Journal of Sustainable Development in Africa (Volume 11, No.4, 2009)
ISSN: 1520-5509
Clarion University of Pennsylvania, Clarion, Pennsylvania

CAUSES OF RURAL HOUSEHOLD FOOD INSECURITY: A CASE FROM KUYU DISTRICT, CENTRAL ETHIOPIA

By: Messay Mulugeta Tefera

ABSTRACT

The objective of this study was to find out the major causes of rural household food insecurity in Kuyu District, Central Ethiopia. The necessary data were generated both from primary and secondary sources. Sample household survey, key informant interview and focus group discussions were the principal means of generating data from primary sources. Secondary data were obtained from related governmental offices at different levels. The study has tried to look into the major physical and socio-economic factors affecting both crop and livestock productivity in Kuyu District. To this effect, regression analysis model was applied to find out to what extent the selected variables affect the productivity level of the agricultural sector in the area. According to this analysis, possession of farm oxen and livestock, level of fertilizer application and family size were among the critical factors determining both the agricultural productivity and food security status of the farm households. Based on the findings of the study, both short term and long term agricultural development intervention schemes, strategies and policy issues have been recommended.

Keywords: Food insecurity, dietary calorie, Kuyu

INTRODUCTION

Ethiopia is one of the poorest countries in the world with more than half of its population believed to be living below poverty line. The country's economy is typically an agricultural economy and agriculture is the source of livelihood for more than 80% of population in the country. Agriculture accounts for about half of the gross domestic product (GDP) and for 90% of the country's export value. *(CSA, 2008; Mesay, 2009)*

Though it is endowed with varieties of natural resources and agro-climatic zones suitable to produce a wide variety of crops and animals, the productivity level of agriculture is very low and could not cope with the needs of the country's rapidly growing population. The sector is almost entirely dominated by small-scale resource-poor farmers. Additionally, degraded farmlands, shortage of draft power, low level of modern farm inputs and inefficient working habit (less working days per week) of the peasants characterize most of the Ethiopian peasantry agriculture. As a result, both cereal and livestock productivity level has remained low particularly since the beginning of the 1970s. It cannot provide sufficient food for the people *(Belay, 1995; Eshetu, 2000; Goyder, J. and Goyder, C., 1998; Hailu, 2000; MEDaC, 1995; Sisay, 1994)*

Majority of the Ethiopian rural population has been chronically suffering from mass poverty in more severe situations than the urban dwellers. Under-nourishment and malnutrition are common in rural Ethiopia and very large proportion of the peasants lives under absolute poverty. Moreover, landlessness, lack of means of production, and large family size (majority of which are dependent) are the major characteristics of the Ethiopian peasants at present.

This is why the issue of the problem of food insecurity has become the concern of many academicians, political leaders and other professionals today. However, majority of the researches that have been done so far on the issues related to food insecurity in Ethiopia are very general and considers the problem from national or regional points of view. Only very few case studies have been done on household or individual levels. But, as indicated by many scholars *(Debebe, 1995; Degefa, 2002; Messay, 2009; Sisay, 1994)* the food security/insecurity situation at national level fails to be the case at household's or individual level.

OBJECTIVE OF THE STUDY

This study aimed at finding out the basic physical and socio-economic causes of rural household food insecurity in Kuyu District, central Ethiopia. It also tries to identify the major factors hindering better agricultural productivity in rural Ethiopia with special emphasis to the study area.

HYPOTHESES

The following hypotheses have been laid down based on the objectives stated above. The hypotheses were used as guiding assumptions for the investigation.

1. Dietary energy available per household increases with an increase in the number of farm labor and draft animal (oxen) in the household
2. Dietary energy available per household increases with an increase in the size of landholding and the number of days the farmers spend working in the farm
3. The major proportion of the peasants has no access to adequate farm assets such as farmlands, oxen, and modern farm inputs
4. The amount of agricultural output for female-headed households is less than that of the male-headed households
5. Amount of agricultural output is positively correlated with the utilization of chemical fertilizers and access to non-farm employment opportunity.

METHODOLOGY

The fieldwork for this study was carried out in January and March. This period was chosen mainly because it is an ideal time when the peasants in the study area complete harvesting processes and easily recall and comment on what factors negatively or positively contributed a lot to their production activities.

The data used for this study were collected both from primary and secondary sources. Majority of the primary data were collected through household survey, in-depth interviews and intensive discussions with the household heads. Administrative officials at *kebele* (locally known as *kebele*) and district (locally termed as *woreda)* levels, rural development agents, health extension professionals and elders have provided crucial information for this study. Secondary data were obtained from Oromiya Food Security Disaster Prevention and Preparedness Commission, Central Statistical Authority and Oromiya Planning and Economic Development Bureau and different offices in *Kuyu* District. Educated enumerators were recruited from each sample peasant association and effectively trained on issues related to how to approach the samples (household heads) and collect appropriate data.

