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Detrminants of Household Food Security among Southwest Ethiopia Rural Households

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ABSTRACT

Aim of this study was to analyze determinants of household food security in Mana woreda of Jimma zone. As a specific objective, this study assessed food security status, identified determinants of food security and analyzed range of coping strategies practiced by food insecure households in the study area. Purposive sampling technique was used to select both Jimma Zone and Mana woreda. For this study a total of 70 households were selected randomly followed by probability proportional to sampling technique from two kebeles'. Both primary and secondary data were collected for this study. Primary data was collected by direct interview of sample respondents whereas, secondary data was also collected from published and unpublished documents. Household caloric acquisition was employed to measure household food security in the study area. The collected data was analyzed by SPSS version 16.0. Regression model was used to reveal the effect of different variables on household food security. Accordingly, 42.9 and 57.1% households were found to be food insecure, food secure, respectively. Out of nine explanatory variables, educational status of household head, family size, use of farm input and number of oxen owned by households were found to be significant at less than 10% probability level. Sale of livestock, borrow grains and cash from relative and reduce size of meal were identified at initial stage as first, second and third choice whereas, escaping of meal, ate less preferred food and reduce size of meal were also identified at severe stage as first, second and third choice in which food insecure households practiced during food shortage. To improve household food security, the farmer should use their oxen for cultivation purpose, use family planning and allocate their income for all expenditure and the woreda education office together with minister of education should provide adult learning programme to reduce illiteracy.

Key words: Determinant, food security, regression model

INTRODUCTION

The concept of food security was originated in the mid-1970s. The initial focus of food security was primarily on food availability and to some degree the price stability of basic food stuffs at the international and national level (Clay, 2002; FAO, 2005). Thus, in the 1970s the issue of food security was the national food supply's capacity to meet the population's energy and nutrient needs. The concept of household food security has been understood by many development workers as the availability of food in the world market place and on the food production systems of developing countries (FANTA, 2003; Bedeke, 2012).

The term food security was introduced, evolved, developed and diversified by different researchers since the World Food Conference in 1974. Food security is perceived at the global, national, household and individual levels. Food security at global level does not guarantee food security at the national level and food security at the national level does not guarantee food security at the household (Duffuor, 2011).

Food insecurity is decreasing in the world where 925 million people are undernourished. Out of them, about 900 million people are living in developing countries (FAO, 2010). The majority of food insecure and hungry people in the global context live in Asia and the Pacific (16%), Sub-Saharan Africa (30%), North Africa (8%) and Latin America and the Caribbean (9%). On the other hand, about 870 million people are estimated to have been undernourished in the period 2010-12. Out of them, about 852 million people are living in developing countries. This figure represents 12.5% of the global population (FAO, 2012).Whereas, a total of 842 million people in 2011-13 were estimated to be suffering from chronic hunger, regularly not getting food to conduct an active life. The total number of undernourished has fallen by 17% since 1990-92 (FAO, 2013).

The performance of agriculture in terms of feeding the country's population is poor. Currently in Ethiopia, there are more than 10 million people who have been affected by drought. Some 4.6 million people are threatened by hunger and malnutrition and require urgent food assistance. The deteriorating situation is compounded by high food prices (WFP, 2009).

Several studies indicated that 41% of the Ethiopian population lives below the poverty line and 31.6 million people are undernourished. The latest undernourishment numbers show a positive trend (1990-92:71% of the population; 1995-97: 64%, 2000-02: 50%, 2004-06: 44%) (FAO, 2010). The concentrations of food insecurity and malnutrition are prevalent in rural areas with a population of six to seven million chronically food insecure and up to 13 million seasonally food insecure (ATA, 2010).

Different factors were identified in various studies that aggravate food insecurity problem in Ethiopia. These are: Poor soil fertility, land shortage, occasional droughts and degradation of farm lands, frost attack and chronic shortage of cash income, poor farming technologies, weak extension services, high labour wastage and poor social and infrastructural situation. The combinations of those factors have resulted in serious and growing problem of household level food insecurity in Ethiopia (Hussein, 2006; Gilligan *et al*., 2008).

Through time, poor and hungry populations become less flexible to stress and disasters as they rely a great deal on the natural environment and lack the capacity and the resources required recovering from disasters (Oluoko-Odingo, 2011). In Ethiopia, the seriousness of food shortage problem varies from one area to another depending on the state of the natural resources and the extent of development of food shortage (Mitiku *et al*., 2012).

