lived experiences and great challenge for household life at Woreda. Young people find it hard to get credit from individuals, bank or credit institutions due to a lack of guarantors or collateral as well as access. They do not own houses or other property to use as collateral. There are good initiatives by the Government, in which unemployed young

[1] *injera (a type of flatbread)*

people are organized into cooperatives and receive credit, for example, in stone carving, handicrafts, trade, etc.

CONCLUSION

The researchers identifying and prioritizing the determinants of food security and food security status of households in the context of that specific area have undeniable importance. This study was conducted to assess the status and identify major determinants of food security of rural households in Bule Hora Woreda of West Guji Zone. It forwards some important contribution to households and other stockholders who are responsible in solving food security problems at the household level.

The study employed 385 sample households from eight kebeles of the woreda. Descriptive statistics and Binary logit regression model was used to analyze the data. The descriptive statistics result depicts that 259 (67.3%) of the sample households were food secure and 126 (32.7%) of the sample households were food insecure. The logistic regression result shows out of 14explanatory variables employed in the model land size, livestock ownership, credit service, agricultural extension service, and irrigation service positively influence food security and was statistically significant, whereas, family size and infestation (insect, pest and disease) negatively influence food security and statistically significant. The remaining seven variables are less powerful to explain the food security status of households in the study area. Since food security is one of the main agenda in Ethiopia for five years strategic plan. Among the efforts, improving access to infrastructure, education, extension services, credit service, technology, information and other similar efforts like household asset building, health care and family planning are the major ones and play a significant role in solving the problem of food security. The absence of these efforts may aggravate the food insecurity situation and retards the development process. Improving these efforts may help to improve the food security status of those rural poor peoples of Bule Hora Woreda.

RECOMMENDATION

The finding of the study gives clue for the concerned body including households and other stockholders to guide policy decision, expected possible intervention mechanisms and integrated effort to combat food insecurity at the house hold level. Therefore, all these parties should play their own role to improve the food security status of households and the researchers recommend the following key solution for the concerned bodies as the problem related with their activities.

- Family size is one of the well known variables in determining the food security status significantly and negatively. So that still attention should be given for designing and implementing family planning policies to reduce the increasing population pressure on the available scarce resource.
- By improving the quality of the land through improved soil and nutrient management, using intensification, agricultural inputs and improved mode of production which have potential in increasing production and productivity becomes the final options so that households and concerned stakeholders should give due attention.
- The study area has a low irrigation potential and it highly influences in determining food security status; the necessary effort should be made by Bule Hora Woreda Agriculture and Rural Development Office as well as NGO to improve the use of potential irrigation in the area. This can be done by creating awareness about the importance of irrigation in increasing production and productivity of crops and overcoming the problem of drought and erratic rain, and finally improving access to irrigation by constructing the important infrastructure.
- The provision of extension service was positively related with food security. Implying that, the households who have access to extension service have got more chance of being food secure. Since the provision of extension service is more powerful in determining food security status, Bule Hora Woreda Agriculture and Rural Development Office including households should expand and strengthened the access to extension services as well as the implementation of extension service for those who are in need of the extension service.

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APPENDIX 1

Appendix: 1 Table

Table: 1-AConversion Factor used to Calculate Tropical Livestock Unit (TLU)

Livestock	**Conversion Factor**
Oxen	1
Cow	1
Bull	0.5
Heifer	0.50
Calf	0.2
Sheep	0.1
Goat	0.1
Chicken	0.01
Horse	0.8
Mule	0.7
Donkey	0.4

Source: EEA/EEPRI 2002 taken from Hanas, E., Jahnke(1982)

Table: 2-A Conversion Factor Used to Calculate Energy Content in Kilo Calorie

Food Item	**Energy per 100 gram**
Tef	355
Wheat	340
Maize	344
Barley	370
Potato	75
Sweet	109
Potato	38
Bean/Pea	310
Onion	75
Vegetable	900
Edible Oil	324
Beef/Meat	79
Milk	699

Butter	375
Sugar	67
Salt	119
Coffee	

Source: Technical Centre for Agricultural and Rural Cooperation/East, Central and Southern Africa Food and Nutrition Cooperation (CTA/ECSA)(1987)

Table: 3-A Conversion Factors used to Calculate Adult Equivalent (AE)

Age in years Sex

	Male	**Female**
0-1	0.33	0.33
1-2	0.46	0.46
2-3	0.54	0.54
3-5	0.62	0.62
5-7	0.74	0.70
7-10	0.84	0.72
10-12	0.88	0.78
12-14	0.96	0.84
14-16	1.06	0.86
16-18	1.14	0.86
18-30	1.04	0.80
30-60	1	0.82
60+	0.84	0.74

Source: calculated from WHO (1985) by Stefan Dercon cited in MOFED (2002).

Table: 4-A Variance Inflation factor for Continuous Variables.

Variables	**VIF**	**Tolerance**
AGE	1.33	0.752
FSIZE	1.34	0.746
LLSIZE	1.32	0.756
SNLIVE	1.31	0.763

Source: Own survey result (2019).

Table: 5-AMulti-collinearity test for Discreet Variables

	SEX	EDU	LFERT	IPDIS	CRED	ESER	AGIN	IRRIG	MARK	OFFIN
SEX	1.000									

EDU	0.3106	1.0000								
LFERT	-0.1871	-0.2036	1.0000							
IPDIS	-0.1092	-0.3503	0.0358	1.0000						
CRED	0.1615	0.1579	-0.1918	-0.0405	1.0000					
ESER	0.1234	0.1515	0.0765	-0.0628	0.1631	1.0000				
AGIN	0.1701	0.3808	-0.0747	-0.2386	0.3267	0.3836	1.0000			
IRRIG	0.0896	0.2351	0.0004	-0.0775	0.1247	0.2251	0.2129	1.0000		
MARK	0.1848	0.4253	-0.3668	-0.0902	0.1290	0.1060	0.1553	0.2051	1.0000	
OFFIN	0.1937	0.1524	-0.1760	-0.1393	0.1356	0.1193	0.2897	0.2469	0.1134	1.0000

Source: -Own survey result (2019).

Table: 6-A Link Test Results Using Stata 12

Fs	Coef.	Std. Err	t	P>t	[95% Conf.	Interval]
_hat	1.24004	2.1549141	8.00	0.00	0.9338058	1.546277
Hatsq	-.221499	3.1352375	-1.64	0.104	-.488838	3.0458397
_cons	-.02536	8.0401013	-0.63	0.528	-.104640	7.0539048

Source: Own survey result (2019