A two stage sampling technique was employed in this study to collect the primary data. Firstly, 4 *kebeles* were selected purposely out of the 19 *kebeles* in the *wereda*. At this stage, the researcher has taken very great care so that the selected *kebeles* would represent the *wereda* in terms of socio-economic and physical characteristics sufficiently. Spatial accessibility was also taken as additional factor. Secondly, the sample household heads were selected from each *kebele* using systematic random sampling method. This was carried after the households in selected *kebeles* were stratified into three groups based on the *woreda's* agro-climatic set-up: *dega* (cool temperate), *woinadega* (temperate) and *qolla* (hot tropical). At this stage, the rural development agents (RDAs) and *kebele* officials were consulted to identify the location of each household's residence within PAs. The sample respondents were then taken at certain uniform intervals from the prepared alphabetical list of the whole household heads living in each agro-climatic zone.

The sample size taken from each agro climatic zone was on the basis of the areal proportion of each agro-climatic zone to the total area of the *wereda*. Accordingly, 188 (47%) of the respondents were taken from *woinadega*, whereas 176 (44%) were from *dega* agro-climatic zone. The remaining 36 respondents (9%) were taken from *qolla* regions. These add up to 400 total sample households accounting for 2.53 percent of the total registered farm households in the district.

This research employs both qualitative and quantitative research techniques to analyze the data. In quantitative research approach the methodologies employed to analyze the collected data include both descriptive and inferential statistics. Most of the quantitative data were analyzed using SPSS software.

Stepwise regression model, mean, percentage, and coefficient of correlation are widely used statistical techniques in this research. A modified form of a simple equation termed as Household Food Balance Model, originally adapted by Degefa (1996) from FAO Regional Food Balance Model and thenceforth used by different researchers in this field (Eshetu, 2000; Mesay 2009) was used to calculate the per capita food available

Household Food Balance Model

NGA = (GP + GB + FA + GG) - (HL+ GU + GS +GV)

Where,

NGA = Net grain available/year/household

GP = Total grain produced/year/household

GB = Total grain bought/year/household

FA = Quantity of food aid obtained/year/household

GG = Total grain obtained through gift or remittance/year/household

HL = Post harvest losses/year

GU =Quantity of grain reserved for seed/year/household

GS =Amount of grain sold/year/household

GV =Grain given to others within a year

CONCEPTUAL FRAMEWORK

Food security is a broad and flexible concept, encompassing issues related to the nature, quality and security of the food supply, causes, coping strategies as well as issues of food access. Food security as a concept originated only in the mid-1970s in the discussions of international food problems at a time of global food crises. Since then there was a substantive change in definition and concept of food security. The initial focus of attention was primarily on food supply problems that is assuring the availability and price stability of basic food staffs at international and national levels (Tarasuk, 2001; Clay, 2002).

Food security was defined in the *Proceedings of the 1974 World Food Summit* as: '*availability at all times of adequate world food supplies of basic foodstuffs. . to sustain a steady expansion of food consumption. . . and to offset fluctuations in production and prices*' (UNFAO, 1992). In 1983, FAO expanded its concept to include a third prong: 'Ensuring that all people at all times have both physical and economic access to the basic food that they need' *(*UNFAO, 1998*).* In the World Bank (1986) report, *Poverty and Hunger,* this concept of food security is further elaborated in terms of: 'access of all people at all times to enough food for an active, healthy life.' The 1996 World Food Summit in its *Plan of Action* adopted a still more complex definition: 'Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO, 1998). This food security definition is again refined in *The State of Food Insecurity*

