

*Full Length Research Paper*

## Rural household food security status and its determinants: The case of Laelaymychew Woreda, Central Zone of Tigray, Ethiopia

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**An assessment and analysis on food security status and its determinant, the experience of the farmers' food insecurity coping mechanisms and the major farm operation problems were the major focusing objectives of this study; which was conducted in Laelaymychew Woreda Central Zone of Tigray. The required data was collected from three kebeles of 125 randomly selected rural households. The data collected were presented, organized and discussed using descriptive statistics and econometric model analyses. According to the survey result the study shows that 31.2% and 68.8% of sample households were found to be food secure and food insecure, respectively. In addition, the model results revealed total cultivated land holding size, total livestock holding, total annual income per AE and use of chemical fertilizer were found positively related and statistically significant to food security status in the study area. Similarly, family size of the households was also found negatively related and statistically significant to food security status of the rural households. Collecting data in a given interval and working with the farmers at the grass root level will ensure the accuracy of household food security prevalence and proper attention has to be given to limit the rapidly growing population. In addition, increasing production and improving productivity is possible through integrated water shed management and extending small scale irrigation.**

**Key words:** Food security, determinants, coping strategy.

### INTRODUCTION

Ethiopia continues to face high levels of food insecurity. It is estimated that 6.2 million people requires emergency food assistance from July 2009 until the end of the year, an increase of 1.3 million people over the January 2009 figure. Based on current estimates, the total food requirement from June 2009 to December 2009 is 462,500 MT. Additionally, in Ethiopia there are currently more than 10 million people who have been affected by

drought. The deteriorating situation is compounded by high food prices, the cost of cereals has more than doubled in many markets since the beginning of the year, hampering the ability of many people to meet their most basic food needs and impoverishing them further (WFP, 2009). Major parts of the country are characterized by persistent food insecurity. While droughts and other disasters such as floods are significant triggers, more

important are the factors which create and/or increase vulnerability to these shocks and which have undermined livelihoods. These factors include land degradation, limited household assets, low levels of farm technology, lack of employment opportunities and population pressure. As a consequence, but also exacerbating the situation, levels of education are low and disease prevalence is high. Prior to 2005, the typical response to this persistent food insecurity was emergency relief resourced through an unpredictable annual appeals process (MARD, 2009).

A number of studies that made use of various methodologies were conducted to identify determinants of food security in different parts of Ethiopia. According to these studies, ownership of livestock, farmland size, family labor, farm implements, employment opportunities, market access, levels of technology application, and levels of education, health, weather conditions, crop diseases, rainfall, oxen, and family size are identified as major determinants of food security (Shiferaw et al., 2003; Yared et al., 1999; Webb et al., 1992).

The particular study area is characterized by high population pressures, lack of alternative employment opportunities, serious land degradation, heavy dependence on agriculture based livelihood strategies, and inappropriate utilization of land based resources which cumulatively lead to diminution of agricultural land and thereby its production and productivity. In response to these, farmers in the area are forced to seek out alternative off-farm or non-farm income sources within and/or outside their villages. In same token, as the household's access to and react to different livelihood diversification strategies are affected by different internal and external factors. Still, the prevalence of food member per year (MARD, 2008). Hence, for this study birr 5600 per family member per year, a weighted average of birr 28000 for one insecurity and hunger among households in the district has been a long-standing challenge. Therefore, this study intends to analyze the rural household food security status and its determinants.

## METHODOLOGY

### Survey design, data type and data collection method

#### Data type

Both primary and secondary data were used for this particular study. Primary data related to personal, farming system, socio-economic, institutional variables and other relevant variables were collected. Secondary information from published and unpublished documents and reports from relevant organizations were also gathered and incorporated with the primary data.

#### Method of data collection

**Household survey:** From the household survey carried out in 2009; the necessary quantitative and qualitative data on household demographic characteristics, resource endowments, food and non-

food expenditure, coping strategies of household, access to various institutional services, and other relevant information of sample households were collected.

**Focused group discussion:** Besides the surveyed information, open-ended interviews were used in order to extract different detailed and relevant information on rural households livelihood strategies and the constraints they faced.

### Sampling techniques

The study was applied a simplified formula ( $n = \frac{N}{1 + N(e)^2}$ ) where  $n$

is the sample size,  $N$  is the population size and  $e$  is the level of precision) provided by Yamane (1967) to determine the required sample size at 95% confident level and 90% level of precision. This formula requires 100 responses. But, the study had 125 respondents, avoiding sampling problem which is at 99% level of precision. Furthermore, for this particular study, a two-stage random sampling procedure was implemented. In the first stage three PAs, out of 12PAs were selected using a random sampling technique. In the second stage, probability proportional to size sampling technique was employed to draw 125 sample households from the selected sample PAs.

