



Rural Household Food Insecurity Status and Coping Strategies in Damot Sore Woreda of Wolaita Zone, Southern Ethiopia

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ABSTRACT

Food insecurity exists when people lack access to sufficient amount of safe food and key policy challenges. Due to this reason understanding the determinants with surviving strategy is important for interferences aiming at regulating it. Hence, this study conducted to state the determinants of rural household food insecurity and ascertain households coping strategies. For this primary and secondary sources were collected in the study area. The study drew 121 rural households through three stage sampling technique from four kebeles of the woreda based on agro-ecology; data gathered randomly using probability proportional to size. The survey data were analyzed by using descriptive and econometric methods. Binary Logit regression model were used to achieve the existing food insecurity status and determinants of it. The results from descriptive statistics show that of the total surveyed households, 59.5% and 40.5% were food insecure and secure respectively. The majority of the respondents viz. more than 58% and about 62% have no enough physical and economic availability and accessibility of food throughout the year respectively. The model results show that six variables were significant determinants of household food insecurity. These were sex of household head, age of household head, family size, education level of household head, cultivated land size and use of chemical fertilizer. Furthermore, rural households also used different coping strategies to against food deficit at initial and sever stage but the most common are ate less prepared food, borrowing grain (cash), reducing number and size of meals and sale of firewood/ charcoal or grass. Moreover, the results suggest that more attention should be given to older age households in food security projects, increasing family size creating awareness on family planning, agricultural sector should be given close attention to farmers providing and using recommended rate on time to the chemical fertilizer. Also attention should be given to pest and disease through providing necessary remedies. Therefore, based on the findings of this study, stakeholders should focus on the rural household food insecurity situation and coping strategies to better serve at any direction in the study area.

Key words: Food insecurity, coping strategies, rural household, Logit, Damot Sore.

Introduction

Absolutely, food is the foundation for human and economic development along with oxygen and water but, it is much more than nutrients. As a result, enough food in terms of quantity and quality for all people is an important issue for a

nation to continue its development. Conversely, food insecurity is prevalent in today's world in general, and in sub-Saharan Africa in particular (GAO, 2011). As far as this, an unacceptably large number of people still lack the food for an active and healthy life. The latest



estimates indicate that about 795 million people in the world - just over one in eight - were undernourished in 2014-16, down 167 million over the last decade, and 216 million lower than in 1990-92. In the same period, the prevalence of undernourishment has decreased from 18.6% to 10.9% globally, reflecting fewer undernourished people in a growing global population (FAO, 2015).

Despite the overall progress in developing countries as a whole, there is still considerable room to reduce undernourishment and improve food security. Food security explained by physical and economic access to the food needs of human beings is often associated with food availability, accessibility and utilization (FAO, 2014). As yet, the FAO report indicates that the number of people undernourished in the world has been on the rise since 2014, reaching an estimated 815 million in 2016. In fact, alleviating food insecurity and hunger is one of the millennium development goals. Ever more, it is recognized that improving food security is a foundation for reducing poverty, hunger and economic development. However, it has not been attained in most developing countries mainly in SSA; it continues to form a deep seated problem.

Statement of the Problem

The effort has been made by the Government and non-governmental organizations to alleviate food insecurity problem in the world. Besides, the government of Ethiopia placed significant attention on agricultural productivity improvement and implementation to achieve food self-sufficiency and reduced food aid dependency. Principal strategies engaged that contain agricultural

extension program, diploma level development agents have been employed in each kebeles while the use of inputs and farm practices increased over the last years. However, it remains the main problem in our country and the requirement for food aid become increasing. Moreover, the country has failed to produce sufficient food (even under ideal weather condition) and has been heavily reliant on food aid in recent years.

Due to this matter, to solve these issues different food aid responses taken through emergency reliefs as well as development works. Like PSNP, it started covering 192 districts and 4.5 million beneficiaries by identifying chronically food insecure households in famine-prone areas of rural Ethiopia. But, know the size of the program expanded over the years both in geographic coverage and number of beneficiaries about 318 districts and 8.3 million beneficiaries in 2015 (Bonsa, 2016). Hence, poverty, inequality and food insecurity are the most crucial and persistent problems facing humanity. So, food security and poverty reduction remains as a top issue and prior agenda as far as rural development is concerned. To insure this objective government and non-government organizations are working in the area. However, factors affecting food security and level of coping strategy remain a long-standing challenge.