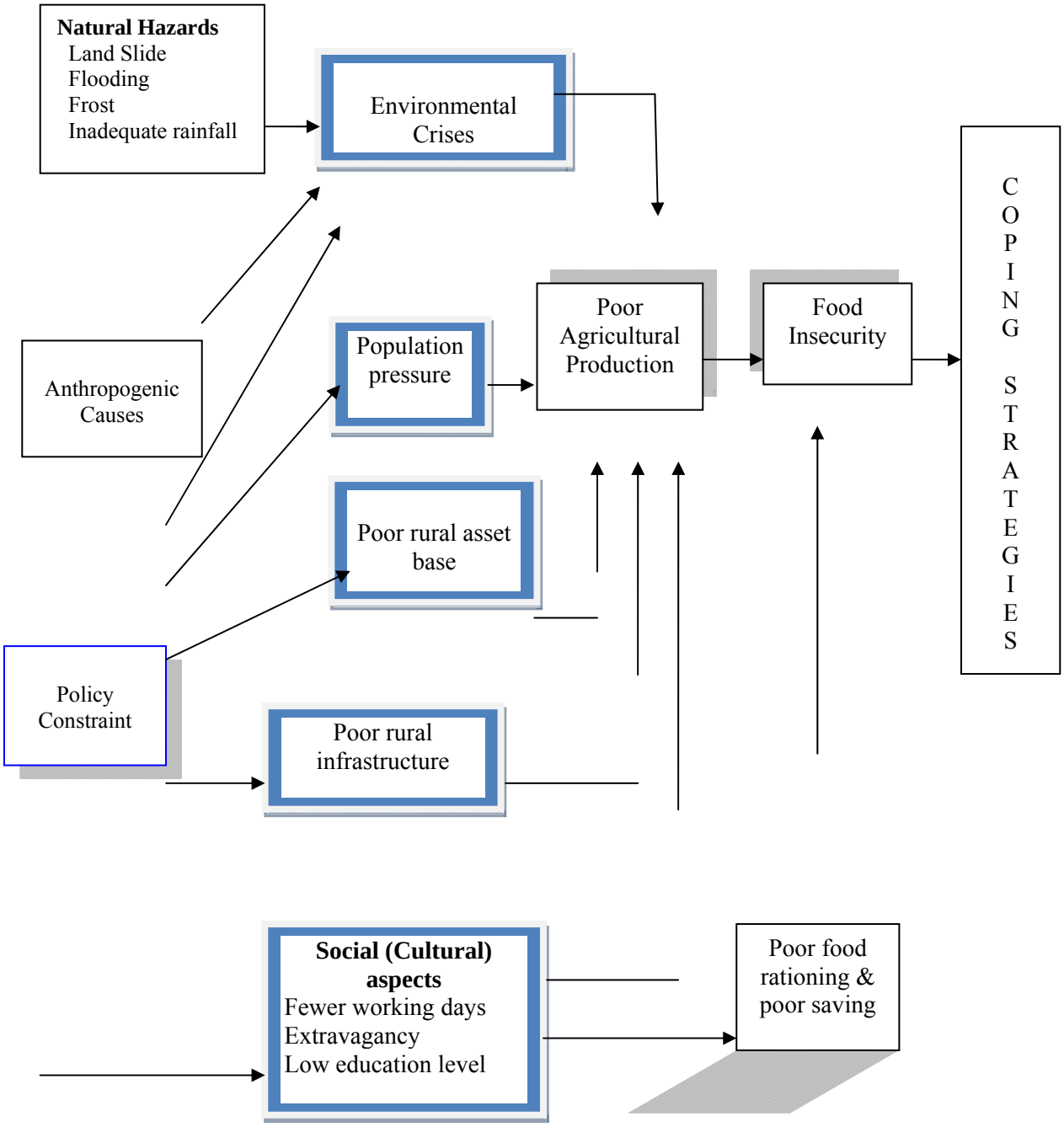
(held in 2001) 'Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary food preferences for an active and healthy life. A comparison of these definitions highlights the considerable reconstruction of official thinking on food security that has occurred over 33 years. These statements also provide signposts to researches and policy analyses, which have re-shaped our understanding of food security as a problem of international and national responsibility.

In general, the recent concept of food security has given more attention to households and individuals than its availability at international, national and regional levels. This is because, as it has been indicated hereinbefore, increasing food production, supply and sufficiency at broader levels does not necessarily ensure that each and every individual is food secured. This is why, as reported by the WFP (2009), over 1 billion people throughout the world have been suffering from hunger and malnutrition despite the fact that there is more than sufficient food supply at global level at present.

On the basis of the food security concept indicated hereinbefore, Ethiopia is found to be one of the most food insecure and food aid dependent countries in the world. A great majority of people both in urban and rural areas have been suffering from chronic and transitory food shortfalls particularly over the past four decades. The large gap between food demand and food supply was filled by food imports and food aid, the later contributing the largest share.

In this regard, different researchers agree that the causes of the existing food insecurity problems in Ethiopia are numerous and interrelated as indicated in the visual conceptual framework herein. These include rainfall variability, soil degradation, inappropriate storage facility, pre and post harvest crop loss, inability of the households to purchase adequate food, less and fragmented farmland size, lack of off-farm income opportunity, the underdevelopment of livestock sub-sector, inadequate credit and extension services, and tenure insecurity.