### Method of data analysis

For this particular study, food security status at the household level was measured by direct survey of total wealth (computing the value of the households wealth in monetary terms) of the farmers and comparing it with the minimum subsistence requirement of wealth. The government of Ethiopia has set the minimum acceptable probable value of the total wealth of the household per family household having five family members (family size was converted to AE) was employed as a cutoff between food-secured and food-insecure households. Once the households are categorized as food-secure and food-insecure, the data collected on these factors were presented, organized and discussed using descriptive statistics and logistic distribution (logit) model analyses.

## RESULTS AND DISCUSSION

This chapter reveals that the statistical analyses part of the study was discussed under three main sections. These sections are organized in line with the objectives of the study. The first section of the chapter reports on the food security status of the households. The second section presents and discusses the descriptive results of coping strategies of sampled households. Finally, the results of econometric analysis of the determinants of food security status of the rural households is presented and discussed.

### Food security status of sampled households

In this study, the households' food security status was measured by direct survey of total wealth; different income generating activities, credit in use and food and non-food expenditure in order to identify the food secure and food insecure households.

The total wealth accumulated (computed in monetary terms) by the household is weighted against the minimum recommended amount of birr 5600 per family member per year (MARD, 2008). Thus, considering birr 5600 as a benchmark, 31.2% sample households were found to be food secure and the remaining 68.8% sample households were found to be under the category of food insecure (Table 1).

### Household coping strategies

There are several different strategies that households adopt when faced with circumstances at initial stage of food insecurity called relative food insecurity and households' strategies used to assure sustainable food security. The adoption of particular mechanisms such as reduction in food consumption, migration to work, sale of household assets and others depends not only on the severity of the food insecurity created by the external shock but also on the pre-crisis food security situation of the households. Accordingly, rural households of the study area engage themselves in several coping mechanism so as to combat food insecurity. The following strategies are the main means of coping mechanism to fight food insecurity in the study area (Table 2).

### Econometric result

#### Definition of variables

**Dependent variable:** Household food security status (HHFSS) is a dependent dichotomous variable with the value of 1 if the household is food secure and 0, otherwise.

**Independent variables:** Socioeconomic, environmental and institutional variables identified from various literature and direct observations made on the field were expected to affect significantly the rural household food security status in the study area.

#### Model result

A combination of socioeconomic, environmental and institutional factors influence and create a problems on rural household food security position. These explanatory variables hypothesized to influence household food security status are presented in Table 3. The binary logit model reveals that out of fifteen hypothesized variables, five variables were found to be statistically significant. These variables include family size (FAMSIZE), total cultivated land (LANDCULT), total tropical livestock unit (TLU), use of chemical fertilizer (FERTCHEM), and total

annual income per AE (TOTINCOM) (Table 3).

**Family size (FAMSIZE):** This variable was significant at 5% probability level and negatively related with food security status of rural households. Negative relationship indicates that the odds ratio in favor of the probability of being food secure decreases as the family size measured in adult equivalent increases. The odds ratio of 0.316 implies that, other variables being constant, the likelihood of being food secure decreases by a factor of 0.316 as family size increases by one adult equivalent. This means the existence of large number of family in a household affects their wealth as it is segregated by it. The result indicates that households with larger family size tends to be food insecure compared to households having small family size. The possible explanation is that those households who depend on limited productive resources will face food insecurity by increasing family size. Moreover, land size scarcity, absence of family planning and degradation of cultivable land are common problems in the study area. This result is in conformity with the findings of Getachew (1994), Mulugeta (2002), Abebaw (2003), Ayalew (2003) and Yilma (2005). This is in agreement of the hypothesis that the family size is likely to play a role in determining the state of food security at household level.

**Total size of cultivated land (LANDCULT):** The model result reveals that this variable was significant and positively related to food security status of the household at 5% probability level in the study area. It is obvious that land holding stands for a host of factors such as wealth, access to credit, capacity to bear risk and source of income. Larger farms are associated with greater wealth and income and increased availability of capital, which increase the probability of investment in purchase of farm inputs that increase food production and ensuring food security. The positive relationship indicates that, the households with owned land resource are access to these opportunities. The implication is that, keeping other variables constant, the probabilities of being food secure increases by a factor of 1.001 as the total cultivable land holding size increases by one ha. This variable is found to be significant and supported by the findings of Dagnev (1995), Eshetu (2000), Mulugeta (2002), Ramkishna and Assefa (2002), Abebaw (2003) and Ayalew (2003).