Objectives of this Paper

The general objective of this study is to identify food insecurity situation and coping strategies of rural households in Damot Sore Woreda. In line with this, the



$$n = \frac{5131}{1 + 5131 (0.09)^2} = 121$$

Table 1: Sample Size Distribution by the Kebeles Administrations

Sample KAs	Total HHs	*Sample HH %	**Sample size
Dagaga Lenda	1209	23.56	28
Chifisa	1266	24.67	30
Dawe Sake	1455	28.36	34
Anka Shashara	1201	23.41	28
Total	5131	100	121

Source: Own Computation, 2019

Sources and Methods of Data Collection

For this study both primary and secondary data were collected from different sources. The primary data was collected from the target respondents such as; sample households, key informants (KIs) and focus group discussants (FGDs) to address stated objectives. Quantitative data was collected through semi-structured questionnaires. To complement the quantitative data, qualitative data was also collected through focus group discussions, key informant interviews and personal observation. Secondary data which pertinent to the research were collected from relevant sources like ANRD, FED, published and unpublished documents and internets.

Methods of Data Analysis

In this study, both descriptive and econometric data analysis were employed.

Descriptive and inferential statistics: **After completion of data collection, collected data were coded and entered into SPSS software for windows version 20. Hereafter, the**

data were cleaned and verified for analysis. Quantitative types of data such as; demographic and socio-economic factors of sample households and institutional conditions in the study area were analyzed using percentage, frequency, minimum, maximum, standard deviation, mean values and inferential statistics such as chi-square analysis and t-test. Interpretation and tabulation of data was done in order to analyze the data.

Econometric analysis

The purpose of this study was to assess the food insecurity status in rural households. The dependent variable in this case dichotomous variable, which took a value of one for food secure households and zero for food insecure ones. When one or more of the independent variables in a regression model are binary or dichotomous, we can represent them as dummy variables and proceed to analyze. Binary models assume that households belong to either of two alternatives and that depends on their characteristics. Hence, the aim of qualitative choice model is to determine



the probability that a household was fall in one of either alternatives, in this study come to be food secure or food insecure.

The Probit and Logit models are commonly used and quite comparable in binary choice food security status (Gujarati, 2004). Therefore, in this study, Logit model was selected for its simplicity and less complexity of its interpretation. Moreover, (Train, 1986) pointed out it has got advantage over the others in the analysis of dichotomous outcome variable in that it

is extremely flexible and which approaches zero at slower and slower rates as an independent variable (X_i) gets smaller and approaches one at slower and slower rates as X_i gets large. To identify determinants of rural households' food insecurity status the qualitative types of data were evaluated by using the structure of logistic regression model. The data analysis was conducted using STATA version 13. To these, the logistic distribution function is specified according to (Gujarati, 2004) as:

$$p_i = E \left(Y = \frac{f}{x} \right) = 1 - \dots \dots \dots (2)$$

$$p_i = E \left(y = \frac{1}{x} \right) = \frac{1}{1 + e^{-(B_0 + B_i X_i)}} \dots \dots \dots (3)$$

For ease of exposition, the relationship between p_i and X_i , which is non-linear, can be expressed as;

$$p_i = \frac{1}{1 + e^{-z_i}} = \frac{e^{z_i}}{1 + e^{z_i}} \dots \dots \dots (4)$$

The slope show log-odd in favor of food security change as the respective independent variable change by a unit. The odds ratio is the probability that a household would be food secure (p_i) to the probability that it was food insecure ($1-p_i$) and can be expressed as:

$$(1 - p_i) = 1 - \frac{1}{1 + e^{-z_i}} = \frac{e^{-z_i}}{1 + e^{-z_i}} = \frac{1}{1 + e^{z_i}} \dots \dots \dots (5)$$

$$\text{So, } \frac{p_i}{1 - p_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \dots \dots \dots (6)$$

This equation (6) indicates simply the odd-ratio in favor of a household would be food secured. The odds ratio is the probability that a household would be food secured (p_i) to the probability that it will be food insecure ($1-p_i$).