Figure 1: Visual Theoretical Framework



Note: *Adapted from Degefa (2002)*

THE RESEARCH SITE

Kuyu is one of the districts in North Shewa zonal administration, central Ethiopia. Astronomically, it is located at about 9º36'34"-9º56'56"N latitude and 38º05'00"-38^{0}34'13"E longitude. The total area of *kuyyu* district is 974 square kilometers (97,400 hectares). It accounts for about 8.3 percent of the zone. According to the estimated data from district's office of agriculture, about 529 square kilometers (54 percent) of the total area is arable land of which 457 square kilometers (86 percent) was cultivated. The rest non-arable land of the wereda is occupied by several land use patterns such as forests (manmade), bush and shrubs, grasslands, bare land and urban areas.

As most parts of Ethiopia Shewan plateau Kuyu Woreda receives its maximum rainfall during summer season-June, July and August (EMA, 1981; Mesfin, 1984). Likewise, the rainfall for the study area is heavily concentrated in four months: June, July, August and September. About 77 percent of the total rainfall is gained in these months. Hence majority of the food crops such as *teff (Eragrostis tef*), wheat, barley, and *nug* (*Guizotia abyssinica)* are sown during the first or second months of this major rainy season in the area. In fact, a considerable amount of rainfall is received during the three months of *belg* season (i.e March, April and May) accounting for about 16 percent of the total rainfall. As a result, Sorghum, one of the most common food crops in the area, is sown in the first or second months of this season.

According to the 2007 Population and Housing Census of Ethiopia, the total population in *Kuyu* District is 126,546 of which the rural population is 103,065 (81.44%). The rest 18.56% is urban dweller; all have been living in the town of *Garba Guracha*, the capital of the district. Of the total population, 49.79% was found male and the remaining 50.21% was female (CSA, 2008).

RESULTS AND DISCUSSIONS

(a) Food security status of rural households in Kuyu District

The single most important indicator of food adequacy level of a community is the per capita dietary energy supply measured in calorie (also called kilocalorie). This is the measure of the average daily food available to each person in a country or region.

The researcher has, therefore, converted the households' annual available food grain supply into dietary calorie equivalent using Ethiopian Health and Nutrition Research Institute (EHNRI)'s food composition table. This was done after computing the balance between grains gained and lost using the simple equation developed by termed as Household Food Balance Model.

The finding of the analysis indicates that the daily per capita dietary calorie available for the households varies significantly by agro-climatic zones. A glance at the mean value shows that the households in *dega* areas were better than those in the other parts of the study area. The residents in *qolla* regions were found the most food insecure people with average daily per capita calorie supply of only 607.99 kcal. This value is only 29 percent of the nationally recommended minimum daily requirement, 2100 kcal/day/person. Moreover, what makes the shortage of the caloric supply more serious in the area is the fact that its distribution among the households was found highly uneven.

Table 1 gives the percentage distribution of the sample households by level of calorie supply and agro-climatic zones. Accordingly, only a small proportion of the total respondents (7.8 percent) had access to adequate daily per capita dietary energy supply. Those households belonging to the lowest range of calorie supply (≤ 500 kcal) were rather large (20.8 percent) as shown in the table.

Table 1: Percentage Distribution of the Households by Level of Calorie Available

Agro-climatic	Dietary Energy (kcal/day/person)							
Zones	≤500	501-1000	1001-1500	1501-2000	2001-2500	2501-3000	>3000	Total
Dega	10.2	41.5	32.4	2.8	1.7	8.5	2.8	100.0
Woinadega	24.0	36.2	28.2	3.2	5.6	2.7	0.0	100.0
Qolla	30.5	30.7	25.0	8.3	5.5	0.0	0.0	100.0
	20.8	**38.3**	**28.5**	**4.3**	**3.5**	**3.8**	**1.0**	**100.0**

Source: *Computed from the Survey Data*

As Table 2 shows, out of the total minimum daily requirement of 4,788,000 kcal for the whole sample population, only 1,919,917 kcal (40.1%) was available in the investigated crop year. This analysis has been done based on the nationally recommended minimum dietary energy requirement of 2100 kcal/day for a moderately active adult. Accordingly, the total daily available as a whole was deficient for 2,868,083 kcal (59.9 percent). The table also shows that the proportion of the deficit to the total available calorie varies significantly by agro-climatic zones.

