

**Project Failures and Factors:
The Case of Four Public Sector Undertakings
in Illu-Ababora Zone, Oromia Region**

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A Thesis Submitted to

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ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF WATER, ENVIRONMENT AND
DEVELOPMENT STUDIES

Household coping strategies against crop production failure in Kuyu
woreda, North Shoa, Oromia Regional State, Ethiopia

By

Feleke Yehuwalashet Motumma

Thesis Submitted to Center of Environment and Development Studies, Addis Ababa
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This is to certify that the thesis prepared by Feleke Yehuwalashet Motuma entitled: Household coping strategies against crop production failure in Kuyu woreda, North Shoa, Oromia Regional State, Ethiopia and submitted in Partial Fulfillment of the Requirements for the Attainment of the Degree of Masters in Environment and Development complies with the regulations of the University meets the accepted standard with respect to originality and quality.

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Abbreviations

DA –Developmental Agent

DFID- Department for International Development

DPPC -Disaster Prevention and Preparedness Commission

EDRI –Ethiopian development research institute

EEA- Ethiopian Economic Association

FGD-focus group discussion

IFPRI- International Food Policy Research Institute

IFAD -International Fund for Agricultural Development

IPGRI-International Plant Genetics Resources Institute

KAO- kuyu agricultural office

MATRIC- Midwest Agribusiness Trade Research and Information Center (Iowa State University)

NMA -national metrological agency

MOA-ministry of agriculture

MoARD- Ministry of Agriculture and Rural Development

MoFED - Ministry of Finance and Economic Development

OECD- Organization for Economic Cooperation and Development

PASDEP- Plan for Accelerated and Sustained Development to End Poverty

SNNPR -Southern Nations Nationalities People Regional State

UNDP-united nation development program

USGS-united states geological survey

WFP- World Food Program

Glossary

Afan oromo: - oromo language

Boyi: - small canal that used to takeout water from cropped land to safe crop

Dabo: - the mechanisms by which oxen-poor farmers beseech many oxen-owners to prepare farm land on time

Gabare: - it is direct hiring of cultivator from poor family through grain transaction

Garagalchu: - it is turning over weeds by harrowing weedy land sometime before sowing of crop to manage weeds

Gulgalu: - it is collecting the ruminants of past crop and weed that can harm coming new crop

Higni: - it is system by which oxen-meager crop producer use oxen labor for one day to farm crop land in response to give two days same service for oxen-rich farmer

Kebele:-it is the lowest unit of administration in government structure

Kira: - it is direct hiring of daily laborer from poor family by money

Kitira: - it is renting one or two oxen by grain transactions

Kokobi:-it is huge flood canal at the border of cropped land to block incoming flood to the cropped land

Makanajo: - a local contractual agreement to team a single ox of a household with a single ox of another household for equal use on each other's farm land.

Sijalle:-oxen-meager crop producer let one honest neighbor/fellow to beseech oxen-rich cultivator from nearby neighbor to plough all the farm land and other economic activity.

Sirribisu: - it is making calf and other small animals moving on the early germinated of weeds before seed germination to manage weeds. Especially on weedy crop land

Wanfala: - it is the practice of group of nearby neighbor farmer to help each other turn by turn to harrow, weeding, harvesting and any other social activity.

Woreda: -it is the level of administration unit in government structure above the kebele and below zonal administration

Abstract

Household coping strategies against crop production failure in Kuyu woreda,

North Shoa, Oromia Regional State, Ethiopia

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Addis Ababa University, 2013

This is the thesis looked into household coping strategies against crop production failure in the kuyu woreda, North Shoa, Oromia regional state. Hence the main objective of the study was to assess household coping strategies against crop production failure in the study area. Relevant data were collected through questionnaires, key informants, personal observation and reviews of document. The generated data were analyzed through both qualitative and quantitative method and it was found that crops were failed due to some biophysical and socio-economic factors and household farmers were developed different coping strategies against crop production failure in Kuyu woreda. Thus, extreme temperature, extreme rainfall, drought, crop pests, flood storm, hail storm, weeds, frost, unavailability of farming labor, unavailability of draft animals and farming inputs were major constraints to crop production in the study area. Kruskal Wallis statistical calculation results indicate that all aforementioned impediments to crop production not significantly different among dega, woinadega and kola agro-climatic setup of Kuyu woreda in causing crop production failure except flooding. To overcome crop failure stress and its causes, different coping strategies household used were organized to problem focused household coping strategies and emotional focused household coping strategies in this study. Thus, problem focused household coping strategies are altering/reducing the identified biophysical and socio-economic factors that caused crop production failure by 'Sijalle', 'Dabo', 'Wanfala', 'Higni', 'Kitira', 'Makanajo', 'Graragalchu', 'Gulgalu', 'Sirribsisu', 'Kokobi' and 'Kira' at farm level. While emotional focused household coping strategies are smoothing the stress of crop production failure at household level through liquidity, hedging, celling fire wood, engaging in wag labor, reducing amount of food, eating crop reserved for seed, requesting food aid, moving to other area for temporary employment, sending household member to live everywhere, reducing amount of food for adult and adding for child and borrowing money. Finally, it was recommended that the detail of how, why, when biophysical and socio-economic factors that affect crop production in the kuyu woreda should be added and get attention in research and development to enhance crop production and productivity in kuyu woreda.

Key words: - Crop production failure, Agro-climatic zone, Problem focused coping strategies, and Emotional focused coping strategies.

CHAPTER ONE

1. INTRODUCTION

1.1. Background

“Agricultural production and productivity are spatial process that influenced by the joint decisions of what to produce, when, where, and how to produce it” (MATRIC, 2010).

Crop production is an essential human activity in the world by providing food, clothing, medicine, and other useful products more for human beings. Primarily, crop production is means of livelihood for about 70% of the world’s poor people living in rural areas. This in mind, our world population is expected to reach 9.1 billion people by 2050 (WWF, 2010). Thus, agricultural production needs to grow according to meet this population (IFPRI, 2009). However, world crop production is projected to increase over the period from 1997/99 to 2030 by 1.4% growth per annual, against 2.1 % population growth per annual over the past period of similar length (FAO, 2003).

Crop production forms the basis of rural economies throughout the developing world. The developing countries have about 2.8 billion hectares of potential land for crop production. However, this crop land is unevenly distributed throughout these developing countries. It is concentrated in a few countries of South America and sub-Saharan Africa. In contrast, many countries in South Asia and near East Africa region have less crop land distribution to crop producers. In these regions, a good part of the land is simply under either of protection, forest, human settlements, weak infrastructure or /and the incidence of disease. Hence, limited crops are harvested from these regions relatively (FAO, 2003).

According to IFPRI (2007), while there is a growing industrial sector in many African cities, agriculture still provides the dominant livelihood for 65 percent or more of Africa’s population. However, UNESCO (2007) report indicated that agricultural productivity levels in Africa, in terms of land and labor productivity, still lag far behind even than other developing regions. Much of the growth of agricultural output in Africa has been due to expanded use of land and labor. This report confirm that the total of factor of production grew in Africa at an

annual rate of 1.3% on average during the 1990s, accounting for approximately 40% of the 3.1% annual growth in agricultural output. Growth in the traditional inputs of land, labor, and livestock accounted for the other 60% of agricultural output growth.

According to DFID (2007), agriculture is back bone of Ethiopian society because, the country's economy is typically an agricultural economy and agriculture is the source of livelihood. But crop production is unsecured in different part of Ethiopia. This report confirm that the national crop harvest vary up to 25% between successive years. Furthermore NMA (2007) and Alemu et al (2005) indicate that in Ethiopia, crop performance is depending on meher and belg season rainfall pattern. Variability on seasonal rains has kept crop production and productivity very low in Ethiopia. Especially, Arid, semi-arid, and dry sub-humid areas of the country experience very high seasonal and inter annual rainfall variability that causes crop production failure. However, increasing the agricultural research and extension capabilities of the country could mitigate these crises.

According to DPPC (2003) and MoA (2012) report, major crops grown in the Oromia region were expected to be low mainly in some woredas of North Shoa zone. In this zone, in which Kuyu woreda is part, only 18% of the planned area was covered with crops in 2012. This is mainly because of late onset of rain, insufficient rains, moisture stress, and early termination of rain, shortage of input, traction power, and lump skin disease. Specifically, Massay (2009) reveal that crop production processes in Kuyu woreda is based on poor technologies on fragmented and poor farm land per household. Consequently, kuyu woreda was facing severe crop production failure. Based on his finding, Massay urges that short term and long term agricultural development intervention and strategies can reduce crop production failure.

