

**ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES**

**A STUDY ON  
RURAL HOUSEHOLDS' FOOD SECURITY  
STATUS: THE CASE OF KUY YU WEREDA,  
OROMIYA REGIONAL STATE**

**BY  
MESAY MULUGETA TEFERA**

**ADDIS ABABA  
JUNE 2001**

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Mesay Mulugeta**

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## **DEDICATION**

This research paper is dedicated  
to the memory of my mother,  
**Alemnesh Mammo Tola**

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Mesay Mulugeta

## ***ABSTRACT***

*This research paper is a study on rural households food security status in Kuyyu wereda. The general objective of the study was to find out the status of the rural households to access to resources which enable them to produce or purchase adequate amount of food. Moreover, the basic factors to food security/insecurity conditions in the study area were also discussed in detail.*

*The analyses of the study were made use of both primary and secondary data. The primary data were collected from 400 sample households living in four of the nineteen Peasant Associations (PAs) in the wereda. The secondary data, on the other hand, were collected from different libraries, document centers and offices.*

*The study discusses some demographic characteristics of the study area like size and sex distribution, fertility, language, religion, literacy and marital status of the population. Major farm activities of the peasants and access to productive assets such as farmlands, livestock, draught power, farm inputs and labor were also discussed. Moreover, the households' sources of grain/cash income and expenditure, factors determining grain productivity and per capita dietary energy supply as well as the households' asset, dietary energy supply and cash positions were discussed in detail.*

*Food availability calculations were carried out to measure the status of households' food security status in the area. Accordingly, only 5.2 percent of the sample households in the area were found to be access to the nationally*

*recommended daily per capita dietary energy supply i.e. 2100 kcal. On the whole, the total available dietary energy from all sources as reported by the households fulfills less than half of their per capita calorie requirement. Multiple regression analyses were also carried out to find out to what extent the selected variables affect the households' per capita dietary energy supply and the farmlands productivity. According to these analyses, possession of farm oxen and livestock, fertilizer application and family size were among the critical factors determining both productivity and the status of the households to access to adequate amount of food.*

*Therefore, it is suggested that among other things, increasing the real income of the peasants, diversifying the rural economy, assuring tenure security, subsidizing basic commercial farm inputs and awaking the peasants continuously on issues related to resource management and family planning must receive policy attention to reduce the households' food insecurity. Moreover, attempts should be made to increase the productivity of the livestock sub-sector in the area so that its food security role will be maximized.*

## ABBREVIATIONS

|              |   |  |
|--------------|---|--|
| <b>AAU</b>   | - | Addis Ababa University                             |
| <b>AEG</b>   | - | Association of Ethiopian Geographers               |
| <b>AESE</b>  | - | Agricultural Economics Society of Ethiopia         |
| <b>CSA</b>   | - | Central Statistical Authority                      |
| <b>EEA</b>   | - | Ethiopian Economics Association                    |
| <b>EHNRI</b> | - | Ethiopian Health and Nutrition Research Institute. |
| <b>EMA</b>   | - | Ethiopian Mapping Authority                        |
| <b>FAO</b>   | - | Food and Agricultural Organization                 |
| <b>FDRE</b>  | - | Federal Democratic Republic of Ethiopia            |
| <b>GDP</b>   | - | Gross Domestic Product                             |
| <b>hh</b>    | - | Household  |
| <b>IDR</b>   | - | Institute of Development Research                  |
| <b>ILCA</b>  | - | International Livestock Center for Africa          |
| <b>Kcal</b>  | - | Kilocalory   |
| <b>MEDaC</b> | - | Ministry of Economic Development and Co-operation  |
| <b>MoA</b>   | - | Ministry of Agriculture                            |
| <b>NBE</b>   | - | National Bank of Ethiopia                          |
| <b>NOP</b>   | - | National Office of Population                      |
| <b>PA</b>    | - | Peasant Association                                |
| <b>Qtl</b>   | - | Quintal  |
| <b>RRC</b>   | - | Relief and Rehabilitation Commission               |
| <b>TGE</b>   | - | Transitional Government of Ethiopia                |

# **CHAPTER ONE**

## **1. INTRODUCTION**

It is believed that hunger is said to have occurred as far back as the inhabitation of man on earth. But the present times have the obvious distinction of being the period when more people suffer from hunger, malnutrition and under nourishment and die of famine or diseases related to these problems. Though more food is available than is needed at global level, billions of people suffer from hunger and millions die each year especially since the beginning of 1970s. According to some research findings and documents, several people have been at risk of food insecurity problems even in countries where food supplies are adequately available at national level (See Mengistu, 1987; Curtis, D. et.al., 1988; Ingco, D. et.al., 1996).

The food insecurity problems over the last three or four decades have been worse not because of insufficient production at global or national levels but due to some other reasons as shall be discussed in the future. Globally, there has been a steady improvement in food production and consumption though not in each country. Even in developing countries as a whole per capita food production has increased steadily despite the deteriorating situation in some countries like Ethiopia. For instance, per capita food production has increased 37 percent from early 1960s to mid-1990s and caloric supplies increased 35 percent from early 1960s to 1990s. The 1923 kcal daily per capita available in 1961 in developing countries as a whole increased to 2,541 kcal in 1992, which was greater than the generally accepted minimum requirement of 2,200-2,300 kcal by FAO (Ingco, D. et.al., 1996).

Despite these promising gains at global level, the trend of food production and consumption in Africa over the last three or four decades has either been stagnating or declining. Africa, where more than half of 'Low-Income Food-Deficit' countries are found, is the continent characterized by deteriorating food security situation and growing number of chronically food insecure people (FAO, 1996). In Sub-Saharan Africa, in particular, several millions of people have no access to the minimum dietary energy recommended by FAO. In 1996, for example, about 210 million or 39 percent of the total population in this sub-region were undernourished (FAO, 1998).

Ethiopia is not out of the general picture of Sub-Saharan Africa. As Seyoum (1995:1) notes "Ethiopia is one of the countries severely hit by problem of food insecurity more pronounced in the decades of the 1970s, the 1980s and even at present." Over 64 percent of the total population is absolutely poor and the average per capita available caloric supply is only 73 percent of the minimum requirement (Bariagaber, 1995). Moreover, the country is characterized by increasing structural food deficit as a result of increasing population and stagnating food crop production.

One may raise at least two questions at this juncture. Firstly, why some parts of the world or some individuals suffer from malnutrition provided that there is adequate food at global or national level. Secondly, why Africa, particularly sub-Saharan Africa, is most severely affected by food crisis? As far as the former question is concerned, Pandya-Lorch (1999:93) rightly says "Availability of food does not guarantee access to food . . . [rather] food security is jointly determined by availability of food and [the individual's ability to] access... at all times to the food required for a healthy and productive life."

On the other hand, the reason why Africa, sub-Saharan Africa in particular, has been suffering from hunger is varied and complex. As briefly discussed by Tekolla (1997), the fact that Africa is not food self sufficient is a 'Puzzling Paradox.' This is because Africa is not the poorest, though not the richest, in several kinds of resources such as soil, forest, livestock, fish, varieties of crops, minerals and human resources. The problem is that most of these resources were not utilized effectively so as to boost the overall development of the continent. According to Ingco, D. et.al. (1987), the prevailing extreme poverty in the continent is the main cause of hunger in Africa and not lack of natural resources and insufficient production. Mengistu (1987) also argues that hunger is caused not only by natural factors and shortage of food but also by worsening of the normal climatic cycle by societal influences, unequal distribution of resources of food production and prolonged conflicts/ wars. Poor governance, lack of openness to trade, inappropriate policies, poor public services and disease prevalence are also said to have played a great role in increasing the risk of food insecurity in Africa (Blackden and Bhanu, 1999). Moreover, the argument by Taylor, A. et.al (1996) indicates that the failure to develop and adopt new farming technologies have also great contribution to the ever increasing problems of hunger in Africa in general and in Ethiopia in particular.

As far as the future food security situation is concerned, some documents and research findings indicate that Sub-Saharan African countries will face the bleariest prospects though the world's grain production is expected to increase remarkably. In Sub-Saharan Africa the number of hungry and malnourished people is believed to grow roughly at the same rate as the population growth in this sub-region (Ingco, D.et.al., 1996). The daily per capita food consumption which had not surpassed 2,140 kcal since 1960s (Tekolla, 1997) is expected to be at its worse condition in the future. Likewise, the number of chronically food insecure people in Ethiopia,

which is estimated to have constituted over half of the total population, is expected to scale up in the future. Particularly, the landless, the elderly, the disabled, female-headed households, the poor pastoral and the new established households are/will be the most severely affected group of the society (Mansfield, 2000).

## **1.1 Statement of the Problem**

As discussed earlier, Ethiopia is one of the poorest countries in the world with more than half of its population believed to be living below poverty line (Brune, 1990). Moreover, the works of several scholars and documents agree that the country's economy is typically an agricultural economy and about 85 percent of the total population in Ethiopia lives in rural areas. Agriculture accounts for about half of the GDP and for 90 percent of the country's export value.

Though agriculture is the source of livelihood for vast majority of population and mainstay of the Ethiopian economy, its productivity level is very low and could not cope with the needs of the rapidly growing population. The sector "is almost entirely dominated by small-scale resource-poor farmers" (Belay, 1997:11). Due to this and other related factors such as lack of appropriate policy and technology, degradation of farmlands, shortage of draft power, and socio-cultural problems, the Ethiopian agricultural sector could not provide sufficient food for the people. (MEDaC, 1996; Goyder, J. and Goyder, C., 1998; Eshetu, 2000; Hailu 2000). As a result, cereal production has remained low particularly since the beginning of the 1970s (MEDaC, 1998). This, no doubt, has been affecting the lives of many people by widening the level of poverty and increasing the number of food-insecure citizens both in rural and urban areas.

previous paragraphs, the primary focus of this research is on the rural households food-security status in *Kuyyu Wereda*, North Shewa Zone, Oromiya Regional State.

## **1.2 Objective of the Study**

This paper generally aims at assessing the food security status of the rural households in *Kuyyu Wereda* and to find out causes for the households' failure to access to enough food in the study area. It also attempts to overview the crop and livestock production processes of the peasants.

### **The specific objectives of the paper are:**

1. to examine to what extent the households have access to enough food through out the year and to analyses the households' per capita dietary caloric supply.
2. to assess the household's position in cash, saleable material resources and productive assets such as land, oxen, labour and livestock resources.
3. to overview the general living condition of the farming community in the area.
4. to identify the major environmental, economic and socio-cultural problems influencing agricultural productivity in the area.
5. to assess the crop and livestock production processes/activities and technologies in the area.
6. to identify whether or not there is any non-farm employment opportunity and to what extent this contributes to the households' food availability.
7. to suggest some ideas that help alleviate the peasants problems related to agricultural productivity and food availability.

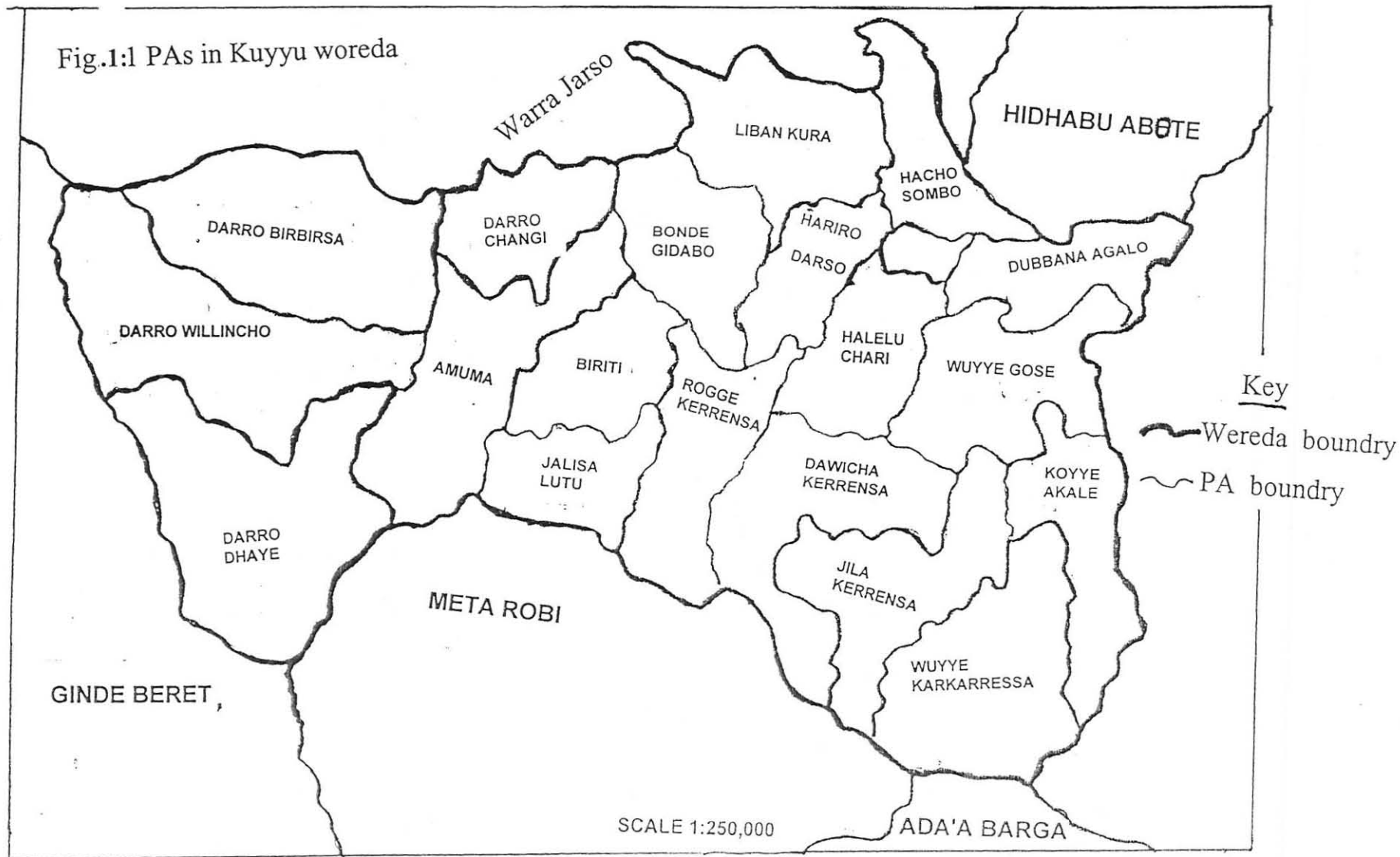
### 1.3 Research Questions

The purpose of this study is to answer the following questions. The questions have been laid down based on the objectives stated above.

1. What does the rural households' food security (dietary caloric supply) status look like in Kuyyu *wereda*.
2. Is there any temporal or chronic shortage of food (dietary caloric supply) in the area?
3. Do people feel that food insecurity is one of the society's major problems?
4. What proportion of the peasants have access to adequate farm assets such as farmlands, oxen, and farm inputs (such as fertilizer, pesticide and selected seeds)?
5. What do the cash and material resource position of the households look like?
6. What are the factors that affect the households' per capita dietary caloric supply? Which explanatory factors are more significant?
7. What are the major factors affecting agricultural productivity in Kuyyu *wereda*? Which of these factors are more significant in affecting yield per unit area?
8. What do crop and livestock production systems look like in the area?
9. Is there any non-farm employment opportunity in the study area? To what extent it contributes to the households' dietary caloric supply?
10. What does the general living condition of the farming community in the area look like?
11. To what extent does the present rural-oriented policy encourage the peasants to produce more?

structured questionnaires and semi-structured interviewing guides. The questionnaires were filled by sample household heads living in four PAs and the interview was held with numerous individuals ranging from the destitute group of peasants to the officials and experts in the field. Some of the interviewees were elderly persons, PA officials, youngsters, women, development agents (hereafter DAs), PA officials, and experts at the wereda's office of agriculture and rural credit institution.

A two stage sampling technique was employed in this study to collect the primary data. Firstly, 4 PAs were selected purposely out of the 19 PAs in the *wereda*. At this stage the researcher has taken very great care so that the selected PAs will represent the *wereda* in terms of socio-economic and physical characteristics sufficiently. In other words, those PAs which were assumed to constitute agro-ecological zones roughly as proportional as that of the wereda's were selected. Spatial accessibility was also taken as additional factor. Secondly, the sample household heads were selected from each PA using systematic random sampling method. This was carried after the households in selected PAs were stratified into three groups based on climatic set-ups (*dega*, *woinadega* and *qolla*) using top-maps and the list of each PA members obtained from the *wereda's* office of finance. About 1751, 1871 and 229 registered households were identified in *dega*, *woinadega* and *qolla* regions, respectively. At this stage, the DAs and PA 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 agroclimatic zone.



Source: Adopted from a sketch map prepared by North Shewa Zone Planning and Economic Development Office, 1989 E.C.

The sample size taken from each agro climatic zone was on the basis of the areal proportion of each 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 which accounts for 2.53 percent of the total registered farm households in *Kuyyu Wereda*.

The stratification of the households into agro-climatic zone was done to study the spatial variation in socio-economic characteristics and therefore food security status of the community by climatic set-ups. Hence, the dietary energy supply position of the community and the impacts of major food security/insecurity determinants have been analyzed both as a whole and by agro-climatic variation in this study.

The researcher organized group discussions and field observations to substantiate the data obtained by interviews and questionnaires. Discussions were made with group of different individuals in the community. The researcher has also made field observations and tried to grasp knowledge on some of the environmental and socio-economic conditions of the peasants.

Research results, documents and other related literature were used as secondary data in this research. The writer has visited several libraries, document centers and offices in order to obtain the secondary data used in this paper. Some of these libraries and offices are AAU libraries, CSA, MEDaC, UNECA library, EMA and several offices in *kuyyu wereda* and North Shewa Zone of Oromiya Region.

### **1.4.3 Data Processing**

The methodologies employed to analyze the collected data include both descriptive and inferential statistics. The data were analyzed using manual and computer soft wares such as SPSS (Statistical Package for Social Scientists) and the results have been presented in tables and graphs.

Mean, percentage, coefficients of correlation and determination, and standard deviation are the most widely used statistical techniques in the analysis of the data. Stepwise Multiple Regression Model has been employed to see the association between the selected independent variables and crop production per unit of land in the study area. The extent of the influence of numerous selected variables on the households' per caput dietary energy supply has also been analyzed by use of Stepwise Multiple Regression Model.

The Stepwise Multiple Regression Model was selected for the analysis because this model has the capacity to retain the significant independent variables which have a critical effect in describing the variance of the dependent variables. It has, therefore, the significance of entering the variables in their order of importance.

The net available food grain for the households has been computed using simple arithmetic formulas. The balance between total quantities of food obtained and the quantities lost have been calculated and converted into calorie equivalent based on EHNRI's food composition table.

The calculated calorie has been compared against the national average daily caloric requirement for a moderately active adult (2100 kcal) to measure the food

security status of the sample households in the study area. A modified form of the simple equation developed by Tegegne et. al. (1999) and modified by Eshetu (2000) has been used to calculate the balance between the gross quantities of grain obtained and the quantities lost. The equation is as given below:

$$\text{NAG} = Y + \text{FP} + \text{FA} + \text{R/G} - \text{S} - \text{SR} - \text{PHL}$$

|            |   |                         |
|------------|---|-------------------------|
| Where, NAG | = | Net Available Grain     |
| Y          | = | Own production/stock    |
| FP         | = | Food Purchased          |
| FA         | = | Food Aid                |
| R/G        | = | Remittance/Gift         |
| S          | = | Sales                   |
| SR         | = | Seed Reserve (5%)       |
| PHL        | = | Post Harvest Loss (10%) |

## 1.5 Significance of the Study

In fact, this study was carried out for academic purposes and it is confined only to a single *wereda*. However, the findings of the study will be helpful to have deeper knowledge about the food security status of the country's rural community in general and the surrounding area in particular. It contributes a lot to indicate issues related to the nature and extent of the households' food insecurity problems that the rural population is facing at present. Therefore, the result of this study will be helpful to formulate policies and strategies which could alleviate both the immediate and long-term problems of the society and bring about sustainable development.

## **1.6 Scope and Limitations of the Study**

The scope of this study is confined to the analysis of the rural households food security status in *Kuyyu wereda*. The study considers the households' asset, cash and calorie supply positions and the basic factors determining the households' ability to access to adequate food supply through out a year. However, this study is not free from limitations owing to data collection and analysis problems.

Some of the limitations are:

- the fact that most of the data obtained from rural household were rough estimations.
- some of the households in the sample PAs might be misplaced while categorizing into agro-climatic zones.
- lack of standardized food security insecurity indicators to measure the status of food security for a given society.

## **1.7 Organization of the Paper**

This research paper has been divided into six chapters. The first chapter deals with the introduction part which again comprises the overview of food security/insecurity situations at global, continental and national levels, statement of the problem, research objectives and questions, methodology and limitation of the paper.

In the second chapter the writer tries to review briefly the concepts and current thinking of food security and definitions of important terms in this research.

## CHAPTER TWO

### REVIEW OF THE RELATED LITERATURE

#### **2.1 Food Security: The Concept**

The major concept in use in this study is "food insecurity/security." This concept has developed through time and attained a wider attention at the beginning of the 1980s (see Debebe, 1995, Kifle and Yoseph, 1999). More emphasis was given to it after ". . . the focus of unit of analysis shifted from a national and global levels to a household and individual level" (Debebe, 1995:2). This means that before early years of the 1980s (prior to the growing incidence of the shortage of food supply particularly in developing countries) food security was considered as availability of food supply at national and global situation rather than individual level.

The consideration of food security as an adequacy of food supply at global, regional and national levels undermines the variables which determine the households' or individuals' ability to access food. It gives more emphasis to the variables that affect food production (Debebe, 1995). On the other hand, since the early 1980s, the essential elements of the concept of food security have become the availability of food and the household's or the individuals' ability to acquire enough food at all times. Hence, the current concept emphasizes the role of multiple factors that affect the households' or individuals' ability to acquire enough food all the times. (see Debebe, 1995; Kifle and Yoseph, 1999).

From the brief explanations in the above paragraphs, it is now possible to differentiate food security from food self-sufficiency. Kifle and Yoseph (1999:60) differentiates these two terms as follows:

*"[Food self-sufficiency]... refers to an aggregate local (national, regional, sub-regional, etc) food production which is sufficient to feed the population under consideration. The country can be food self-sufficient. However, this does not mean that the food security of all its population is ensured."*

This is why, as indicated by the World Bank (1997), several million people through out the world have been suffering from hunger and malnutrition despite the fact that there is more than sufficient food production at global level. For instance, as noted by Seyoum (1995), if the world's total available food were evenly distributed in 1989/90, each person would have been assured of the dietary energy supply of 2700 kilocalories. But over 786 million population was suffering from chronic food malnutrition during the same year. This, therefore, indicates the availability of food at global or national level does not guarantee household or individual food security.

In general, the more recent concept of food security has given more attention to households and individuals. This is because, as already indicated, increasing food production, supply and sufficiency at global and national levels does not necessarily ensure that each and every individual is food secure.

## **2.2 Definition**

As discussed by Kifle and Yoseph (1999), there are several definitions of household food security. One of the most commonly used definitions is that of

World Bank (1986) which is read as "access by all people at all times to enough food for an active, healthy life." Many researchers have adopted this definition to their works (see Bazaaro, 1991; Hinchcliffe, et. al. 1996; Markos, 1997; Lorch, 1999; Hailu, 2000).

As indicated by Kifle and Yoseph (1999), the definition for household food security has four major components. These are availability, access, utilization and asset creation. Availability, as component of food security, ". . . is the household's capacity to produce the food it needs", whereas, "Access is the ability of the household or individual to purchase food" (Kifle and Yoseph, 1999: 60-61) The term access is more clearly explained by Debebe (1995:2) in such a way that 'access' "marks the ability of households to get command over . . ." enough supply of food through production, purchase, exchange or gift. 'Utilization' is also an important consideration of food security because the food provides the consumer with essential nutrients so that the body carries out its functions properly. As 'asset creation' is concerned, it is very important because the peasants sale their belongings or 'assets' to purchase food items during grain shortfalls. (Kifle and Yoseph, 1999).

Food insecurity, the direct opposite of food security occurs when a certain proportion of the population in a country fails to access to enough food during a certain period of time. Inability to access to enough food in turn implies household's failure to establish access to productive resources such as land, livestock, agricultural inputs and labour power declining of household's asset position, and declining productivity of farm lands due to environmental degradation (Markos, 1997).

Depending on its level of influence and the duration of occurrence, researchers identified two types of food insecurity: chronic and transitory food insecurity. Getachew (1995:29) differentiates them as follows:

*Chronic food insecurity is a continuous inadequate food intake caused by the inability to acquire food. Transitory food insecurity is a temporary decline in a household's access to enough food.*

According to MEDaC's (1999) document, chronic food insecurity is the indication of poverty as a result of which the people fail to access to enough food over longer period of time. On the other hand, transitory food insecurity happens due to a short-term failure in production or increase in prices of food. According to Kefle and Yoseph (1999), transitory food insecurity is caused by seasonal instability in food supply, food prices and fluctuations in household's income. The persistence of the situation for months could lead to famine. Chronic food insecurity, on the other hand, affects those households who persistently lack the capacity to produce or buy enough food. Chronic food insecurity, therefore, is regarded as being synonymous with poverty.