Table 2: The Total Dietary Energy Available and the Quantities Required by Agro-climatic Zone

Agro-climatic Zone	Total Production	Total Minimum Daily Requirement (kcal/day)	Total Daily Available (kcal/day)	Deficit (kcal/day)	% of Deficit
Dega	1001	2,102,100	1,008,497	1,093,603	52.0
Woinadega	1053	2,211,300	774,015	1,437,285	65.0
Qolla	226	474,600	137,405	337,195	71.0
All Zones	***2280***	***4,788,000***	***1,919,917***	***2,868,083***	***59.9***

Source: *Computed from the Survey Data*

(b) Factors affecting agricultural productivity in Kuyu District

As it is true for the country as a whole, both crops and livestock production practices in the area have remained backward and traditional. According to the data obtained through household survey, interviews and discussions, only very few proportion of the peasants have currently access to adequate modern farm inputs such as selected seeds, chemical fertilizers, herbicides and insecticides. Rate of fertilizer application (kg/ha) is also very small. No farmer has been found using modern harvesting and threshing facilities in the district; and hence the peasants harvest/thresh their crops through traditional means which is said to be one of the causes for pre-harvest grain losses. Moreover, only very few farmers have so far introduced selected livestock breeds (either exotic or cross-breed) to their livestock production sub-sector. Particularly, no selected breeds of goats, sheep and equines are introduced so far.

No large scale modern irrigation practices have been practiced though there are perennial streams and springs which could have been used to cultivate both cash and food crops in some parts of the area. Thus,

the peasants are typically subsistence food crops cultivators and are entirely dependent on rainwater for their farming activities.

The vast majority of the households (89.3 percent) use only oxen-plow to till their farmlands. The peasants in *qolla* zone practice both oxen-drawn and hoe-culture, which are among the most traditional tilling practices. About 37.5 percent of the farm households did not apply fertilizers to their farmlands mainly because of their inability to purchase the input. Moreover, only 35.8 percent of them have reported to have been applying herbicides. The percentage of the peasants practicing simple and traditional irrigation schemes (majority of which were used to cultivate small-scale vegetables for household consumption and sale) makes up only 30.8 percent.

Table 3: Farm Households by Production Technology: (% distribution)

Production Technology	Agro-Climatic Zone			
	Dega	*Woinadega*	*Qolla*	*Total*
Hoe-culture only	0.0	0.0	16.7	1.5
Oxen-drawn only	100.0	88.3	41.7	89.3
Both hoe and oxen-drawn	0.0	11.7	41.7	9.3
Local seed only	-	-	-	-
Improved seed only	0.0	0.0	0.0	0.0
Both local and improved seed	-	-	-	-
Peasants using fertilizers	64.8	66.5	8.3	62.5
Peasants using herbicides	52.8	46.8	0.0	35.8
Peasants using traditional irrigation	18.2	42.6	8.3	30.8
Average fertilizer application (kg/ha)	39.5	33.3	4.6	34.4

Source: *Field survey*

As briefly indicated above, crop production processes in *Kuyyu* District are characterized by poor production technologies and resource deficit. This has both current and foreseen impacts on the food security situation of the people. Particularly, these traditional farming processes undoubtedly reduce the per capita grain production in the future alongside the prevailing rapid population growth. It may also results in improper management of natural resources such as soil.

The other severe problem affecting the agricultural productivity status of the peasants in the study area is the existing meager farmland per household. As summarized in Table 4, about a quarter of the households owned land holdings of less than 1.01 hectares. About 43.5 percent owned holdings ranging from 1.01 to 2.00 hectares, while 18 percent of the households owned land ranging between 2.01 and 3.0 hectares. The landholding size of the remaining 13.75 percent was found to be over 3.0 hectares. The landholding in the area is, therefore, too small to produce adequate grain for a household under current production technology. Provided that the present rapid population growth continues unabated, the scarcity of farmlands will be more severe in the future and the corresponding grain production per household will undoubtedly be affected.

Table 4: Distribution of Households by Size of Landholding

Items	Size of landholding (Hectares)								Total
	< 0.10	*0.10-0.5*	*0.51-1.00*	*1.01-1.50*	*1.51-2.00*	*2.01-2.50*	*2.51-3.00*	*> 3.00*	
No of hlds	*0*	*16*	*79*	*118*	*56*	*37*	*39*	*55*	*400*
% of hlds	*0*	*4.0*	*19.75*	*29.50*	*14.00*	*9.25*	*9.75*	*13.75*	*100*
Average holding per hld (in ha)	-	*0.38*	*0.75*	*1.26*	*1.76*	*2.22*	*2.86*	*3.56*	*1.8*

Source: *Field Survey* **Note:** *hld/s = household/s*

An attempt was made to see the variation in the size of landholding by agro-climatic zone. Then, it was found that more proportion of the peasants in *dega* have access to larger farmlands than those living in *woinadega* and *qolla* regions as indicated in Table 5.