Therefore, the study area (kuyu woreda) has been facing crop production failure. The focus of this study was so, to identify causes of crop production failure and to assess ecologically sound, economically viable, and socially acceptable coping strategies based on farmers' indigenous knowledge and some other identified coping mechanism against crop production failure in the kuyu woreda.

1.2. Statement of the problem

Kuyu was one of the important productive woreda of North Shoa, Oromia regional state suitable for crop production. However, most of the areas within the woreda had been facing crop production failure recently. In this woreda, the variety of crop hold on risk increases from time to time by following bad year, because some area of the woreda were abandoned from crop production ambitions. Most farmers in the woreda get less food supply due to sudden food shortages. Thus, people are forced to remain under food aid program. For instance, data obtained from MoA (2012) indicate that about 3,301 households in Kuyu woredas were under food aid program due to crop production failure. But, these episodes were not the experience of the area in the past decades. As a result, most farmer suspect crop production and start to think as first-rated crop production is obtained by chance than effort currently.

To escape from this problem, the responses of the farmer households in the rural areas may be different based on condition of the problem, situation of the environment, people perception and other social value and belief system. Accordingly, Kuyu woreda's farmers household coping strategies to crop production failure that are viable to the society and environment should be recognized according to the milieu. Hence, what makes this problem worth studying is to have clear understanding on the cause of crop production failure and household coping strategies to crop production failure in Kuyu woreda. Another thing that made the researcher to study was to fill the gap of the study left by Massay. Massay (2011) was focused on food security status of the rural households and socio-economic condition of the house hold in kuyu woreda in his study. But, biophysical factors that cause crop production failure and coping strategies in kuyu woreda were not given emphasized in the massay research. So, in this study, major emphasized were given for biophysical constraints to crop production and household coping strategies in kuyu woreda.

Therefore, identifying major cause of crop production failure and assessing acceptable household coping strategies that fits the available resources of their locality against crop production failure which this study focus on is very imperative to take measure that reduce the present circumstance of crop production failure in Kuyu woreda.

1.3. Objective of the study

a. General objective

The general objective of this study was to assess major household coping strategies against crop production failure in the kuyu woreda.

b. Specific objective

The specific objective of this study was:-

- To assess level of crop production failure in the study area.
- To find out major biophysical and socio-economic cause of crop production failure in the study area.
- To identify main existing household coping strategies.

1.4. Research question

- What is the level of crop production failure in the study area?
- What are the major causes of crop production failure in the study area?
- What coping strategies households of the study area use to tackle crop failure?

1.5. Significance of the study

Providing detail information on the problem understudy would enable any interested intervener (government, indigenous and international NGOs) to promote better crop productivity into the study area. More over this study tried to forward same information to researchers, planners, administrators, and local community to provide them with reasonable, adequate, and updated information on the status of crop failure in kuyu woreda, thus supporting for future management of the problem. It also indicates some further research areas in the problem of crop production failure for other interested researchers.

1.6. Scope of the study

This study covered rural area of kuyu woreda by excluding urban kebele of study area in the reason that the problem is not the concern of two of urban kebeles. The other focusing area of the researcher was crop. Crops have a number of classifications like cereal, pulses, cash crop, vegetable, stimulant crop, and fruit crop which inurn have many sub- elements. From this, the researcher focused on only the most important, dominant and known field crop (teff, wheat, barley, nug, and sorghum) practiced in the rural kebele of Kuyu woreda. In this study, detail of how, why and when biophysical and socio-economic factors causing crop production failure were not analyzed. Simply, this research focused on to identify key biophysical and socioeconomic factors that cause crop production failure in the kuyu woreda. Additionally, key household coping strategies used to tackle crop production failure was discussed. It is necessary to underline that household coping strategies and dominant grain vary according to local context. In addition, households were the main units of analysis that was used in this paper.

1.7. Limitation of the study

On the way of doing the research, the researcher was facing the some challenges. Therefore, this research was conducted in the specified period with limited budget. Consequently, the researcher was forced to limit the sample population to hundred (100) households from all dega, woinadega and kola agro-climatic zone of the study area. As compared to the study population of 2,192, the sample household limited to 100 may affect the degree of representation.

1.8. Organization of the paper

The study is divided into five chapters. The first chapter is introductory part which discusses background, statement of the problem, research questions, objectives, significance, scope, limitations of the study, and organization of the paper. The second chapter deals with literature review and conceptual frame work and the third chapter focuses on research methodology and description of the study area. Fourth chapter deals with result and discussions. The final chapter is about the conclusions and recommendations.

CHAPTER TWO

2. LITERATURE REVIEW AND CONCEPTUAL FRAME WORK

2.1 Introduction

This chapter looks into the previous literature review and conceptual framework that reflect household coping strategies against crop production failure. Accordingly, the following issues were discussed. First, highlight of crop production, 2nd crop production failure in the developing region, 3rd crop production situation in sub-Saharan Africa, 4th overview of Ethiopian crop production that covers crop production, crop production pattern and agro-climatic zone of Ethiopia, role of crop production, crop production failure, and manifestation of crop production failure, 5th overview of coping strategies that includes concept of coping strategies, household risk management instrument and strategies, households level coping strategy for crop production failure and major coping strategies to crop production failure in Ethiopia, 6th Empirical review on crop production, and finally, conceptual frame work was discussed as follows.

2.2. Highlight of crop production

The influence of weather and climate on crop production is justified and understood in worldwide as it increase and/or decrease crop production. Accordingly, the Cline R (2007) finding shows, crop production and productivity is expected to increase slightly at mid to high latitudes for temperature increase of up to 1^oc to 3^oc. But, crop production would be unfavorably affected if temperature gets higher and higher. In seasonally dry and tropical regions, crop production and productivity is expected to decrease, even for small local temperature increases of 1^oc to 2^oc. Consequently, global food production is expected to decrease with temperature increases. As FAO (2010) also analysis the situation of crop in India, the decline in crop production is estimated to be higher in warmer locations than the other areas. FAO analyses also indicate that decreasing of rainfall by 30% to 40% can severely collapse crop production.

According to IFPRI (2009) and NAS (1993), crop production and productivity is a function of soil water, nutrient, climate, terrain and soil properties. These factors produce appropriate

conditions for different crops to be grown in certain favorable areas and season but not for contrary. Moreover, USGS (2011) finding indicates that Socio-economic, institutional/policy, and technology transfer, and linkages affect crop production.

2.3. Crop production failure in developing region

The crop production failure was witnessed in developing world due to different reason. Accordingly, Mayozern and Roudart (2006) indicate that crop production is failed in most developing countries, due to peasants underequipped, unfair competition, untrained peasant agriculture, fall in prices, over and over tax and insufficient protection that harm crop production. Specifically, UN (2008) determined crop production failure by indicating that, improved crop varieties have a major benefactor to crop production growth in the developing world, except in Africa where production growth is essentially based on increasing the area of farm land. This is due to the difficulties in producing improved varieties suitable for local growing conditions in the region. And also NAS (1993) indicate that crop production practices in tropical regions are frequently failed because of low capacity of land to support crop production. As identified, there was unsustainable crop production due to frequent soil erosion, loss of soil nutrients, water management problems, socioeconomic environments and pest outbreaks in the tropical region.

The crop production has become increasingly vulnerable over recent decades because of a combination of population pressure, environmental degradation, inefficient land-use systems, poverty, governance problems and high exposure to recurrent natural hazards such as hurricanes, drought, landslides, and earthquakes (FAO, 2010). These all are not the only limiting factor for crop production. Different arable land may give the best/ low yield in different years, because of uneven and unequal availability of water and nutrients in a farmland that causes crop production failure. In line with this, Brouwer (2008) confirmed that some parts of a field may be relatively fertile but dry; other parts may be less fertile but wetter. Thus, it may leads to limiting factor for crop production.

2.4. Crop Production Situation in Sub-Saharan Africa

Crop yields in many parts of the world have increased tremendously within the last half-century except in sub-Saharan Africa, including Ethiopia. In sub-Saharan Africa, particularly in Ethiopia, the rate of increase in crop production has been significantly below the rate of population increase. Thus, sub-Saharan Africa's cereal import requirements are set to remain high in 2002, reflecting mainly the anticipated sharp drop in cereal production. For 2001/2002, cereal import requirements of sub-Saharan Africa were estimated 15.9 million tones, including 1.7 million tons of food aid (FAO, 2002). Particularly in horn of Africa, more than 40% of the population is undernourished and millions are food insecure. Those suffering most from food insecurity are subsistence farmers, pastoralists and agro-pastoralists whose livelihoods largely depend on agriculture and animal production (IFAD and FAO, 2007). Therefore, FAO (2002) urged that the choice of the appropriate crops for each major ecological zone and the related improvement of crop yields are necessary for producing more food.