It was hypothesized that households who have large cultivated land are more likely to be food secure than those with smaller cultivated land area. Thus, this result is in convenience of the hypothesis that the landholding is likely to play a role in ensuring the economic justice of the rural households.

**Total livestock holding (TLU):** The model result reveals that this variable is significant at 10% probability level and influences positively food security status of the households. The positive relationship is explained by the

**Table 1.** Total wealth available per family member per annum in Birr for sample households.

Total annual wealth per family in Birr	Food secure (39) (31.2%)	Food insecure (86) (68.8%)	Total (125) (100%)
Minimum	5600.00	558.00	558.00
Maximum	8793.00	5114.00	8793.00
Mean	6147.77	2564.21	3682.28
SD	887.576	883.178	1885.45

Source: Computed from own survey data, 2009.

**Table 2.** Type of livelihood strategies.

Practiced strategies	Food secure (39)		Food insecure (86)		Total (125)	
	Number	Percent	Number	Percent	Number	Percent
Work as a daily labor	24	61.53	51	59.3	75	60
Received relief food aid	23	38.97	39	45.34	62	49.6
Migrate to work	11	28.2	33	38.37	44	35.2
Reduce the number of meals	12	30.76	26	30.23	38	30.4
Sale of livestock	15	38.46	23	26.74	38	30.4
Purchased food on cash	10	25.64	18	20.93	28	22.4
Ate less preferred food	9	23.07	15	17.44	24	19.2
Sold household possession	7	17.94	16	18.6	23	18.4
Sale of fire wood	5	12.82	9	10.46	14	11.2
Sold seed meant for planting	8	20.51	6	6.97	14	11.2
Borrow food/money from relatives	7	17.94	7	8.13	14	11.2
Children discontinued school	0	0	2	2.32	2	1.6

Source: Own survey data result, 2009.

**Table 3.** Logit regression estimates of variables affecting food security status of the household head (HH).

Explanatory variables		Coefficients	Odds ratio	Significance	P-value
Category	Variables	( $\beta$ )	Exp ( $\beta$ )	level	
Household characteristics	AGE	-0.008	0.992	0.893	1.382
	SEX	-1.859	0.156	0.366	1.982
	EDULEVEL	1.446	4.246	0.382	1.075
	FAMSIZE	-1.153	0.316	0.033**	4.501**
Household resource endowments	LANDCULT	7.306	1.001	0.038**	3.046**
	SOILFERTPRO	1.898	6.672	0.178	1.472
	TLU	0.283	1.327	0.066*	2.889*
	NUMOX	-0.348	0.706	0.762	1.473
Institutional services	CREDIT	2.172	8.775	0.135	0.983
	DISTMARKT	-0.283	0.754	0.227	1.389
	FERTCHEM	0.003	1.997	0.052*	4.516*
	PESTLOSS	-0.001	0.001	0.198	0.981
Household income and expenditure	OFFNONFI	0.000	1.000	0.231	2.012
	TOTINCOM	0.001	1.001	0.084*	12.273*
	FOODAID	-1.513	0.220	0.237	1.237

Source: model output, 2009; \* and \*\* is significant at 10 and 5% probability level, respectively. AGE, age of the household head; SEX, sex of household head; EDULEVEL, educational level of household head; FAMSIZE, family size of household head; LANDCULT, size of cultivated land; SOILFERTPRO, soil fertility problem; TLU, total livestock unit; NUMOX, number of oxen owned; CREDIT, credit service; DISTMARKT, distant from market center; FERTCHEM, use of chemical fertilizer; PESTLOSS, pest infestation; OFFNONFI, off-farm/non-farm income; TOTINCOM, total annual income; FOODAID, total food aid.

fact that herd size being a proxy for farmer's resource endowment, those sample farmers with large herd size have better chance to earn more income from livestock production. This in turn enables them to purchase food on cash when they are faced by food deficit, and invest in purchase of farm inputs that increase food production, and thus ensuring food security at household level.

The odds ratio for total livestock holding converted to TLU indicates that, other things being constant, the likelihood of being food secure increases by factor of 1.327 as the total livestock holding increases by one TLU. The relationship also suggests that households who have a higher mean value of TLU are food-secure, and those, who have less than the mean value of livestock resources are food-deficit. Generally, the study demonstrated that as livestock resource increases the probability of being food-secure increases too. This result is recognizable with result found by Tewodros (2007).

