Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.12, No.3, 2022

Determinants of Rural Household Food Insecurity and Local Coping Strategies: The Case of Hoko District in Sidama Region, Ethiopia

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Abstract
There are myriad of factors contributing for household food insecurity in rural households in Ethiopia Several efforts have been put in place to alleviate food insecurity globally, nationally and even locally. Despite these efforts, the situation continues to prevail and sometimes even increase in the contemporary human society. It is therefore imperative that food insecurity gets addressed appropriately. Therefore, this study sought to investigate household food insecurity and coping strategies rural households in the study area. A mixed method study design was used to attain the objectives of the study. A total of 382 sample households (308 male and 74 female) selected from 5 kebeles of the district were interviewed using structured and semi structured interview schedule. Qualitative data were collected using focus group discussion and key informant interview. Data analysis was done with the help of STATA 13. A binary logistic regression model was also employed to identify factors affecting farmer's adoption of common bean technologies in the area. The result of a descriptive statistics revealed that more than 62% of the study participant were food insecure and the remaining 37.3 were on food secure category. The result of a binary logistic regression model showed that the covariates sex of household head, age of household head, landholding size, livestock holding and off farm income size have a statistically significant positive relationship with the food security status of a household in the study area. The overall findings of the study revealed that a monotonous dietary pattern is prevalent and manifested among majority of the study participants. Therefore, all the necessary awareness creation and training on preparing different types of well-diversified recipes by using locally available farm produce such as Enset should be done by concerned bodies.
Keywords: Coping strategies, food insecurity, rural households
DOI: 10.7176/JBAH/12-3-03
Publication date: February 28th 2022

1. Background

The concept of food security has evolved over time. Food security as an issue became prominent in the 1970s and has been a topic of considerable attention since then (Maxwell, 1996). The most widely agreed definition of food security was introduced by (FAO, 1996) which defined food security as "a *situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life".* According to this definition, factors that may lead to a situation of food insecurity include non-availability of food lack of access, improper utilization and instability over a certain time period. In the definition, the dimensions of food security represented entail food sufficiency (quantity), nutrient adequacy (quality), cultural acceptability, safety, and certainty/stability (Jennifer Coates et al., 2013).

Even though considerable efforts were made to reduce food insecurity, the number of people suffering from malnutrition and hunger remains unacceptably high, globally. According to recent estimates of (FAO, 2021), between 720 and 811 million people in 2020 which is higher than the previous year. In addition, more than 2.3 billion people did not have access to adequate food in and about 12 percent of the global population was severely food insecure in 2020 (ibid). In the developing countries, the vast majority, over 850 million people, are estimated to be undernourished. In particular developing countries, such as Ethiopia, have been facing severe version of this problem over a longer period of time (Tesfahun and Osman, 2003).

Apart from the rapid population growth, climatic and land pressures, there are various socio-economic, demographic, institutional and socio-cultural factors related to the food insecurity in rural Ethiopia. A myriad of factors have been responsible for the continuing food insecurity in a rural household. This could be categorized into two dimensions namely demand and supply side factors. The demand side factors involves household size, per capital aggregate production and market access. On the other hand, the supply side factors includes farmland size, agricultural technology adoption, farming system and land quality (Kabui, 2012).

The impact of household food insecurity can be minimized post its occurrence through coping strategies. Coping strategies are 'ex post' measures in that they seek to reduce the impact of a negative event once it has happened (Rose, 2008). Increased reliance on coping strategies is associated with lower food availability and the more a household is food insecure, (Maxwell, D, 2008). In the study area, food insecurity is one of the prevalent

problem due to production deficit associated with climate variability and subsistence agricultural production. Given the fact that food insecurity imposed a widespread effect in the livelihood of rural households in Ethiopia, there remains a paucity of objectively verified evidences on the food insecurity status, its determinants and local coping strategies in the context of the study area.

2. Material and Method

2.1 Description of the study area

Hoko woreda is one of the 30 rural woredas found in Sidama regional state. The Woreda is located at the southern part of the region and neighboured with Oromia regional state in the south; Aroresa Woreda in the north east and Chabe gambeltu Woreda in the north. Geographically, it is located at 6º14' and 6º22' latitude north and 38º54' and 38º56' longitude east (Ethio-GIS, 2017). The elevation of the Woreda ranges from 1384-2387 m.a.s.l. It also consists of 14 rural and 3 urban kebeles. The administrative capital of the city is called Girija. According to (SRFEDO, 2019), the total number of population in the woreda was 98,990.Out of which, 48,945 were female and 50,045 were male. The livelihood of majority of the population in the Woreda is relied on mixed farming system. The Woreda is categorized into Dega, Woina dega, and Kola agro-climatic zones. The area receives an annual average rainfall of 1132mm. The major crops grown in the area includes: Enset, coffee, maize, haricot bean, Teff and Khat. Enset is the staple food of the population in the area while chat, coffee, haricot bean and maize are the major cash crops. On the other hand, cattle, sheep, goat and donkey are the major livestock's reared in the study area.