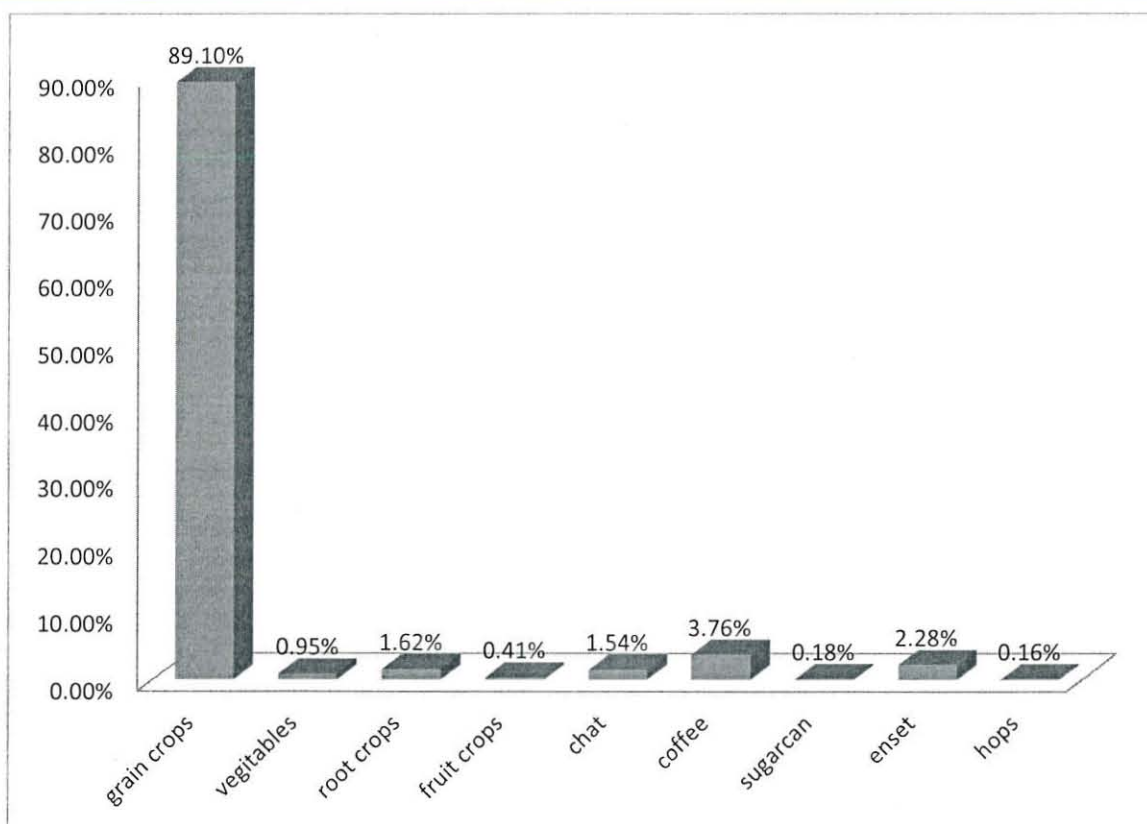
2.5. Over view of Ethiopian crop production

“Agriculture is the mainstay of the Ethiopian economy and the most volatile sector.... mainly due to its dependence on rain and the seasonal shocks that are frequently observed” (MoFED, 2006)

2.5.1. Crop Production in Ethiopia

According to EEA (1999/2000) finding, Ethiopia has total arable area of about 113,000,000 hectares which traditionally been typified by two major agro-ecological zone. These are high land and low land. Highland part of Ethiopia constitutes about 35-40% of the country land areas and it is found above 1500m. The lowland part of Ethiopia constitutes about 60% of the land areas and it is found below 1500m. According to these Ethiopian economic associations, about 12.6 million hectares (10.3%) of the total arable area is intensively cultivated while 15.3 million hectares is moderately cultivated. Generally, 27.9 million hectares of the land was already cultivated in Ethiopia.

According to IFPRI/EDRI (2011) report, much of the increase in crop production in the past decade has been due to increases in area cultivated. On these extended farm area, Ethiopia grows large varieties of grain crops. In line with this, CSA (2010/11) finding indicate that 89.10% of area planted was occupied by most important grain crops that followed by coffee, enset, root crops, chat, vegetables, fruit crops, sugarcane and hops in occupying 3.76%, 2.28%, 1.62%, 1.54%, 0.41%, 0.18% and 0.16% respectively, as shown in fig.1 being the chief element in the diet of most Ethiopians.

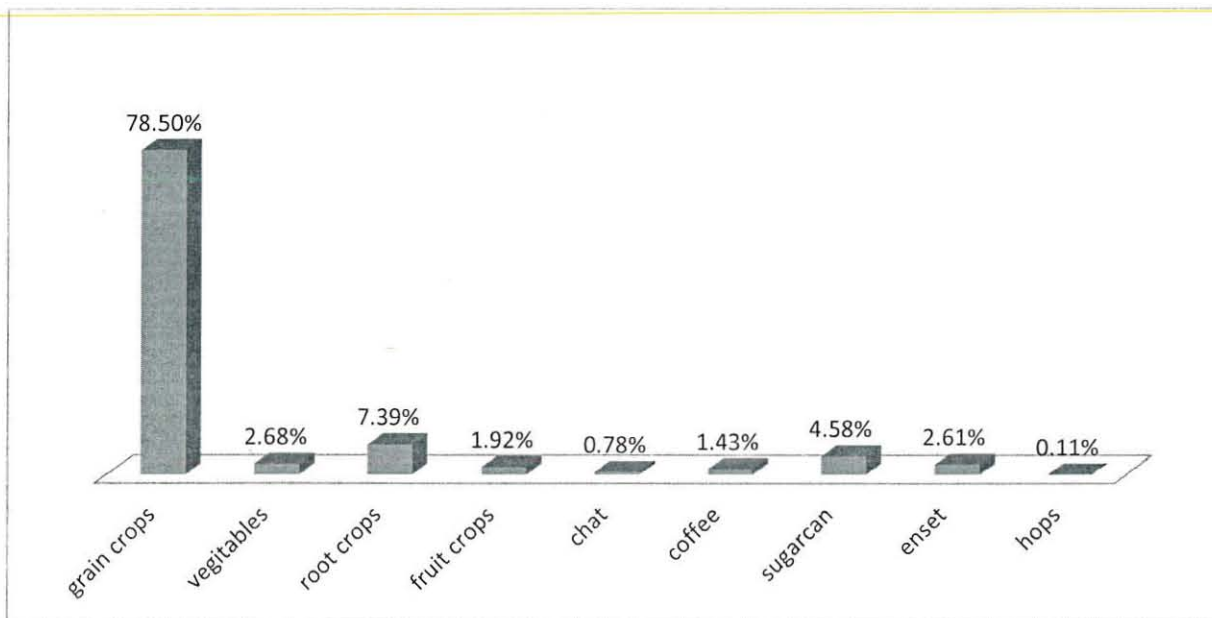


Source: CSA, 2010/2011

Fig.1 Area under major crops in meher season of Ethiopia in 2010/11(2003EC)

According to CSA (2010/11) report, major food crops are produced almost in all regions of the country in spite of the dissimilarity in total volume of crop production from the regions. Accordingly, grain crops contribute about 78.50% of total major crop production followed by

root crops, sugarcane, vegetables, enset, fruit crops, coffee, chat and hops that contribute 7.39%, 4.58%, 2.68%, 2.61%, 1.92%, 1.43%, 0.78% and 0.11% to total crop production respectively, as shown in(Fig.2). The difference in volume of crop production may be attributed to the extent of area dedicated to each crop type, weather change and a shift in preference for the crops grown. Crop yield per area (amount of crop harvested per amount of land planted) is the most commonly used impact indicator for agricultural productivity in Ethiopia.



Source: CSA, 2010/11

Fig. 2 Production of major crops in meher season in Ethiopia in 2010/11

2.5.2. Crop production pattern and agro-climatic zone of Ethiopia

Crop production arrangements vary evidently across Ethiopia according to agro-climatic conditions through rainfall variation, temperature variation, soil type and elevation. Thus, Ethiopia is classified into five (5) agro-climatic zones (wurch, dega, woinadega, kola and bereha) in which you find different crop production activities. Wide ranges of crops are grown under a wide range of ecological conditions in Ethiopia, ranging from hot lowlands all the way up to the frost affected highlands. Crops grown under these wide ranges of

conditions are various kinds of cereals, pulses, and oil crops. Many of the traditional crops in these groups are indigenous to Ethiopia, prominent of which are teff, sorghum, finger millet, barley, wheat, chickpea, lentil, nug, safflower, and enset (table 1). These crops are often grown under subsistence farms with rain fed conditions. Although the genetic diversity of these crops is high, the yields under farmers' conditions are very low. Science based crop production strategies are highly needed to improve productivity per hectare of these and other indigenous crops (Brhane , 2003 ; Alemayehu, 2006).