### **2.3 Current Thinking on Food Security**

Currently food security has become one of the burning issues of the world. The question of how to feed the rapidly growing population of the world, geared by developing countries, has become one of the prominent discussion points of politicians, academician and other concerned bodies in the world at present. Some scholars or schools of thought believe that it is by no means possible to feed the population of the world in the future; and others believe that both agricultural

productivity and population number will continue growing hand-in-hand and there will be no problem of food scarcity in the future. Recently, there are five major schools of thought that deal with the prediction of agricultural production and food security situation of the world in the future (Hinchcliffe, F., et.al. 1996). These are briefly considered below:

1. ***Optimists and complacents***: The proponents of this school of thought say that the growth in food production will continue in the future alongside reductions in the world's population growth. They hope that the biotechnology research will fully develop and the area under production will significantly expand in the near future which in turn results in development of both crop and livestock productivity. They also expect a significant reduction in population growth in developing world, and more diversified economic system so that the society gets less GDP from agricultural sector than the present situation.
2. ***Environmental pessimists***: These group of thinkers suggest that the world has approached the ecological (environmental) limits to growth. These limits are soon to be passed; or have already been reached. As a result, yield growth of major crops will be slower than the present situation. The growth will even stop or fall particularly due to soil erosion, land degradation, deforestation, and over exploitation of other resources. They recommend the control of population growth to be put as the first priority.
3. ***Industrialized world to the Rescue***: This group of thinkers believes that the countries in the developing world will never be able to feed their population. So the industrialized countries should fulfill their food deficit. According to this group of people the Third World countries will continue facing the present

production constraints such as ecological, institutional and infrastructural problems.

4. ***New Modernists***: The New Modernists believe that the maximum food production growth is possible only when high external farm inputs are used on existing lands. This idea is supported by the World Bank, Winrock International, FAO and the Sasakawa Global 2000. This group argues that maximum productivity can be obtained by increasing the farmers' use of modern farm inputs such as fertilizers and pesticides.
  
5. ***Sustainable Intensification***: This group argue that substantial growth is possible in unimproved or degraded areas through farmer participation in technology development and extension. According to this school of thought, protecting and regenerating natural resources while performing agricultural practices, particularly in degraded and unimproved areas, can help for sustainable agricultural development and food production. The protection and regeneration of natural resources could increase the substitution of natural resources for external farm inputs which could in turn reduce the adverse impact of the external farm inputs on the environment.

These all schools of thought, probably except the Environmental pessimists, agree that food production will have to increase substantially over the next decades so that the world's increasing population will access to adequate food supply. The environmental pessimists do not see any means of boosting the volume of production owing to ecological limits to growth.

## 2.4 Indicators of Household Food Insecurity

As Debebe (1995:9) noted, "Assessment of food insecurity is a difficult issue as there are no universally established indicators which serve as measuring tools." However, several researchers agree that numerous interrelated socio-economic, environmental and political factors determine the food security situation of a society. (see Intana, 1995; Debebe, 1995; Markos, 1997, Lorch, 1999). These factors include the ability of the households to produce or purchase adequate food, size of land holdings, off-farm income opportunity, availability of sufficient member of livestock particularly oxen, and households' access to several other valuable assets.

Several food insecurity indicators have come into use along with the development of the concept of food security. The utilization of these indicators depends on the procedure, purpose and depth of a research. Three major important indicators have been developed which enable a researcher assess, analyze and monitor food security situation of the people under consideration. These are 'supply', 'food access' and 'outcome' indicators. These can be classed into two major categories based on their use. 'Supply' and 'access' indicators are considered as process indicators and they measure the major causes of food insecurity in the region under study. On the other hand 'outcome' indicators measure the level of food intake sufficiency in the areas. (Debebe, 1995).

As Debebe (1995) pointed out 'supply' indicators are not appropriate to analyze food security situation at household level. Rather they provide a general picture of the food security status at broader levels such as national, regional or societal levels. But 'access' and 'outcome' indicators serve better to measure

household food situation. The detail of the three major indicators is given in the table below.

**Table 2.1: Indicators of Household Food Security**

| <b>Supply Indicators</b>       | <b>Food Access Indicators</b>      | <b>Outcome Indicators</b>                 |
|--------------------------------|------------------------------------|---|
| - Meteorological data          | - Land use practices               | -Household budget and expenditure         |
| - Natural resource data        | - Dietary change                   | - Food consumption frequency              |
| - Agricultural production data | - Livestock sales                  | - Subsistence potential                   |
| - Market information           | - Sale of assets                   | - National status                         |
| - Information on pest damage   | - Change of food source            | - Storage estimates                       |
| - Food balance sheet           | - Access to loans/credit           | - Household perception of food insecurity |
| - Regional conflict            | - Seasonal migration               |   |
| - Agro-ecological models.      | -Diversification of income sources |   |
|                                | - Diversification of livestock     |   |

Source: Debebe (1995:11) as summarized from Frankenberger (1992).

An important issue related to food security indicators is the households' 'coping strategies' at times of food shortfalls. As Yared (1999) pointed out, rural households are not passive victims of food shortfalls; they implement coping strategies that balance the need to maintain their food security. These include, among others, sale of livestock, agricultural tools and jewelers, reduction of consumption levels, credit from merchants and money lenders, sale or mortgaging land, collection of wild foods and distress migration (Debebe, 1995).

The significance of the 'coping strategies' to resist food crisis depends on the quality and quantity of the resources that the households owned. Those households who possessed more resources such as productive and reasonable size of land, livestock, labour power, and other valuable assets can better cope up the problem of food crisis. Based on this, Kifle and Yoseph (1991), has identified three major groups of households:

1. '**Enduring households**': are those households who have access to adequate quality and quantity of food at all times.
2. '**Resilient households**': are those households who may suffer from food shortfalls during food crisis, but easily recover afterward.
3. '**Fragile household**': are those groups of households who are prone to food insecurity utmost during food crisis and cannot recover unless special attention is given to them.

## **2.5 Food Security Situation in Ethiopia**

It has been briefly indicated in the previous portion of this paper that food security is attained if and only if each and every person is assured of access at all times to the food required for a healthy and productive life. However, the globally adequately available food is not found evenly distributed among or within countries. Hence, millions of people are suffering from malnutrition, under- nourishment and famine in different parts of the world. Several countries in the developing world, majority of which are found in Africa, are currently unable to provide their population with adequate food requirement (Lorch, 2000).

Most of the people in Sub-Saharan African countries within which Ethiopia is identified in particular have been suffering from both chronic and transitory food shortages. In this sub-continent per capita food production has been decreasing while the demand for food has been soaring at an annual rate of 2.9 percent per year over the past three decades (Tekolla, 1997).

As part and parcel of the Sub-Saharan African countries, the food security situation in Ethiopia is not better than the general picture of the region. According to the food security strategy document (1996) of Ethiopia, over 52 percent of the Ethiopian population are food insecure or found below the poverty line. This figure indicates that the problem of food insecurity in Ethiopia is the worst compared to other Sub-Saharan African countries such as Nigeria, Sudan, and Tanzania, the corresponding figure of which are 17%, 18% and 35%, respectively. Consequently, Ethiopia has become one of the principal food aid recipient countries in the world. (Tekolla, 1997).

In general, as Seyoum (1995:1) noted Ethiopia, ". . . is one of the many countries severely hit by problem of food insecurity more pronounced in the decades of the 1970's, the 1980s and even at present."

According to the Food Security Strategy document of Ethiopia (1996), currently over 52 percent of the total population of Ethiopia is thought to be food insecure. Moreover, about half of the children under five years age are suffering from malnourishment (World Bank, 1997). And the situation has been further made complex by the current very fast population growth rate and the resulting declining per capita food production in the country. Therefore, let alone in a position to feed the thousands of people that have been added annually, the country has become

increasingly dependent on foreign food aid to meet its ever-increasing food requirements.

From the fact that ". . . the demand for food has been growing at rates much greater than the rate at which it could be produced. . ." (Seyoum, 1952:2), some researchers dare to say that Ethiopia is trapped by Malthusian problems of food shortfalls. The Malthusian classical approach to population growth and food production argues that the power of population to reproduce is indefinitely greater than the power in the earth to produce food for people . Hence, at times of imbalance between the two variables, the increase of population is necessarily limited by food insecurity (McCleary, 1952). In fact, several scholars have criticized the Malthusian approach in that this school of thought has undermined the role of trade, family planning and technology (see Boserup, 1965; Grigg, 1980).

What so ever the idea of both the contrasting approaches is, Ethiopia is suffering from malnutrition, undernourishment, famine and mass poverty. Though the time ". . . in which we live has the obvious distinction of being the period when more people die of famine than any previous century" (Curtis, et.al., 1988, 3), the case of Ethiopia is unique in that the problem is so vast and being aggravated by the prevailing rapid population growth and severe environmental degradation. Moreover, many scholars agree that the attempts that have been made so far to increase productivity both in crop and animal sub-sectors did not bring about sounding development (Yigremew, 1999; Hailu, 2000).

## **2.6 Cause of Food Insecurity in Ethiopia**

At this juncture, one can raise a question, what are the causes of food insecurity or lack of adequate food in Ethiopia? By considering the fact that Ethiopia is endowed with diverse agro-ecological systems, favorable climatic conditions for agriculture, and soil fertile enough to produce variety of crops (Bayou, 1996), the country could have produced food commodities adequate to feed its people. However, due to the following major factors, according to several scholars in the field, the country's agricultural sector has failed to produce as much food as the country requires.

### **a) Environmental Degradation**

According to Belay (1995), environmental degradation is the result of several interactive factors. However, the prevailing rapid population growth rate has been exerting the most serious stress on land in Ethiopia. At present, Ethiopia belongs to a group of countries whose population is growing at alarming rate. Along with this rapid increase in human population, the number of farm animals is also increasing. This has created a severe burden on lands in Ethiopia particularly in the highlands where 80 percent of the human population lives. As a result of the scarcity of land in the highlands, the peasants have been forced to cultivate marginal areas (areas of very steep slopes, shallow soils, etc). This situation has aggravated soil erosion and deforestation in these areas (Goyder, 1988). Hence, "Ethiopia is considered to have one of the most serious soil degradation problems in the world" (MEDaC, 1995:10).

According to the scholars in the field, the overall consequence of the existing alarming rate of environmental degradation on the one hand, and the fast population

growth on the other hand, will undoubtedly be the growing disproportion between the demand and supply sides of food in the country. This in turn results in food scarcity and frequent occurrence of hunger and famine.

## **b) Low Level of Agricultural Technology**

Though agricultural activity is believed have been started since time is immemorial in Ethiopia (Mesfin,1972), agricultural techniques from ancient to present has been at its lowest standard compared to other parts of the world, even to that of many African countries (Sisay, 1995). The tools are too traditional and supposed to be resembling the ancient ones. Majority of the farmers till their plots with animal-drawn plows, hoes and other traditional hand tools. Thus, agriculture in Ethiopia is ". . . almost entirely dominated by small-scale resource-poor farmers who produce 90-95 percent of all cereals, pulses and oil seeds" (Belay, 1997:11).

Moreover, the use of modern farm inputs such as commercial fertilizers, selected seeds, pesticides and herbicides is found to be very low owing to several constraints. According to Mulat Demeke (1996), for instance, the profitability of commercial fertilizer in particular has been affected by three major interrelated factors: high input price, low yield response and low output price.

Alongside its high prices compared to the peasants' purchasing capacity, the delay and shortage distribution characteristics of fertilizer has adversely affected the use of fertilizer in Ethiopia. The response of yield to fertilizer application is also low because the peasants cannot afford to apply the optimum amount of fertilizer and other complementary inputs at appropriate time. Furthermore, the farmers do

not obtain encouraging prices for their limited surplus grain production since the marketing system is constrained by numerous factors such as inadequate road networks. Thus, the output that could have been obtained from using fertilizers has remained low in the country (Mulat, 1996).

### **c) Inadequate Research in the Sector**

In most parts of Africa research activities on food crops and livestock production are very limited and ineffective. Even the existing limited researches done so far are too academic to solve the real problems of the peasants. According to Tekolla (1997), the ineffectiveness of the research work to bring about sustainable development in the sector is attributable to several factors some of which are lack of funding and facilities, inadequate qualified staff, and deficiencies in the management and coordination of the related activities.

Ethiopia is not exceptional to this general picture of Africa. In fact, Ethiopia has about five decades experience in agricultural research, since the late 1940s and early 1950s. Today, agricultural researches in the country are carried out by several national research centers like Institute of Agricultural Research, Alemaya University, Forestry Research center, National veterinary Institute and Institute of Development Research of Addis Ababa University.

However, most of the researches done so far fail to meet their objectives due to almost similar constraints to that of the whole Africa explained above. These include lack of research personnel particularly senior staff, shortage of resources, lack of motivation and incentives to the research personnel, and the fact that

majority of the researches are too academic or not target oriented. As a result, they lack scientific depth and integrity. On top of this, the peasants in the country are not taken into consideration in decision-making processes of technology generation. The peasants are forced to accept whatever newly introduced technologies if there is a chance to reach them: but usually the generated technology does not reach the peasants which means that the research resources remain wasted (Goshu, 1995; Robinson, 1994; Habtemariam, 1996).

In connection to the existing weak linkage between the research findings and farm practitioners (extensionists) Mulugetta (1995) writes:

*"Historically, there has been a weak linkage between extension and agricultural research..... Extensionists have not been formerly involved in ..... farm research activities, the number of forums or publication passed to the extension worker have been limited, and there have been few attempts by extensionists and researchers to collect farmers feed-back concerning newly introduced technologies (Mulugeta, 1995:45).*

Therefore, one can safely say that the agricultural researches done so far are limited both in quality and quantity to solve the real problems of the agricultural sector in the country. Even the findings of the limited researches did not reach the farmers to the extent that it must have been and hence it is said to have been a wastage of the country's available meager resource without any sounding advantage for the development of the sector.

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## **D) Pre-and Post- Harvest loss**

Though the scholars in the field notes that reliable estimates of pre-and post-harvest food losses are difficult to measure it is estimated that about 20-30 percent of major food commodities is lost per year in Ethiopia. This figure is very high compared to that of some African countries such as Chad, Cameroon, Sudan and Tunisia, the percentage estimated loss of which are 10%, 6%, 10% and 7-14%, respectively (Tekolla, 1997). As Kifle and Yoseph (1999:70) noted, this may be attributable to the adverse impact of "pest diseases, wild animals and the [country's] poor storage facilities."

### **e) Inadequate and variable Rainfall**

As Kifle and Yoseph (1999:69) noted "Long-term lack of adequate rainfall, in association with changing rainfall pattern, has been a major contributing factor of food short-falls. . . ." In such a country where irrigation farming constituted very small proportion of cropland, the amount and variability of rainfall, no doubt, affects agriculture severely. According to Food Security Strategy Document of Ethiopia (1996), there is a significant rainfall variation between years and places in Ethiopia. The average coefficient of variation during 1961-1987, for instance, was 7 percent for the whole country the highest being in Tigray where the coefficient of variation was 29 percent.

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Mesfin (1984) supports the adverse effects of the country's rainfall characteristics saying:

*"About 41% of the country receives an annual rainfall of less than 800mm, which is considered to be the minimum for crop production . . . But it is the variation rather than the total yearly rainfall that is problematic, because the peasants have no way of adjusting themselves to the fluctuation. (Mesfin, 1984:75).*

#### **f) Policy Constraints**

Several scholars agree that appropriate land reform system and land policy is crucial for sustainable agricultural development and poverty alleviation (see Saco, 1978; Gizachew, 1994; Dessalegn, 1994; Mesfin, 1999). In such an agrarian country like Ethiopia, land reform arrangement in particular is found to be one of the most important factors affecting the overall development of the agricultural sector and land use practices.

In connection to the importance of land and land tenure system in Ethiopia, Dessalegn (1995:i-ii) writes:

*Land is a critical asset in rural Ethiopia. The determination of rights to land, and the resolution of uncertainties regarding tenure and access to land is essential if any meaningful development effort is to be undertaken in rural areas. There are few aspects of rural life which are not affected by land and system of holding . . . The peasant's land management practices, cropping strategies, investment plans, and even routine decisions having to do with labor, employment and household consumption are influenced by the existing tenure arrangements" (Quoted in Yegremew, 1999:213).*

Aklilu and Tadesse (1994:51) also emphasized the importance of tenure security saying "we have learnt that the peasants tend to produce more if they are assured . . . not only the right of possession but also the rights of ownership, with all its implications therein."

However, Ethiopia is an unfortunate country in this case because all its past and present rural land policies were not designed so as to create favorable conditions for the sustainable development of the agricultural sector. As Tadesse (1999) indicated, during Haile-Selassie's government a few groups of ruling class controlled majority of the nation's land leaving over 50 percent of the rural population as tenants. The land tenure system did not guarantee the peasants any legal protection. They were forced to pay a great proportion of their produce to the landlords. They were also susceptible to unexpected evictions from the land that they till. The overall feature of Haile-Selassie's land tenure system, therefore, did not encourage the peasants to increase their output and take care of the natural resources such as soil and vegetation.

Haile-Selassie's government fell in 1974 and the socialist-oriented government, Derg, came to power which macro-economic policy, as Hamza and Azanaw (1995) and Kuma (1995) stated, was guided by socialist principles that allow excessive intervention of the government to all economic sectors. For instance, by declaring land to be the collective property of people the state became the real owner of land." As a result, the peasant farmers had become the occupiers, but not the real owners, of the distributed land.

During the Derg regime, the peasants did not have long-term security on their land. They were also forced to sell part of their grain produce at less than market

prices. On top of this, the policy suppressed the participation of private farm operators which could have been played a great role in the development of the sector and poverty alleviation. All these Derg's policy constraints, among others, had severely discouraged the peasants to increase their output and to invest in long-term development strategies. Hence, the peasants lacked initiations to practice such crucial activities like terracing, afforestation and irrigation schemes (Hamaza and Azanaw, 1995; Kuma, 1995; Tadesse, 1999).

Similarly, the current rural land policy is believed to be developed by small group of decision makers with little room for public debate and it is even more difficult to understand. There are no fundamental changes in land reform systems. The ownership right on rural land remained vested in the state. Hence, all those bad consequences of the previous government land tenure system on agricultural productivity will be expected to continue in the future (Robinson, 1994; Tadesse, 1999; Yigremew, 1999; Worku, 2000).

In addition to the problem of land insecurity, there are other several problems related to the current land policy issues in Ethiopia. One of the major problems is the government's failure to subsidize some crucial farm inputs such as fertilizers, pesticides and herbicides. In connection to this Yigremew (1999:71) writes:

*In the name of free market and structural adjustment, the government is quickly retreating from the responsibility of providing important services to the peasant sector. Subsidies on fertilizer prices have been lifted and fertilizer prices have been soared. . ."*

This, no doubt, aggravates the peasants' limited use of fertilizers as they cannot afford to pay for the further increased prices. Even when the price was lower than the present case, the amount of fertilizers per unit of farmland was very low compared to most African countries (Tekolla, 1997). Thus, one can safely say that the effective use of fertilizers in the near future is unthinkable under current high price for the commodity, the consequence of which will be a decline in food grain output and increasing prevalence of malnutrition, under-nourishment and famine in the country.

The other important drawbacks of the current rural development strategy, as Hailu (2000) pointed out, is the failure of the adopted intensive use of bio-chemical technology to boost production as much as it is required. The fact that the country is found at its infant stage of development and majority of the peasants are absolutely poor, contributed to the insignificant impact of the adopted technologies. The country's research capacity, irrigation practices, and rural developmental institutions were not well developed to facilitate the wide use of these inputs. Moreover, majority of the peasants are very poor and cannot afford the prices of the inputs. On top of this, the marketing, pricing and distribution network of both the inputs and outputs are not well developed. All these bad situations have created a tremendous impact on the effectiveness of the adopted technologies.

The rural credit is one of the major problematic institutions of the current rural development strategy. It is not designed so as to alleviate the finance-related problems of the peasants. Yigremew (1999:220) concludes the drawbacks of the rural credit institutions saying, "They have a very bureaucratic and stringent loan administration policy. . . and have left out the poorest section of the peasants."

In addition to the above explained current rural land policy constraints to agricultural development, the fate of landless group of farm households have yet to be clarified. Though the number of landless rural households is growing alongside rapid population growth, the current reform system has not clearly stated the fate of those groups of peasants who have no direct access to land. According to Gavian, S, and Amare (1996), these groups of peasants were forced to farm by borrowing, sharing or renting the land from their family or neighbors informally. According to the findings of Gavian, S. and Ehui, S. (1996), this informal tenure arrangement create a tremendous difficulties on peasants to invest in long-term development ventures such as terracing, legume planting or crop rotation.

#### **g) Diminishing Size of Landholdings**

As it is clearly indicated in the previous sections of this paper, Ethiopia is characterized by very fast population growth rate. This has in turn resulted in severe population pressure on the lands of the country. Particularly the highlands are characterized by persistent land fragmentation and decreasing holdings per household. As Yigremew (1999) computed from CSA (1998), 36.3 percent of the farming households have 0.5 or less hectares of farmlands and 62.3 percent own 1.0 or less hectares of land. Other several studies through out the country also indicate that the average landholding size is very small. For example, the average holding size is found to be 1.4 ha in Gera Midir wereda (Mulat and Teferi, 1996), 1.5 ha in Karsa Qondaltiti (Fanaye, 2000), and 1.4 ha in Dayi Abu areas, North shewa, Oromiya Regional State (Mesay, 1997). A study by Yeraswork (1995) in Wollo (Yeju, Ambasel and Dessie Zuria) and North Shewa (Menz and Tegulat) also indicates the prevalence of acute shortage of land where 63.4 percent of the farm

In general, the estimates of the Ethiopian country are food single year while decades. Hence, high and possible

The over access to resource amount of food regional or national adequate amount production resource of the rural household food on the basis earlier.

households have less than 0.75 ha of land and nearly 80 percent have no more than a hectare of land.

Moreover, Desalegn (1993), Yohannes (1997), Eshetu (2000), and Fanaye (2000), have observed that a considerable proportion of farm households lack access to farmlands. As many as 50 percent of the households own no land and only very few of them have reasonable land size, in some peasant associations.

In general, several researches in the field agree that under current production technology the present land holding size of the peasants, particularly in the highlands, is barely adequate for feeding household members and provide living on a sustainable basis. The problem seems more severe in the future provided that the present rapid population growth rate continues unabated.

#### **h) Lack of Draught Power**

It is clear that the major source of draught power for the smallholder subsistence farming in Ethiopia is animal particularly Oxen. Nevertheless, according to certain researchers, such as Desalegn (1997), the rural households who own less than two Oxen make up about 57 percent of the total rural households in the country. Those who own no oxen are estimated to be over 30 percent. The findings of other researchers such as Beyene (1996), Teferi (1994), Aklilu and Tadesse (1994), Mekonnen (1999), Fanaye (2000) and Eshetu (2000) also indicated the existence of acute shortage of draught power in certain peasant Associations or *weredas* in the country.