Table 5: Distribution of Households by Size of Landholding and Agro-climatic Zone

Items	Size of Holding (Hectares)								
	< 0.10	***0.10-0.5***	***0.51-1.00***	***1.01-1.50***	***1.51-2.00***	***2.01-2.50***	***2.51-3.00***	***>3.00***	**Total**
% of hlds in Dega Zone	0.0	2.50	0.0	9.75	4.75	5.25	8.5	13.25	**44.0**
% of hlds in Woinadega Zone	0.0	1.50	19.0	16.0	9.25	1.25	0.0	0.0	**47.0**
% of hlds in Qolla Zone	0.0	0.0	0.75	3.75	0.0	2.75	1.25	0.5	**9.0**
% of All Hlds	***0.0***	***4.0***	***19.75***	***29.50***	***14.0***	***9.25***	***9.75***	***13.75***	***100.0***

Source: *Field Survey* **Note:** *Hld/s = Household/s*

Fragmentation of farmlands was also found to be the critical factor negatively affecting the agricultural productivity in the study area. The average number of parcels owned by a farm household was found to be 4.2 during the survey. The highest number of parcels per household was reported in the *woinadega* part and the lowest in *qolla*, the corresponding figures of which were 13 and 1 respectively. As summarized in Table 6, 23.4 percent of the households operated on 6 or more plots. The percentage of the sample households owning 1 to 2 parcels accounts for 9.0 percent, whereas those who owned 3 to 5 makeup 67.5 percent of the sample farm households.

Table 6: Percentage Distribution of Households by the Number of Parcels

Agro-climatic Zones	Number of Plots						
	1	2	3	4	5	6^{+}	Total
Dega	4.5	0.0	9.1	16.7	40.9	28.8	100.0
Woinadega	6.4	4.5	17.3	20.4	30.0	21.8	100.0
Qolla	0.0	16.7	8.3	33.3	33.3	8.3	100.0
All Zones	***5.3***	***3.7***	***13.8***	***19.7***	***34.0***	***23.4***	***100.0***

Source: *Field Survey*

Generally, farmlands in the study area are small and fragmented. The writer, therefore, thinks that this could contribute a lot to the food insecurity risk of the community as the fragmentation of farmlands plays against production activities in several ways. Firstly, the fragmentation of holdings results in long distance travel from one plot to the other and consumes more time that could be used to perform other farming

activities. Secondly, it creates a problem of transporting agricultural inputs and products. Particularly, there could be a great grain loss while transporting the produce over long distances. Thirdly, the peasants who owned more number of plots may face problems in protecting the crops against wild animals which again results in pre-harvest grain loss.

Of the food security role played by the livestock sub-sector, the share of farm a pair of oxen predominates in this area. As briefly discussed hereinbefore, oxen are the only source of traction power in *Kuyyu* District and the surrounding areas. No other type of animal is used in this process unlike the case in some parts of the country in which some domestic animals such as horses and donkeys are used.

However, the survey results show that 10.7 percent of the households owned no ox and 27.5 percent of them owned only one ox. This means 38.2 percent of the households suffer from acute shortage of traction power and seek assistance from their relatives or friends.

Table 7: Distribution of Households by Number of Farm Oxen

Agro-ecological Zones	Number of Oxen					Total
	0	1	2	3	4	
Dega	7.6	36.4	39.4	12.1	4.5	100.0
Woinadega	13.1	23.4	41.1	5.6	16.8	100.0
Qolla	19.4	41.7	16.7	11.1	11.1	100.0
All zones	**13.5**	**28.5**	**38.0**	**9.0**	**11.0**	**100.0**

Source: *Field Survey*

Table 7 shows that the shortage of oxen is most acute in *qolla* agro-climatic zones than in *dega* and *woinadega*. About 61.1 percent of the peasants in *qolla* had less than two oxen; whereas the comparable figure for *woinadega* and *dega* areas is 36.5 and 44.0 percent, respectively.

Lack of non-farm income opportunity, labor wastage and tenure insecurity are also found to be other critical factors worsening agricultural productivity in the study area. Non-farm income opportunity as stated by FAO (1998:283) is the *"income derived …from wage paying activities and self-employment in commerce, manufacturing and other services [in rural areas]".* It is viewed as contributing to the diversification of the households' source of income. It is an important factor in rural economy as it allows the farmers' greater access to commercial farm inputs that could enhance agricultural performances.

However, no such wage-paying rural non-farm employment sources in the *Kuyu* until the last date of the survey for this research. The study area as a whole is characterized by complete absence of non-farm rural industries.