Table 1. Crop production pattern and agro-climatic zone of Ethiopia

Traditional zone	Altitude (m)	Soil type	Crops	Rainfall (mm)	Temp.(° c)
High wurch (alpine)	> 3,700	Black, little disturbed	None, Frost Limit	> 1,400	<10°c
Wet wurch (Sub-alpine)	3,700-3,200	Black, highly degraded	Barley (2 Crops/Year)	> 1,400	
Moist wurch (sub-alpine)	3,700-3,200	Black, degraded	Barley (1 Crop/Year)	1,400-900	
Wet dega (high land)	3,200-2,300	Dark brown clay	Barley, Wheat, Nug, Pulses (2 Crops/Year)	>1,400	10 °c-15°c
Wet woinadega (mid altitude)	2,300-1,500	Widespread drainage	Teff, Maize, Enset (In West) Nug, Barley	> 1,400	15°c -20°c
Moist woinadega (mid altitude)	2,300-1,500	Red brown drainage	Maize, Sorghum, Teff, Enset, (Rare) Wheat, Nug, Finger, Millet, Barley	1,400-900	
Dry woinadega (mid altitude)	2,300-1,500	Light brown to yellow	Wheat, Teff, Maize (Rare)	<900	
Wet kola (low land)	1,500-500	Red clay, oxidized	Mango, Taro, Sugar, Maize, Coffee, Orange	>1,400	20°c-25°c
Moist kola (low land)	1,500-500	Yellow silt	Sorghum, Teff(Rare), Nug, Finger, Millet, Groundnuts	1,400-900	
Dry kola (low land)	1,500-500	Yellow sand	Sorghum (Rare), Teff	<900	
Bereha (low land deserts)Note in the earlier table this unit is over 500 m	<500	Yellow sand	Only With Irrigation	<900	25°c -30°c and above

Source: Adapted from MoA, 2000 in Alemayehu , 2006

2.5.3. Role of crop production in Ethiopia

Ethiopia's crop agriculture is dominated by small farms that cultivated cereals for both own-consumption and sales mostly. Smallholders account for 96 percent of total area cultivated in Ethiopia. Thus, the five major cereals (Teff, wheat, maize, sorghum, and barley) occupy almost three-quarters of total area cultivated, and represent almost 70 percent of total value added in recent years (IFPRI/EDRI, 2011). Cereals are the dominant food staple for the majority of Ethiopians that contribute 62% of average Ethiopians' daily calorie intake and about 45% of food expenditure for an average household. Hence, cereals like barley (12%), maize (20%), teff (30%), wheat (16%) and sorghum (18%), are the most important crops Ethiopian agriculture. More than 11 million smallholders engage in cereal production in Ethiopia (OECD/IFPRI, 2010).

2.5.4. Crop production failure in Ethiopia

The Ethiopian agriculture is characterized by extreme dependence on rainfall, low use of modern agricultural inputs and low output levels in general. Crop production failure in Ethiopia has been caused by weather variability than policy setting and the technique of production. Crop production failure is directly reflected in increased market and price instabilities and therefore harms wellbeing of farmers in food insecurity (Zerihun et al, 2003). Likewise, CSA (2010/11) also shows that crop productions are affected by factors like weather, amounts of fertilizer used, quality of seed varieties, low levels of irrigation, soil degradation, inadequate agricultural research, and limits in market development.

Different parts of the country face crop production failures. In view of that FAO/WFP (2010) reports that the overall crop performance of the 2009 meher season has been affected by general late seasonal rains together with erratic distribution, and prolonged dry influences in several eastern parts of the country. Particularly, the poor performance of the meher rains affected eastern, south-eastern and southern part of Tigray, eastern Amhara, Afar, Gambella, parts of eastern Oromia, parts of SNNPR and Somali regions. Although the performance of meher rains was relatively better in the western parts of the country, the late onset of the rains affected yields of crops in some high-producing areas, especially in West Shoa, East Shoa,

Arsi, Hawi, East Gojam, West Gojam, North Gonder, South Gonder, and Metekel in Ethiopia.

2.5.5. Manifestation of crop production failure in Ethiopia

According to FAO/GIEWS (2002), Ethiopia is an agrarian economy with a very small industrial sector. Crop production is highly dependent on the nature with significant variability in production and actual production patterns. Utilization of modern technologies has been extremely low in Ethiopia. Growth in the crop production has been mainly driven by area expansion with little gain in productivity. As the result, MoA (2012) indicate that about 3,244,575 people faced severe food shortages and need food assistance in 2002. The overall existence of food deficient in most parts of the country was occurred due to localized drought, population displacement and limited purchasing power. Accordingly, emergency food requirements in 2002 are projected at about 367,247 MT targeting some 3,244,575 people in Ethiopia in general (see table 2). Particularly, emergency food requirements in 2002 are projected for about 346,202 people in Tigry, 145,189 people in Afar, 331,617 people in Amhara, 1,093,427 people in Oromia, 1,115,806 people in Somali, 97,830 people in SNNPR, 33,432 people in Benishangul Gumuz, 48,100 people in Gambella, 4,000 people in Harari and 28,972 people in Dire Dawa.

As DPPC (2003) indicated, in countries like Ethiopia and Burkina Faso, food aid will continue to be needed for the foreseeable future, especially where household coping mechanisms (income diversification, asset disposal, borrowing and sharing, and consumption rationing) have proven unable to protect against loss of income and food. Against this background, the attention of the international community is drawn to the following priority areas requiring action: First, high priority should be given to food assistance for southern African countries facing food crisis, particularly for Malawi, Zambia Zimbabwe, Mozambique, Lesotho and Swaziland. Second, continued food assistance is needed for populations in several countries of sub-Saharan Africa affected by conflict and adverse weather, including Angola, Burundi, DR Congo, Eritrea, Ethiopia, Kenya, Guinea, Liberia, Sierra Leone, Somalia and Sudan. Third, donors are urged to give priority to local purchases wherever possible for their food aid programmed in sub-Saharan Africa.

Table 2. Affected population and Relief Food Requirements by Region in Ethiopia

Region	Beneficiaries	Emergency Food Requirement (MT)			
		Cereal	Sup. Food	Pulses	Total
Tigray	346,202	31,158	3,272	3,116	38,480
Afar	145,189	13,067	1,372	1,307	16,138
Amhara	331,617	29,627	3,111	2,963	36,589
Oromia	1,093,427	95427	10020	9543	117853
Somali	1,115,806	110,738	11,627	11,074	136,761
SNNPR	97,830	7,112	747	711	8,784
Benishangul Gumuz	33,432	3,009	316	301	3,716
Gambella	48,100	4,260	447	426	5,261
Harari	4,000	360	38	36	445
Dire Dawa	28,972	2,607	274	261	3,220
Grand Total	3,244,575	297,366	31,223	29,737	367,247

Source: MoA, 2012

Similarly, MoA (2012) indicated that crop production was deteriorating in many areas of the belg benefiting zones of Oromia region. This is due to a combination of factors which include: recurrent poor rainfall performance especially of the belg season, the current poor production prospect of the belg season, high food prices, and low livestock productivity. For that reason, most zone of the Oromia region fail under food aid program. Thus, the amount of food aid requirement in Oromia zone in 2012 was 1,274 MT for Arsi, 5872 MT for Bale, 25959 MT for Borena, 26001 for MT for East Hararghe, 3599 MT for North shoa, 24165 MT for West Hararghe, 10921 MT for West Arsi, 3083MT for West shoa, 942 MT for East wollega, 8996 MT for Guji, and 382MT Jima (see Table 3).