2.2 Study design

A cross-sectional convergent mixed method design was employed to attain the purpose of this study. The design converges or merges quantitative and qualitative data to provide a comprehensive analysis of the research problem (Creswel, 2014) and (Creswell, J. and Creswell, D, 2018) In this design, as found from the same sources, both the qualitative and quantitative data were collected concurrently and then the information integrates into the interpretation of the overall result. Moreover, the quantitative and qualitative data were collected concurrently through a community based cross-sectional survey and in-depth interview methods respectively.

2.3 Sampling techniques and sample size

In this study, a multi stage random sampling technique was employed. At the beginning, Hoko district was purposively selected based among 30 woredas found in Sidama region. Then five kebeles were selected randomly among the 14 rural kebeles found in the district. In the second stage, 382 farm household heads were selected using systematic random sampling technique considering proportional to size of the total population found in each of the selected four kebeles. As a result, the survey was administered and data were collected and analyzed for 382 respondents. The total sample size of the study was computed using statistical formula for a population size (N) that was greater than or equal to 10,000 recommended by(Kothari, 2004),

$$n = \frac{(Z^2)\mathrm{P}(1-\mathrm{P})}{d^2}$$

$$n = \frac{(1.96^2)0.54 * 0.46}{0.05^2} = \mathbf{382}$$

Z = standard normal distribution corresponding to significance level at d = 0.05 or confidence Interval (CI), 95% = 1.96, by using single population proportion formula, taking prevalence of food insecurity reported by a related study conducted in the region (Gezahegn, 2018) p = 54% (0.54), marginal of error=5% and 95% CI.

2.4 Data collection and analysis

The data were collected using interviewer administered questionnaire. The questionnaire was initially prepared in English and translated into the local Sidama language. Beside this, the data collectors assigned were fluent speakers of Sidamigna language. Moreover, the questionnaire was first pretested in non-sample respondent prior to actual data collection. The qualitative data was collected through focus group discussion and key informant interview with purposively selected farmers, development agents and experts in the district. The primary data were collected from sample HHs through formal survey. Semi-structured interview schedule was used to get first-hand information about food security status, its determinants and coping strategies of a household. The collected and completed questionnaires were first checked and coded. Data were entered into computer and analyzed using SPSS version 20 and STATA version 14 software programs after careful scrutiny.

Furthermore, the Household Dietary Diversity Score (HDDS) is an indicator of the number of different food group's consumed over 24 hours (Coates et al., 2007). It is a proxy for the dietary diversity and nutrient adequacy of a household. It includes the food groups consumed by household members in the home, or prepared in the home

for consumption by household members outside the home (e.g., at lunchtime in the fields). Nevertheless, foods consumed outside the home that were not prepared in the home aren't included (Leroy et al., 2015). The HDDS is generated by adding the number of food groups consumed in the household during the last 24 h before the interview was conducted. The HDDS value ranges from 0 to 12 and the lowest HDDS value indicates higher food insecurity status and vice versa. Based on a review of various literature such as (Moroda et al., 2018) 12 food groups have been included in this study namely: cereals; root and tubers; vegetables with tubers; leafy vegetables; fruits; meat; poultry; eggs; fish; pulses/legumes/nuts; milk and milk products; oil/fats; and sugar/honey In this study, based on the total HDDS, a household has been categorized into two groups. A household with the HDDS between 1 and 6 was regarded as food insecure and a household with HDDS above 6 was considered as food secure.

In order to capture and analyse the main the household coping strategies to food shortage, Coping Strategy Index (CSI) was calculated based on the ranks of local coping strategies adopted using Weighted Mean Score. A four-point scale with the scoring order of 4, 3, 2, 1 for frequently, sometimes, rarely and never was used to calculate frequency of household reliance on various coping strategies. The steps described herein to compute the Coping Strategy Index can be summarized in a simple algebraic form as follows:

$$\mathrm{CSI}_j = \sum_{i=1}^{n} F_i S_i$$

Where; $\mathrm{CSI_j}$ shows the Coping Strategy Index of ***j^th^*** sample household, **j**=1, 2, 3,... ; F_i=is the frequency of the ***i^th^*** coping strategy taken by a household in the past thirty days; Si=represents the severity weight attached to ***i^th^*** coping strategy, and **n**=refers to the maximum number of coping strategies used by ***j^th^*** sample household. The higher the sum, the more food insecure the household is.