Owing to numerous religious or *"Saint-days"* in each month and other socio-cultural occasions, labor wastage has also been equally affecting agricultural performances in the area. The peasants waste several days performing nothing important to their day-to-day farming activities. Such farming activities like tilling, weeding, cutting and threshing are strictly forbidden on *"Saint-days"* including Saturdays and Sundays in most cases. Particularly, no any form of production activity is allowed on certain *"very influential Saint-days"* such as St. Michael, St. Gabriel, St. Mary, and St. George: the 12th, 19th, 21st and 23rd day of each month in Ethiopian Calendar. As reported by the sample respondents, almost all of the households observe 12-20 days per month. Undoubtedly, this tradition adversely affects the timely preparation of farmlands, weeding, harvesting and threshing as a result of which the crops are under produced.

In addition to the above stated constraints, the data from the survey respondents (peasants) reveals that other several factors play against optimal crop production in the study area. These include inadequate extension support and credit facilities, tenure insecurity, crop damage by pests and wild animals, on-harvest and post-harvest grain losses. Moreover, the prevailing lack of adequate rural infrastructure such as feeder roads may also share the role in increasing the food security risk of the peasants.

(c) Regression analysis of the factors affecting dietary caloric supply (amount of food available) per household

The variables selected for this analysis are more of socio-economic factors the physical factors remaining the same (constant) to all households. This is because, the writer believes, the environmental factors bring no significant difference among the plots of the households as all of them are more or less exposed to similar environmental conditions. The variation in crop yield among the sample households is mainly due to socio-economic constraints though the environmental factors are assumed to be among the major constraints to agricultural productivity in the area as a whole. Hence, crucial socio-economic factors were selected, analyzed and put in order of significance by using stepwise regression model as indicated below.

Dependent variable	Independent variables
Dietary caloric supply (amount of food available) per household	X_1 = Number of farm laborers per household X_2 = Landholding size per head X_3 = Number of oxen per household X_4 = Number of livestock per household X_5 = Chemical fertilizer per hectare X_6 = Cash earned from non-farm employment opportunity per household X_7 = Number of days devoted to major agricultural activities within a month X_8 = Number of farm parcels X_9 = Sex of household head (Male=0, Female =1)

As indicated above, nine socio-economic explanatory variables (predictors) were selected for this analysis. Stepwise regression analysis was applied to screen out the most significant variables and summarized using multicollinearity diagnosis. Accordingly, four variables were found to be most significant in determining the dependent variable i.e. dietary caloric supply (amount of food available) per household. These are the number of farm laborers per household (X_1), number of oxen per household (X_3), number of livestock per household (X_4) and amount of chemical fertilizer per hectare (X_5).

Table 8: Regression Analysis Results

Predictors	R	R^2	% Explained
X_5	*0.905*	*0.819*	*81.9*
X_5, X_3	*0.934*	*0.872*	*87.2*
X_5, X_3, X_1	*0.944*	*0.892*	*89.2*
X_5, X_3, X_1, X_4	*0.948*	*0.899*	*89.9*
$X_1 - X_9$	*0.949*	*0.900*	*90.0*

Source: Computed from the survey data , Note: R = Coefficient of correlation

R^2 = Coefficient of determination

As summarized in the table above all the selected variables (X_1 – X_9) explain 90.0 percent of the variance in the dependent variable. The remaining 10.0 percent of the variance is said to be accounted for some other extraneous factors. The combined effect of the four screened most significant variables alone

accounts for 89.9 percent of the variance; whereas the other four insignificant ones explain only 0.01percent of the variance in the amount of crop production per unit of farmland.

Out of the most significant predictors, the use of fertilizer was most strongly associated with the availability of food grain (r = +0.905) followed by the number of oxen (r =+0.793). The other important variable, labor supply, had a moderate positive association (r =+0.533) with the dependent variable which confirms Boserup's (1965) *theory of agrarian change* which argues that the households with more family size (labor supply) tend to produce higher crop yield per unit of area. Similarly, the association between cultivated land and availability of food grain was found moderately positive (r=+0.536).

Weak negative correlation (r = -0.157) was observed between labor wastage and availability of food grain. This confirms the less the number of working days in each month, the more food insecurity status of the household. Likewise, there is a weak negative association (r = -0.083) between the number of plots per household and the quantity of available food grain in a family. The analysis also shows a moderate positive correlation (r = 0.060) between the households' non-farm income status and food grain availability.

CONCLUDING REMARKS

It has been pointed out in the discussions hereinbefore that the food security status of the farm households in the study area is precarious. A great proportion of the households have no access to optimum quantity and quality of resources to purchase and produce adequate amount of food grains. Severe environmental degradation, rainfall variability, extreme rural poverty, low income base, lack of rural infrastructure (such as feeder roads), rapid population growth, acute lack of draft power, lack and low use of modern farm inputs are among the most notable characteristics of the area.