Table 3. Emergency beneficiaries & food requirement for Oromia region

zone	Beneficiaries	Emergency food requirement (MT)			
		Cereal	Sup. Food	Pulses	Total
Arsi	71367	1,032	108	103	1,274
Bale	52827	4754	499	475	5872
Borena	233547	21019	2207	2102	25959
East Harerghe	233928	21054	2211	2105	26001
North Shoa	32383	2914	306	291	3599
West Harerghe	217408	19567	2055	1957	24165
West Arsi	131378	8843	928	884	10921
West Shoa	27738	2496	262	250	3083
East Wellega	8471	762	80	76	942
Gujji	80940	7285	765	728	8996
Jima	3440	310	33	31	382
Total	1093427	95427	10020	9543	117853

Source: MoA, 2012

2.6. Over view of coping strategies

2.6.1. Concept of coping strategy

Coping strategies refer to all strategically selected acts that individuals and households use to limit crop failure to enable them to succeed their basic necessities and not fall too far below their society's level of welfare. Coping strategies can be classified into ex ante and ex post coping option, according to whether they help reduce risk or reduce the impact of risk after the crop production shortfall has occurred. Ex-ante coping strategies help reduce the fluctuations in income and are also referred to as income-smoothing strategies. Ex-ante coping strategies can be grouped into two categories, those that reduce risk by diversification and those that do so by maintaining flexibility in decision-making. Diversification is growing several crops that have weakly correlated with incomes. Examples are spatial diversification

of farms, diversification of agricultural enterprises and diversification from farm to non-farm activities. Maintaining flexibility is an adaptive strategy that allows farmers to adjust between activities as the situation demands. Examples are using split doses of fertilizer, temporally adjusting input use to crop conditions and adjusting the area allocated to a crop according to the climatic conditions. Ex-post coping strategies are designed to prevent shortfall in consumption when income drops below that needed to maintain consumption at its normal level. Ex-post coping strategies are also referred to as consumption-smoothing strategies, as they help reduce fluctuations in consumption even when income fluctuates. These include migration, consumption loans, asset liquidation and charity. Farmers who are exposed to risk use these strategies in different combinations to ensure their survival despite all odds. Over a long period of time, some of these strategies are incorporated into the nature of the farming system and are often not easily identifiable as coping mechanisms (IFAD, 2009 ; OECD, 2009).

2.6.2. Household Risk management instrument and strategies

According to OECD (2009), more concrete household risk management strategies can be grouped into three categories. These are preventative strategies to reduce the probability of an adverse event occurring, mitigation strategies to reduce the potential impact of an adverse event, and coping strategies to relieve the impact of the risky event once it has occurred. There is complex interaction among risk management strategies that require the government to make significant efforts to achieve coherence. The result of these interactions is the set of risk management strategies and tools that is available and used by farmers. But the available strategies are not the simple addition of government programs and instruments for decisions rather they are mutually interdependent and constitute a unique system. Prevention and mitigation strategies focus on income smoothing. Coping with risk refers to situations in which measures are needed to ensure minimum consumption requirements of farmers or their families equity considerations. Once all available measures or instruments to reduce or mitigate and prevent risk have been exhausted, only consumption smoothing strategies are available to cope with any remaining problem. Of course, all agricultural support programs contribute to consumption or income smoothing (Fig.3).

Many risks directly affect farmers' production decisions and welfare. In response to the potential impact of events, farmers implement diverse risk management strategies in the context of their production plans, the available portfolio of financial, physical and human capital, and the degree of aversion to risk. These risk management strategies may include decisions on-farm, changes in portfolio structure, use of market instruments, government programs, and diversification to other source of income. Many general agricultural support policies have risk management implications and influence risk management decisions (IPGRI/FAO, 2001).

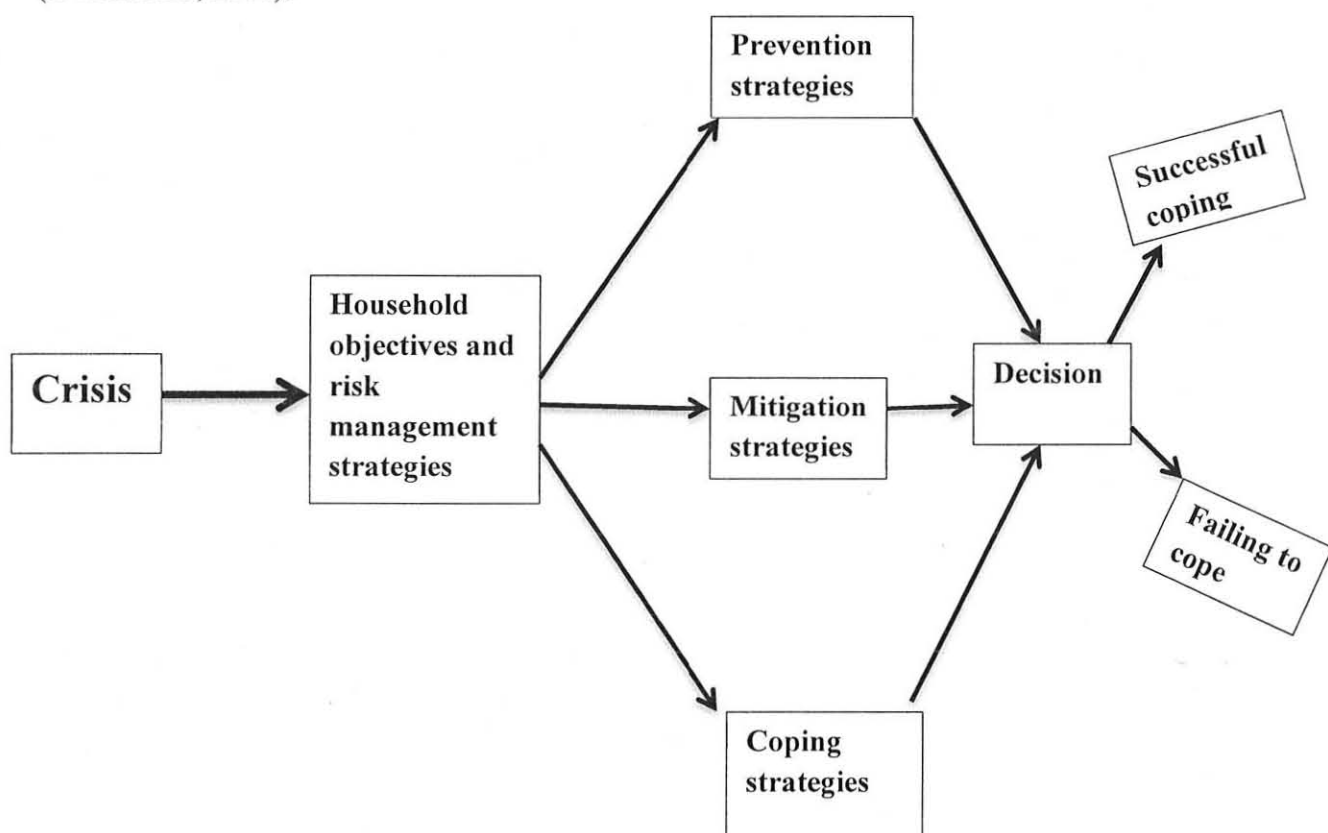


Fig.3 Household Risk management instrument and strategies

Source: OECD, 2009 (Modified)

2.6.3. Households level coping strategy for crop production failure

As Saman (2007) revealed, household coping mechanisms formed a continuum of strategies from “risk minimization” to “risk absorption” and finally to “risk taking”. Risk minimization involved asset accumulation, saving and income diversification. Risk absorption involves savings and existing food reserves and often restriction of consumption of food and non-food items. The final stage is risk taking which involves the disseminating of family, migration, consumption of famine foods and sale of private possessions. Thus, many of the household responses (especially during the last phase) became irreversible impacts on household wellbeing and conditions get worse unless external assistance arrives. Due to the irreversible nature of the risk taking strategies and their adverse impact on post-crisis recovery, households would be reluctant to sell assets, especially agricultural assets in an agrarian community, and would only do so as a measure of last remedy.

Poor crop producers suffer more stress on their livelihoods and welfare, because they may experience larger relative losses from adverse events and also they have less access to relevant risk management strategies. Farm households accept diverse strategies to manage risk affecting their income and consumption. These strategies depend on the characteristics of risk they face, their attitude to risk and the risk management instruments and tools available. Likewise, strong measure should be taken to overcome crop production failure. Accordingly EIAR (2011) and FAO, (2010) indicate that farmers attempt to cope with crop failure by liquidating productive assets, pulling children out of school, migrating to distance places in search of employment, going deeper into debt, change in sowing time, reduce amount of food, borrow money, eat crop reserved for seed, request for food aid, move to other area for temporary employment, migrate to other area permanently, migrate to other area temporary, send household member to live everywhere, restrict consumption of adult, increasing the use of irrigation, promoting soil conservation, distributing seed of short-cycle (that had already been accepted by local farmers and adapted to changes in local climatic conditions) and promoting good agricultural practices that enhance risk reduction and risk management according to severity of problem.