## CHAPTER THREE

### 3. GENERAL BACKGROUND OF THE STUDY AREA

#### 3.1 Physical Characteristics

##### 3.1.1 Location

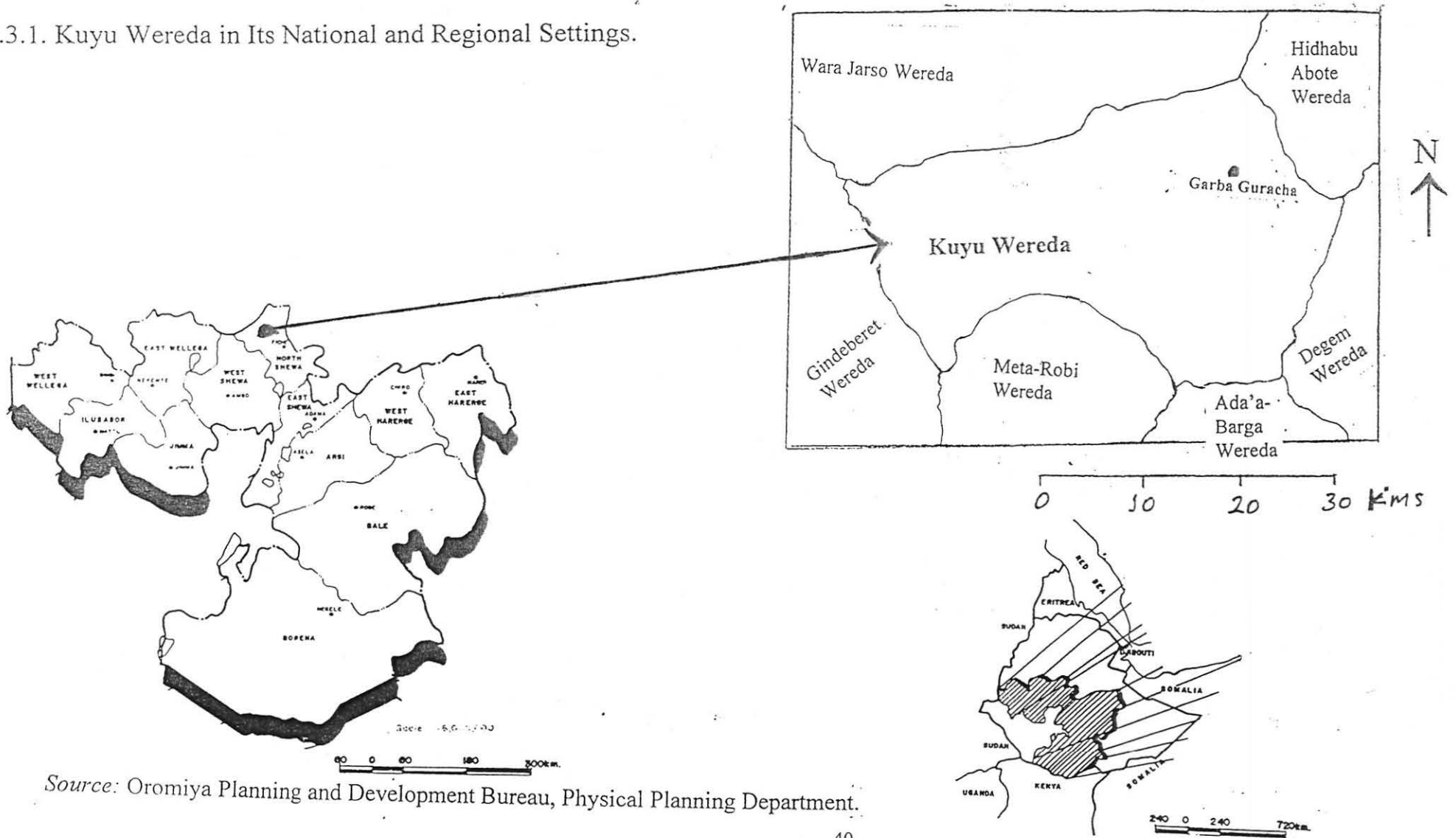
*Kuyyu wereda* is one of the twelve *weredas* in North Shewa administrative zone of Oromiya Regional State. It is found at about 150 km from Addis Ababa in northwestern direction on the main road to the town of Bahrdar. Astronomically it is located at about 9°36'34"-9°56'56" North latitude and 38°05'00"-38°34'13" East longitude.

As clearly indicated in Figure 3.1, the study area shares boundary with six *weredas* all found in North Shewa administrative zone. It is bordered by *Wara Jarso wereda* in the north, *Gindeberet wereda* in the west, *Meta-Robi* and *Ada' a Berga weredas* in south, *Hidhabu Abote wereda* in northeast, and *Degem wereda* in southeast. *Muger River*, one of the major tributaries of Abay, helps as a physical boundary between the study area and the neighbouring *weredas* in western and southern directions (see Figures 3.1, 3.2 and 3.5).

##### 3.1.2 Area

The total area of *kuyyu wereda* is 974 square kilometers (97,400 hectares). It is the sixth largest *wereda* in North Shewa zone of Oromiya Regional State and

Fig.3.1. Kuyu Wereda in Its National and Regional Settings.



Source: Oromiya Planning and Development Bureau, Physical Planning Department.

accounts for 8.3 percent of the zone (CSA, 1998). According to the estimated data from *kuyyu wereda* office of agriculture, about 528.44 square kilometer (54.25 percent) of the total area is arable land of which 457.18 square kilometers (86.51 percent) was cultivated. The rest non-arable land of the wereda is occupied by several land use patterns such as forests (man made), bush and shrubs, grasslands, bare land and urban areas.

**Table 3.1: Land use Pattern of Kuyyu wereda**

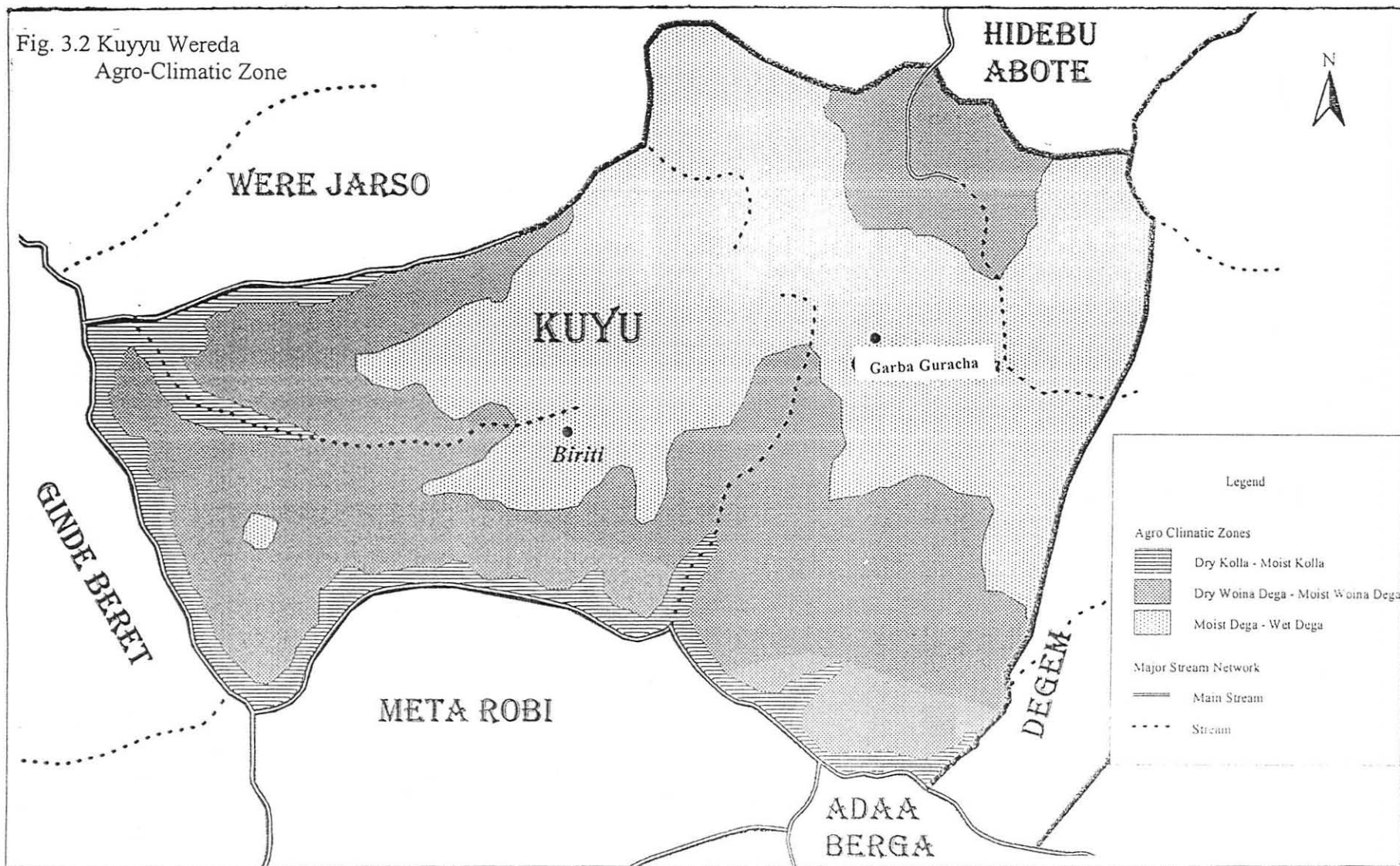
| Rol. No.     | Land use Type          | Size (ha)     | Percentage    |
|--------------|------------------------|---------------|---------------|
| 1            | Cultivated             | 45,718        | 45.94         |
| 2            | Forest land (man-made) | 2,416         | 2.48          |
| 3            | Bush and Shrubs        | 9,954         | 10.22         |
| 4            | Grassland              | 18,321        | 18.81         |
| 5            | Bare land              | 6,560         | 6.74          |
| 6            | Urban area             | 7,126         | 7.52          |
| 7            | Others                 | 7,305         | 7.50          |
| <b>Total</b> |                        | <b>97,400</b> | <b>100.00</b> |

Source: Kuyyu Wereda Office of Agriculture

### 3.1.3 Climate

In general, the land of Ethiopia is classified into five major vertically stratified agro-climatic zones: *Kur (Wirch)*, *'dega'*, *woinadega*, *qolla* and *bereha*. The two extreme zones, *Kur (Wirch)* and *bereha* are restricted to the areas where altitudes are over 3300, and below 500m above sea level, respectively. (EMA, 1981). Hence, no part of the study area belongs to these two extreme climatic zones

Fig. 3.2 Kuyyu Wereda  
Agro-Climatic Zone



10 0 10 20 Kilometers

source :AAU ,department of geography

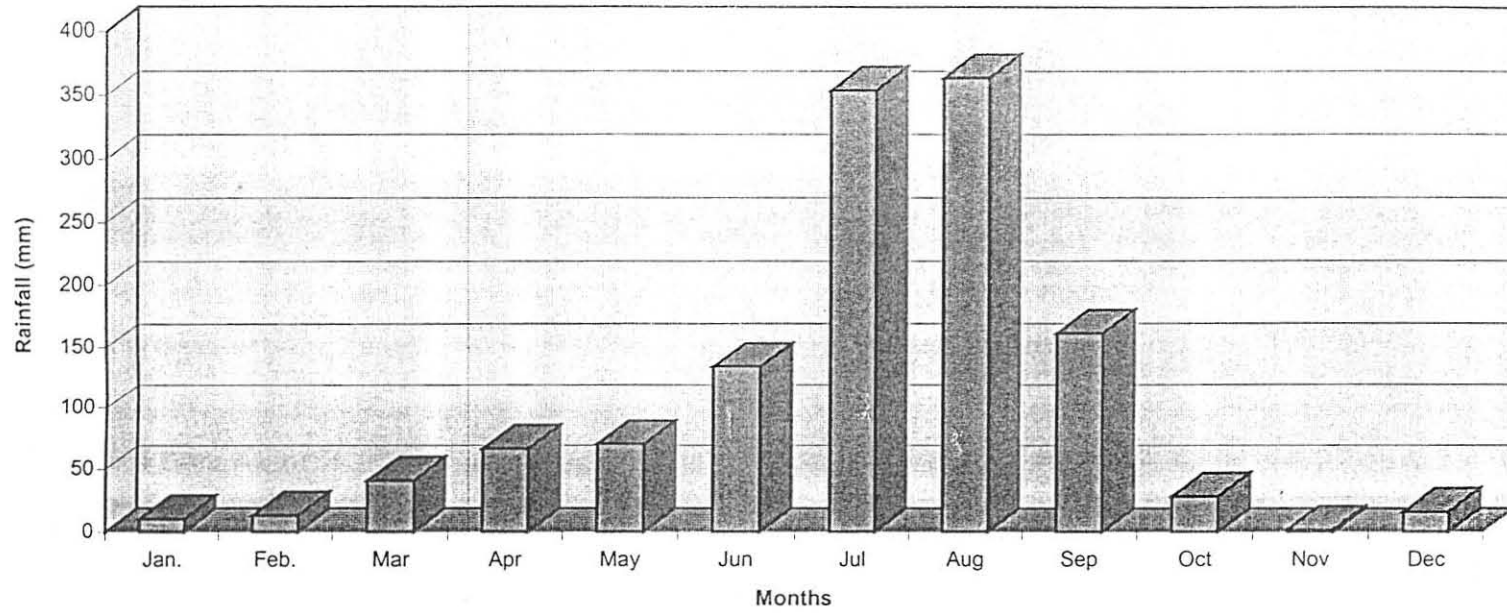
since its altitude varies between 1200m and 2800m above sea level. The vast major part (95 percent) of the *wereda* belongs to *dega* and *woinadega*. *Woinadega* alone accounts for 47 percent of the area followed by *dega* which constitutes 44 percent. The rest 9 percent of the area is constituted by *qolla* agro-climatic zone. (See Figure 3.2).

Dealing with the climatic conditions of a certain area is incomplete unless its rainfall and temperature characteristics (the two most important elements of weather and climate) are explained. Thus, it seems so essential analyzing the data generated from *Garba Guracha* meteorological station which is the only station recording rainfall and temperature in the *wereda*. In fact, the data recorded at this station may not represent the whole part of the *wereda* particularly those areas found in *qolla* agro-climatic zones. This is because the station is located in *dega* area at the center of the *wereda*. Moreover, most of the *qolla* agro-climatic zones are found at the southern and western borders of the *wereda* very far from the station.

However, the fact that the station is located in *dega* at the center of the study area (particularly at the center of the selected PAs) makes the data to some extent represent the major part of the *wereda*. The writer, therefore, thinks that the data from this station reveals the general climatic conditions of the study area satisfactorily. One can safely say that the rainfall and temperature data obtained from *Garba Guracha* station reveals the general picture of the study area.

In fact, the data obtained from *Garba Guracha* station may not reflect the situation in *qolla* parts of the area basically for the reasons explained above. Hence, the writer has estimated the temperature values of these regions based on Bekure's unpublished altitude-temperature correlation analysis document. It bases on

Fig.3.3. Monthly Total Rainfall in Kuyyu Wereda During 1985 - 1999



*Source:* Computed from Appendix IV

volume of food grain produce decreases in a year immediately after the year when there was lack of *belg* rain.

Winter (*bega*) is the driest season when only 5 percent of the total rainfall is received. During this season the peasants practice some activities like harvesting, clearing forests in search of more farm lands and house construction.

In general, the average annual rainfall from 1985 to 1999 (excluding 1997 for which there were no data) was 1270.88 millimeters. This figure is a little bit lower than the average total annual rainfall for most highland areas of Ethiopia which is said to be about 1,400 millimeters (see Alemneh, 1990). However, similar to that of most parts of the country (Mesfin, 1972), rainfall in *Kuyyu wereda* is characterized by fluctuations in amount and periodicity from year to year. In some years it comes early and in some years late. The annual coefficient of variation (percentage deviation from the average) during 1985-1999 was computed to be 10.4 percent. The coefficient is very high for drier months such as January, February, March, October, November and December. The two extreme months for which the highest and the least coefficient of variation of rainfall data were computed are January and August, respectively (see Table 3.1).

This fluctuating nature of rainfall both in amount and periodicity, no doubt, adversely affects the agricultural practices and the availability of food items. In connection to this, the investigated households said that both the sowing and harvesting periods are fluctuating as result of untimely rains. They complain for the unreliability of rainfall as one of the primary reasons for food grain shortfalls and livestock death.

**Table 3.2: The Variability of Rainfall Measured in Standard Deviation (SD) and coefficient of Variation (CV) During 1985-1999: Kuyyu Wereda**

|        | Months |       |       |      |      |      |      |      |      |       |       |       | Yearly |
|--------|--------|-------|-------|------|------|------|------|------|------|-------|-------|-------|--------|
|        | J      | F     | M     | A    | M    | J    | J    | A    | S    | O     | N     | D     |        |
| SD     | 12.5   | 15.0  | 42.1  | 37.6 | 54.9 | 59.8 | 65.0 | 50.3 | 72.4 | 39.1  | 2.8   | 16.6  | 131.2  |
| CV (%) | 188.6  | 112.7 | 102.5 | 56.3 | 77.9 | 44.6 | 18.4 | 13.8 | 44.9 | 137.3 | 155.6 | 102.7 | 10.4   |

Source: Computed from Appendix IV

### 3.1.3.2 Temperature

The writer has estimated the spatial temperature variation in the *wereda* based on Bekure's temperature-altitude correlation analysis in Ethiopia. Accordingly, the annual mean maximum temperature varies from 31.3°C in lowlands (*qolla*) to 21.7°C in upland areas. The annual mean minimum temperature lies between 16.3°C and 6.7°C in *qolla* and upland regions, respectively.

This estimation is assumed to be highly dependable because temperature and altitude are highly inversely related (-0.94) in Ethiopia as Bekeru's unpublished material indicates.

Based on the data generated from *Garba Guracha* meteorological station, the annual average temperature (1984-98) computed to be 16.5°C. As it is indicated in Tables 3.2 and 3.3, the highest temperature occurs during the months just before the main rainy season, whereas the least temperature occurs in July, August and

September. The average annual mean maximum and mean minimum temperature for 14 years are 23.0<sup>o</sup>c and 8.0<sup>o</sup>c, respectively.

The coefficient of variation for mean maximum (monthly and annual) is not as such sounding. Particularly for annual case it is so small which was only 4.8 percent for the investigated 14 years. On the other hand, the coefficient of variation for mean minimum temperature (both monthly and annual) is relatively high except for the months of June, July and August. (See Tables 3.2 and 3.3)

**Table 3.3: The Variability of Mean Maximum and Mean Minimum Temperature Measured in Standard Deviation (SD) and Coefficient of Variation (CV) /1984-1998/: Kuyyu Wereda**

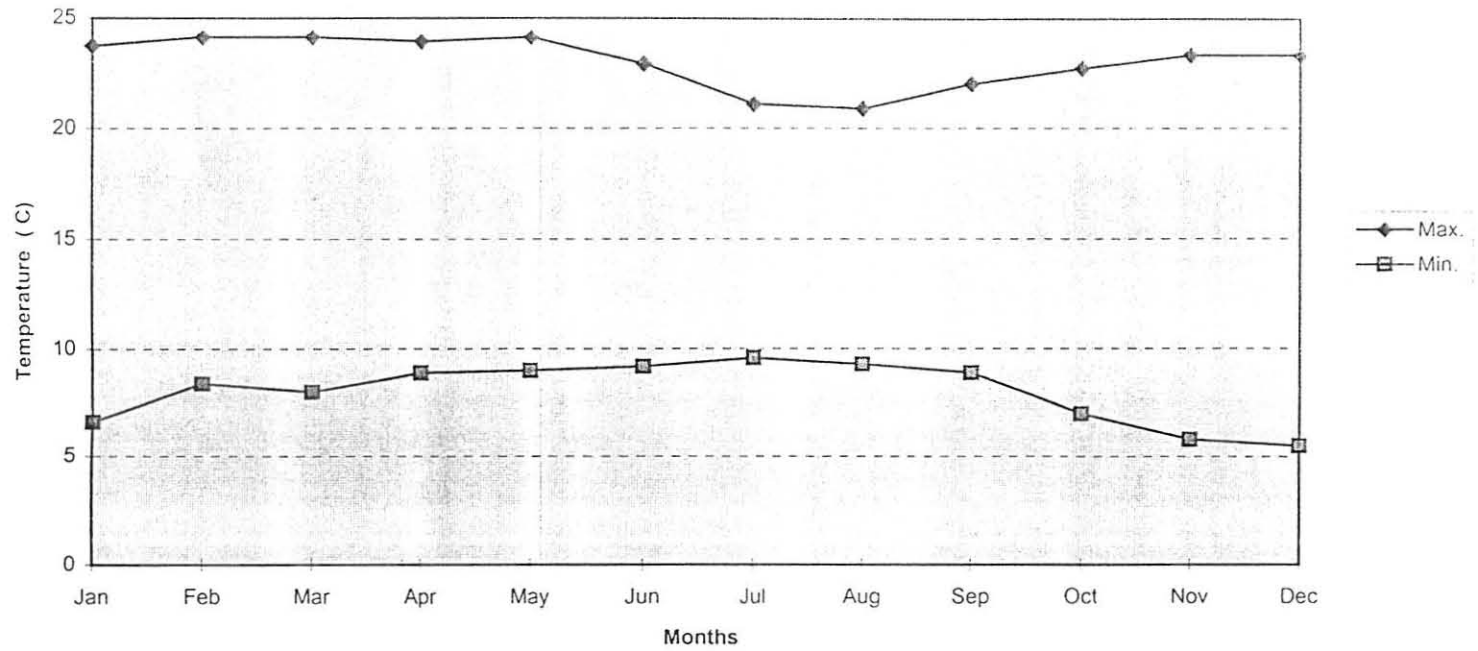
|                      | Months |      |      |      |      |      |      |      |      |      |      |      | Yearly |
|----------------------|--------|------|------|------|------|------|------|------|------|------|------|------|--------|
|                      | J      | F    | M    | A    | M    | J    | J    | A    | S    | O    | N    | D    |        |
| Mean Max             |        |      |      |      |      |      |      |      |      |      |      |      |        |
| To ( <sup>o</sup> c) | 23.7   | 24.1 | 24.1 | 23.9 | 24.1 | 22.9 | 21.1 | 20.9 | 22.0 | 22.7 | 23.3 | 23.3 | 23.0   |
| SD                   | 1.9    | 1.7  | 1.7  | 1.8  | 1.8  | 1.9  | 2.8  | 2.8  | 2.7  | 2.0  | 2.0  | 2.0  | 1.1    |
| CV (%)               | 8.0    | 7.1  | 7.1  | 7.5  | 7.5  | 8.3  | 13.3 | 13.4 | 12.3 | 8.8  | 8.6  | 8.6  | 4.8    |
| Mean Min             |        |      |      |      |      |      |      |      |      |      |      |      |        |
| To ( <sup>o</sup> c) | 6.6    | 8.4  | 8.0  | 8.9  | 9.0  | 9.2  | 9.6  | 9.3  | 8.9  | 7.0  | 5.8  | 5.5  | 8.0    |
| SD                   | 4.2    | 2.4  | 2.2  | 1.5  | 1.5  | 0.9  | 1.1  | 1.2  | 1.5  | 2.5  | 3.6  | 3.0  | 1.4    |
| CV (%)               | 63.6   | 28.6 | 27.5 | 16.9 | 16.5 | 9.9  | 11.4 | 12.6 | 17.2 | 36.0 | 61.9 | 54.4 | 17.1   |

Source: Computed from Appendices V and VI

### 3.1.4 Relief and Drainage

*Kuyyu wereda* is found within the central lava highlands of Ethiopia (EMA, 1981). Its altitude varies between 1200 meters and 2800 meters above mean sea

Fig.3.4. Monthly Mean Maximum and Mean Minimum Temperature During 1984 - 1998: Kuyyu Wereda.



source :Computed from Appendices V and VI

level. Majority of its area (91 percent) lies above 1500 meters and belongs to the highland parts of the country. Even most of its areas that are found below 1500 meters are river valleys.

Most of the lands in the '*dega*' agro-climatic zone are flat (plateau) and cut by small number and size of streams majority of which are seasonal. The lands in this zone are intensively cultivated and densely settled.

The '*qolla*' and '*woinadega*' parts, on the other hand, are severely cut by running water and are characterized by several gullies, escarpments, cliffs and resistant rocks. It, therefore, undoubtedly belongs to some of the severely eroded parts of the country. The *qolla* parts of the PAs are characterized by extensively barren rocky lands and very steep slopes.

Sharp drops in elevation from '*dega*' to '*woinadega*' and then to '*qolla*' is common in the study area. As a result, several PAs are found partly in two or three of the agro-climatic zones. A typical example to this is *Halelu Chari* PA which elevation drops from 2,560 meters on *Dayyi* plateau to about 2300 meters at the bottom of the plateau and then 1,500 meters at *Qerrensa* river valley. *Bonde Gidabo* PA can be another example which 2,590 meters elevation at Harbu Bose plateau drops sharply to 2,380 meters at the bottom of the plateau. Several other sharp drops can be observed in *Koyye Akale*, *Jila Qerresa*, *Jalisa Lutu*, *Dawicha Qerresa*, *Darro Wilicho* and *Darro Dhaye* PAs.

Due to several cliffs, river gorges, and steep slopes, movements in '*qolla*' parts of the PAs is relatively difficult. Hence, the vast majority of the lands in these

agro-climatic zones are not suitable for ox-drawn tilling. The peasants till most of their plots using hoes unlike the *dega* and majority of the *woinadega* settlers.