**Use of chemical fertilizers (FERTCHEM):** This variable is found to be positive and significant at 10% probability level. The positive sign indicates that the use of chemical fertilizer has been perceived as a factor of improving productivity per unit area. The result shows that those households who have sufficient access to chemical fertilizer is more likely to be food secure than those who have no and/or insufficient access to. The odds ratio of 1.997 for this variable indicates that assuming other factors are constant, the likelihood of being food secure increases by a factor of 1.997 as a farmer increases the use of fertilizer by one unit. This result is supported by the findings of Mulugeta (2002), Ramakrishna and Assefa (2002) and Ayalew (2003).

**Total annual income (TOTINCOM):** The total annual income per adult equivalent was hypothesized to have positive influence on rural household food security status. In agreement with the hypothesis, its coefficient came out to be positive and significant at 10% probability level. The probable explanation is that those households, who have better access to different types of farm income and off/non-farm income and earn larger annual income, are more likely to become food secure than those households who have less income. The odds ratio in favor of food security increases by a factor of 1.001 as the total annual income increases by one unit. In a similar way Abebaw (2003) and Tewodrose (2007) have found this variable as a significant determinant of food security status of the rural households in their research studies.

## CONCLUSION AND RECOMMENDATIONS

Significant part of the Woreda is characterized by food insecurity (68.8%; Table 1), thus there is a need of food security strategy which rests on increasing food supply, improve access to food and strengthening emergency

response capabilities.

Furthermore, family size and food security status are strongly and negatively related due to the rapidly growing population than the food production in the study area. Therefore, proper attention has to be given to limit the increasing population through education and intervening family planning policy in the study area. In addition, when households especially those who have larger family size confronted with food deficit from their own produce, they have to get food aid in order to reduce households' vulnerability in severe food shortage.

Total cultivated land size was found to be significant. But, the landholding size is declining from time to time due to rapid population growth. Thus, increasing production and improving productivity is possible through integrated watershed management, protect and restore ecosystems in agricultural landscapes and strengthen land tenure security. The watershed development approach is the cornerstone of the sustainable land management and using chemical and biological technology on such limited land resources could improve food security status in the study area. This also implies that research and extension have to look for the better expanding diversified agricultural practices and extending small scale irrigation so as to improve the farmers' food access sustainably.

Livestock sub-sector is an integral part of farming system that contribute meat, milk, manure, and traction power as well as acting as a reserve to be liquidated into cash in time of need and ultimately improve household's food security. Of course, low productive breed and the already limited holding size coupled with unprofitable livestock market, due to poor health; the households had never got significant income from livestock sector. Thus, this challenge calls for policy instruments that aimed at supporting the livestock sector development or/and replacing the gap by providing appropriate technology in the country in general and in the study area in particular. Even if farmers used the blanket recommended rates of chemical fertilizers, yield improvements are feasible through the increased use of chemical fertilizers. Therefore, timely chemical fertilizers supply at a reasonable price have to be adapted to support this possibility.

Improving households' total annual income through expanding income generating activities such as off-farm/non-farm income together with the accustomed farming practices will have greater impact on improving the state of food security among the community. Therefore, intervention areas such as promoting effective extension and credit services, expanding diversified agricultural activities and creating off-and non-farm activities such as employment generating scheme would serve in reinforcing the existing local coping strategies and absorb those who are resource poor households to be productive citizen. In this regard, government and NGOs operating in the area should closely relate their

financial and technical knowledge to the benefit of the household food security.

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## ABBREVIATIONS

**AE**, Adult equivalent; **AGE**, age of the household head; **CREDIT**, credit service; **DISTMARKT**, distant from market center; **EDULEVEL**, educational level of household head; **FAMSIZE**, family size of household head; **FERTCHEM**, use of chemical fertilizer; **FOODAID**, total food aid; **Ha**, hectares; **HH**, household head; **Kcal**, kilo-calorie; **Kg**, kilo-gram; **Km**, kilometre; **LANDCULT**, size of cultivated land; **MARD**, ministry of agriculture and rural development; **MT**, million tonnes; **NUMOX**, number of oxen owned; **OFFNONFI**, off-farm/non-farm income; **Pas**, peasant associations; **PESTLOSS**, pest infestation; **SEX**, sex of household head; **SOILFERTPRO**, soil fertility problem; **SPSS**, statistical package for Social Sciences; **TLU**, total livestock unit; **TOTINCOM**, total annual income; **WFP**, world food program.

## Conflict of Interests

The author(s) have not declared any conflict of interests.

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