2.6.4. Major coping strategies to crop production failure in Ethiopia

Ethiopia is one of the most populated countries. To feed the large and growing population, crop production has to be increased by improving the crop productivity per land area because most of accessible fertile lands have been cultivated. To improve the crop productivity, the traditional and low yielding crop production practices in Ethiopia must give way to modern and high yielding approaches if the ever-increasing population size is going to be fed adequately. To end this, Ethiopian government has been implementing policies under the Sustainable Development and Poverty Reduction Program (SDPRP) and, more recently, the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) at national level. Locally, farmers in Ethiopia have developed traditional coping mechanisms to deal with idiosyncratic shocks. Applying cash and food-for-work to improve communities' resilience and support water harvesting, soil and water conservation, improving water conservation and harvesting, improving the water use efficiency, and water delivery systems are central to solving the food production problems of Ethiopia and distributing farming inputs in response to crop production failure (FAO, 2011).

Crop production trends in Ethiopia pass beyond chronic into tragic, exceeding the ability of food aid to make up the difference in Ethiopia history. To terminate and reverse these threatening trends, Ethiopia urgent changes in its rural landscape and national development security of land holdings, improvements in crop yields and production technologies, restoration of the environment, more efficient markets, protection of livelihoods and entitlements, and reductions in population growth is needed (USGS, 2003). Zerihun et al (2003) also advocate adaptive strategy that can ensure food supply. Hence, cereal production failure can be improved through increasing the agricultural research and extension capabilities of the country.

2.7. Empirical review on crop production and its coping strategies

Different graduate and authors did empirical studies on constraints of crop agriculture and its coping strategy in different place and time. On the view of this as Ayele (2008) did PhD thesis on six kebele of wolaita zone of SNNP, findings indicate that rainfall variability,

declining farm size, shortage of draught power and institutional deficiencies in input and credit delivery were the main constraints to crop production that hinder food supply. In addition, frequent production losses and coping with seasonal food shortages through asset sales, renting out agricultural land, and borrowing were found to be responsible for food production failures.

Based on secondary data collected from governmental organization and field survey carried out in six Tabia's of the Hentalo Wajerat and Kilde Awelaelo districts in Tigray Region (Gebrehiot , 2008) , different but interrelated factors that are responsible for household food insecurity was identified. These are natural and socio-economic factor like drought, environmental degradation, and crop pests and lack of infrastructural services like marketing and transport communications, population pressure and shortage of farmland, long armed conflict and lack of productive assets are the factors contributing to the problem respectively.

By Supporting of regression analysis model on both secondary and primary data collected, (Masay, 2009) find out to what extent the selected variables affecting the productivity level of the agricultural sector. According to this analysis, possession of farm oxen and livestock, level of fertilizer application and family size were among the critical factors determining both the agricultural productivity and food security status of the peasant households. Based on the findings of the study, both short term and long term agricultural development intervention strategies and policy issues have been recommended to overcome the problem.

Analysis of historical rainfall records from 12 stations and time series data on area coverage production and yield of cereals during the meher season were used (Waldaamlak, 2009) as inputs to analysis drought-prone of Amhara National Regional State. Accordingly, Inter-annual and seasonal variability of rainfall was a major cause of fluctuations in production of cereals in the region. He justified the above information based on crop production related data collected 1994-2003. Hence, the patterns of inter-annual variability in productions of major cereals (teff, barley, wheat, maize, sorghum, and millet) cultivated in the region show similar patterns of inter-annual variability in the seasonal or annual rainfall amounts. Productions of teff, barley, and wheat show stronger correlations with the kiremt rainfall

while sorghum production is more strongly correlated with belg rainfall. Maize appears to require a more even distribution of rainfall throughout the belg and kiremt seasons. Sorghum shows the largest year-to-year variability as it is cultivated in semi-arid and arid parts of the region where rainfall variability is high.

Based on descriptive and variance decomposition procedures to determine the sources of increased instability in cereal production (Alemu, 2005) was found that cereal production between the period 1990 and 2000 was characterized by significant instability. It was found that production instability was caused by increased yield instability. These in turn could be the result of changes in technology, changes in policy, and changes in weather conditions. It was concluded by this study that instability regarding yield was magnified because the use of high-powered inputs was limited to a small number of farmers, production was at subsistence level, and farmers' responsiveness to changes was constrained by infrastructure, institution and the existing land policy.

2.8. Conceptual framework

The following chain of variables were developed by recruiting different concept relating to the problem understudy from whole section of literate review to ends the objective of the studies. Hence, an agricultural crop production is subjected to multiple chains of risks from different sources. These are biophysical factors like flood, rainfall, temperature, pest pressure, and drought, which can create pressures on crop production performance directly and through socio-economic variables as well. Socio-economic variables in turn influence performance of crop production through changing the status of crop yield .Though all these parameters have negative/positive impact on the crop production directly or indirectly, taking measures on these variables is essential.

To overcome crop production failures caused by different risks, problem and emotion focused coping mechanisms existing. Both problem focused and emotion focused coping strategy can occur from the individual field where a crop is grown; crop varieties are selected; and management decisions are made to the farm and household level.

Therefore, from all above literature concept, the following conceptual framework was developed by researcher to analyze the exact and major cause of crop production failure and its coping strategies in the study area. Thus, the framework for the study is shown her under.

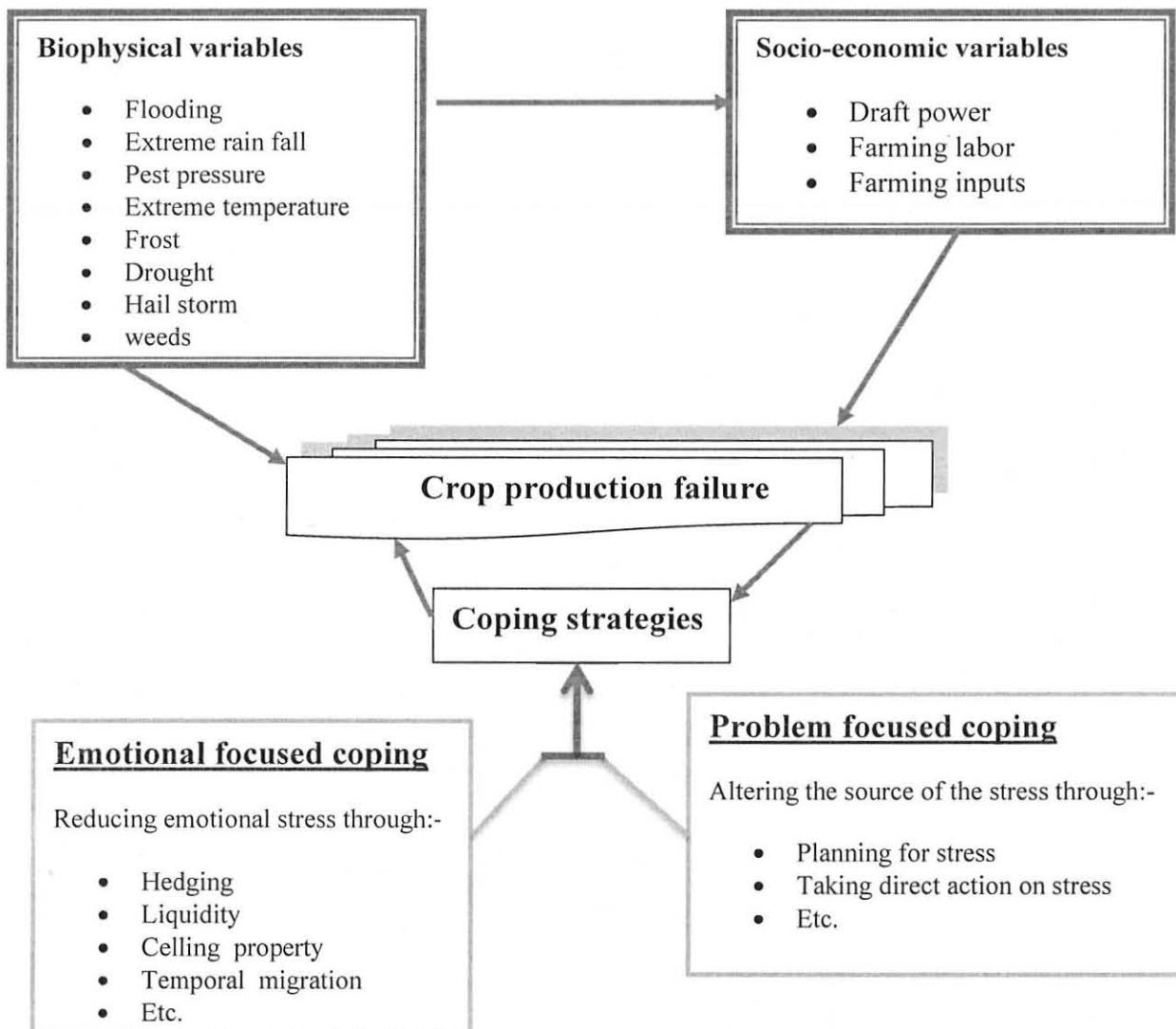


Fig.4 Conceptual frame work

Source: Organized from literature review

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Geographical profile of kuyu woreda

3.1.1. Location

Kuyu woreda is one of the 180 woredas in the Oromia regional state of Ethiopia and also one among 14 woredas in North shoa/selale/. This woreda is about 42 km from Fiche and 155km from Addis Ababa. The administrative city of kuyu woreda is Garba guracha. Astronomically, it is located between $9^{\circ}35'$ and $9^{\circ}49'$ N latitude, and between $38^{\circ}03'$ and $38^{\circ}31'$ E longitude. In relative terms woreda is located North of Ada'a barga and Meta robi, East of Gindeberet, South of Wara jarso, south west of Hidabu abote and West of Dagem. See the following figure.