METERIALS AND METHODS

Description of the study area: Mana is one of the woredas in the Oromiya region of Ethiopia. Part of the Jimma Zone, Mana is bordered on the south by Seka chekorsa, on the west by Gomma, on the north by Limmukossa and on the east by Kersa. It is classified in to dega (12%), woinadega (63%) and kolla (25%) agro-climatic zones. Average rainfall is 1,467 mm. The 2007 national census reported a total population for this woreda of 149,631, of whom 76,218 were men and 73,414 were women, 4,393 or 3% of its population were urban dwellers (CSA, 2007).

Mixed cropping system is mainly practiced in the district. Maize, teff, sorghum, barley, wheat, coffee, chat and horse bean are the most widely cultivated crops in the district. Chat and coffee are important cash crops. The households purchase cereals from the market through the income they generated from sale of coffee and chat produce. This implies that those perennial crops encourage farm households to be food secured (OCFCU, 2006).

Sampling procedure: A multistage sampling technique was used for this study where in the first step Jimma Zone was selected purposively and second step Mana Woreda was selected to address food security issue. Then at the third step, two Kebeles namely: Gube Muleta and Lemi Lelesa were selected by using simple random sampling followed by probability proportional to sampling technique. A total of 38 and 32 households were selected from Lemi Lelesa and Gube Muleta kebele, respectively.

Data collection: Both primary and secondary data were collected from different sources to identify important variable that affect household food security. To generate primary data, household interview schedule was used to ask the respective households directly about food security issue. This method of data collection is crucial to get first hand information about food security status, determinants of household food security and range of coping strategy practiced by food insecure households. Secondary data was collected from published and unpublished sources related to the subject.

Data analysis: Household caloric acquisition was used to measure food security in the study area. After the data were collected from sample respondents, the results obtained were compared with the minimum requirements per day per Adult Equivalent (A.E). Accordingly, the household whose caloric consumption greater than or equal to 2100 kcal/day/AE was categorized as food secure. On the other hand, households whose consumption less than 2100 kcal/day/AE was categorized as food insecure.

Statistical analysis: The collected data was analyzed by Statistical Package for Social Sciences version 16.0. To estimate food insecurity incidence, depth and severity, Foster Greer Thorbeck (FGT) was employed. The household is food secure when Yi>Z for this model.

$$FGT(a) = \frac{1}{N}\sum_{i=1}^{q}\left[\frac{Z - yi}{Z}\right]^{a}$$

Where:

q = Number of food insecure households
Z = Minimum requirements per day per adult equivalent (2100 kcal/day/AE)
Yi = Calorie intake of each food insecure households
α = Weight attached to food insecurity
N = Total sample size

Within this FGT index, we compute the three most commonly employed indices: Head count ratio, food insecurity gap and squared food insecurity gap. The head count ratio indicated the number of households whose caloric intake is less than the minimum requirements. On the other

hand, food insecurity gap measure, on average, how far the food insecure households are below the cut off value and square food insecurity gap is a measure closely related to severity of food insecurity gap but giving those further away from the minimum level a higher weight in aggregation than those closer to the subsistence level (Hoddinott, 2001).

Binary logistic regression model was used to address the objective of this study. Household food security is a dependent variable for this model.

Mathematically:

$$Li = \left[\frac{\ln P}{1-P}\right] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \ldots\ldots\ldots + \beta_n x_n + ui$$

Where:

ln = Natural logarithm
P = Probability of being food secure
1-p = Probability of being food insecure
B_n = Coefficients of explanatory variables
X_n = Predictor variables
ui = Error term

Hypothesis: The dependent variable for this study is household food security. It is hypothesized to be a function of the following variables.

Age of household head: It is a continuous explanatory variable measured by year. Older people have relatively richer experiences of the social and physical environments and greater experience of farming activities. Older household heads are expected to have better access to land than younger heads, because younger men either have to wait for land redistribution, or have to share land with their families (Kidane *et al*., 2005). Thus, it is hypothesized that age of the household heads and household food security are positively correlated. So, it is hypothesized that age of the household heads and household food security are positively correlated.

Educational status of household head: It is dummy variable and an important determinant of household food security status in that educated households have a better chance of adopting soil conservation measures which in turn increases crop production (Million and Kassa, 2004). Educated household head has the capacity to innovate and to adopt timely technology and has better understanding of the cash crops that can help them to have a better income than the non-educated households (Fekadu, 2008; Amaza *et al*., 2009). Thus, education status is hypothesized to have a positive effect on household food security.