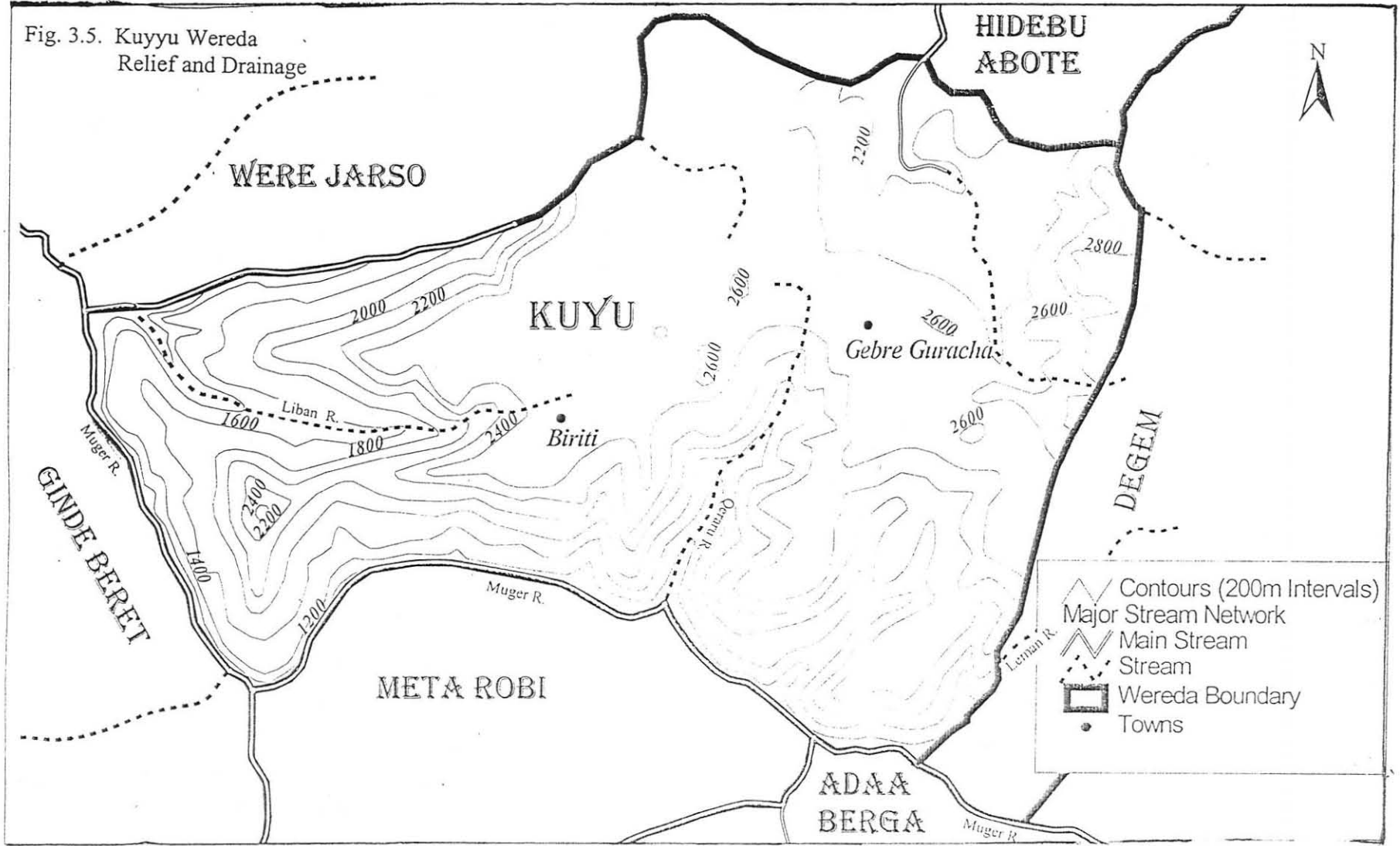
As far as the drainage pattern of the study area is concerned, *Muger* is the most important drainage basin which together with its tributaries drains the western, southern and central parts of the area. The important rivers joining *Muger* are *Qeraru*, *Leman*, *Liban*, *Chirecha (Qerrensa)*. *Leman* drains the southeastern part of the area, whereas *Qeraru* and *Chirecha (Qerrensa)* rivers drain the southern and central parts. The northeastern part of the wereda is drained by *Liban* river. The northeastern regions are drained by the small streams joining *Aleltu* river in *Hidhabu Abote wereda*. Moreover, several other small streams drain different parts of the area. However, very little use is made of these streams and rivers for irrigation at present.

### 3.1.5 Soils

No soil survey has been done so far in *Kuyyu wereda* and the surrounding areas. The only source of data pertaining the soils of the *wereda* is, therefore, the *wereda's* office of agriculture. According to the data from this office, the dominant soil type of the wereda is black soils (vertisols) and clay is the dominant soil texture. Soil depth in cultivable land ranges between 125 cm to 25 cm.

The data from the same office reveals that soil erosion in the area is so severe. About 3000 quintals of soils is lost from farmlands per annum. This is mainly because the vast proportion of the land is uncovered by vegetation and steep slopes are widely available in *woinadega* and *qolla* parts of the *wereda*. About 50

Fig. 3.5. Kuyyu Wereda Relief and Drainage



source :AAU ,department of geography



percent of the total area is found within the slope range of 10-30% which is said to be one of the prominent causes of soil loss in the area.

### 3.1.6 Vegetation

According to the Forestry Development and Protection Department of the wereda's Office of Agriculture, the study area lacks natural forest. In fact, man-made forests (eucalyptus trees) are found scattered in *dega* and *woinadega* regions of the *wereda*. Eucalyptus trees are mostly restricted to settlements/villages and churches.

Almost all flat-topped plateaux have no form of natural vegetation; where as the gorges, valleys and sloppy sections are covered by scattered bushes and shrubs. Particularly river valleys are covered by short and denser natural vegetations. Thorny bushes are the typical vegetation of the valleys. *Zigba* (*Podcarpus gracilior*), *Wanza* (*Cordia africana*), *Weira* (*Olea africana*), *Sombo* (*Ekebergia capensis*) and accacia trees are also found, but rarely, in the lowland parts of the study area.

As is true for most areas of Ethiopia deforestation has been one of the serious problems in this area. Vegetations have been cleared for the purpose of settlement, firewood, construction materials and farmlands. Experienced peasants told the researcher that some areas which had been once covered by forests some two decades back are currently devoid of natural vegetation. As a result, the fertile soils have been lost and the wild animals have been endangered.

## 3.2 Human Conditions

### 3.2.1 Population Size and Density

During the 1994 population and housing census of Ethiopia, the total population in *Kuyyu wereda* was 98,753 of which the rural population was 87,640 or 88.8 percent. The rest 11.2 percent was urban dwellers, all lived in the town of *Garba Guracha*. Of the total population 49.8 percent was found male and 50.2 percent was female (CSA, 1996). According to CSA's (2000) projection, the total population in the *wereda* by July 2000 was 117,932 of which 87.4 percent was rural population. This indicates that within only 4 years the population increased by 19,179 persons and the annual growth rate over the years was said to be over 3.0 percent.

On the basis of the projected total population by CSA for July 2000, the average crude population density in the *wereda* is found to be 125 persons/km<sup>2</sup>. If the density is calculated taking into account only the rural population, it decreases to 118.8 persons/km<sup>2</sup>. This *wereda*, therefore, is very highly populated by national and regional standard, the comparable figures of which are 60 and 63.3 persons/Km<sup>2</sup>, respectively (CSA, 2000).

A great deal of variation in population density can be observed within the *wereda* based on the variation in agro-climatic zones. There is a general decrease in population density with a decrease in elevation. Based on rough areal estimates from the *wereda's* sketch map, for instance, population densities in *Darro Wilincho* and *Darro Dhaye* PAs (whose major parts are found in *qolla* zones) were found to be 28.5 and 38.9 persons/Km<sup>2</sup>, respectively. On the other hand, the comparable figure for *Bonde Gidabo* and *Hacho Sombo* PAs (which are entirely *dega* and

*woinadega*) were 262.7 and 256.2 persons/km<sup>2</sup>, respectively. Crude population density, in general, varies from 262.7 persons/km<sup>2</sup> in *Bonde Gidabo* PA to 28.5 persons/km<sup>2</sup> in *Darro Wilicho* PA.

### 3.2.2 Household Size, Sex Ratio and Age Structure

During the 1994 population and housing census of Ethiopia, the average rural household size in *Kuyyu wereda* was 4.6 persons. It varies among PAs from 5.4 to 4.4 persons/ household (CSA, 1996b). As shown in Table 3.3, in the investigated PAs, the average household size was 5.7 persons. This figure is higher than the average rural household size of Ethiopia and Oromiya Regional State, the corresponding figures of which are 5.2 and 5.6 persons/ household (CSA, 1998).

**Table 3.4: Household Size and Sex Composition of the Family of the Investigated Households in Kuyyu Wereda.**

| PAs                 | Number of Investigated Households | Population Size in Investigated hhs |             |             | Household Size (persons/hh) |
|---------------------|-----------------------------------|-------------------------------------|-------------|-------------|-----------------------------|
|                     |                                   | M                                   | F           | Total       |                             |
| <i>Halelu Chari</i> | 110                               | 324                                 | 276         | 600         | 5.4                         |
| <i>Wuyye Gose</i>   | 98                                | 298                                 | 280         | 578         | 5.9                         |
| <i>Hacho Sombo</i>  | 120                               | 359                                 | 325         | 684         | 5.7                         |
| <i>Darro Changi</i> | 72                                | 193                                 | 225         | 418         | 5.8                         |
| <b>Total</b>        | <b>400</b>                        | <b>1174</b>                         | <b>1106</b> | <b>2280</b> | <b>5.7</b>                  |

Source: Field Survey, Jan - Feb. 2001.

The sex ratio (the number of males per 100 females or vice versa) for the wereda is more or less balanced. Of the total population in the wereda by July 2000, 49.6 percent was male and the rest 50.4 percent was female, i.e a little bit more

number of female population than male. When rural and urban areas are considered separately, there is a little bit more male population in rural areas and more female population in the town (CSA, 2000). In the same manner, the summary of the survey for this paper (Table 3.3) reveals roughly balanced sex ratio for the investigated households with a little bit more male population than the females.

As far as the age structure of the investigated population is concerned, over 14.1 percent of the population was found below the age of 10 years and those group of people over 64 years of age constituted 0.8 percent of the population. While considering the two sexes separately, 14.0 percent of the male and 14.1 percent of the female population belongs to the age group of 0-9 years. On the other hand, the survey data reveals that 1.6 percent of the males and none of the females are above the age of 64 years. Eighty-four percent of the females and 86 percent of the males (85.1 percent of both sexes) were between the age of 10 to 64 years (see Table 3.5).

Based on the assumption that most of the rural children aged about 10 years participate in some productive activities such as herding animals, tilling, harvesting, collecting firewood and fetching drinking water (see Tegegne and Nichola, 1984) those group of population between the ages of 10-64 years can be taken as economically productive in rural Ethiopia in general and the study area in particular. Hence, it is safe to say that 85.1 percent of the total population in the study area participates in productive economic activities.(see Table 3.4).

Interestingly enough, significant age variation could be observed among different agro-climatic zones. According to the survey for this study, more proportion of population in the old age group (64<sup>+</sup> years) was found in '*dega*' and

**Table 3.5: Sex and Age Structure of the Family Members of the Investigated Households: *Kuyyu Wereda***

| Age Group    | Male        |              | Female      |              | Total       |              |
|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
|              | Number      | %            | Number      | %            | Number      | %            |
| 0-4          | 82          | 7.0          | 70          | 6.3          | 152         | 6.7          |
| 5-9          | 82          | 7.0          | 86          | 7.8          | 168         | 7.4          |
| 10-14        | 164         | 14.0         | 164         | 14.8         | 328         | 14.4         |
| 15-19        | 183         | 15.6         | 208         | 18.8         | 391         | 17.2         |
| 20-24        | 128         | 10.9         | 199         | 18.0         | 327         | 14.3         |
| 25-29        | 174         | 14.8         | 129         | 11.7         | 303         | 13.3         |
| 30-34        | 101         | 8.6          | 25          | 2.3          | 126         | 5.5          |
| 35-39        | 27          | 2.3          | 52          | 4.7          | 79          | 3.5          |
| 40-44        | 45          | 3.9          | 77          | 7.0          | 122         | 5.4          |
| 45-49        | 19          | 1.6          | 70          | 6.3          | 89          | 3.9          |
| 50-54        | 55          | 4.7          | 9           | 0.8          | 64          | 2.8          |
| 55-59        | 46          | 3.9          | 9           | 0.8          | 64          | 2.4          |
| 60-64        | 46          | 3.9          | 8           | 0.7          | 54          | 2.4          |
| >64          | 22          | 1.6          | 0           | 0.0          | 22          | 0.8          |
| <b>Total</b> | <b>1174</b> | <b>100.0</b> | <b>1106</b> | <b>100.0</b> | <b>2280</b> | <b>100.0</b> |

Source: Field Survey, Jan-Feb. 2001.

'wainadega' parts of the PAs; the corresponding figures of which are 0.7 and 1.1 percent, respectively. On the other hand, none of the respondents from *qolla* was found aged above 64 years. (see Table 3.6).

The writer thinks that this variation might be attributable to several adverse factors determining the peasants' life expectancy in *qolla* agro-climatic zones. *Qolla* seems prone to such adverse factors like enervating climatic conditions, more prevalence of diseases and worse peasants' working conditions. Due to its climatic and environmental conditions, it is also more vulnerable to food shortfalls. Moreover, located at the borders of the wereda, most *qolla* regions are very far from modern health facilities. On the contrary, the *dega* and *woinadega* parts are more conducive in all these cases and may probably be why more proportion of old age group of population is found in these parts than in *qolla* regions of the study area.

**Table 3.6: Age Structure of the Family of the Sample Households by Agro-climatic zone. (Number and Percentage Distribution)**

| Popn by<br>Agro-ecologies<br>Age Group (years) | Dega       |              | Woinadega   |              | Qolla      |              |
|--|------------|--------------|-------------|--------------|------------|--------------|
|  | Number     | %            | Number      | %            | Number     | %            |
| ≤ 9  | 151        | 17.0         | 130         | 11.2         | 38         | 16.5         |
| 10-19  | 277        | 31.2         | 367         | 31.6         | 71         | 30.9         |
| 20-29  | 238        | 26.8         | 330         | 28.4         | 62         | 27.0         |
| 30-39  | 67         | 7.5          | 111         | 9.6          | 26         | 11.3         |
| 40-49  | 75         | 8.5          | 120         | 10.3         | 17         | 7.4          |
| 40-64  | 73         | 8.2          | 91          | 7.8          | 16         | 7.0          |
| >64  | 7          | 0.7          | 16          | 1.3          | 0          | 0.0          |
| <b>Total</b>                                   | <b>888</b> | <b>100.0</b> | <b>1162</b> | <b>100.0</b> | <b>230</b> | <b>100.0</b> |

Source: Field Survey, Jan-Feb. 2001.

### **3.2.3 Ethnicity and Religion**

According to the 1994 population and housing census of Ethiopia, majority of the population (96.1 percent) in *Kuyyu wereda* belongs to *Oromo* ethnic group. About 3.5 percent of the total population belongs to *Amhara*. The rest 0.4 percent was constituted by *Guraghe*, *Tigrawi* and others. Except *Oromos* and *Amharas* almost all others live in the town of *Garba Guracha* (CSA, 1996a).

At the time of the survey for this paper, 92.7 percent of the household heads said that they are *Oromos*, whereas 2.0 percent are *Amharas*. The rest 5.3 percent replied that they belong to both *Oromo* and *Amhara* ethnic groups either through their father or mother.

As far as the religion of the investigated household heads was concerned, almost all of them (96.8 percent) said that they are Orthodox Christians. The rest 3.2 percent of the household heads were found Protestant Christians. However, almost all the *Oromos*, except the Protestant Christians, practice other traditional religions alongside Christianity which is uncommon among the *Amharas*.

### **3.2.4 Marital Status**

The survey results for this paper reveals that divorced and widowed household heads are commonly found in the study area. The divorced household heads make up 4.9 percent and the widowed ones are 14.7 percent of the investigated households. The percentage of female-headed households makes up 17.5 percent of the samples.

What is more interesting as far as the marital status of the rural population in the *wereda* is concerned is that only very few males (2.0 percent) below 18 years old have reported married. On the contrary, 6 percent of the females below 15 years have got married. Only 6 percent of the healthy adult males above 25 years were unmarried and living with their parents. And only 1.4 percent of the healthy adult females above 22 years were found unmarried. This indicates that the vast majority of the youngsters get married between 18-25 years for male and 15-22 years for female. Economically, almost all of the unmarried adults (both male and female) have no direct access to valuable farm assets such as oxen and farmland.

### **3.2.5 Educational Status**

Though almost all the sample household heads reported they attended the literacy campaign launched by the previous government, majority of them (96.8 percent) still cannot read and write. Only a small proportion of them (3.3 percent) reported they have attended formal education. Of the total sample household heads 2.0 percent attended primary school (1-6 grades), 1.3 percent Junior Secondary school (7-8 grades) and none of them reached grade 9.

In general, only 37.6 percent of the family members of the sample households, those found at 10 and above, are educated or currently attending formal education. Even majority of the literate population (57.5 percent) have not completed grade 4. And only 17.1 percent have completed or currently attending their high school (9-12 grades) education.

Among those populations who have once attended or currently attending formal education, the females make up only 40.6 percent. The proportion of the

number of educated females at high school level is also smaller by more than half than the number of males at this education level. The percentage of female population educated at high school level to the whole population ( $\geq 10$  years old) was only 4.1. The comparable figure for male is 8.7 percent (see Table 3.7).

**Table 3.7: The percentage Distribution of the Family Members of the Sample Households Aged Ten Years and Over by Literacy Status**

| PAs          | Illiterate  |             | Grades 1-4  |             | Grades 5-8  |            | Grades 9-12 |            |
|--------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|------------|
|              | M           | F           | M           | F           | M           | F          | M           | F          |
| Halelu Chari | 57.6        | 62.1        | 27.7        | 25.9        | 8.2         | 6.9        | 6.5         | 5.2        |
| Wuyye Gose   | 56.3        | 73.1        | 22.2        | 18.5        | 11.9        | 5.9        | 9.5         | 2.5        |
| Darro Changi | 49.5        | 76.7        | 23.8        | 12.6        | 16.5        | 8.7        | 10.1        | 1.9        |
| Hacho Sombo  | 53.8        | 63.9        | 25.0        | 19.0        | 11.5        | 11.6       | 9.6         | 5.4        |
| <b>Total</b> | <b>54.8</b> | <b>67.8</b> | <b>25.0</b> | <b>19.9</b> | <b>11.5</b> | <b>8.3</b> | <b>8.7</b>  | <b>4.1</b> |

Source: Field Survey, Jan-Feb. 2001.

### 3.3 Settlement Patterns

Traditional village and individual homesteads are the typical form of settlement through out the sample PAs. One's sons usually built houses around their father's home and form a village. A village, therefore, consists several individual houses of very close relatives.

The number of houses in a village varies considerably based on the suitability of the available space to accommodate different houses properly and its proximity to wider farmlands. The only exception in the *wereda* in general and the surveyed PAs

in particular is the *Dayyi* village (in *Halelu Chari* PA) established under the previous government's villagization programmes. The number of households in this village is estimated to be over 200.

The houses in the surveyed PAs are mostly traditional tukuls with cone-shaped, thatched roofs circular walls made of wood and plastered with mud (see Figure 3.6). About 70 percent of the sample households live in the traditional tukuls. The tukuls have no windows and sufficient partitions inside. A peasant usually owns only one tukul which is used for sleeping, living room, spaces for small and young animals and kitchen. Mostly only matured cattle are kept in separate building.

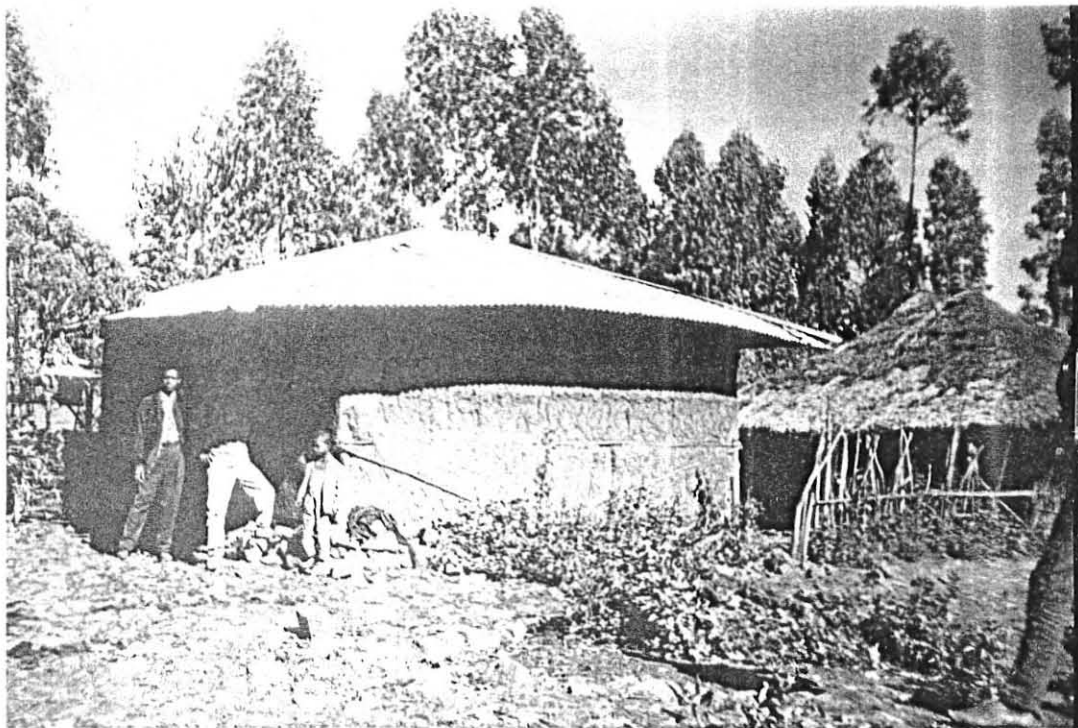
The rest 30 percent of the households live in relatively modern tin-roofed houses. Tin-roofed houses are owned by relatively better off households and the community consider these household as rich. All of the tin-roofed houses are rectangular (unlike tukuls), and built in woods and plastered with mud. Almost all of the households who owned tin-roofed houses have also owned one or two tukuls. These better off households use the tin-roofed houses only for sleeping and living room; where as they use the tukuls as kitchens and spaces for small animals.

From the overall discussions in this chapter, one can easily understand the fact that the study area is encircled by several physical and socio-economic problems such as severe environmental degradation, variable rainfall, dense and rapidly growing population, and high illiteracy rate. This might have contributed a lot to the prevailing rural poverty and therefore food insecurity since all these are constraints to optimum agricultural productivity as shall be discussed in the proceeding sections.

Figure 3.6: A Type of the Peasants' Traditional Tukul and Tin-roofed House in Kuyyu Wereda.



A/ Tukul



B/ Tin-roofed house

## CHAPTER FOUR

### ASSET, CASH AND FOOD GRAIN (DIETARY ENERGY SUPPLY) POSITION OF THE HOUSEHOLDS

#### **4.1 Livestock Ownership Position**

As shall be discussed in the proceeding sections of this paper, the peasants in the area raise several livestock types. It shall also be discussed that the livestock sub-sector determines the food security/insecurity position of the peasants helping as a source of food, cash and dung as well as a means of production. However, a significant number of survey respondents had no adequate number of livestock population which could presumably be one of the major causes of lack of access to adequate food supply for several households in the area.

The summary of the households' livestock ownership in Table 4.1 shows that 14.0 and 16.7 percent of the sample households in the area had no access to two most important farm animals, ox and cow, respectively. Similarly, about 9 percent of the households had no heifer/calf. In fact, the Overwhelming majority of the peasants (97 percent) owned either sheep or goats. Pack-animals (equine) are the scarcest livestock species owned only by 47.8 percent of the sample households. On the whole, the total available livestock population per household was found to be 9.1 heads.

The ratio of the number of each type of animals to the investigated households varies considerably by agro-climatic zones in the area. The number of each type of animals, excepting goats, owned by a household was found very

**Table 4.1: Size and Species of Livestock Owned by  
Sample Household**

| Livestock kinds | Number of animals owned | % of hhs | Number of animals per Owner hhs | Number of animals per total hhs |
|-----------------|-------------------------|----------|---------------------------------|---------------------------------|
| Oxen            | 688                     | 86.0     | 2.0                             | 1.7                             |
| Cows            | 544                     | 83.3     | 1.6                             | 1.4                             |
| Young cattle    | 800                     | 91.0     | 2.2                             | 2.0                             |
| Sheep/goats     | 1373                    | 97.0     | 3.5                             | 3.4                             |
| Equine          | 230                     | 47.8     | 1.2                             | 0.6                             |
| <b>Total</b>    | <b>3635</b>             | <b>-</b> | <b>-</b>                        | <b>9.1</b>                      |

Source: Sample Survey, Jan- Feb. 2001.

small in *qolla* as compared to *dega* and *woinadega* areas. Oxen per household, for instance, was 0.9 in *qolla* which comparable figures were 1.7 and 1.9 in *dega* and *woinadega*, respectively. Cows per household was 0.9 in *qolla* areas; whereas the households in the other parts of the area owned 1.4 cows on the average. Similarly, the sample households in *qolla* areas reported having owned less number of young cattle (heifer, calf and bull) than those in *dega* and *woinadega* regions. The only exceptional case was goats ownership in which the peasants in *qolla* regions owned more number of goats (3.5 heads/household) than the other peasants (See Table 4.2).