2.5 Statistical model specification

The dependent variable, household food insecurity status, has a dichotomous nature. Binary logistic regression model was used to identify the determinants of household food insecurity in the study area. It is one of the popular statistical technique employed when the probability of a dichotomous outcome (such as food insecure or food secure) is related to a set of explanatory variables that are hypothesized to influence the outcome (Neupane et al., 2002). The functional form of the logistic regression model is presented the equation as follows. Let the binomial logistic regression has a dichotomous dependent variable or two values that are labeled as food insecure (1) and food secure (0). The probability of the event occurred and not occurred is predicted from *X* or independent variables under a Bernoulli trial and is given as:

$$Pi \ = \frac{e^{zi}}{1 + e^{zi}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where: subscript i denotes the i^{th} observation in the sample; Pi is the probability that an individual household will fall the category of household food insecurity (food secure and food insecure); e is the base of natural logarithms and approximately equal to 2.718; Zi is a function of n-independent variables.

$$Zi = \beta 0 + \beta 1x1 + \beta 2x2 + \cdots \beta nxn \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . (2)$$

Xi is a vector of exogenous; variables α and β are parameters of the model, β1, β2……, βk are the coefficients associated with each explanatory variables X_1, X_2, …, Xn. The above function can be rewritten as:

$\ln [P /(1- P)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k$……………………………………………………(3)

Where: P/ (1-P) is the odds (likelihoods); β0 is the intercept; β1, β2 … and βk are coefficients of the associated independent variables of X_1, X_2…and Xk.

The effect of the independent variables (e.g., β_1) is interpreted as the odds (likelihoods) of the outcome increases or decreases by a factor of eβ1. The quantity eβ1 is called the odds ratio. The odds ratio is a measure of association between the independent and the dependent variables. Likewise, marginal effects are an alternative metric that can be used to describe the impact of independent variable on dependent variable. Marginal effects can be described as the change in independent variable as a function of the change in independent variable holding all other variables in the model constant. In this study, marginal effect is used to describe the relationship between independent and dependent variables. For this analysis, post-estimation test were done after logistic regression. In order to test the existence of multi-collinearity of both the continuous and discrete explanatory variables were checked using variance inflation factor (VIF). In addition, heteroscedasticity and goodness-of- fit test was calculated to auto correlation and appropriateness of data with model.

3. Results and discussion

3.1 Household food insecurity status in the study area

The result of the Household Dietary Diversity Index (HDDI) as depicted in Table 1 indicates that there is a statistically significant (p>0.05) difference in the dietary diversity and quality between food secure and food insecure household participated in the study. As can be seen in table 1, the percentage of food insecure households take the prodigious share of the total study participant households 62.3% had low HDDS (between 1 and 5 food groups) and the remaining 37.3% had high HDDS (6 and above). It indicate that food insecurity in terms of dietary diversity and quality is less diverse among majority of households in the study area. This result is further confirmed

by a qualitative information obtained from in depth interview with key informants which ensured that there is a monotonous consumption habit extremely relied on Enset products (*kocho*) and vegetable, particularly boiled kale. From dietary quality point of view Enset diet is poor in terms of proteins and vitamins (Kusin, 1973). With enough Enset, poor households will not go hungry, but their diets will be lacking essential nutrients.

Table 1. Household food insecurity status as measured by HDDS

Household Food insecurity status	Number	Percentage	$\chi 2$
Food secure	144	37.7	0.023*
Food insecure	238	62.3	

Source: Researcher field survey, 2021

Where**:** * and ** are significant association at P≤0.05 and P<0.01 respectively;

3.2 Determinants of household food insecurity in the study area

Among the predictor variables examined in this study, those variables with a statistically significant effect on the outcome variable (household food insecurity status) are discussed below.

Sex of the household head: the regression model result in Table 2 shows that there is a positive and significant relationship (*P>0.05*) between sex of household head and household food insecurity status. The marginal effect value indicated that, holding other variables constant, the probability of being food in secure is 5.4% more likely among household headed by females than males. This finding is consistent with the findings of a study conducted by (Kabbar, 2015) in Sudan, central Darfur, comparing the food insecurity status of household headed by male and female using HDDS.

Table 2. Factors determining household food insecurity status in the study area

Variables	**dy/dx**	**Odds ratio**	**P-value**
Age of household head	0.0091	1.0394	0.067
Sex household head	0.0540	0.9771	0.044**
Educational status	0.0460	0.8221	0.022**
Household size	0.0082	1.0037	0.073
Landholding size	0.0217	1.0963	0.031**
Livestock holding	0.1133	1.6033	0.001*
Dependency ratio	0.0311	0.8761	0.048
Off farm income	0.0886	1.4553	0.002**
Access to credit	0.0037	1.0616	0.061
Number of observation = 382; Person chi^2 (110) = 33.8; Prob>chi^2 = 1.00; Pesudo-R^2= 0.7381 and Log pseudo likelihood = -58.58741			

Source*:* Researcher field survey, 2020

Where: * *significant association at P≤0.05 and* ***significant association at P<0.01; (n = 382)*

Educational status of a household head: the covariate educational status of a household head has shown a positive and statistically significant relationship (*P>0.05*) with household food insecurity status in the study area. As the result from Table 3 depicted that an increase in one level of educational status increases the likelihood of household food insecurity by 16% much higher than literate households. It indicate that illiterate households are more food insecure than literate households. This reflects improvement in human capital contributes to household food security. This finding is consistent with the result of a study conducted by (Mutisya et al., 2016) using longitudinal data analysis.as well as (Asenso et al., 2013) which found positive and significant association between level of household head and food insecurity.