The finding of the research also indicates that oxen and other livestock ownership, human labor supply and rate of chemical fertilizer application play a critical role in determining the food security situation of the peasants. Therefore, any initiative that would enable the peasants to own a pair of oxen, reasonable number of livestock and access to better quantity of fertilizer per unit of farmland would substantially improve the food security level of the rural people in the area.

The other critical rural development measures that should be implemented in the area as the sustainable rural development options include afforestation, family planning, non-farm income generating activities and the development of small-scale communal irrigation schemes. Voluntary resettlement scheme may also be another most notable option to ease the problem of overpopulation and acute farmland scarcity in *Kuyu* District.

Lastly, the researcher would like to recommend the continuation of the current government's all-out attempt in encouraging the promising and self-sufficient farmers who have been appearing very recently. The appearance of these promising small-scale farm households could be an indication of the possibility for food security mitigation in the near future provided that the aforementioned interlocked problems are abated.

REFERENCES

Belay, T. (1995). *Population Pressure and Problems of Arable Land Degradation in Ethiopia*. In A Workshop Proceedings of the Demographic Training and Research Canter of the Institute of Development Research, 18-19 April 1995. Addis Ababa University

Boserup, E. (1965). *The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure:* Earthscan Publication Ltd, London

Central Statistical Authority (CSA) (2008). Statistical Abstract. CSA, Addis Ababa

Clay, E. (2002). *Food Security: Concepts and Measurements*. A Paper for FAO Expert Consultation on Trade and Food Security. FAO, Rome

Debebe, Habtewold (1995). *Food Security: A Brief Review of Concepts and Indicators*. In Mulat, et.al (eds.) Proceedings of the Inaugural and First Annual Conference of the Agricultural Economics Society of Ethiopia, 8-9 June 1995, Addis Ababa

Degefa, Tolosa (1996). *Belg Crop Production as a Strategy of Households' Food Security: A Comparative Study of Belg Grower and Non-Belg Farmers in Munessa Woreda, Arsi Zone*. MA Thesis, Addis Ababa University

Degefa, Tolosa (2002). *Household Seasonal Food Insecurity in Oromiya Zone: Causes.* Organization for Social Science Research in Eastern and Southern Africa (OSSREA) Research Report No. 26, Addis Ababa University

Ethiopian Mapping Agency (EMA) (1981). *National Atlas of Ethiopia*. EMA, Addis Ababa

Eshetu, Bekele (2000). *The Underlying Causes of Household Food Insecurity and Coping Strategies. The Case of Ligambo Woreda, South Wollo Zone, Amhara Region, Northern Ethiopia*. MA. Thesis, Addis Ababa University

Goyder, H. and Catherine Goyder (1998). *Case Studies of Famine: Ethiopia. In Curtis, D. et al (eds.) Preventing Famine: Policies and Prospective for Africa*. Routledge Publisher, London

Hailu, Ejata. (2000). *The Impact of Agricultural Bio-Technologies on Rural Households Food Security: The Case Study of Two Woredas in Oromiya Region*. MA Thesis: Addis Ababa University

Hussien, Bekele (2006). *Major Causes of Household Food Insecurity in Wuchale-Jidda Woreda, Oromiya National Regional State.* MA Thesis, Addis Ababa University

Ministry of Economic Development and Cooperation (MEDaC) (1995). *Towards Increased Domestic Cereals Production in Ethiopia.* Working Papers, Addis Ababa

Mesfin, Wolde-Mariam (1984). *Rural Vulnerability to Famine in Ethiopia 1958-1977*. Addis Ababa University Press, Addis Ababa

Messay, Mulugeta 2009. The Food Security Attainment Role of Urban Agriculture: A Case from Adama Town. Unpublished Research Report

Oromiya Planning and Development Bureau (OPDB) (1997). *Condensed Physical Geography of Oromiya National Regional State*. OPDB, Addis Ababa.

Sisay, Asefa (1994). *Agricultural Development Policy, Poverty and Food Insecurity in Africa: A political Economy Prospective*. In Wiley's (ed.) African Rural and Urban Studies, Vol.1, No.3, Michigan State University, Michigan.

Tarasuk, Valerie (2001). *Discussion Paper on Household and Individual Food Insecurity*. Health Canada

United Nations Food and Agricultural Organization (UNFAO) (1992). *The State of Food and Agriculture.* UNFAO, Rome

United Nations Food and Agricultural Organization (UNFAO) (1998). *The state of Food and Agriculture*. UNFAO, Rome