Generally, when the livestock resources are considered in absolute or relative figures, the lowlanders are less endowed with these resources than their counterpart. Thus, by considering the crucial role of the livestock resources, one can safely say that the lowlanders are more at risk of food insecurity than those peasants living in *dega* and *woinadega* regions.

**Table 4.2: The Distribution of Average Number of Livestock Types Per Household by Agro-climatic zones**

| Types of     | Dega       | Woinadega  | Qolla      | All zones  |
|--------------|------------|------------|------------|------------|
| Oxen         | 1.7        | 1.9        | 0.9        | 1.7        |
| Cows         | 1.4        | 1.4        | 0.9        | 1.4        |
| Young cattle | 1.9        | 2.2        | 1.4        | 2.0        |
| Sheep        | 2.2        | 1.0        | 0.0        | 1.4        |
| Goats        | 1.4        | 2.3        | 3.5        | 2.0        |
| Equine       | 0.7        | 0.5        | 0.2        | 0.6        |
| <b>Total</b> | <b>9.3</b> | <b>9.3</b> | <b>6.9</b> | <b>9.1</b> |

Source: Field Survey, Jan- Feb. 2001

The above enquiry to identify the households' endowment with livestock resources was based on the fact that those peasants who owned more quantity and quality of these resources are less likely affected by food insecurity than those who do not. Rather than their crucial importance as a direct source of food and means of rural transport and traction power, the animals could be sold during food consumption shortfalls and the obtained cash could be used to purchase food items. However, the summaries in Table 4.1 and 4.2 indicate that the livestock ownership position of the households was found to be unremarkable. In addition to less number of the ratio of the animals to the sample households, the animals were not found equally distributed among the households. A significant proportion of the respondents owned very small number of livestock population and very few respondents (2.0 percent) reported that their number of livestock population is satisfactory to perform their agricultural activities effectively. The quality of the livestock farming was also found too traditional and backward to provide the peasants with optimal output owing to numerous constraints.

## 4.2 Saleable Materials Ownership Position

Households' assets, in this case, are all the households material possessions excluding land, animals and grain stocks. As Markos (1997:234) states "Assets which are valuable and tradable in the market [are] ... the best resources at the household's disposal in mitigating food crisis....". These tradable (saleable) assets, among others, are bed, wrist watch, weaving equipment, saw, table, radio, kerosine stove, jewelers, saddle and hammer. Those households who possessed some or all of these valuable assets are presumably in a better food security position than who do not, because these materials can be changed into cash to purchase food items during grain shortfalls.

The table below shows the summary of the percentage distribution of the respondents by the cash equivalent of the valuable assets they owned. The cash equivalent of the material (s) was estimated and reported by the owner during the survey. These, as indicated above, do not include livestock, poultry, grain stock, land as well as the money they reported having put for emergency case.

**Table 4.3: Distribution of Households by Value of Tradable Material they Owned**

| *value of materials<br>(Eth.Birr) | No. of<br>Households | % of<br>hhs   | Mean value<br>(Birr) |
|-----------------------------------|----------------------|---------------|----------------------|
| 0-50                              | 122                  | 30.50         | 15.59                |
| 51-100                            | 95                   | 23.80         | 78.64                |
| 101-150                           | 50                   | 12.50         | 129.86               |
| 151-200                           | 68                   | 17.00         | 169.37               |
| 201-250                           | 18                   | 4.50          | 225.6                |
| 251-300                           | 11                   | 2.70          | 268.67               |
| 301-350                           | 7                    | 1.80          | 330.00               |
| 351-400                           | 14                   | 3.40          | 370                  |
| >400                              | 15                   | 3.80          | 840.0                |
| <b>Total</b>                      | <b>400</b>           | <b>100.00</b> | <b>136.22</b>        |

Source: Field Survey, Jan-Feb. 2001

\* value of each material was as estimated by the owner respondents

products, and in very few places vegetables and fruits. In fact, extremely poor peasants and some female-headed households secure subsistence cash from firewood and charcoal sales, and petty trades.

As shown in Table 4.4, the most significant source of cash income, livestock and livestock products, accounted for 61.2 percent of the total cash earned by the respondents in 1999. Though it is an arrangement to be paid later, rural credit institution as a source of cash ranked second constituting 18.8 percent of the total income in the community. Grain sale was found the third most important source of the peasants' subsistence cash in the area. Here it should be noted that majority of the peasants sell their grain produce not because it is surplus but to meet their cash obligations such as land tax, purchase of inputs, and credit repayment. The remaining minor sources such as transfer or gift, firewood and charcoal sales, poultry and bee production, petty trades and local crafts work are responsible for only 8.1 percent of the total financial income for the sample households.

**Table 4.4: Summary of Households' Major Source of Cash Income**

| No.          | Source of cash income                 | % of hhs | Income (Birr)     | % as of total Income | Cash income per hh (Birr/hh) |
|--------------|---------------------------------------|----------|-------------------|----------------------|------------------------------|
| 1            | Livestock and livestock products sale | 81.3     | 231,488.23        | 61.2                 | 712.26                       |
| 2            | Poultry                               | 94.0     | 12,347.84         | 3.3                  | 32.84                        |
| 3            | Bee product                           | 3.5      | 680.96            | 0.2                  | 48.64                        |
| 4            | Grain sale                            | 94.8     | 44,944.88         | 11.9                 | 118.72                       |
| 5            | vegetables sale                       | 40.0     | 9,513.6           | 2.5                  | 59.46                        |
| 6            | Firewood sale                         | 18.0     | 4,094.64          | 1.1                  | 56.87                        |
| 7            | charcoal sale                         | 10.3     | 940.13            | 0.2                  | 22.93                        |
| 8            | Transfer/gift                         | 4.5      | 1,262.16          | 0.3                  | 70.12                        |
| 9            | Rural credit                          | 22.3     | 71,174.57         | 18.8                 | 799.71                       |
| 10           | local trades                          | 3.0      | 1,346.40          | 0.4                  | 112.20                       |
| 11           | Other non-farm activities             | 1.8      | 310.10            | 0.1                  | 44.30                        |
| <b>Total</b> |                                       | -        | <b>378,153.51</b> | <b>100.0</b>         | <b>945.38</b>                |

Source: Field Survey, Jan-Feb. 2001

### 4.3.2 The Households Cash Flow

The households' cash flow is the balance between the households' gross annual income, expenditure and net annual income. The total gross annual income reported by the sample households was Birr 378,153.51 in 1999 which was earned through various sources the major ones of which have been shown in Table 4.4. The maximum gross cash income per household per annum was about Birr 1435, whereas the minimum was Birr 42. On the whole, the average figure per household was computed to be Birr 945.38 (See Table 4.4).

Out of the total gross income, over 98 percent (Birr 370,914.07) was spent to meet several cash obligations. According to the respondents' estimation, the most significant source of expenditure was the cost for commercial consumption commodities, schooling and health which accounted for 37.9 percent of the total expenditure. The expenditure for food grain purchase was the second most important source of household expenditure followed by farm input purchase, social and religious festivals, land tax and credit repayment in order of their significance. On the whole, the average annual household expenditure was computed to be Birr 927.67 in 1999.

As far as the net annual cash income of the households was concerned, only the cash amounting to Birr 7238.54 (Birr 19.00 per household) was assumed to be saved. As summarized in Table 4.6, the overwhelming of the respondents (77.5 percent) had a net annual income of less than the average figure. What

**Table 4.5: Summary of Sources of Households' Cash Expenditure**

| No.          | Source of Expenditure          | % of hhs | Expenditure (Birr) | % as of total Expenditure | Expenditure per hh (Birr/hh) |
|--------------|--------------------------------|----------|--------------------|---------------------------|------------------------------|
| 1            | Land tax                       | 100.0    | 24,122.56          | 6.5                       | 60.31                        |
| 2            | Grain purchase                 | 88.0     | 89,031.55          | 24.0                      | 250.79                       |
| 3            | Farm input purchase            | 59.0     | 56,807.47          | 15.3                      | 240.71                       |
| 4            | credit repayment               | 13.5     | 20,496.15          | 5.5                       | 379.56                       |
| 5            | Social and religious Festivals | 75.0     | 39,791.01          | 10.7                      | 132.64                       |
| 6            | Others*                        | 100.0    | 140,666.28         | 37.9                      | 351.67                       |
| <b>Total</b> |                                | -        | <b>370,914.97</b>  | <b>100.0</b>              | <b>927.67</b>                |

Source: Field Survey, Jan-Feb.2001

*\* include expenditure for schooling, health (medical) expenses, clothing, payment for some social institutions and the expenditure to purchase some commercial commodities such as salt, soap and oil.*

could be considered as the most severe case is the fact that a significant proportion of the peasants (7 percent) were characterized by negative cash flow i.e. the amount of money they need to pay to meet several requirements was greater than the amount they could earn.

In general, the study area is characterized by acute lack of cash sources unlike the other parts of the country as a result of which the peasants are forced to depend on subsistence cash income. As discussed earlier, there are no important cash crops, such as coffee and chat, in the area and no considerably important off-farm employment opportunity in this section of the country as a whole. Hence

according to the survey respondents, it is not uncommon to observe that the peasants sell some of their crucial farm animals such as farm oxen and milk cows in order to meet their cash obligations. Consequently, absolute rural poverty has become a growing incidence in this area.

**Table 4.6 Summary of the Sample Households' Net Cash Income**

| Net Annual Income (Birr) | % of hhs      | Minimum (Birr) | Maximum (Birr) | Mean (Birr)  |
|--------------------------|---------------|----------------|----------------|--------------|
| 0-15                     | 33.75         | 0.0            | 13.40          | 8.50         |
| 16-30                    | 36.75         | 16.70          | 29.00          | 18.40        |
| 31-45                    | 16.00         | 31.00          | 43.50          | 33.62        |
| 46-60                    | 5.00          | 46.10          | 55.00          | 47.91        |
| >61                      | 1.50          | 61.00          | 68.00          | 62.00        |
| <b>Total</b>             | <b>93.00*</b> | -              | -              | <b>19.00</b> |

Source: Computed From Survey Data, Jan-Feb. 2001.

\* The remaining 7 percent (28 households) had negative cash flow balance

## 4.4 Food Supply Position of the Households

### 4.4.1 Sources of Food

The single most important sources of food in the area are grain crops majority of which are *teff*, sorghum, wheat; barley and pulses in order of their significance. Though livestock products (eggs, butter and milk), some root crops and fruits are produced, their importance as source of household food is very limited. These are rather changed into cash to supplement the financial requirements of the farm households.

Food grains, as the single most important source of dietary energy supply, are obtained through several mechanisms: own production, purchase, food aid, transfer

**Table 4.7: Households' Major Source of Food Grain. The Net Available Volume in 1999 crop-year.**

| Production* |                    |                              | Purchase |                          |                              | Food Aid |                         |                              | Transfer |                         |                              | Borrowing from friends and relatives |                         |                              | Total                       |                          |
|-------------|--------------------|------------------------------|----------|--------------------------|------------------------------|----------|-------------------------|------------------------------|----------|-------------------------|------------------------------|--------------------------------------|-------------------------|------------------------------|-----------------------------|--------------------------|
| % of hhs    | Net Quantity (Qtl) | % as of total available food | % of hhs | Quantity purchased (Qtl) | % as of total available food | % of hhs | Quantity received (Qtl) | % as of total available food | % of hhs | Quantity received (Qtl) | % as of total available food | % of hhs                             | Quantity received (Qtl) | % as of total available food | Total available grain (Qtl) | Quantity per hh (kg/ hh) |
| 100.0       | 3,057.8            | 87.7                         | 85.3     | 303.3                    | 8.7                          | 17.5     | 17.4                    | 0.5                          | 1.8      | 14.0                    | 0.4                          | 19.5                                 | 97.6                    | 2.8                          | 3,486.6                     | 8.7                      |

Source: Computed from Survey Data, Jan-Feb.2001

\* Calculated using simple equation:  $NQ = TP - GS - SR - PHL$

Where, NQ = Net Quantity

TP = Total Production

GS = Grain Sale

SR = Seed Reserve (5%)

PHL= Post-Harvest Loss (10%)

**Table 4.8: Distribution of the Sample Households by Net Food Grain Available**

| Net grain available (Qtl) | No of hhs  | % of hhs     | Mean net (Qtl) |
|---------------------------|------------|--------------|----------------|
| ≤4.0                      | 21         | 5.3          | 3.9            |
| 4.1-8.0                   | 212        | 53.0         | 6.4            |
| 8.1-12.0                  | 103        | 25.8         | 10.6           |
| 12.1-16.0                 | 56         | 14.0         | 14.2           |
| 16.1-20.00                | 8          | 2.0          | 19.2           |
| <b>Total</b>              | <b>400</b> | <b>100.0</b> | <b>8.7</b>     |

Source: Computed From Survey Data

#### 4.5 Measuring the Households' Food Adequacy

The single most important indicator of food adequacy level of a community is the per capita dietary energy supply measured in calorie (also called kilo calorie). This is the measure of the average daily food available to each person in a country or region (FAO, 1998). Here, it should be noted that it is usually the average value which is taken into consideration though the amount of calories a person needs depends on the person's sex, age, body build and degree of physical activity. This helps to simplify the complexity that arises while analyzing the available daily dietary energy supply of a community.

The researcher has converted the available food grain supply into calorie equivalent using EHNRI's food composition table. This was done after computing the balance between grain gained and lost using the simple equation developed by Tegegne, et.al (1999) and modified by Eshetu (2000):  $HHFS = Y + FP + FA + R/G - S - SR - PHL$ . Moreover, before starting the conversion process, the average calorie

value per 100 gram of each type of food grain was computed based on the kind of food that the community consumes utmost. This is because the calorie equivalent of the grains varies by the kind of the end product prepared for consumption. For instance, a 100 gram of *teff* grain (white) produces a dietary energy equivalent to 240.30 kcal when prepared in the form of bread and 145.00 kcal when it is consumed in the form of *enjera* (see Appendix 3). The researcher has taken the average value of the major end product of each crop for the conversion processes.

**Table 4.9: Major Traditional Food Kinds in the Study Area and their Average Energy Composition**

| Major Sources of Foods | Products (Major traditional foods in the area)  | Average Food Energy (kcal/ 100 gram) |
|------------------------|---|--------------------------------------|
| <i>Teff</i>            | <i>enjera</i> , porridge  | 182.38                               |
| Sorghum                | <i>enjera</i> , <i>nefro</i> (boiled grain),  | 227.72                               |
| Wheat                  | bread, porridge, <i>nifro</i> , <i>qollo</i> (roasted grains), <i>enjera</i> , <i>qinche</i> (split, boiled). | 200.23                               |
| <i>Barley</i>          | <i>enjera</i> , bread, porridge, <i>qollo</i> , <i>tella</i> .  | 243.90                               |
| Maize                  | bread; whole-boiled, whole-roasted, cob-boiled, on cob-roasted.   | 251.64                               |
| Pulses                 | <i>nifro</i> , <i>qollo</i> , <i>kik</i> (split) <i>ashuqi</i> (roasted and then boiled).                     | 223.05                               |
| Emmer wheat            | bread, porridge   | 190.00                               |

Source: computed Based on EHNRI's Food Composition Table and Survey Data

All the net available grain quantities were converted into calorie equivalent using the above table and Table 4.10 has been produced indicating the annual total available calorie supply for the investigated households. The average food energy per unit gram of grain was multiplied by the total volume of each kind of grain to

convert into total dietary energy available. Accordingly, Table 4.10 shows that the total food energy available for the sample households was 701,249,684 kilo calories; giving the average daily per capita value of 842.1 kilo calories.

**Table 4.10: Total Quantity of Grain Available and Dietary Energy Equivalent by Types of Grains**

| Types of food grains | Total quantity available (Qtl) | Total dietary energy equivalent (kcal) | Contribution to total dietary energy supply (%) | Dietary energy per Qtl (kcal/Qtl) |
|----------------------|--------------------------------|--|---|-----------------------------------|
| <i>Teff</i>          | 1719.60                        | 312,967,734                            | 44.63   | 182,000                           |
| Sorghum              | 694.65                         | 158,412,304                            | 22.59   | 227,720                           |
| Wheat                | 605.53                         | 121,246,070                            | 17.29   | 200,230                           |
| Barley               | 138.87                         | 33,870,360                             | 4.83  | 243,900                           |
| Maize                | 70.23                          | 17,671,492                             | 2.52  | 251,640                           |
| Pulses               | 249.31                         | 55,609,100                             | 7.93  | 223,050                           |
| Emmer wheat (Ajja)   | 7.38                           | 1,402,499                              | 0.20  | 190,000                           |
| <b>Total</b>         | <b>3,486.57</b>                | <b>701,249,684</b>                     | <b>100.0</b>                                    | -                                 |

Source: Computed from survey data based on EHNRI's Food Composition Table

As compared to the nationally accepted 600 grams of cereals equivalent to 2100 kcal, the calculated calorie equivalent per unit volume of grain for this study is found very small. This might be due to two main reasons: Firstly, the greatest source of food in the area is *teff* which is known for its low caloric value as compared to the other food grains such as wheat, barley and maize. Secondly, the community utmost consumes the food grains in the form of *enjera* which again contains by far lower caloric value as compared to other forms of food such as bread, *nifro* (boiled grains), *qollo* (roasted grains) and porridge (See Appendix 3).

**Table 4.11: A Summary of Daily Per Capita Dietary Energy Available by Agro-climatic Zone.**

| Agro-climatic zone | Minimum (kcal) | Maximum (kcal) | Mean (kcal)   | Coefficient of variation | No. of hhs |
|--------------------|----------------|----------------|---------------|--------------------------|------------|
| <i>Dega</i>        | 377.80         | 3148.50        | 1007.49       | 59.32                    | 176        |
| <i>Woinadega</i>   | 118.10         | 2518.80        | 735.06        | 68.28                    | 188        |
| <i>Qolla</i>       | 170.00         | 2021.50        | 607.99        | 90.65                    | 36         |
| <b>All zones</b>   | <b>118.10</b>  | <b>3148.50</b> | <b>842.10</b> | <b>90.52</b>             | <b>400</b> |

Source: Computed From Survey Data Based on ENHRI's Food Composition Table

As indicated in Table 4.11, the daily per capita 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 29.0 percent of the nationally recommended minimum daily requirement of 2100 kcal. On the whole, the average daily per capita calorie available for the sample households was 842.10 kcal which represented only 40.1 percent of the acceptable standard. 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. This can be noted from the analysis using coefficient of variation as shown in Table 4.11.

According to the findings, the shortage of dietary energy supply in the area is very serious. Table 4.12 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 a

**Table 4.12: Percentage Distribution of the Sample Households  
by Level of Calorie Available**

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

Source: Computed From the Survey Data

daily per capita dietary energy supply of over 2001 kcal. Those households who belong to the lowest range of calorie supply ( $\leq 500$  kcal) were rather large (20.8 percent) as shown in the table.

In fact, it should be noted that the recommended daily per capita dietary energy value of 2100 kcal has been for the adult and not for the children or elderly persons. This means, children and elderly persons require less amount of the daily dietary energy than the recommended value for the adult. Hence, the shortage of food energy among the investigated households may not be as serious as it is indicated in the table since children constitutes a great proportion of the population in the area.

The figures in the table show that the shortage of food is more acute in *qolla* areas, the areas which are at the same time characterized by shortage of crucial farm resources as discussed earlier. A smaller proportion (5.5 percent) of the respondents in *qolla* areas were found having access to over 2000 kcal of daily per capita food consumption as compared to 13.0 and 8.3 percent in *dega* and *woinadega* areas, respectively. Moreover, more than 30.5 percent of the peasants in *qolla* had a per

capita caloric supply of less than 500 kcal per day, whereas the comparable figures in *dega* and *woinadega* were 10.2 and 24.0 percent, respectively.

A further comparison between the two better agro-climatic zones, *dega* and *woinadega*, gives that more proportion of the peasants in the former place had access roughly to the nationally recommended caloric value. On the other hand, more households in the latter area belong to the lowest range of caloric value ( $\leq 500$  kcal) according to Table 4.12. In general, the respondents in *dega* areas were found better in dietary caloric supply as compared to the other peasants living in *woinadega* and *qolla* parts of the study area.

As Table 4.13 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 (Table 4.13) has been done based on the nationally recommended minimum 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) to fulfill the minimum recommended dietary energy supply. The table also shows that the proportion of the deficit to the total available calorie varies significantly by agro-climatic zones.

**Table 4.13: Total Dietary Energy Available and the Quantities Required by Agro-climatic Zone**

| Agro-climatic zone | Total population | Total minimum dai requirement (kcal/day) | Total daily available (kcal/day) | Deficit (kcal/day) | % of deficit |
|--------------------|------------------|--|----------------------------------|--------------------|--------------|
| <i>Dega</i>        | 1001             | 2,102,100                                | 1,008,497                        | 1,093,603          | 52.0         |
| <i>Woinadega</i>   | 1053             | 2,211,300                                | 774,015                          | 1,437,285          | 65.0         |
| <i>Qolla</i>       | 226              | 474,600                                  | 137,405                          | 337,195            | 71.0         |
| <b>All zones</b>   | <b>2280</b>      | <b>4,788,000</b>                         | <b>1,919,917</b>                 | <b>2,868,083</b>   | <b>59.9</b>  |

Source: Computed From the Survey Data

## 4.6 Regression Analysis of the Factors Affecting the Households' Per capita Dietary Energy Supply

Stepwise Multiple Regression Model has been employed to analyze to what extent the dependent variables explain the variation of per capita dietary energy supply among the households.

The Multiple Regression Model takes the equation:

$$Y = a + b_1x_1 + b_2x_2 + \dots + b_ix_i \pm e$$

Where, Y = dependent variable

$x_i$  = independent variables

a = constant (intercept) value

$b_i$  = regression coefficients

e = error term

( Shaw and Wheeler, 1994)

### 4.6.1 The variables

Dependent variable: per capita caloric supply

Independent variables:

- $x_1$  : Family size
- $x_2$  : Size of cultivated land/household
- $x_3$  : Number of farm oxen/household
- $x_4$  : Number of livestock population/household
- $x_5$  : Fertilizer used per farmland (kg/ha)
- $x_6$  : Non-farm income in cash or grain
- $x_7$  : Labor wastage (number of work days per month on which the household perform no important farming activity)
- $x_8$  : Transfer income in cash or grain
- $x_9$  : Number of plots.

#### 4.6.1.1 Rationale for Selecting the Variables

As indicated above, nine explanatory variables that are assumed to determine the food security status (level of dietary energy supply) of the households were selected for this analysis. It should be noted that these by no means are the only variables rather they are assumed to have more significant effect on the households' per capita dietary energy supply. The effect of the other factors such as climatic conditions, soil fertility and policy issues are held constant or considered as if they have similar impact on all the households in the area.

Family size ( $x_1$ ), size of cultivated land and ( $x_2$ ), number of oxen ( $x_3$ ) and livestock population ( $x_4$ ) have been selected as important variables with the view that the households who have better quantities of these resources will tend to have higher harvest than those who do not provided that the other factors held constant. Better harvest in turn results more likely in better per capita caloric supply for the households.

Quantities of fertilizer used per hectare of farmland ( $x_5$ ), non-farm employment opportunity ( $x_6$ ) and transfer income ( $x_8$ ) are expected to be positively related to crop productivity and hence per capita caloric supply. This is because reasonably more quantities of fertilizer per unit of farm land results in more yield. Likewise, non-farm employment as recommended by Tegegne (1999) and FAO (1998), is an important income for rural households' economies as it generates cash to purchase both consumption commodities and farm inputs. The effect of the income by transfer/remittance (gift) on the households' per capita caloric supply is considered with the view that those who have the opportunity to obtain such income are expected to be better than those who do not provided that other factors remaining constant.

insignificant variables describe only 0.3 percent of the variance of the dependent variable.

**Table 4.14: Regression Analysis Results: Per capita Dietary Caloric Supply with all Selected Explanatory Variables**

| Predictors  | Coefficient of Correlation | Coefficient of Determination | % of Explained |
|---|----------------------------|------------------------------|----------------|
| x <sub>5</sub>  | 0.861                      | 0.741                        | 74.1           |
| x <sub>5</sub> ,x <sub>1</sub>                                  | 0.885                      | 0.783                        | 78.3           |
| x <sub>5</sub> ,x <sub>1</sub> ,x <sub>3</sub>                  | 0.917                      | 0.841                        | 84.1           |
| x <sub>5</sub> ,x <sub>1</sub> , x <sub>3</sub> ,x <sub>4</sub> | 0.921                      | 0.849                        | 84.9           |
| x <sub>1</sub> -x <sub>9</sub>                                  | 0.924                      | 0.852                        | 85.2           |

Source: Computed From the Survey Data

Table 4.15 shows that amount of fertilizer used (x<sub>5</sub>) was the variable most strongly associated (r= +0.861) with the households' per capita dietary caloric available. Size of cultivated land (x<sub>2</sub>) by contrast had moderate positive correlation (r=+0.501) with the dependent variable. This indicates the fact that the peasants who used more quantities of fertilizer per unit of cultivated land had obtained more yield than those who owned more size of farmland.