Landholding size: the area of farmland owned by the household was also statistically significant at (P<0.05) and positive association with the food insecurity status of a household in the study area. It shows that household who own larger size farm land is more likely to be food secure than those with relatively smaller size farm land. As the logit model result shows a one hectare increase in cultivated land reduces the probability of being food insecure increased by 2.17%. This study produced results which corroborate the findings of a great deal of the previous work by (Buom, 2013) that revealed the variable under consideration has a positive and statistically significant relationship with household food insecurity.

Livestock holding: It is the proximate measure of household wealth status. The finding in the Table 3 depicted that livestock holding has a statistically significant (P<0.01) positive association with the food security status of a household in the study area. It is apparent from the marginal effect result in table 3 that as the livestock holding of a household increased by one TLU, the likelihood of a household being food insecure is also decreased 11.3%. The finding is consistent with the result of (Kassie et al., 2015) study in rural Malawi. The result also agrees with the qualitative information obtained from key informant interviewees on the role (importance) of livestock holding on household food security status; as the interviewee said that a household who owns livestock has better food and nutritional outcome and vice versa. As it enables a household to sell the products from livestock such as milk, milk products, and egg. Cognizant of the importance of livestock, there is a culture among poor households borrowing

a calf/cow from wealthier households and taking all the necessary care and husbandry activities to rear the calf/cow while benefiting from products of the cow basically milk.

Off-farm income: the covariate off-farm income was found to have a statistically significant at 1% (P>0.01) and positive relationship with food insecurity of households in the study area. The more the household has opportunity of participating in off-farm income generating activities, the more it will be food insecure. As such household who participated in off-farm were significantly less likely to be food insecure, compared to households that haven't participated in off-farm income. According to the logit model reported in the above table keeping other variables constant, a household who participate in one unit of off-farm income has 8.86% less likely to be food insecure than those who didn't participated in off-farm activities. This indicates that participation in off-farm income generating activities has a noticeable impact on household food insecurity. This result was consistent with the finding of (Eshetu, 2020).

3.3 Household Coping Strategies

Although there is variation in terms of coping mechanism adopted by a given household, the livelihood of majority of the respondent is relied on production, market, consumption and transfer based coping mechanisms of household food insecurity. In this study, the respondents were asked to choose from the different coping mechanism while they face food shortage. Accordingly, the major coping mechanisms adopted by household in the study area were targeted to avoid the household's food availability i.e. relying on less preferred and less expensive foods, borrow cash or grain from others, send household members to eat elsewhere and limit portion size at meal time are practiced by the largest portion of household's livestock which is 47.9%, 20.4%, 24.6% and 39.8% respectively. Conversely, skipping the entire day without eating, sell of livestock more than usual and reducing number of meals eaten in a day 10.7%, 14.6% and 20.1% respectively are the least practiced coping mechanisms in the study area.

Table 3. Households coping strategies during food shortage in the study area

Coping mechanism	Frequency	Frequency weight	Percentage
Rely on less preferred and less expensive foods	183	1	47.9
Borrow cash or grain from others	78	3	20.4
Send household members to eat elsewhere	94	2	24.6
Limit portion size at meal time	152	1	39.8
Sell of livestock more than usual	56	4	14.6
Reducing number of meals eaten in a day	77	2	20.1
Skip entire day without eating	41	4	10.7

Source: Researcher filed survey, 2021

4. Conclusion and Recommendations

The aim of this research has been to assess the household food insecurity status and factors associated with household food insecurity in the study area. The findings of this assessment indicates that the majority of households in the study area (62%) didn't ensure their food security (HDDS). The finding of the study proved that dietary diversity and quality of majority of the study participants were low and follows a monotonous consumption pattern. In addition, the covariates sex of household head, educational status of the household head, livestock holding, land holding size, off-farm income were found to have a statistically significant positive relationship with. In a nutshell, food insecurity in terms of dietary diversity is one of the prevalent problem in the study area. Thus, there is a need to create awareness to people reside in the area on diet diversification and preparation of different food recipes from locally available food sources by concerned bodies in the area. In addition, livestock production activities should be further promoted and existing livestock development activities should also be strengthened. Moreover, farmers should be encouraged and supported to engage in off-farm income generating activities during off-seasons.

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