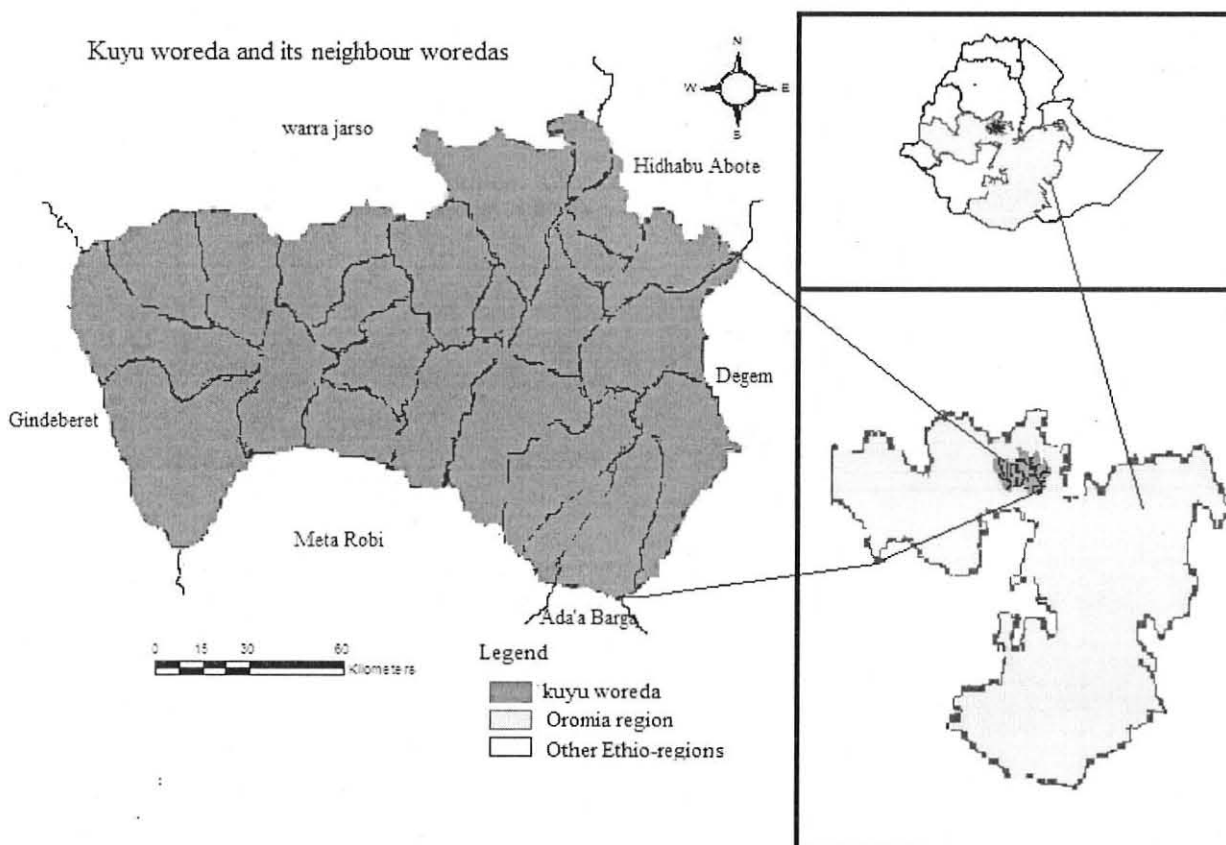


Fig.5 kuyu woreda in its national and regional location

3.1.2. Population

Based on the figure published by the central statistical agency estimation in 2007, kuyu woreda has total population of 140,760 of whom 70,054 are men and 70,706 are women. 19,872 or 16.42% of its population are urban dwellers, which is higher than the zone average of 9.5%. According to the same source, with an estimated area of 950.75km², kuyu woreda has an estimated population density of 148.1 people per square kilometer, which is proportionate to zone average of 160.4 people per square kilometer. The inhabitant of this woreda is mostly believe in orthodox (92.57%), followed by protestant (5.89%) and finally traditional believe (1.07%).

3.1.3. Topography and land use pattern of kuyu woreda

High and rugged mountain ranges that are flat-topped, deep gorges, hills, and plains characterize the study woreda. The altitudinal range of the woreda is from 2757m to 1390m above sea level with the highest known mountain peak of Kesi (2757m), Kurfo (2646m) and Fale (2604m).

According to the estimated data from pamphlet prepared in *Kuyu* woreda office of agriculture in 2012/13, about 60.2% percent of the total area is arable land. The rest of land surface of the woreda is occupied by other land use patterns such as forests 11%, bare land 6.7% and grazing land 14.7%. For more information (see Fig.6).

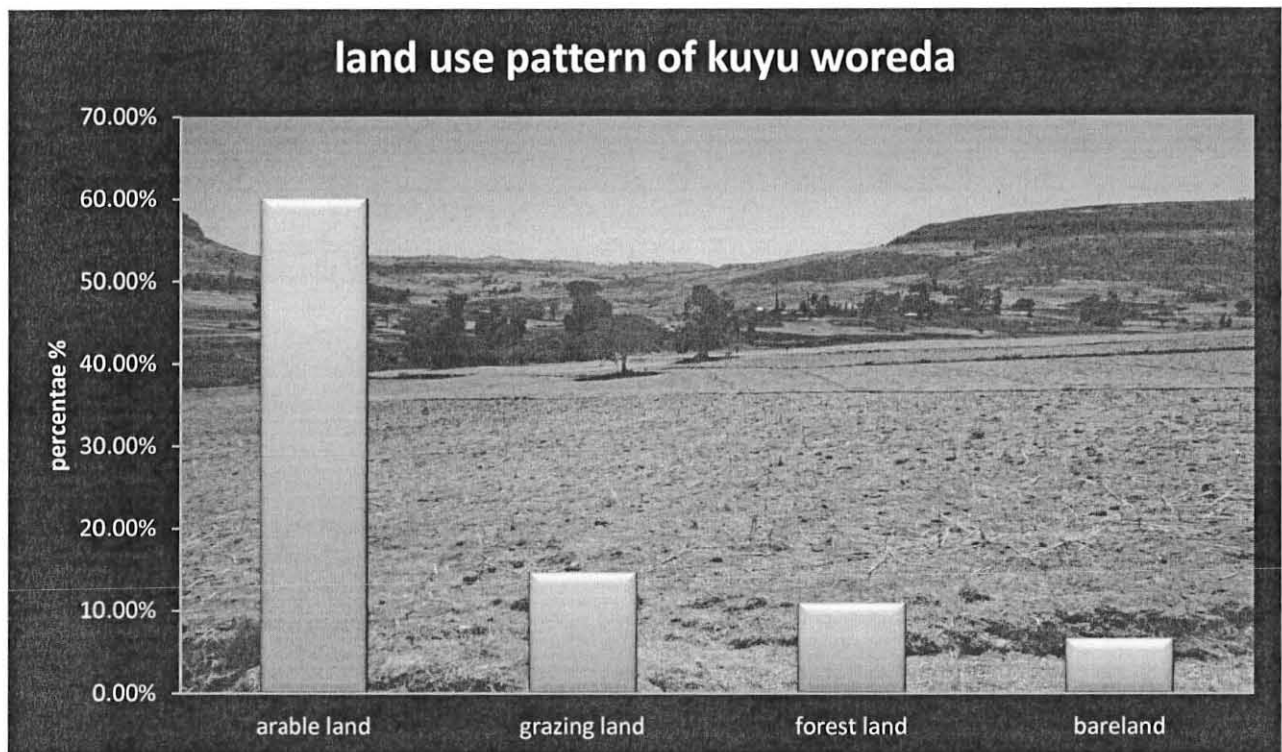


Fig. 6 Land use pattern of kuyu woreda

3.1.4. Agriculture

The field survey evidence shows that the rainfall for the kuyu woreda is closely determined in four months: June, July, August, and September. Over half of the overall rainfall is gained in these months. Hence, greater part of the food crops such as *teff*, wheat, barley, and *nug* are sown during the first or second months of this major rainy season in the area. In reality, a significant amount of rainfall is gained through the three months of belg season (March, April and May) creating second essential rainfall for the study area. As a result, Sorghum, one of the most ordinary food crops in the area, is sown mainly in the first months of this season (Table 4).