(Where: p_i is the probability that a given household being food secure ranges from 0 to 1, e represents the base of natural logarithms (2.718) and Z_i is the function of explanatory variables X_i , $i = 1, 2, 3, \dots, m$) which may be expressed as:

$$Z_i = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m$$

(Where: x_1 = age of household head, x_2 = Sex of household head, X_3 =Educational level of household head, X_4 = Family size, X_5 =Income from off/non-farm activities, X_6 = Cultivated land size, X_7 =Use of inputs, X_8 =Livestock ownership, X_9 = Access to Credit, X_{10} = Land rented in, X_{11} = Land rented out, X_{12} = pest and disease, X_{13} = Frequency of extension contact and X_{13} = agro-ecology, β_o = intercept and $\beta_1, \beta_2, \dots, \beta_m$ are slopes of the equation in the model). Finally, the logistic model is obtained by taking the natural logarithm of equation (6) as follows;

$$Li = \ln \left[\frac{p_i}{1 - p_i} \right] = Zi \text{-----} (7)$$

$$Z_i = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m$$

If the disturbance term (U_i) is introduced, the logit model becomes:

$$\ln \left(\frac{p}{1 - p} \right) = Zi = B_o + B_1 X_1 + B_2 X_2 \dots + B_n X_n + U_i \text{-----} (8)$$

So, the logit model has $z_i = \beta_o + \sum \beta_i x_i + U_i$

(Where, β_i s are parameters to be estimated by the model and the intercept (β_o) tells how the log odds in favor of food insecurity of the households when all the independent variables are kept constant. Li = logs of the odds ratio, which is not only linear in X_i but also linear in terms of explanatory variables, z_i = Vector of relevant explanatory variables).

This procedure yields unbiased and asymptotically efficient and consistent parameter estimates (Maddala, 1992; Gujarati, 1995 and Hosmer and Lemeshow, 1989). Changing an

independent variable in this case, is expected to alter the probability that a given individual becomes food secure, and this will be helpful to predict the probability of achieving food security.

Before entering the selected variables into the logistic regression model, the existence of multi-collinearity problems was checked in terms of variance inflation factor (VIF) for the variables. Due to the existence of multi-collinearity affects seriously the parameter estimates. If multi-collinearity turns out to be significance, the simultaneous presence of two variables will attenuate or reinforce the individual effects of



these variables. However, omitting significant interaction terms incorrectly

$$VIF (X_j) = (1 - R_j^2)^{-1}$$

leads to a specification bias. Each selected continuous explanatory variable (X_i) is regressed all the other continuous explanatory variables, the coefficient of determination (R_i^2) being constructed in each case. If an approximate linear relationship exists among the explanatory variables then this should show up as a large value for R_i^2 in at least one of the test regressions. A popular measure of multicollinearity associated with the VIF (X_j) is expressed as:

Where: R_i^2 = is the coefficient of multiple determinations when the variable Y regressed on the other explanatory variable. A rise in the value of R_i^2 that is an increase in the degree of multicollinearity does not indeed lead to an increase in the variances and the standard errors of the OLS estimators. As a rule of the thumb, when the variables having VIF values less than the cut off value (10) is believed to have no multicollinearity problems and those with VIF of above 10 is assumed to have a multicollinearity problem (Gujarati, 1995).

Similarly, there may also be interaction between two qualitative variables, which can lead to the problem of high degree of association between two variables. To detect this problem, contingency coefficients was computed from the survey data. The contingency coefficients are compute as follows:

$$C = \sqrt{\frac{X^2}{N + X^2}}$$

Where: C=coefficient of contingency,

X^2 = chi-square random variable and N= total sample size

Also heteroskedasticity problems were checked. The heteroskedasticity occurs when the variance of error term changes with changes in variables. The existence of heteroskedasticity can affect: the parameter estimators are efficient and the estimators of the variance are also biased and as a result the test of significance would be invalid. To detect this problem the Breusch-Pagan ttest were carried out.

RESULTS AND DISCUSSION

In this section, the analytical results of the study are presented and discussed. The first section presents the descriptive results of the study pertaining to previously determined specific objectives. It followed by the discussion of econometric model results; while the final section deals with households coping strategies.