Number of farm oxen (x<sub>3</sub>) and size of livestock population (x<sub>4</sub>) per household had also strong correlations (r=+0.696 and r= +0.610, respectively) with per capita calorie available. This result conforms to Dessalegn's (1997:7) statements which he notes as ". . . those who have more farm oxen are more likely to own more cattle to farm more land, and to obtain a bigger harvest..." In turn those households who obtained bigger harvest have, most likely, access to more dietary caloric supply than those who obtained less volume of grain.

The relationship between family size ( $x_1$ ) and per capita dietary calorie available was found moderately negative ( $r = -0.504$ ) contrary to the expectations discussed earlier. This might be because the total available dietary calorie for the household is to be divided by more figures when family size is larger. This, in turn, indicates the fact that unreasonably large family size is one of the causes for low per capita dietary caloric supply. Though their association is not significant at 0.01 critical value (one-tailed), non-farm employment and transfer income variables were also found contrary to expectations and both are negatively associated with per capita dietary caloric value. This is because the better-off households had obtained little or no non-farm or transfer income as compared to the destitute ones whose livelihood has been determined more significantly by the meager income they obtain from these sources.

Likewise, both labor wastage ( $x_7$ ) and number of plots ( $x_8$ ) were found negatively associated with per capita calorie available. Though not statistically significant at 0.01 critical value, these negative correlations are not unexpected because more values for these explanatory variables have more adverse impact on the households' per capita dietary caloric supply as discussed earlier.

**Table 4.15: Regression Analysis Results: Per capita Dietary Calorie Available with all the Selected Explanatory Variables.**

| Predictors | Coefficient of Correlation | Coefficient of Determination | % Explained | Level of Significance (1-tailed) |
|------------|----------------------------|------------------------------|-------------|----------------------------------|
| $x_1$      | -0.504                     | 0.2540                       | 25.40       | 0.000                            |
| $x_2$      | 0.501                      | 0.2510                       | 25.10       | 0.000                            |
| $x_3$      | 0.696                      | 0.4844                       | 48.44       | 0.000                            |
| $x_4$      | 0.610                      | 0.3721                       | 37.21       | 0.000                            |
| $x_5$      | 0.861                      | 0.7413                       | 74.13       | 0.000                            |
| $x_6$      | -0.021                     | 0.0004                       | 0.04        | 0.416*                           |
| $x_7$      | -0.083                     | 0.0068                       | 0.68        | 0.196*                           |
| $x_8$      | -0.096                     | 0.0092                       | 0.92        | 0.161*                           |
| $x_9$      | -0.025                     | 0.0006                       | 0.06        | 0.400*                           |

Source: Computed From the Survey Data

\* not significant at 0.01 critical value

Generally, the results of the study covered in this chapter reveals that the asset, cash and dietary energy supply positions of the investigated household were not remarkable. There were numerous households who had no farm animals and the average number of livestock heads per household was only 9.1. The cash equivalent of the saleable (valuable) assets that the households owned was also minimal. The households' source of cash was not yet diversified and their net cash income was found too small. Moreover, the average daily per capita calorie supply for the sample households represents only 40.1 percent of the acceptable standard (2100 kcal/day/person). As the regression analysis results indicate the dietary energy availability is highly correlated with quantities of fertilizer use per hectare of farmland, family size, number of farm oxen and livestock population owned by the households. The basic factors of the prevailing food insecurity in *Kuyyu wereda* will be dealt in detail in the following section

## CHAPTER FIVE

### **5. Basic Factors of Food Security in *Kuyyu Wereda***

#### **5.1. Overview**

As it true for most other parts of the country, subsistence farming has remained the dominant source of employment and income in *Kuyyu wereda*. Agriculture makes a living for the vast majority of population in the *wereda*. Even a great proportion of the urban residents (those in the town of *Garba Guracha*) generate their income from crop production and livestock rearing. Hence, agriculture is the mainstay for almost all rural inhabitants and for a considerable proportion of the urban residents in *Kuyyu wereda*.

However, 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 from the wereda's office of agriculture, no peasant uses any form of modern farming tools and storage facilities. Only very few proportion of the peasants are currently applying selected seeds on their entire farmlands. In the same way, the proportion of the peasants applying herbicides and insecticides to their crops are insignificant. Rate of fertilizer use (kg/ha) is very small compared to some other parts of the country. No modern harvesting and threshing facilities have been reported in the wereda; and hence the peasants harvest/thresh their crops through traditional means which is said to be one of the causes for pre-harvest grain loss. 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.

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Coupled with some other factors like ecological degradation and adverse climatic conditions, the prevailing backward production processes have undoubtedly affected the food security status of the community in the area. Almost all the investigated farm households (98.9 percent) said they have observed that crop yields have been either decreasing or stagnant over the past several years owing to the factors indicated above. Only 10.1 percent of them have reported that their production has been increasing over years. According to these experienced peasants, the food-insecurity situation in their community has been getting worse over years. Unlike the case of some two or three decades back, almost all the peasants produce food grains not sufficient to feed their family at present.

The other serious problems related to agriculture in the area are the diminishing size of farmlands, landlessness and environmental degradation fueled by rapid population growth. According to the peasants' opinion (substantiated by the experts of agriculture in the *wereda*), the current peasants' land holding size cannot support the population under current production technology. Moreover, the soil is getting infertile over years and the natural vegetation has been devastated at very great rate. Yield per unit of land has, therefore, decreased highly compared with the yield from equivalent farm size two or so decades ago. The scarcity of grazing land is also getting severe over years according to the peasants. Hence, they strongly argue that majority of them cannot produce the amount of food grains which is adequate to feed their family through out a given year. A greater proportion of the households are, therefore, at precarious position and any considerable change in climatic condition can severely affect their lives.

## **5.2. Physical Factors**

### **5.2.1. Climate**

As briefly discussed in earlier chapter, although the total annual rainfall is said to be above the average for the whole country, the area is characterized by high coefficient of variation from one year to the next. There is also great variation in the timing of the starting and stopping of the rains. (See Tables 3.1 and 3.2). This high varying magnitude, no doubt, increases the food insecurity risk of the peasants in one way or another.

The problem of variable rainfall conditions has been substantiated by the survey respondents. A great proportion of the peasants say that the varying condition of the rains both in time and amount has been severely affecting agricultural activities over the past several years. It is not uncommon, as the peasants reported, that they plant at wrong time to make use of the rain and not having sufficient seed stock at hand to replant, as a result of which they lose the possible grain produce.

### **5.2.2. Environmental Degradation**

Mengistu (1987) pointed out that soil erosion is the single most important factor of land degradation and man has reached a point when soil erosion has become a great problem affecting agricultural productivity at present. Similarly, several research documents indicate that soil erosion by water is a major form of land degradation in Ethiopia (Sutcliffe, 1995; MEDaC, 1995; Kifle, 1999; Tesfaye, 1999). According to some of the documents, the average annual rate of soil loss is estimated at 12 tons/ha and it is cited as a major factor exacerbating reductions in crop production in the country. Likewise, experts in the wereda's office of agriculture and the experienced peasants agree that soil fertility has been

considerably decreasing over years in the area. Particularly, the bare sloppy areas are severely eroded to the extent that only extensive rocks are found exposed to the surface.

What seems aggravating the soil loss in the study area are the unfair land tenure, traditional farming systems and the prevailing indiscriminate deforestation. Moreover, the fact that the most widely cultivated crop in the area is *teff*, subjects the farmlands to severe soil erosion since such "... small-seed crops require fine tilth of seed beds" (Wood, 1990). Nonetheless, the peasants have not been well informed about the wise use of natural resources in general and soil conservation techniques in particular

### **5.3. Production Processes and Socio-economic Factors.**

#### **5.3.1. Production Processes and Technologies.**

There is no basic difference in farming systems and technologies among the ecological zones in the *wereda*. Farming processes are carried out by means of simple traditional methods across the area. A considerable difference is the fact that both hoe and oxen-plough tilling mechanisms are used in *qolla* regions as contrary to *dega* and *woinadega* where the latter is the only means to till the soil. Through out the *wereda* annual crops cultivation predominates. Only very few peasants (the lowlanders) produce such crops like chat and orange the greatest proportion of which is consumed at household level. No considerable irrigation practices are applied 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 totally dependent on rainwater for their farming activities.

As summarized in Table 5.1, the vast majority of the sample households (89.3 percent) use only oxen-plough to till their farmlands. Only those peasants in *qolla* zone practice hoe-culture. No household has reported using modern farm machines such as tractors and combine harvesters. Likewise, majority of them use local (unimproved) seeds; and about 37.5 percent of the sample households did not apply fertilizers to their farmlands during 1999 crop year. Moreover, only 35.8 percent of them have reported applied herbicides during the indicated crop year. The percentage of the peasants practicing simple irrigation schemes makes up 30.8 percent.

**Table 5.1: Sample Household Heads by Production Technology During 1999 Crop Year (Percentage Distribution)**

| Rol. No. | Production Technology                    | Agro-Climatic Zone |           |       | Total |
|----------|--|--------------------|-----------|-------|-------|
|          |  | Dega               | Woinadega | Qolla |       |
| 1        | Hoe - culture only                       | 0.0                | 0.0       | 16.7  | 1.5   |
| 2        | Oxen plough only                         | 100.0              | 88.3      | 41.7  | 89.3  |
| 3        | Both hoe and oxen plough                 | 0.0                | 11.7      | 41.7  | 9.3   |
| 4        | Local seed only                          | ***                | ***       | ***   | ***   |
| 5        | Improved seed only                       | 0.0                | 0.0       | 0.0   | 0.0   |
| 6        | Both local and improved seed             | ***                | ***       | ***   | ***   |
| 7        | Peasants using fertilizers               | 64.8               | 66.5      | 8.3   | 62.5  |
| 8        | Peasants using herbicides                | 52.8               | 46.8      | 0.0   | 35.8  |
| 9        | Peasants using simple irrigation scheme* | 18.2               | 42.6      | 8.3   | 30.8  |
| 10       | Average fertilizer usage (kg/ha)**       | 39.5               | 33.3      | 4.6   | 34.4  |

Source: Field Survey, Jan-Feb. 2001

\* Used to cultivate vegetables and fruits in this area

\*\*Calculated by dividing quantities used by area under grain crops.

\*\*\* no data available

As briefly indicated above crop production processes in *Kuyyu wereda* are characterized as poor production technologies or resource deficit as true for the

whole small-holder (peasantry) agriculture in Ethiopia. This has both current and foreseen impacts on the food security situation of the people. Particularly, the fact that these traditional farming processes have serious impact on natural vegetation and soils will undoubtedly reduce the per capita grain production in the future alongside the prevailing rapid population growth. This is because these types of backward agricultural practices involve improper management of natural resources such as soils which are very crucial in this sector.

### 5.3.1.1 Crop Production

The data from *Kuyyu wereda* office of agriculture reveals that cereals constitute the vast proportion of the crops grown in the area. Similarly, according to the sample survey for this paper, *teff*, sorghum, barley and wheat make up 84.0 percent of the crops produced. *Teff* alone accounts for 51.2 percent and it is the single most important food crop in the area. Pulses such as beans, chick-peas and peas are produced at very small scale constituting only 7.4 percent of the whole crops produced. *Nug* and linseed are important oilseed crops produced in the area though their production is at extremely low scale (See Table 5.2).

Owing to rapid population growth and the resulting diminishing size of farmlands, it seems that the peasants turned to produce only stable food crops such as *teff* and sorghum. *Teff* is the single most important crop in *dega*, while sorghum is produced at greatest scale in *qolla* agro-climatic zones. At the middle zone, *woinadega*, both major crops are produced roughly at balanced ratio provided that the climatic condition is suitable to produce the two crops during the same crop-year. Pulses and oilseeds are, therefore, produced at small scale not because they are needless but due to the scarcity of farmlands on which they are to be cultivated and because the peasants give priority to stable food crops.

Unlike some other parts of the country, *Kuyyu wereda* and the surrounding areas lack major cash crops such as coffee and *chat*. Though coffee and chat are said to be grown in areas ranging from 600m to 2200m above sea level (see Paulos and Tesfaye, 2000), none of the peasants in the study area produce these important cash crops on significant scale. Moreover, crop production in the area is almost entirely rainfed and the peasants harvest only once a year.

Owing to the complete absence of cash crops and non-farm activities, the peasants are entirely dependent on the sale of non-surplus cereal and oilseed crops, livestock and poultry for cash. Particularly, oilseed and root-crops are produced for sale leaving only very small proportion as seeds for the proceeding crop season.

The fieldwork data for this paper reveals that almost half of the sample households produce oilseeds (mainly *nug*) just for cash. A total of 51.1 Quintals of these crops was harvested by these households during the 1999 crop year, giving a yield per household of 17.2 kg.

As shown in Table 5.2, during the 1999 crop year 520.5 hectares of land were put under cultivation by the survey respondents and a total of 3190.0 Quintals of grain was harvested. This gives the average per household grain production of 8.0 Quintals and per capita production of 139.9 kg. In fact, there is a significant variation among the sample households in grain per capita by agro-climatic variation.

A significant variation was observed in the importance of a certain crop and per capita production by agro-climatic variation in the area. Accordingly, sorghum was found the single most important crop in *qolla* regions, while *teff* is produced in greatest proportion in *dega* parts. These two major crops are almost equally produced in *woinadega* areas. Likewise, per capita grain production

**Table 5.2: Size of Farmland Covered by Major Crops and Total Production During 1999 Crop Year.**

| Crops        | Area Cultivated |              | Total Production |              |
|--------------|-----------------|--------------|------------------|--------------|
|              | Size (ha)       | %            | Quintal          | %            |
| <i>Teff</i>  | 2540            | 48.8         | 1634.3           | 51.2         |
| Sorghum      | 96.3            | 18.5         | 606.5            | 19.0         |
| Wheat        | 64.0            | 12.3         | 491.6            | 15.4         |
| Barley       | 14.6            | 2.8          | 127.7            | 4.0          |
| Maize        | 6.8             | 1.3          | 38.3             | 1.2          |
| Pulses       | 29.7            | 5.7          | 236.2            | 7.4          |
| Oilseeds     | 54.1            | 10.4         | 51.1             | 1.6          |
| Oats         | 1.0             | 0.2          | 6.3              | 0.2          |
| <b>Total</b> | <b>520.5</b>    | <b>100.0</b> | <b>3190.0</b>    | <b>100.0</b> |

Source: Field Survey, Jan-Feb. 2001.

varies by agro-climatic variation. The annual per capita grain production for those respondents from *qolla* was found 5.37 quintals during 1999 crop-year which was lower than the average figure (8.7 quintal) for the whole households.

As a result of the difference in the importance of crop type by agro-climatic zone, *qolla* regions are said to be more influenced by *belg* rains than other parts of the area. This is so because sorghum, the main source of food for the community in this region, is sown mainly during *belg* seasons. A deficit in *belg* rains, therefore, affects the production of sorghum crop which in turns affects the food situation of the community in the proceeding year. According to the respondents from this region, though they prefer to cultivate sorghum because of its better yield per unit area and easier working conditions, the inadequate *belg* rains during most of the years has remained one of the most important constraints. Because of this and other worse environmental conditions, ".....the peasants living in *qolla* agro-ecologies..." as indicated by Dagneu (1993:12), "... are more vulnerable to serious disaster induced food shortages than people who live in *dega* and *woina-dega* areas".

### 5.3.1.2. Livestock production

As shown in Table 5.3, the total livestock population owned by the sample households is estimated to be 3635 in which the share of cattle, sheep, goats and equine is 2032 (55.9 percent), 577 (15.9 percent), 796 (21.9 percent) and 230 (6.3 percent), respectively. The total number of poultry population is estimated to be 1230 and the total number of beehives is 238. Though this figure gives the per capita livestock population of about 1.3 heads, a considerable number of households owned no animal. Particularly, numerous households had no reasonable size of cattle. Likewise, of the total 400 sample household heads, only 50 peasants had beehives. Out of these 48 had less than 4 beehives and only one peasant in *Halelu Chari* PA had 50 beehives.

**Table 5.3: Livestock, Poultry and Beehives Population Reported by Sample Households.**

| Type            | Number      | Percent      | Number /hh |
|-----------------|-------------|--------------|------------|
| Cattle          | 2032        | 55.9         | 5.1        |
| Goats           | 796         | 21.9         | 2.0        |
| Sheep           | 577         | 15.9         | 1.4        |
| Equine          | 230         | 6.3          | 0.6        |
| <b>Total</b>    | <b>3635</b> | <b>100.0</b> | <b>9.1</b> |
| <b>Poultry</b>  | <b>1230</b> | -            | <b>3.1</b> |
| <b>Beehives</b> | <b>238</b>  | -            | <b>0.6</b> |

Source: Field Survey, Jan-Feb, 2001

As indicated by Tilahun (1995), livestock productivity in Ethiopia is low owing to several factors such as feed shortages, inadequate veterinary services, poor genetic potential, lack of marketing infrastructure, inadequate investment and inappropriate policies and strategies. *Kuyyu wereda* cannot be out of this general picture of the country's livestock sub-sector. Majority of the animals owned by the sample households are indigenous breeds which are characterized by low

(particularly cattle) and dietary energy intake or the cash position of the households are directly proportional.

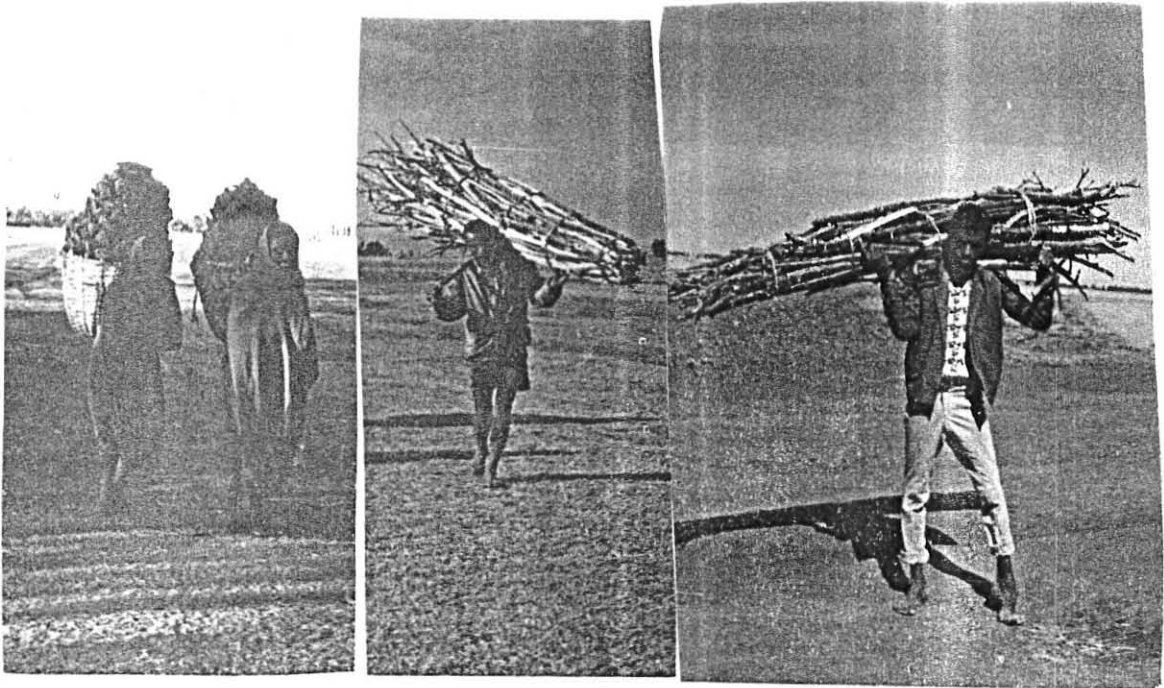
The food security role of livestock ownership is very great among the households in this area mainly because of three reasons. Firstly, ox ownership is an important factor in grain production processes as ox is the only source of traction power in the *wereda* particularly in *dega* and *woinadega* regions. Those households who owned a pair of oxen tend to cultivate more size of farmlands and more likely obtain better grain production. Secondly, the better off peasants have the chance to sell some of their livestock to meet the need of food consumption during grain shortage. Thirdly, as learnt from the respondent peasants, in order to borrow cash or grain from friends or relatives to meet urgent needs, most of the better-off households are unwilling to give to those households who have no or few livestock. This effectively influences the ability of the peasants to access to food grain through borrowing. In general the households who are better in livestock resources have in one way or another, a better opportunity to access to adequate food supply throughout a year than the poorer household in livestock resource.

The contribution of the livestock sub-sector as a source of food items such as milk, butter meat and eggs is said to be very low in this area. As learnt from the respondent peasants, these food items are not commonly consumed; rather the major volume is taken to market for cash. They are considered as luxury food items and consumed only during the prominent religious festivals (Easter, Christmas, etc.) and other big social ceremonies such as wedding days.

In the same manner, it is estimated that the greatest proportion of animal dung is used as a source of household energy rather than applied to farmlands as a source of fertilization. A great proportion of the animal dung is also transported to urban areas, on human backs, for cash. Usually the suppliers are females belonging

to very poor farm families and collect the dung from the field. The transported ones are also used as source of household energy.

**Fig 5.1: Extremely Poor Peasants Transporting Dung and Firewood to *Garba Guracha* Town.**



Source: Field Survey, Jan. -Feb, 2001

### **5.3.2. Landholding Conditions**

#### **5.3.2.1. Size of Holding**

As indicated in earlier chapters, *Kuyyu wereda* and the surrounding areas are characterized by high population density. The crude population density in the area was calculated to be over 125 persons/km<sup>2</sup>. As summarized in Table 5.4, 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 holding size of the remaining 13.75 percent was found to be over 3.0 hectares. Surprisingly

enough, only one peasant reported to have owned over 6 hectares of land. Under current production technology, as justified by different researchers, this holding size is too small to produce adequate grain for a household in the country as a whole. 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 5.4: Distribution of Sample Households by Size of Holding per Household During 1999 crop year.**

| Items                           | Size of Holding (Hectares) |          |           |           |           |           |           |              | Total  |
|---------------------------------|----------------------------|----------|-----------|-----------|-----------|-----------|-----------|--------------|--------|
|                                 | Under<br>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 | over<br>3.00 |        |
| No of hhs                       | 0                          | 16       | 79        | 118       | 56        | 37        | 39        | 55           | 400    |
| % of hhs                        | 0                          | 4.00     | 19.75     | 29.50     | 14.00     | 9.25      | 9.75      | 13.75        | 100.00 |
| Average Land Holding<br>hh (ha) | -                          | 0.38     | 0.75      | 1.26      | 1.76      | 2.22      | 2.86      | 3.56         | 1.76   |

Source: Field Survey, Jan. -Feb. 2001

*Note: Size of holding is determined by area under crops, fallow land, grazing land and others*

While considering the average land holding size per household in the area, one may say that it is moderately sufficient to produce adequate volume of grain for a household. But when we consider the fact that the sample households, as it has already been pointed out, are only the registered ones and it is assumed that there are thousands of unregistered landless households in the area, this figure is very low to be sufficient for the whole farm community, Moreover, Dessalegn (1984), the well known researcher in the field, assumes that a peasant can handle fruitfully and efficiently a normal quality land of as big as 5 to 6 hectares. Hence, it is safe to say that farmland is a very scarce resource in the area.

An attempt has been made to show the variation in the size of land holding by agro-climatic zone (Table 3.5.) and it seems that more proportion of the peasants in *dega* have access to larger farmlands than those living in *woinadega* and *qolla* regions. For instance, of the total sample households, about 21.8 percent who owned over 2.5 hectares of land lived in *dega*, whereas only 1.8 percent reported to have owned the same size of land in the other parts of the area. On the contrary, while only 12.3 percent of the samples whose size of holding lies between 0.10-1.50 ha lived in *dega*, those in *woinadega* whose holding size lies between this range make up 36.5 percent.

**Table 5.5: Percentage distribution of the Sample Households by Size of Land holding and Agro-climatic Zone.**

| Items                      | Size of Holding (Hectares) |          |           |           |           |           |           |           | Total |
|----------------------------|----------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|
|                            | Under 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 | over 3.00 |       |
| % of hhs in Dega Zone      | 0.0                        | 2.50     | 0.0       | 9.75      | 4.75      | 5.25      | 8.5       | 13.25     | 44.0  |
| % of hhs in Woinadega Zone | 0.0                        | 1.50     | 19.0      | 16.0      | 9.25      | 1.25      | 0.0       | 0.0       | 47.0  |
| % of hhs in Qolla Zone     | 0.0                        | 0.0      | 0.75      | 3.75      | 0.0       | 2.75      | 1.25      | 0.5       | 9.0   |
| % of All Households        | 0.0                        | 4.0      | 19.75     | 29.50     | 14.0      | 9.25      | 9.75      | 13.75     | 100.0 |

Source: Field Survey, Jan. -Feb. 2001

### 5.3.2.2. Fragmentation of Holdings

The fragmentation of land holdings, as argued by Yibeltal (1995), has both negative and positive impacts on agricultural productivity. The respondents for this research also agree with this idea. Though they know that it takes much time to move from one plot to the other as well as the larger number of plots makes the work of crop management more difficult, they need to own as many parcels as possible because it gives them the chance to access to varied soil types so that they can grow different kinds of crops. They also feel freer from the impacts of weather

and pests damage as they grow crops on different plots of land. As a result, every respondent had landholding of several small parcels.