Family size: It refers to the total number of household members who lived and eat with household at least for six months. It is an important variable which determines the state of household food security and expected to have negative effect on household food security (Beyene and Muche, 2010; Mequanent, 2009). According to reviewed literatures, increasing family size tends to exert more pressure on consumption than the labour it contributes to production (Tsegay, 2009).

Farm land size: It is continuous explanatory variable and an important determinant of household food security. Farm size is the total area of land cultivated to food and cash crop by households, measured in hectares. Positive relationship has been established between farm size and improvement in household's income and food security (Jayne *et al*., 2005; Yilma, 2005). It is therefore, expected of a household with a larger farm size to be more food secure than a household with a smaller farm size.

Dependency ratio: It is measured as total household size divided by the number of individuals working to support the household. Due to the scarcity of resources, an increase in household size especially the non-working members put pressure on consumption than production (Mequanent, 2009; Aschalew, 2006; Feleke *et al*., 2005). An increase in the number of non-working member of household or dependency ratio increases the food insecurity level of household (Feleke *et al*., 2005). Number of oxen owned: Oxen are the most important means of land cultivation and basic factors of production. Households who own more oxen have better chance to escape food shortages since the possession of oxen allows effective utilization of the land and labour resources of the household (Getinet, 2011; Guled, 2006; Tesfaye, 2005). Positive correlation is expected between number of ox/oxen owned and household food security.

On farm income: This source of income is collected from sale of crop produce, sale of livestock and livestock products and hiring of agricultural land. The more household head engage in gainful employment, the higher he/she earns income and the greater the chances of being food secure (Beyene and Muche, 2010).

Use of farm inputs: Refers to use of chemical fertilizer, improved seed, pesticide and herbicide. The amount of farm input used was converted to monetary value based on market price during time of the survey. A household who could have used farm inputs was hypothesized to have positive relation with food security status because he/she produce more (Arene and Anyaeji, 2010). Credit access: Credit serves as a means to boost production and expand income generating activities. Thus, a household which has access to credit does initiate investment in farm and non-farm activities and achieve food security. Thus, it is hypothesized that credit access has positive relation with household food security (Gebrehiwot, 2006).

RESULTS

To identify food secure and insecure households, food items consumed for seven days were obtained from respective households. Then after it was converted to kcal/day basis and it has been made ready to calculate kcal/day/AE. On the other hand family size which was collected in number was converted to adult equivalent. Lastly, the household whose caloric consumption is greater than or equal to 2100 kcal/day/AE was categorized as food secure. On the other hand, the household caloric consumption is less than 2100 kcal/day/AE was categorized as food insecure. Accordingly, 42.9% households were food insecure whereas, 57.1% of them were food secure.

Descriptive statistics of continuous variables: The mean ages of the food insecure households were 45.1 years with standard deviation of 12.6 and the food secured household also 41.5 years with standard deviation of 10.2 (Table 1).

Table 1: Descriptive statistics of continuous variables

	Food security status								
	Food insecure (N = 30)				Food secure (N = 40)				
Variable	Min	Max	Mean	SD	Min	Max	Mean	SD	t-value
Age	25	80	45.1	12.6	28	65	41.5	10.2	1.31
Family size	3	12	6.1	1.72	2	8	5.1	1.4	2.82***
Dependeny (R)	0	1.9	0.3	0.3	0	0.5	0.2	0.1	1.98*
Land size	0.25	3	1.4	0.7	0.25	4	1.6	0.8	1.31
On-farminc	3500	24250	10922	4462	800	40000	12717	7314.6	-1.19
Off-farminc	0	2400	176.7	611.2	0	10800	1994	3587.4	-2.74**
Non-farminc	0	14800	1447.5	3458.7	0	10000	2085	3439.7	-0.77
Ox	0	2	0.8	0.7	0	2	1.1	0.8	-1.53

***,**Significant $p<0.01$, $p<0.05$ and $p<0.1$, respectively, Source own survey

The mean number of family size of food insecure households was 6.1 with standard deviation of 1.7 and for food secure households 5.1 and 1.4, respectively (Table 1). The survey indicated that there is significant mean difference between households because of family size at $p<0.01$.