Descriptive Results

In this subsection, the descriptive analysis were addressed through describing the characteristics of the



sample households in terms of the major independent variables; these are demographic characteristics (sex of household heads, age of household heads, family size and educational level of household heads), socio-economic factors (cultivated land size, livestock owned, off/non-farm participation, pest and disease problem, land rented in or out), institutional factors (credit access, frequency of extension contacts and use of farm inputs) and coping strategies (Sale of more livestock than usual, Borrowing of food, Sale of firewood/charcoal and short term migration).

Household characteristics for continuous variables

This section presents some of the demographic and socio-economic characteristics of the respondent households which are unceasing considered in this study, those variables have influential relationship to the food insecurity situation of a household in the study area. As indicated in the table 3, age is an important demographic characteristics of the household assumed to bring food insecurity difference among the rural households. The average age of the total sampled household heads was 50.82 years while, the age of sampled respondents ranges from 25 up to 77 years. Similarly, the mean age of food secure and insecure household heads were 45.71 and 54.29 years respectively. The t-test value (4.482) revealed that there is significant mean difference between the two household groups with respect to their age at less than 1% probability level. Compared to food insecure households, the food secured households had small age. The reason for this could be, when age gets older the household head

becomes physically weaker and potentially unable to undertake different productive activities.

The average total sampled household size was 6.13 while the maximum and minimum sample respondent family sizes were 9 and 2 respectively. Furthermore, the mean family size of the food secure and food insecure households were 4.67 and 7.13 respectively. In addition, there is significant mean difference between the two household groups with respect to their family size at less than 1% probability level. The survey result showed that the households with large family numbers were more likely to be insecure than their counterparts.

The cultivated land holding per sampled households ranged from 0.094 ha to 2.75 ha and the average total cultivated land size was about 0.889 hectare with mean cultivated land size of food secure and insecure households were 1.497 (SD. 0.623) and 0.476 (SD. 0.539) respectively. There was statistically significant difference between food secure and insecure households in their mean cultivated land at less than 1% probability level. In addition, during in the time of FGD, the discussants confirm that the study area is categorized by very small and highly fragmented land holdings. Thus, the result shows that food insecure households were relying on very small pieces of land to meet their food requirement.

Livestock production is also an important source of livelihood which contributes as a source of transport, nutrition, income and serves as coping strategies during food deficit. The



survey results revealed that, the minimum and maximum livestock holding range from 0 up to 8.3 TLU and its average size of livestock is 2.329 TLU. The mean livestock holding for food secure and insecure households were 3.688 (SD=1.967) and 1.404 (SD=1.313) TLU respectively. The t-test value for means between food secure and insecure households shows that there was statistically significant mean difference at less than 1% probability level.

Also, during in the time of FGD concisely discussed that the livestock ownership is detrimental to the food insecurity situation in the study area. Especially, those who lack ox/oxen ownership are highly exposed to food insecurity, since farming activity mainly performed with oxen power and ownership of it determines the amount of production and income of a household. In general households with large livestock size are less vulnerable to food insecurity.

Rural farm households who have access to frequent extension services are more

likely to adopt better technologies to improve production and productivity. Hence, it was hypothesized as, farmers who use frequent services are found to be food secure than those less contact. In this study, farmers advised and visited a number of times by development agents per a year to identify and analyze their production problems by making them aware of opportunities for improvement. The survey result revealed that the mean frequencies of extension contact for the food secure and insecure households were 17.29 and 7.44 per year respectively. The maximum and minimum extension contact frequency in the sample households was 24 and two times per a year. The t-test value showed that there is a significant mean difference between the two household groups at less than 1% probability level. Thus, extension agents are the major sources of information provides; technical support, advice on use of technology, encourage participation for extension package and other development issues which have cumulative impact for enhancing production and productivities (Table 3).

Table : Household characteristics for continuous variables

Variables	Food insecurity status		Mean	SD.	Mean	Min.	Max	t-value
Age HH	Insecure	72	54.29	10.548	50.82	25	77	4.482***
	secure	49	45.71	10.186				
Family size	Insecure	72	7.13	1.162	6.13	2	9	10.094***
	Secure	49	4.67	1.505				
Cultivated land in ha	Insecure	72	0.476	0.539	0.889	0.094	2.75	-9.597***
	Secure	49	1.497	0.623				
livestock (TLU)	Insecure	72	1.404	1.313	2.329	0	8.3	-7.663***
	Secure	49	3.688	1.987				
Extension contact frequency	Insecure	72	7.44	4.847	11.43	2	24	-11.391***
	Secure	49	17.29	4.383				

Note: ***Significant at 1% probability level

Source: Own survey results, 2019



CONCLUSION AND RECOMMENDATIONS

On the base of the findings of the results presented in the preceding chapters, this chapter attempts to present the general conclusions and useful recommendations.