In general, the average number of parcels owned by a farmer was 4.2. It was found 4.9, 4.4, and 4.1 in *dega*, *woinadega* and *qolla* agro-climatic zones, respectively. The highest number of parcels per household was reported in *Wuyye Gose PA* (in *woinadega* area) and the lowest in *Halelu Chari PA* (in *qolla*), the corresponding figures of which were 13 and 1 respectively. As summarized in Table 5.6, of the total respondents 23.4 percent operated on 6 or more plots. The percentage of the sample households with 1 to 2 parcels accounts only for 9.0 percent, whereas those who owned 3 to 5 make up 67.5 percent. (See Table 5.6)

**Table 5.6: Percentage distribution of the Sample Households by Number of Parcels they Owned**

| Zones            | Number of Plots |            |             |             |             |             | Total        |
|------------------|-----------------|------------|-------------|-------------|-------------|-------------|--------------|
|                  | 1               | 2          | 3           | 4           | 5           | 6+          |              |
| <i>Dega</i>      | 4.5             | 0.0        | 9.1         | 16.7        | 40.9        | 28.8        | 100.0        |
| <i>Woinadega</i> | 6.4             | 4.5        | 17.3        | 20.4        | 30.0        | 21.8        | 100.0        |
| <i>Qolla</i>     | 0.0             | 16.7       | 8.3         | 33.3        | 33.3        | 8.3         | 100.0        |
| <b>All Zones</b> | <b>5.3</b>      | <b>3.7</b> | <b>13.8</b> | <b>19.7</b> | <b>34.0</b> | <b>23.4</b> | <b>100.0</b> |

Source: Field Survey, Jan. - Feb. 2001

Generally, as discussed above in detail 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 travel distances 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.

### **5.3.2.3. Land Tenure**

There is a widespread agreement that the issue of tenure security is a crucial aspect of sustainable agricultural development and food security. Several researchers conclude that insecure land rights have adverse impact on natural resources and agricultural production. Maler, K. (1998:262), for instance, notes "in Southern and Eastern Africa ...the lack of well-defined property rights is the main force driving over-grazing soil degradation and over fishing." However, as true for the country as a whole the property right of land and other natural resources have been vested on the state in the study area. This, no doubt, has adversely affected the peasants long-term concern to the well-being of the soil, vegetation and other natural resources on the land which they occupied but not possessed.

This might be why, as learnt from the respondents, natural vegetation is being severely cut down and farmlands are being quickly degraded in the study area. Presumably, this might have contributed to the previously discussed food insecurity problems in the *wereda*.

### **5.3.3. Draught Power**

Of the food security role played by the livestock sub-sector, the share of farm oxen seems predominate in this area. As briefly discussed in the previous section of this paper, oxen are the only source of traction power in *Kuyyu wereda* 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.

The households' food security role of the oxen is considered in such a way that, as discussed by Dessalegn (1997:7), those households "who have more farm

oxen are more likely to farm more land and to obtain a bigger harvest than those who do not, even though the size or quality of the land of both groups may be the same".

However, not all households own ox in the sample. The survey results show that 10.7 percent of the households owned no ox, 27.5 percent owned only one ox, 39.9 percent owned more than two oxen. This means 38.2 percent of the households are characterized by shortage of traction power and seek assistance from their relatives or friends. In fact, the distribution of oxen in this area may appear better as compared to the other parts of the country. This is because some research documents indicate that over half of the peasants in Ethiopia do not have a pair of oxen. (see Fisseha, 1996; Betre, 1997; Dessalegn, 1997). But it is important to note that there are thousands of unregistered farm households in the area who have totally no access to basic farming resources such as oxen and land though there is no aggregate data which reveals the exact number of landless peasants in the PAs.

**Table 5.7: Percentage Distribution of the Sample Households by Number of Farm Oxen**

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

Source: Field Survey, Jan. - Feb. 2001

The figures in Table 5.7 show 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 the former had less than two oxen; whereas the comparable figure for *woinadega* and *dega* areas is 36.5 and 44.0 percent. Similarly, the proportion of the peasants who owned more than two oxen in *dega* was found to be less than those who live in the other parts of the area.

As could be learnt from the interviews held with some of the peasants, the livelihood of those households who own no or one ox is dependent on several but less important local non-farm activities such as sale of charcoal and fire wood, working on the farms of better-off peasants for grain or cash, and mortgaging their plots in exchange for grain. Particularly, the oxenless, female-headed farm households with no adult male in the family suffer more since they cannot perform these laborious activities as competitively as males and generate adequate income to meet their food consumption needs.

The harvest that the oxenless (oxen-deficit) peasants could obtain in one way or another satisfies its minimal subsistence needs for only a few months of the year. For the remaining several months, as the peasants report, they face severe grain shortfalls. Consequently, they revert to perform those local non-farm activities to meet their minimal subsistence needs. What is more dangerous at this juncture is the fact that these non-farm income generating activities are insignificantly important and getting reduced in scope associated with the virtual disappearance of forests and the declining number of well-to-do peasants over years.

On the whole, the food security status of those households who owned reasonable number of oxen is by far better than those who do not. As discussed earlier, the number of oxen owned by the household is directly proportional to the volume of grain produce provided that all the variables remain constant.

Though very rarely available, a variety of traditional mechanisms are used to access to ox/oxen by the oxenless/ oxen-deficit peasants in the area. This traditional cooperation include *Higni*, *Maqanajo*, *Qitira* and *Kontrata* as locally named in Oromo Language.

- A. '*Qitira*': involves a direct renting of one or two oxen through grain transaction. The amount of grain paid for an ox varies between 150 to 250 kilograms depending on the agreement between the peasant who rent out the ox/oxen and the renter. Out of the poor peasants (oxenless and oxen-deficit) 10.5 percent engaged in this form of social arrangement during the survey.
- B. '*Higni*': This is a tradition by which a peasant who own no ox works on the farm of the ox owner for three days for two day oxen labor. Only 4.6 percent of the poor peasants reported to have engaged in this mechanism to access to ox/oxen.
- C. '*Maqanajo*': This is an agreement between two peasants each having only one ox or one extra ox. One of the peasants who own only one ox should work two days on the farm of the other and three days on his own farm. According to the survey data, the proportion of the poor peasants who engaged in this form of traditional arrangement accounts for 15.8 percent.
- D. '*Kontrata*': This is a mechanism by which the ox owner but labor deficit households rent out their ox/oxen for human labor. The oxenless/oxen-deficit households should work on the plots of the owner in the form of weeding, harvesting, threshing, etc. for certain days' ox/oxen labor. According to the opinion of the peasants, this mechanism of establishing access to ox/oxen is very rarely available mainly because almost all the households have adequate human labor. This can be justified from the fact that the average family size of the sample households was found to be 5.7 persons.

The poor peasants are also sometimes benefited from self-help social works which the communities have developed into their day-to-day subsistence farming practices. The widely practiced social works are '*Dabo*', '*Jigi*' and '*Walfala*' as locally named in Oromo Language. '*Dabo*' is when one requests his fellowmen to

finish the work (farming, weeding, harvesting, etc.) on a fixed day. The one who arranges '*Dabo*' is expected to render services for the fellowmen in the same way or another. '*Jigi*', on the other hand, is arranged by the voluntarily members of the community to work for peasant whose close relative or ox/oxen died. Finally, '*Walfala*' involves working on the farm of each other turn by turn.

However, the opportunity to access to ox/oxen through these traditional co-operations, which have been said very rarely found even at present, will most likely decrease in the future associated with the decreasing number of better-off peasants and the ever diminishing land holding size. Particularly, the diminishing size of pastureland as a result of the increasing demand for cropland, as pointed out by the respondents, will be a major factor playing against livestock population in general and the member of oxen in particular. Hence, most likely, there will be less number of oxen and more number of oxenless/oxen-deficit farm households in the future than the case at present. In general the overall prevailing conditions in the area tend to narrow the opportunity of the rural poor to access to ox/oxen.

#### **5.3.4. Non-farm Income opportunity**

Rural non-farm income as defined by FAO(1998:283) is the "income derived ...from wage paying activities and self -employment in commerce, manufacturing and other services." It is viewed as contributing to the diversification of the households' source of income. Therefore, it is an important factor in rural economy and food security as it allows greater access to food and the income from this sector enhances the performance of agriculture by providing the rural poor with cash to invest in agriculture.

The non-farm income activities in the study area are very traditional and practiced in their simplest form. These activities include weaving, pottery, simple

land which could have either omitted or reduced the variation between the peasants' holdings in fertility status. In general, the variation in crop yield among the sample households is mainly due to socio-economic constraints of the peasants though the environmental factors are assumed to be among the major constraints to the optimal agricultural productivity in the area as a whole. Hence, to analyze these socio-economic factors and put them in order of their significance in affecting the peasants' food security situation at household level seems very important.

#### 5.4.1.1 Dependent Variable

Yield of crops per hectare: This variable was calculated from the production data for 1999 crop year reported by the sample peasants. The total crop production reported by each respondent was divided by the corresponding size of cultivated land.

#### 5.4.1.2 Independent Variables

Labor Supply ( $X_1$ ): This is the ratio of the total number of male and female population (10 to 65 age group) in a household to the corresponding total size of land covered by crops during 1999 crop year. Ten and Sixty-five years were taken as a lower and upper limits, respectively, mainly because the population of this age group can perform most of the important farming activities in this area

Size of Cultivated Land ( $X_2$ ): This refers to a household's total size of land covered by crops during 1999 crop year. It excludes lands used for other purposes.

Oxen Supply ( $X_3$ ): This refers to the ratio of the total number of farm Oxen owned by a household to the corresponding total size of land (ha) covered by crops.

Livestock population per household (X<sub>4</sub>): This variable is taken as total number of animals (cattle, sheep, goats and equines) owned by a household.

Fertilizer application (X<sub>5</sub>): This refers to the total quantity of fertilizer input in kilograms per hectare of a household's cropped land during 1999.

Non-farm Income Opportunity (X<sub>6</sub>): This variable is taken to identify whether the household had access to any form of non-farm income opportunity or not.

1 = If the household had the opportunity

0 = otherwise

Labor Wastage (X<sub>7</sub>): This refers to the number of days per month that a household spends doing nothing significant to the process of crop production. In other words, it refers to the number of days within a month that a household devotes to the observation of religious holidays.

Number of Plots (X<sub>8</sub>): This is the number of parcels of farmlands owned by a household during the survey

Dung Input (X<sub>9</sub>): This is the quantity of dung that a peasant applied to his/her total cropland during the 1999 crop year. However, only very few peasants responded having used very small quantity of dung to fertilize their cropland. Thus, the researcher thinks that dung has too little significance to be used as a variable in this analysis.

#### **5.4.2 Rationale for Selecting the Variables**

Generally, the detail explanation of the factors affecting agriculture was given in earlier discussions. It is out of those factors that the explanatory

(independent) variables (predictors) for this analysis were selected. Thus, one can refer back for the rationale for the selected variables.

### 5.4.3 Regression Analysis Results

As indicated above, nine explanatory variables (predictors) depicting various characteristics of the farming activities of the 400 sample households were used in this analysis. One of the variables, dung input ( $X_9$ ), was not taken into consideration as it was reported to have been used by very few peasants on very small scale. As a result, the remaining eight variables were chosen that are likely to have significant effects on agricultural productivity.

Stepwise regression analysis was applied to screen out the most significant variables out of the eight selected ones and summarized using multicollinearity diagnosis. Accordingly, four variables were found insignificant in determining the dependent variable i.e. yield per unit area. These insignificant variables are size of cultivated land ( $X_2$ ), non-farm income opportunity ( $X_6$ ), labor wastage ( $X_7$ ) and number of plots ( $X_8$ )

**Table 5.8: Regression Analysis Results: Yield per Unit Area with All Selected Explanatory Variables.**

| Predictors           | R     | R <sup>2</sup> | % 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        |
| $X_1 - X_8$          | 0.949 | 0.900          | 90.0        |

Source: Computed from the Survey Data.

Note: R = Coefficient of correlation, R<sup>2</sup> = Coefficient of determination

As summarized in Table 5.8 all the selected variables ( $X_1 - X_8$ ) 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 factors. The combined effect of the four screened most significant variables alone accounts for 89.9 percent of the variance; where as the other four insignificant ones explain only 0.01 percent of the variance in crop produce per unit of land.

The summary in Table 5.9 indicates that out of the most significant predictors, use of fertilizer was most strongly associated with productivity ( $r = +0.905$ ) followed by number of oxen ( $r = +0.793$ ). This indicates the fact that those households who applied reasonably more quantities of fertilizer per unit of land obtain more yields per unit of land than those who applied less quantities of the input. Likewise, farm oxen and livestock population per household had a strong association with agricultural productivity. The other important variable, labor supply, had a moderate positive association ( $r = +0.533$ ) with the dependent variable. This result conforms the Boserup's (1965) "theory of agrarian change" which argues that the households with more family size (labor supply) tend to produce higher crop yield. Similarly, the association between cultivated land and yield per unit area was found moderately positive ( $r = +0.536$ ) though the association is not statistically significant

Weak negative correlation ( $r = -0.157$ ) was observed between labor wastage and yield per unit area indicating the existence of inverse relationship between the number of uselessly spent days in each month of the year and the quantity of crop produce that the households obtained. Likewise, there was a weak negative association ( $r = -0.083$ ) between number of plots per household and yield per unit area.

The only exception is non-farm income opportunity which is contrary to our expectation and is positively associated with areal productivity.

**Table 5.9: Regression Analysis Results: Areal Productivity with and All the Selected explanatory variables**

| Predictors     | Coef. of Correlation | Coef.of determination | % Explaine | Sign. Level (1-tailed ) |
|----------------|----------------------|-----------------------|------------|-------------------------|
| X <sub>1</sub> | 0.533                | 0.2840                | 28.40      | 0.000                   |
| X <sub>2</sub> | 0.536                | 0.2873                | 28.73      | 0.000                   |
| X <sub>3</sub> | 0.793                | 0.6288                | 62.88      | 0.000                   |
| X <sub>4</sub> | 0.733                | 0.5373                | 53.73      | 0.000                   |
| X <sub>5</sub> | 0.905                | 0.8190                | 81.90      | 0.000                   |
| X <sub>6</sub> | 0.060                | 0.0036                | 0.36       | 0.267*                  |
| X <sub>7</sub> | -0.157               | 0.0246                | 2.46       | 0.500                   |
| X <sub>8</sub> | -0.083               | 0.0069                | 0.69       | 0.197*                  |

Source: Computed from the survey data

\* Not significant at 5% significant level

Generally, the discussions in this chapter indicate that several factors affect the farm households' food security/insecurity status in *Kuyyu Wereda*. Some of these factors are rainfall variability, soil degradation, backward production technologies, lack of draught power, tenure insecurity, absence of non-farm income activities, and low use of farm inputs such as fertilizer, selected seed, and herbicides. As the regression analysis results indicate labor supply, possession of farm oxen and other livestock, and quantities of fertilizer used per hectare are highly correlated with yield per unit of land.

## CHAPTER SIX

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Conclusion

From the attempts made to highlight the food supply situation in the world, it is clearly evident that millions of population have been suffering from hunger though there is adequate amount of food in the world. This is because the world is said to be food secure if and only if every person is assured of access at all times to the food required for a healthy and productive life. In other words, the availability of food at global, regional or national level does not guarantee every household's or individual's access to adequate food owing to several factors such as the ability to produce or purchase enough amount of food.

The problems related to food crisis are very acute in Africa, especially in Sub-Saharan regions, than it is in the other parts of the world. According to FAO (1998), for instance, the proportion of undernourished population in Africa was assumed to make up over 51 percent of the continent's total population for the 1994-96 period or over 31 percent of the total undernourished peoples in all developing regions. Of all the underfed peoples in the continent, those in Sub-Saharan regions constituted about 83.3 percent.

What seems more miserable in Sub-Saharan Africa is the fact that the future food security trends in this Sub-region are not encouraging. Rather food crisis in this sub-region are expected to persist and the peoples face the bleariest prospects. Furthermore Sub-Saharan Africa is the only region in the world in which the number of poor has been growing roughly at the same rate as population growth.

The food security /in-security situation in Ethiopia is not out of the general picture of the Sub-Saharan Africa. Though endowed with favorable natural resource base, Ethiopia is a country facing food crisis of grave proportion in Africa. The country's agriculture, which is characterized by low output, backward technology, and traditional production systems, cannot feed the ever increasing population. It is, therefore, believed that over half of the population in Ethiopia are undernourished and live in chronic poverty. Child malnutrition, which is one of the indicators of food insecurity, in Ethiopia is also among the worst in the world.

Several documents and research findings indicate that food insecurity is more acute among rural community than it is in urban areas. According to FSS (2000) document, for instance, about 52 percent of the population in rural areas is believed to be food insecure in Ethiopia, the comparable figure of which is 36 percent in urban areas. Moreover, the country's children in rural Ethiopia are said to be at worse food insecurity risk than those in the counterpart areas.

The causes for the food crises briefly stated above, in Africa and Ethiopia in particular are varied and complex. Different interrelated socio-economic, environmental and political factors are thought to have resulted in the prevailing food insecurity situation in these parts of the world. The prevailing severe environmental degradation (particularly soil loss), ineffective agricultural planning and strategies, weak marketing or marketing distribution performances of production and consumption resources, limited technical capabilities and political instabilities are among the basic factors of food crises in this part of the world. Hence, in Africa (particularly in Sub-Saharan region where Ethiopia is uniquely identified) several hundred millions of people have been suffering from hunger, malnutrition and under-nourishment though this part of the world is endowed with favorable natural resources.

Like many other rural areas in Ethiopia, the economic situation in general and food security status of the farming households in particular in *Kuyyu Wereda* was found precarious. A great proportion of the households had no access to optimum quantity and quality of resources to purchase and produce adequate amount of food. For instance, out of the total sample households 38.2 percent had less than two oxen, 9 percent had no cattle, 3 percent had no livestock at all and 20.8 percent had very small (less than 1.0 ha) land holding. Moreover, no household head reported having its family engaged in economically important non-farm activities owing to lack of employment in the sectors. Only very simple kinds of this sector (such as petty trades, charcoal and fire wood sales, and traditional crafts work) were reported by some destitute peasants. However, the income that the households gain from these simple and traditional non-farm activities was found too meager.

The assessment of food security situation in the *wereda* manifests clearly that the vast majority of the peoples have been suffering from chronic and possibly increasing food insecurity. Only 5.2 percent of the sample households had over the recommended minimum daily per capita requirement of 2100 kcal. Even the percentage of those households who have access to the daily per capita dietary energy supply over the food poverty line (1850 kcal), recommended by RRC, make up only 12.8 percent.

From the overall discussions in the foregoing chapter, in general, it is evident that the farming households in *Kuyyu wereda* faced a number of interlocked problems. Severe environmental degradation, rainfall variability, extreme poverty, low production resource and income base, lack of rural infrastructure (such as feeder roads), rapid population growth and low use of modern farm inputs were among the drawbacks to food security and sustainable development in the area. Among the socio-economic factors, the impact of fertilizer use, oxen supply and

livestock availability on agricultural productivity and the households' food security status, as statistically analyzed, were found crucial. Moreover, the statistical analysis of the socio-economic factors show that large family size and labour wastage had crucial negative impacts on the households' per capita calorie availability and food production, respectively.

## 6.2 Recommendations

It has already been indicated that the scope of this research is limited to four PAs in *Kuyyu Wereda*. However, the findings of the study could be used to suggest a number of policy measures that can be used to alleviate the food security problems and brings about sustainable rural development. Therefore, the writer suggests the following points based on the findings of the research:

1. Generally, poverty is the main cause of malnourishment and food security /insecurity is a matter of access to resources to purchase or produce the required amount of food. Hence, in order to achieve food security in rural Ethiopia in general and the study area in particular attempts should be made to increase the real income of the farm households or improve the ability of the peasants to produce enough food to meet their own needs.
2. The study reveals that several households do not have adequate farm assets such as farm oxen and livestock. Such households, as statistically analyzed, face food scarcity utmost since these assets are among the most important variables of production. Thus, the writer recommends the formulation of long-term credit facilities for the purchase of drought oxen and other crucial farm animals.

3. The government is currently retreating from subsidizing agricultural inputs in the name of free market as a result of which the price of the inputs has been alarmingly increasing. This, no doubt, has resulted in less use of the inputs per unit of land which was substantiated by the responses of the peasants in the study area. Therefore, the government should reconsider its rural development strategies and continue to subsidize the inputs so that the peasants afford to purchase the inputs at their capacity. This in turn could increase the use of farm inputs per unit of area which is said to be one of the most important variables affecting production per unit area.
  
4. As the statistical analyses of the variables indicate, family size highly negatively correlates to the households' daily per capita dietary energy available. Moreover, the area is characterized by very large population density by the Ethiopian standard on national average which could have contributed to the prevailing severe environmental degradation. Contrary to this, most of the peasants have not been well informed about family planning and the problems related to large family size. Thus, concerned bodies should make more attempts in this aspect so that the peasants be able to have reasonable family size.
  
5. There is a widespread agreement that the absence of well-defined property rights to a resource results in its degradation which in turn results in the crisis of agriculture. The researcher has tried to acquire more knowledge in this aspect during the survey for this research. Accordingly, most of the peasants were found lacking initiation to plan for long-term use of the land that they occupied but not possessed. Thus, the government should device a means by which the peasants could be secured of their land holding for longer period of time. In this regard, in

order to resolve the fear of landlordism, the government can limit the maximum holding per household and assure tenure security to the extent that a household can sale /exchange its holdings.

6. It has been indicated in the foregoing discussions that there was no well organized non-farm activities in the study area. Hence, concerned bodies should device a means to create rural - based non-agricultural activities with the objective of diversifying rural employment and increase the households' real income.
7. The study reveals that the peasants living in *qolla* agro-climatic zones in particular were more at risk of food insecurity than those who live in *dega* and *woinadega* areas. Thus, it seems imperative for the concerned bodies to give more attention to those areas.
8. The most widely cultivated crop in the area is *teff*. As noted in the discussion, *teff* cultivation requires a fine-tilth which plays a great role in facilitating soil erosion. Moreover, *teff* is characterized by low caloric supply than other grains such as wheat and barley. Thus, the writer suggests the replacement of the importance of *teff* by other crops with better dietary caloric value per unit of quantity.
9. The peasants in the study area sale their grain during and just after harvest season at low price and purchase at high price during rainy and pr-harvest seasons. To solve this problem attempts should be made to establish local 'Cereal Bank Association' as recommended by *Hunde*, one of the local NGOs. This enables the members of the association to access to grain on credit or cash basis at lower price than the market rate during rainy season.

10. Access by relatively poor farmers to rural credits or loans is more difficult in the study area than by better-off peasants due to collateral problems. This is unhealthy development being witnessed and, no doubt, contributes a lot to continue the poor peasants poorer and poorer. To solve this problem the government should assure the peasants' tenure security so that they can access to credit facilities easily.
11. The production system has been precarious in the study area on account of rainfall variability on which the peasants have no control. Thus, attempts should be made to utilize the available water sources as much as possible and develop local irrigation schemes so that the peasants produce better quantities of food.
12. As revealed in the discussions, almost all of the livestock population in the study area was indigenous breeds which are characterized by low productivity. Hence, selected breeds of each livestock species (could be exotic or cross-breeds) should be introduced so that the present poor livestock productivity would be improved.
13. The survey for this research reveals that almost all of the peasants spend a great proportion of the work-year doing non-economic activities owing to religious issues utmost. This, as statistically analyzed, has got a negative impact both on yield per unit area and the per-capita dietary supply. Thus, the peasants should be strictly taught not to spend several workdays in the name of religion or traditional activities.
14. The discussion in the foregoing sections indicates that the peasant spend their meager grain available extravagantly in the name of traditional and religious feasts. Thus, the peasants should be critically informed about

the non-worthiness of such activities so that the unnecessarily spent grains could be used for household consumption.

15. Finally, though food aid may not be a long-term solution to alleviate food insecurity, it seems essential to continue the relief assistance more widely to keep alive those who are at risk of food shortage.

### **Future Related Research**

As noted earlier, the objective of this research is to find out the food security status of the rural households in *Kuyyu wereda*. Hence, more consideration was given to the socio-economic condition of the households rather than the physical environmental factors. Likewise, the households' coping mechanisms during food shortage were not given emphasize in this study since it is beyond the scope of the objectives of the study. Therefore, future research should give emphasis to the physical environmental factors and the households' coping strategies at times of food shortage should be incorporated.