This analysis aimed to see whether there is a significant difference in the presence of dependent members between the food insecure and the food secured households. The mean number of dependents of food insecure households was 0.3 with standard deviation of 0.3; and 0.2 and 0.1 for food secure households, respectively (Table 1). The independent t-test shows significant difference in the presence of dependent members with in the household at $p<0.1$.

The average farm land size owned by food insecure households was 1.4 ha with standard deviation of 0.7 where as, 1.6 ha with standard deviation of 0.8 for food secure households (Table 1).

On average, food insecure and secure households earned total cash income of 10,922 and 12,717 ETB (Ethiopian Birr) from on farm source, respectively (Table 1).

The averages of farm income generated by food insecure and secure households were 176.7 and 1,994 ETB from of farm income, respectively (Table 1). The independent t-test showed that there is significant difference between the food secure and insecure households at $p<0.05$. This finding is statistically significant at $p<0.05$.

Non-farm income is the third source of household income generated from petty trade, handicraft and sale of charcoal and construction work during off farm season in the study area. On average food insecure and secure households generated 1447.5 and 2085 ETB from non-farm income, respectively.

The average number of oxen owned by food insecure household was 0.8 with standard deviation of 0.7 and 1.1 with standard deviation of 0.8 for food secure households (Table 1).

Descriptive statistics of discrete variables: The survey result indicated that 95.7 and 34.3% households were male and female headed households, respectively. Among male headed households 40% and 55.7% were found to be food insecure and secure, respectively. On the other hand, 2.9 and 1.4% were food insecure and secure from female headed households, respectively (Table 2).

From Table 2, 94.2 and 5.8% household heads were found to be married and divorced. From married household heads 40% and 54.3% were food insecure and secure households whereas, 2.9% for divorced households were food insecure and secure equally (Table 2).

The result in Table 2 revealed that 45.7 and 54.3% households were literate and illiterate. From literate household heads, 12.9 and 32.9% households were food insecure and secure, respectively. Whereas, 30 and 24.3% of illiterate household heads were food secure and insecure, respectively. Education is an important variable for household food security because literate household head shape the activity of his/her family to involve in different income generating activity. This finding is statistically significant at $p<0.05$.

From the households interviewed, 70 and 30% households were found to be users and non-users of farm inputs. From those who use farm inputs, 30 and 40% were found to be food insecure and secure households, respectively. On the other hand, from non-users of farm input 12.9 and 17.1% was food insecure and secure, respectively (Table 2).

The result revealed that 62.9 and 37.1% were users and non-users of credit access. Among the food insecure households, 22.9 and 20% were found to be users and non users of credit access and 40 and 17.1% of food secure households were users and non users of credit access (Table 2).

Extent of food insecurity: Table 3 revealed the FGT indices: Incidence of food insecurity, depth of food insecurity and severity of food insecurity at $\alpha = 0$, 1 and 2, respectively. The result of FGT model indicated that 42.9% of households were living below minimum requirements per day per adult equivalent. To know how far the households from minimum requirements per day per adult equivalent, food insecurity depth was calculated. From the result, on average, 4.4% of households

Table 2: Descriptive statistics of discrete variables

	Food security status				
	Food insecure N = 30		Food secure N = 40		
Variable	No.	%	No.	%	Chi-square
Sex					
Male	28	40	39	55.7	0.73
Female	2	2.9	1	1.4	
Marital status					
Married	28	40	38	54.3	0.09
Divorced	2	2.9	2	2.9	
Educational status					
Literate	9	12.9	23	32.9	5.22**
Illiterate	21	30	17	24.3	
Farm input					
Yes	21	30	28	40	0.0
No	9	12.86	12	17.14	
Credit access					
Yes	16	22.86	28	40	2.04
No	14	20	12	17.14	

**'*Significant $p<0.05$ and $p<0.1$, respectively

Table 3: Extent of food insecurity

Type	Percentage
Incidence food insecurity (head count ratio)	42.9
Depth food insecurity (food insecurity gap)	4.4
Severity food insecurity (squared food insecurity gap)	0.4

were far from recommended caloric intake for active and healthy life. The severity of food insecurity is measured as a weighted average of the square distance below minimum requirement. As the survey result indicated, the severity of food insecurity is 0.4%.

DISCUSSION

Determinants of household food security: As it can be depicted in Table 4, Out of nine variables included in the model, four explanatory variables were found to be significant. The possible explanations of the significant variables are as follows.