Conclusion

This study was conducted to examine food insecurity situation of rural households and coping strategies using descriptive statistics and binary logistic regression model to ascertain factors that influence rural households in Damot sore Woreda. The survey result of this study indicated that, from total sample households 59.5% were food insecure and unable to get the minimum daily energy requirement. Also, in the study area, only 40.5% of the household were food secure while their own production was not covering yearly consumption requirement of rural households.

In general, the majority of respondents in the study area have no enough physical and economic availability and accessibility of food throughout the year i.e., from the total respondents more than 58% and about 62% respectively were conveyed that strongly disagree and disagree. Similarly, more than 84% household respondents were confirmed that there was no adequate, stable and utilization of food for their family members throughout the year.

The output of the binary logistic regression model revealed that, out of fifteen independent explanatory variables entered in the model, six variables were found to be statistically significant in influencing food insecurity status while the remaining variables were statistically

insignificant. These significant variables are; sex of household head, age of household head, family size, education level of household head, cultivated land in hectare and use of chemical fertilizer.

The study was also investigated some coping mechanisms employed during food shortage. So, the survey result of this study indicated that, 62%, 68.6%, 59.5%, 59.5% and 81% of the vulnerable groups use shifting to less preferred food staples, borrowing cash or grain from relatives/friends, reducing number of meals, reducing size of meals and sale firewood, charcoal or grass as their 1st, 2nd, 3rd, 4th and 5th coping strategy respectively during at initial stage of food deficit. Similarly, 76.9%, 72.7%, 62.8%, 61.2% and 52.1% of the vulnerable households employ sale of more livestock than usual, food for work, sale or consume seed meant for next season planting, sale of production equipment and sale of agricultural tools as their 1st, 2nd, 3rd, 4th and 5th coping strategy respectively during at sever stage of food stress.

Recommendations

Based on the findings of this study, the following recommendations are stated as a possible area of interventions to improve food insecurity situation and coping strategies:

- ❖ Age of household head has significant association with household food insecurity. The households which led by older age should be taken in to account by policy maker government body and non-governmental organization during the design and implementation of whatever rural development programs in general and food security programs and



projects in particular. This can be done to build their capacity through benefiting them to improve their households' food insecurity status.

❖ Household size was found to be directly related with household food insecurity. Therefore, a rapidly increasing population needs to be delayed through designing and implementing appropriate decisions and measures. This can be done in collaboration with agricultural and health sector offices through creating strong awareness and training different family planning alternatives as far as the issue are concerned.

❖ Education is another determinant for the rural household food insecurity. The effect of education on household food insecurity confirms significant role of the variable in consideration for betterment of living condition. Hence, it is vital to develop their skills how to use and control farm lands, apply farm inputs and adopting new technologies and others. Therefore, more emphasis should be given to adult learning education to the illiterate households of in the study area by government or other concerned parties to reduce food insecurity.

❖ Farm size is one of critically determinant factor which influences the rural household food insecurity. Agricultural strategies should be designed and implemented that would have effect on maintaining the existing land size on one hand through promoting intensive agriculture and livestock production on the other hand. By doing this, the rural households have to keep the quality of the cultivated lands with good physical and biological conservation measures to improve the fertility of soils and raise land productivity.

❖ Chemical fertilizer is the most important factor for crop production.

Therefore, government and non-government should taken attention by providing it and to use the recommended rate on time.

❖ Different coping strategies were used up at initial and sever stages by rural households to against food deficit in the study area. The study result indicates that source of income and diversifications of activities were very much important factors to determine the most vulnerable households. Thus, interventions should be carried out so as to reduce vulnerability of food insecure through economically feasible alternatives. Therefore, the government should have to give technical skill training in order to increase the income of the household and link these rural food insecure households for the different projects which are food and cash for work activities.

❖ In general, attention should be focused in order to achieve farm household's food security by designing strategies addressing the identified factors as well as other determinants that are useful to achieve rural household food security.

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