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## Appendix 1

### The English translation of the questionnaire filled by Household Heads.

#### 1. General Information

- 1.1. Name of Peasant Association (PA) \_\_\_\_\_
- 1.2. Household Head: A. Male B. Female
- 1.3. Household Size: Male \_\_\_\_\_ Female \_\_\_\_\_
- 1.4. Ethnic background of the Spouse: Husband \_\_\_\_\_ Wife \_\_\_\_\_
- 1.5. Religion of the household head \_\_\_\_\_
- 1.6. Educational status of the household head
  - A. Illiterate
  - B. Can read and write only
  - C. Formal education: Grade \_\_\_\_\_.
- 1.7. Marital status of the household head \_\_\_\_\_
- 1.8. Educational and marital status of other family members

| Grade | Sex and age |     |        |     |
|-------|-------------|-----|--------|-----|
|       | Male        | Age | Female | Age |
| 1     |             |     |        |     |
| 2     |             |     |        |     |
| 3     |             |     |        |     |
| 4     |             |     |        |     |
| 5     |             |     |        |     |
| 6     |             |     |        |     |
| 7     |             |     |        |     |
| 8     |             |     |        |     |
| 9     |             |     |        |     |
| 10    |             |     |        |     |
| 11    |             |     |        |     |
| 12    |             |     |        |     |
| 12+   |             |     |        |     |

1.9. Has any member of your household left the family during the last 12 months?

1.10. If 'yes' for Question No.1.9, give the following details.

| What was the persons relation to the household head? | sex | How old was he/she? | Reasons for leaving | Where she/he is now? |
|--|-----|---------------------|---------------------|----------------------|
|  |     |                     |                     |                      |

## 2. Land holding, crop production activities and livestock ownership Position

2.1. Do you have land? A. yes B. no

2.2. If 'Yes' for Question No. 2.1, can you group the land as follows.

| Type of land | Size in Hectare |
|--------------|-----------------|
| Crop land    |                 |
| Grazing land |                 |
| Forest land  |                 |
| Barren land  |                 |

2.3. What proportion of your land holding was covered by the following types of crops? (Estimate)

| Types of crops | Size in ha, gazim or timad |
|----------------|----------------------------|
| Teff           |                            |
| Sorghum        |                            |
| Barley         |                            |
| Wheat          |                            |
| Maize          |                            |
| Ajjaa          |                            |
| Pulses         |                            |
| Oilseeds       |                            |
| Vegetables     |                            |
| Others         |                            |

2.4. Compared to the land needs of your household, do you rate your present land holding as:

- A. More than enough      B. Enough      C. Too small

2.5. If your answer for Question No.2.4. is 'C', how do you fulfill the land requirement of your household?

- A. Purchasing land  
 B. Share cropping  
 C. renting from other farmers  
 D. Other (specify) \_\_\_\_\_

2.6. Do you like to move to other areas where there is abundant land and be resettled there?

- A. Yes    B. No

2.7. Do you fallow your land so that it regain its fertility? A. Yes    B. No

2.8.If 'No' for Question No. 2.7. why?

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2.9. How do you plow your farmlands?

- A. using my own oxen
- B. using ox pairing with others
- C. using human Labor (hoeing)
- D. leasing the land for crop sharing
- E. Other (specify). \_\_\_\_\_

2.10. What number of plots did you have?

2.11.How much farm animals did your household own? (Fill the table below)

| Animals              | Number |
|----------------------|--------|
| Oxen                 |        |
| cows                 |        |
| Calves               |        |
| Heifers              |        |
| Young oxen           |        |
| goats                |        |
| sheep                |        |
| horses/Mules/donkeys |        |
| Bee colony           |        |
| Hens                 |        |

2.12. Do you have any exotic live stock? A. yes B. No

2.13. If 'Yes' how much ? \_\_\_\_\_

2.14. How much quantities of grain did you produced and sold during 1999crop year?

| Gain type | Quantity produced (Qtl) | Quantity sold (Qtl) |
|-----------|-------------------------|---------------------|
| Teff      |                         |                     |
| Sorghum   |                         |                     |
| Barley    |                         |                     |
| Wheat     |                         |                     |
| Maize     |                         |                     |
| Ajjaa     |                         |                     |
| Pulses    |                         |                     |
| Oilseeds  |                         |                     |
| Others    |                         |                     |

2.15. Do you consider that your crop output over the last years has been:

- A. increasing
- B. constant
- C. decreasing

2.16. If 'C' for Question No.2.15, what do you think is the reason?

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2.17. Do you think that your annual crop output is sufficient to your family?

- A. Yes            B. No

2.18.If 'No' for Question No. 2.17, how do cope with food grain shortfalls ?

- A. Reducing number of meals
- B. Selling animals
- C. Consuming wild foods
- D. borrowing cereals and from relatives or friends
- E. food aid
- F. Selling assets
- G. Other (specify)\_\_\_\_\_

2.19. Have ever sold your only farm oxen to purchase grains to your family?

- A. Yes            B. No

2.20. Generally, do you think that there is a serious shortage of food grains in your community?            A. Yes            B. No

2.21. Is there any person in your family you think died of shortage of food so far?

- A. Yes            B. No

2.23. If 'Yes' for Question No. 2.21, give the detail below.

| His/her relation to the household head | Sex | When did she/he die? Month/Year) | How old was he/she? |
|--|-----|----------------------------------|---------------------|
|  |     |                                  |                     |

2.24. What do you think should be done to solve the problem of food scarcity in you community?

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**3. Household asset position and non-farm income sources**

3.1. Do you own the following items? (Mark 'X' if yes and estimate the value in Birr)

- |   |                                      |
|---|--------------------------------------|
| i. sprig bed _____  | viii. Table _____                    |
| ii. chairs _____  | ix. Radio _____                      |
| iii. Wrist watch _____                                      | x. Kerosene stove _____              |
| iv. <i>Fanos</i> _____                                      | xi. <i>Gold jewelery</i> _____       |
| v. Weaving equipment _____                                  | xii. Saddle ( <i>koricha</i> ) _____ |
| vi. Full farm equipment ( <i>Mofer, Kember</i> ; etc) _____ | xiii. Others _____                   |
| vii. Saw _____  |                                      |

3.2. Is there any member of the household work off the household's farm activity

- A. Yes      B. No

3.3. If 'Yes' what are the works being done?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3.4. Can you estimate the income in cash earned from these activities?

\_\_\_\_\_

3.5. If 'No' for Question No. 3.2, is it because of

- A. No employment opportunity
- B. No need to work
- C. Too low payment for job
- D. Other reasons (specify) \_\_\_\_\_

3.6. Is any relative or friend who support the household in material or financial provision?

- A. Yes      B. No

3.7. If 'Yes' give the details below.

| What is the person's relation to household head? | Kind of support (Money, clothes, grain, etc) | Amount of support per year (estimate) |
|--|--|---------------------------------------|
|  |  |                                       |

- 3.8. Has the household received any relief-aid so far? A. Yes B. No
- 3.9. Is there any resource that you share with the community? A. Yes B. No
- 3.10. If 'Yes' mention it (them), please.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#### 4. Household cash position

- 4.1. Is there any thing (e.g. money, cereals, e t c ) that you or any member of the household put for the emergency cases only?
- 4.2. If 'yes' how much is it?
- A. Grain (in quintal) \_\_\_\_\_
- B. Money \_\_\_\_\_
- C. others (specify) \_\_\_\_\_
- 4.3. How much money did the household earn from the following sources during 1999 crop-year? (Estimate)

| Sources                                  | Estimate Income in Birr |
|--|-------------------------|
| 1. Livestock and livestock products sale |                         |
| 2. Grain sale                            |                         |
| 3. Firewood and Charcoal sale            |                         |
| 4. Credit:                               |                         |
| i. rural credit                          |                         |
| ii. individual credit                    |                         |
| 5. Transfer                              |                         |
| 6. Others (specify) _____                |                         |

- 4.4. How much money do the household spend for the following purposes during 1999 crop-year? (estimate).

| Purpose of expenses | Estimate expenditure in Birr |
|---------------------|------------------------------|
| Wedding             |                              |
| Religious festivals |                              |
| Tiskar              |                              |
| Mahber              |                              |
| Kritinna            |                              |
| Schooling           |                              |
| Clothing            |                              |
| Tax                 |                              |
| Grain purchase      |                              |
| Credit repayment    |                              |
| Others              |                              |

## 5. Production Processes and Constraints

- 5.1. Did you apply the following farm inputs to your farmlands?  
A. Fertilizer  
B. Herbicides/insecticides  
C. Selected seeds
- 5.2. What amount of these farm inputs did you apply during 1999 crop-year?  
A. Fertilizers \_\_\_\_\_  
B. Herbicide/insecticide \_\_\_\_\_  
C. Selected Seeds \_\_\_\_\_
- 5.3..Is there any "Saint Days" that you do not perform any farm activities?  
A. Yes      B. No
- 5.4. If 'yes' list the dates: (Consider Saturdays and Sundays)

- 
- 5.5. Do you think that the peasants obtain fertilizer on appropriate time at present?  
A Yes    B. No

- 5.6. If 'B' for Question No. 5.5 Explain, it

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- 5.7. How do you rate the current cost of fertilizers? It is;  
A. beyond my capacity  
B. high but I could buy  
C. fair  
D. cheap

- 5.8. How much fertilizers you applied during 1999 crop-year?  
\_\_\_\_\_ Quintals

- 5.9. Are you supported by rural development agent in your farm activities?  
A. Yes      B. No.

- 5.10.How do you rate the importance of the rural development agents?  
A. Very important    B. Moderately important    D. Unnecessary

## 6. Family Planning Awareness

- 6.1.What do you think about large number of children in a family?  
A. Very essential  
B. Burden  
C. Other (specify) \_\_\_\_\_

6.2. Have you (your spouse) ever been taught of family planning?

- A. Yes B. No

6.3. If 'yes' what contraceptive methods you ( your spouse) know so far?

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6.4. What, in your opinion, is the ideal number of children a couple should have?

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### 7. Health Condition

7.1. Is there any member of your family any disability or chronic disease?

- A. Yes B. No

7.2. If 'Yes' explain the kind of the health problem.

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### 8. Source of Water

8.1. What is your major source of drinking water?

- A. spring  
B. river  
C. well  
D. Pond/dam/lake  
E. piped system  
F. Other (specify( \_\_\_\_\_

8.2. How much does it take to reach the source of water?

\_\_\_\_\_ Hours \_\_\_\_\_ Minutes

8.3. Do you think that there is a problem of drinking water in your community?

- A. Yes B. No

8.4. If 'yes' how do you rate the problem?

- A. Very high  
B. High  
C. Not as such

## Appendix 2: PAs in Kuyyu Wereda

| Rol No. | Name of PAs                | No. of Registered Farming hhs | % as of total hhs |
|---------|----------------------------|-------------------------------|-------------------|
| 1       | <i>Liban Kura</i>          | 1,160                         | 7.34              |
| 2       | <i>Sombo Hocho*</i>        | 1,147                         | 7.26              |
| 3       | <i>Koyye Akale</i>         | 1,068                         | 6.76              |
| 4       | <i>Halelu chari*</i>       | 1,056                         | 6.68              |
| 5       | <i>Bonde Gidabo</i>        | 970                           | 6.14              |
| 6       | <i>Darro Birbirs</i>       | 956                           | 6.05              |
| 7       | <i>Wuyye Gose*</i>         | 940                           | 5.95              |
| 8       | <i>Amuma</i>               | 909                           | 5.75              |
| 9       | <i>Wuyye Karkarressa</i>   | 905                           | 5.73              |
| 10      | <i>Biriti</i>              | 900                           | 5.70              |
| 11      | <i>Dubbanna Agalo</i>      | 869                           | 5.50              |
| 12      | <i>Jila Qerrensa</i>       | 853                           | 5.40              |
| 13      | <i>Dawicha Qerrensa</i>    | 833                           | 5.27              |
| 14      | <i>Rogge Karkarressa</i>   | 799                           | 5.06              |
| 15      | <i>Darro Changi*</i>       | 695                           | 4.40              |
| 16      | <i>Jallisa Lutu</i>        | 506                           | 3.20              |
| 17      | <i>Dawicha Karkarressa</i> | 493                           | 3.12              |
| 18      | <i>Hairo Darso</i>         | 390                           | 2.47              |
| 19      | <i>Darro Willincho</i>     | 351                           | 2.22              |
|         | Total                      | 15,800                        | 100.00            |

**Source:** Kuyyu Wereda Finance Office.

\* Sample PAs.

**Appendix 3: Energy Composition of some  
Food Types**

| Sources and Products of Foods            | Food Enrgy<br>(Kcal/100<br>grams) |
|--|-----------------------------------|
| <b>1. Barley (black)</b>                 |                                   |
| 1.1 Flour                                | 370.00                            |
| 1.2 <i>enjera</i>                        | 124.90                            |
| 1.3 bread                                | 195.60                            |
| 1.4 split roasted ( <i>qolo</i> )        | 386.60                            |
| 1.5 porridge                             | 150.30                            |
| <b>2. Barley (white)</b>                 |                                   |
| 2.1 flour                                | 368.00                            |
| 2.2 <i>enjera</i>                        | 125.80                            |
| 2.3 bread                                | 202.40                            |
| 2.4 spilt roasted ( <i>qolo</i> )        | 398.10                            |
| 2.5 porridge                             | 116.30                            |
| <b>3. Maize (Yellow)</b>                 |                                   |
| 3.1 bread                                | 233.00                            |
| 3.2 white, boiled ( <i>nifro</i> )       | 182.80                            |
| 3.3 whole, roasted ( <i>qolo</i> )       | 404.20                            |
| 3.4 on cob, boiled                       | 186.50                            |
| 3.5 on cob, roasted                      | 300.70                            |
| <b>4. Maize (white)</b>                  |                                   |
| 4.1 bread                                | 223.40                            |
| 4.2 whole, boiled                        | 170.10                            |
| 4.3 whole, boiled                        | 387.20                            |
| 4.4 on cob, boiled                       | 152.00                            |
| 4.5 on cob, roasted                      | 276.50                            |
| <b>5. Emmer wheat (<i>Ajja</i>)</b>      |                                   |
| 5.1 bread                                | 239.30                            |
| 5.2 porridge                             | 140.70                            |
| <b>6. Sorghum, red (<i>zangada</i>)</b>  |                                   |
| 6.1 <i>enjera</i>                        | 126.10                            |
| 6.2 porridge                             | 135.60                            |
| 6.3 boiled ( <i>nifro</i> )              | 143.10                            |
| 6.4 roasted                              | *                                 |
| <b>7. Sorghum, white (<i>Mashla</i>)</b> |                                   |
| 7.1 <i>enjera</i>                        | +                                 |
| 7.2 porridge                             | 135.40                            |
| 7.3 boiled                               | 124.50                            |
| 7.4 roasted                              | 402.40                            |

| Sources and Products of Foods                          | Food Energy<br>(Kcal/100<br>grams) |
|--|------------------------------------|
| <b>8. Teff, Eragrostis tef (white)</b>                 |                                    |
| 8.1 <i>enjera</i>                                      | 145.00                             |
| 8.2 porridge   | 193.70                             |
| 8.3 bread  | 214.30                             |
| <b>9. Teff Eragrostis tef (rted)</b>                   |                                    |
| 9.1 <i>enjera</i>                                      | 155.90                             |
| 9.2 porridge   | 165.40                             |
| 9.3 bread  | 220.00                             |
| <b>10. Wheat (black)</b>                               |                                    |
| 10.1 <i>enjera</i>                                     | 147.70                             |
| 10.2 bread   | 205.90                             |
| 10.3 porridge  | 157.30                             |
| 10.4 boiled ( <i>nifro</i> )                           | 178.10                             |
| 10.5 split, boiled                                     | 67.90                              |
| <b>11. Wheat (white)</b>                               |                                    |
| 11.1 <i>enjera</i>                                     | 145.60                             |
| 11.2 bread   | 222.00                             |
| 11.3 porridge  | 142.70                             |
| 11.4 boiled ( <i>nifro</i> )                           | 211.30                             |
| 11.5 roasted ( <i>qolo</i> )                           | 391.60                             |
| 11.6 split, boiled                                     | 65.10                              |
| <b>12. Potato</b>                                      |                                    |
| 12.1 potato oromo boiled                               | 100.60                             |
| 12.2 potato irish boiled                               | 89.70                              |
| <b>13. Pulses' products</b>                            |                                    |
| 13.1 broad beans' (split or <i>kik</i> )               | 353.10                             |
| 13.2 broad beans whole, dried boiled ( <i>nifro</i> )  | 149.50                             |
| 13.3 broad beans whole, dried, roasted and then boiled | 275.90                             |
| 13.4 chickpeas whole dried, boiled ( <i>nifro</i> )    | 180.90                             |
| 13.5 chick peas, whole, fresh, roasted ( <i>qolo</i> ) | 238.10                             |
| 13.6 lentil, sauce without chili                       | 151.20                             |
| 13.7 peas, sauce without chili (split)                 | 162.00                             |
| 13.8 peas, whole, fresh, boiled ( <i>nifro</i> )       | 157.80                             |
| 13.9 peas, whole, dried, boiled ( <i>nifro</i> )       | 157.80                             |
| 13.10 peas, whole, roasted and then boild              | 271.50                             |
| 13.11 vetch; sauce, without chilli                     | 124.10                             |
| <b>14. Vegetables</b>                                  |                                    |
| 14.1 cabbage, boiled                                   | 23.70                              |
| 14.2 garlic, boiled                                    | 125.70                             |
| 14.3 green pepper boiled                               | 36.60                              |
| 14.4 green pepper raw                                  | 88.10                              |
| 14.5 onion (shallot), boiled                           | 92.60                              |
| 14.6 pumpkin, boild                                    | 24.90                              |
| 14.7 pepper (chili), boiled                            | 149.30                             |
| 14.8 tomato, raw                                       | 30.50                              |
| 14.9 tomato, boiled                                    | 20.50                              |

Source: Adopted from EHNRI's Food Composition Table.

\* no data available

#### Appendix 4: Amount of Rainfall in Kuyyu wereda (mm)

(1985-1999)

| Month     | Year   |        |        |        |        |        |        |        |        |        |        |        |      |        |          | Average  |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|--------|----------|----------|
|           | 1985   | 1986   | 1987   | 1988   | 1989   | 1990   | 1991   | 1992   | 1993   | 1994   | 1995   | 1996   | 1997 | 1998   | 1889     |          |
| January   | 14.9   | 0.0    | 24.7   | 29.1   | 1.0    | 1.5    | 0.0    | 39.4   | 0.0    | 0.0    | 0.0    | 13.2   |      | 6.3    | 16.81    | 10.51    |
| February  | 0.0    | 29.4   | 11.3   | 36.9   | 33.2   | 28.4   | 12.1   | 34.7   | 0.0    | 0.0    | 0.0    | 0.0    |      | 0.0    | 0.0      | 13.29    |
| March     | 36.8   | 33.5   | 67.7   | 3.3    | 147.1  | 48.4   | 114.5  | 13.1   | 29.2   | 51.6*  | 22.1   | 0.0    |      | 4.7    | 2.2      | 41.02    |
| April     | 102.2  | 107.1  | 120.9  | 64.3   | 70.7   | 53.9   | 8.3    | 39.2   | 112.1  | 72.5*  | 108.5  | 9.8    |      | 23.1   | 41.6     | 66.73    |
| May       | 103.0  | 112.5  | 188.0  | 2.5    | 26.1   | 45.0   | 60.9   | 53.1   | 132.3  | 85.2*  | 128.6  | 0.0    |      | 0.0    | 48.0     | 70.37    |
| June      | 110.3  | 187.2  | 162.6  | 80.3   | 90.6   | 120.6  | 113.2  | 124.4  | 156.1  | 145.3* | 145.3* | 307.6  |      | 50.9   | 82.7     | 134.08   |
| July      | 356.0  | 378.1  | 271.5  | 438.7  | 270.3  | 328.8  | 247.3  | 432.7  | 337.9  | 363.4  | 300.1  | 407.5  |      | 354.0  | 468.7    | 353.95   |
| August    | 444.5  | 341.5  | 332.1  | 324.4  | 394.2  | 371.1  | 338.5  | 293.3  | 278.1  | 464.9  | 360.2  | 399.9  |      | 363.6* | 384.1    | 363.60   |
| September | 129.3  | 260.7  | 51.9   | 270.0  | 124.7  | 186.7  | 100.3  | 152.7  | 278.1  | 188.7  | 200.9  | 40.0   |      | 161.4* | 114.0    | 161.38   |
| October   | 55.5   | 17.5   | 20.7   | 30.8   | 20.6   | 0.2    | 21.4*  | 5.9    | 84.6   | 0.0    | 0.0    | 0.0    |      | 0.0    | 140.6    | 28.41    |
| November  | 6.8    | 0.0    | 0.0    | 0.0    | 0.0    | 0.5    | 0.0    | 8.6    | 0.0    | 5.3    | 0.0    | 0.0    |      | 1.8*   | 2.2      | 1.8      |
| December  | 19.4   | 13.3   | 0.0    | 0.0    | 63.0   | 28.8*  | 12.2   | 0.0    | 0.0    | 0.0    | 31.9   | 25.8*  |      | 16.2*  | 3.8      | 16.18    |
| Total     | 1378.7 | 1480.0 | 1266.5 | 1280.3 | 1241.5 | 1210.9 | 1028.7 | 1197.1 | 1408.7 | 1376.9 | 1297.6 | 1203.8 |      | 932.0  | 1,304.71 | 1,270.88 |

**Source:** National Meteorological services Agency of Ethiopia

**Note:** No data available for 1997

**Appendix 5:** Monthly Mean minimum temperature in 0<sub>C</sub>. (Garba Guracha meteorological Station).

(1984-1998)

| Year    | Months |      |      |      |      |      |       |      |      |      |       |      |
|---------|--------|------|------|------|------|------|-------|------|------|------|-------|------|
|         | J      | F    | M    | A    | M    | J    | J     | A    | S    | O    | N     | O    |
| 1984    | 16.6   | 11.9 | 4.9  | 7.4  | 9.4  | 9.2  | 8.9   | 9.1  | 7.4  | 2.3  | 3.8   | 3.0  |
| 1985    | 3.7    | 4.4  | 5.2  | 8.4  | 8.1  | 8.1  | 8.9   | 9.0  | 7.5  | 5.5  | 2.9   | 3.3  |
| 1986    | 1.7    | 5.1  | 5.8  | 7.7  | 7.8  | 9.0  | 9.0   | 8.5  | 8.4  | 5.6  | 2.8   | 2.1  |
| 1987    | 1.2    | 6.0  | 8.8  | 8.1  | 9.0  | 9.2  | 9.0   | 9.0  | 8.2  | 4.9  | 1.9   | 3.8  |
| 1988    | 5.5    | 8.4  | 7.1  | 9.7  | 9.4  | 10.1 | 10.8  | 10.4 | 9.5  | 6.6  | 2.1   | 2.6  |
| 1989    | 2.6    | 5.8  | 7.9  | 9.4  | 8.2  | 8.6  | 9.9   | 10.1 | 9.7  | 6.9  | 2.8   | 6.9  |
| 1990    | 4.0    | 9.5  | 8.1  | 8.3  | 9.1  | 10.1 | 9.7   | 10.0 | 10.3 | 6.1  | 6.0   | 2.9  |
| 1991    | 8.0    | 9.3  | 10.0 | 10.5 | 11.1 | 10.2 | 10.7  | 9.6  | 9.3  | 5.9  | 5.9   | 3.0  |
| 1992    | 6.3    | 10.0 | 9.9  | 10.8 | 10.4 | 9.3  | 9.6   | 10.5 | 9.1  | 8.9  | 1.8   | 4.9  |
| 1993    | 9.9    | 10.5 | 10.2 | 10.1 | 9.8  | 10.7 | 10.3  | 9.1  | 9.1  | 8.2  | 9.4   | 6.4  |
| 1994    | 8.9    | 10.4 | 9.5* | 8.9* | 8.8* | 9.9* | 10.6* | 10.2 | 10.2 | 10.6 | 9.2   | 8.6  |
| 1995    | 9.0    | 8.3  | 8.7  | 7.6  | 7.7  | 9.0* | 10.9  | 10.6 | 12.2 | 12.5 | 12.2  | 11.9 |
| 1996    | 11.8   | 11.8 | 11.8 | 11.8 | 11.7 | 8.2* | 8.8*  | 8.3* | 8.8* | 8.6  | 10.3* | 9.0* |
| 1998    | 3.6    | 6.2  | 4.4  | 6.4  | 5.6  | 7.3  | 6.7*  | 6.0* | 5.4* | 4.7  | 10.3* | 9.0* |
| Average | 6.6    | 8.4  | 8.0  | 8.9  | 9.0  | 9.2  | 9.6   | 9.3  | 8.9  | 7.0  | 5.8   | 5.5  |

**Source:** National Meteorological Service Agency

**Note** 1. No data available for 1997

2. \* interpolated data

## *Declaration*

I, the undersigned, declare that the thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Signature   
Mesay Mulugeta Tefera