Educational status of the household is positively related with household food security and statistically significant at $p<0.1$ (Table 4) which is consistent with the hypothesis. It is an important determinant of household food security because an educated household is more sensitive to adopt technology to maximize the output he/she generated from farm activities and this contributed directly for household food security. The odd ratio in favor of food secure is increased by 4.29 as the household is educated. This study is in line with the previous studies (Devereux, 2001; Aschalew, 2006).

Family size is statistically significant at $p<0.05$ (Table 4) and exhibits a negative relationship with household food security similar to the hypothesized effect. The possible explanation for this effect is that most of the family members are inactive age group that has no contribution for production rather than consumption. Large family size creates more pressure on household food security because more food and non food expenditure is spent for them increases. As family size increased by one, the odd ratio in favour of food secure decreased by 0.57. This study is congruent with the previous studies (Mitiku and Legesse, 2013; Ejigayhu, 2011; Bogale and Shimelis, 2009).

The result of the logistic regression model (Table 4) also revealed that the coefficient of use of farm input is negative and statistically significant at $p<0.05$ in contradict with the hypothesized effect. This implies that farm input has negative effect on household food security. Farm inputs are highly expensive in price. As a result, the farmers invest their income for farm input by ignoring other expenditures and sold their crop produce to purchase those farm inputs for his/her land when their cash income is not enough to purchase farm inputs. The odds ratio in favour of being food secure decrease by a factor of 0.15 as a farmer gets access to farm inputs. This study is contradicted with previous studies (Arene and Anyaeji, 2010).

Table 4: Result of logit model

Variables	B	S.E.	Wald	Sig.	Exp (B)
Constant	5.72	2.54	5.06	0.02	303.69
Age of house hold	-0.06	0.04	2.13	0.14	0.94
Educational status of house hold	1.46*	0.80	3.28	0.07	4.29
Family size	-0.56**	0.26	4.67	0.03	0.57
Dependance	-3.40	2.69	1.59	0.21	0.03
Land insecurity	0.14	0.41	0.11	0.74	1.15
Farm input	-1.91**	0.93	4.21	0.04	0.15
On farm income	0.00005	0.0001	0.50	0.48	1.00
Credit access	0.40	0.72	0.31	0.58	1.49
Ox	0.84*	0.46	3.37	0.07	2.32
-2Log likelihood ratio					69.18
Pearson chi-square					26.43**
R^2 (Nagelkerke)					0.42

**,*Significant at $p<0.05$ and $p<0.1$, Source own survey (2014)

The coefficient of number of oxen owned by the household is positive and statistically significant at $p<0.1$. Household food security and number of oxen owned is positively related. The household who has oxen can generate income by cultivating others land through rent and from his land. This contributes more for household food security. The odd ratio in favour of being food secure is increased by 2.32 when the number of oxen is increased by one (Table 4). This study is in line with the previous studies (Tesfaye, 2005; Mulugeta, 2002).

Coping strategy: The coping strategy in which food insecure households followed were classified in to two stages for this study with three choices for each. These are at the initial stage of food shortage and at the severe stage of food shortage with first, second and third choice for each stage. The survey result indicated that 63.3, 73.3 and 83.3% of food insecure households practiced sale of livestock, borrow grains or cash from relative and reduce size of meal as 1st, 2nd and 3rd choice at initial stage, respectively. Whereas, 53.3, 30 and 43.3% of the practiced escaping of meal ate less preferred food and reduce size of meal at severe stage of food shortage as 1st ,2nd and 3rd choice, respectively.

CONCLUSION

This finding concluded and recommended the following core idea related to the issue of household food security based on the result obtained and reviewed document.

Family size was found to be negatively related with household food security. The main case behind is that as family size increase the chance of obtaining sufficient food decreases. Due to this reason, having more household size aggravate the problem of obtaining adequate food for healthy and active life as a result, the household head should use family planning service to limit their family size.

Education is an important variable for household food security because it is found to be statistically significant and positively related with household food security. Therefore ministry of education in collaborated with the Woreda education office should provide adult learning programme for those illiterate (54.3%) households which is already set as national adult learning program.

Use of farm input was found to be negatively related and statistically significant. This means as the farmer gets access to farm input, he/she become food insecure. This is due to the income generated from different source is invested for farm input. Therefore, the farmer should allocate their income not only for farm input but also for household consumption.

Number of oxen owned by the households and household food security were found to be positively related and statistically significant. As a result, the farmers should use their oxen for cultivation of crops to get the required yield from crop cultivation and engaged in income generating activity through renting of land from other farmers so as to be food secured.

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