Table4. Displaying planting, weeding and harvesting time of the cereal in kuyu woreda

Cereal	Planting time	Weeding time	Harvesting time
Teff	July	August, September.	November, December
Wheat	July	August, September	November, December.
Barley	May, June	July, August	October, November.
Bean	June	-	October, November.
sorghum	March	May, June	December ,January

Source: Field survey, 2013

Evidence from MoA (2012) shows that, the longest delay and the longest earlier withdrawal of rainfall experienced in North Shewa. As the result, the performance of the 2012 *belg* and *genna* rain fall is considered below normal. Consequently, crop production activities were hindered in North Shoa/Selale in which kuyu woreda is in part.

3.1.5. Climatic feature of the study area

a. Temperature

According to agricultural office and Garba Guracha metrological station (2012), the kuyu woreda has dega, woinadega and kola agro-climatic zones that occupy 15.5%, 50.7% and 33.8% of total land area of the woreda respectively. Its temperature varies from about 10.5oc to 25^oc. In this woreda, high temperature is recorded mainly during the months of December to May .whereas low temperature was recorded during months of October to January (Fig.7).

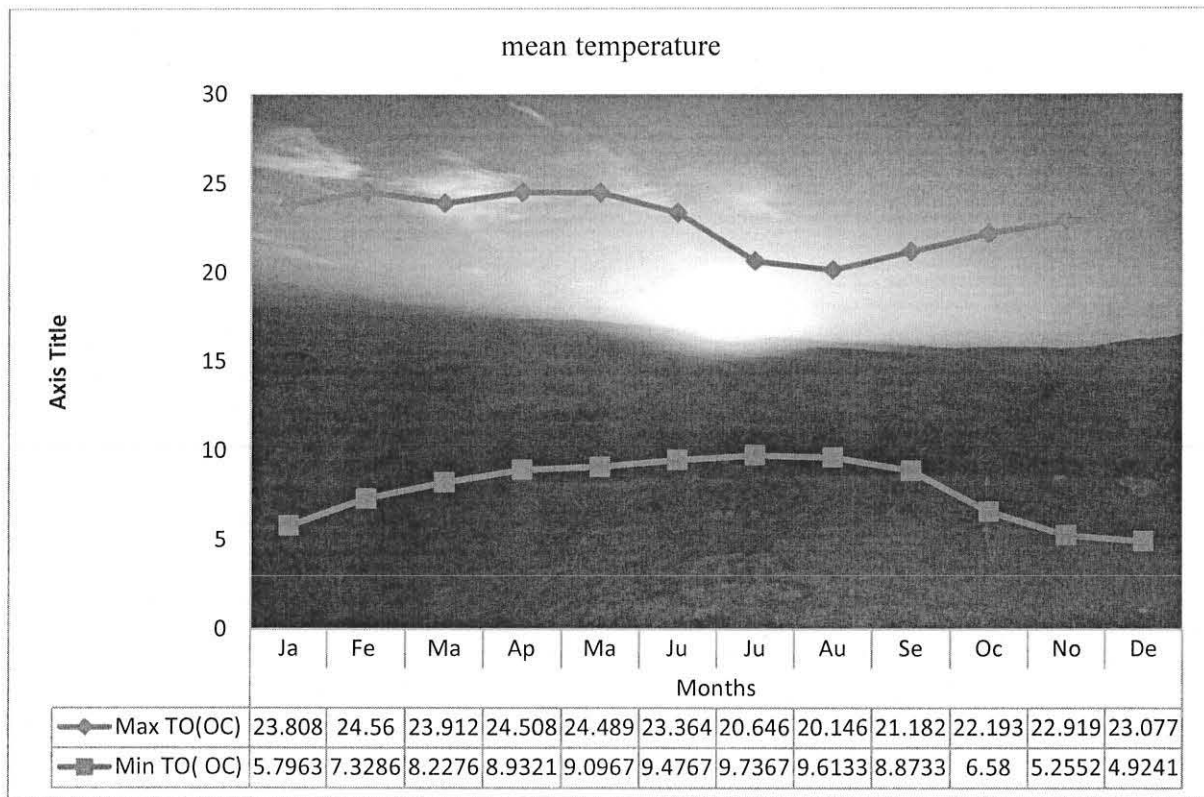


Fig.7 Mean maximum and mean minimum annual Temperature of Kuyu Wereda (1980-2010)

b. Rain fall

In kuyu woreda, most of the rainfall falls during the "kiremt"(June to September) and "belg" (mid-February to March) season. In June to September, the area obtained heavy rainfall in which most of crop production is rely on. In contrary, Belg is short and light rainy season used for some type of crop relatively. The intensity and suitability of rainfall in this woreda is different from year to year. For detail, see Fig.8 below. So, the life of kuyu woreda farmer is dependent on rainfall of these seasons as crop production of the woreda is based on rainfall.

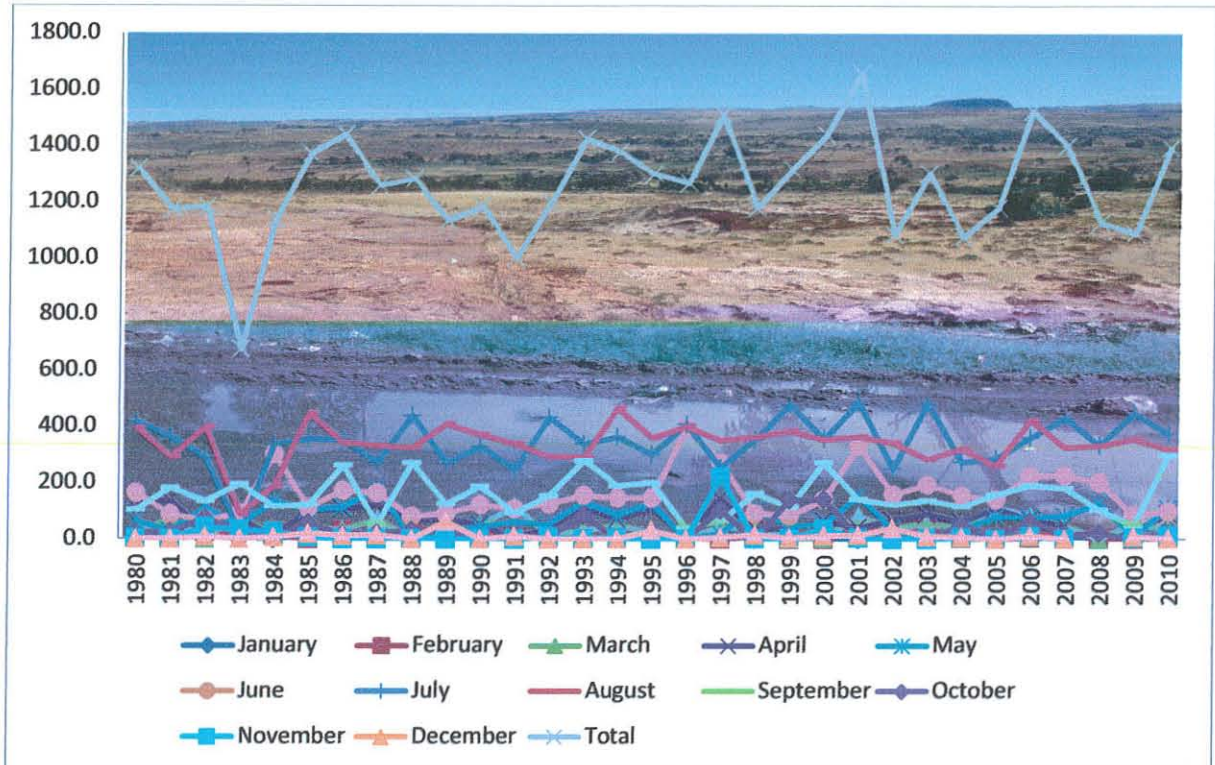


Fig.8 Yearly Rainfall Distribution of Kuyu Wereda (1980-2010)

3.2. Method of data collection and analysis

3.2.1. Sampling design

Kuyu woreda is one of the 14 woreda of north shewa/selale zone. The researcher focused on this woreda because, the study area has been facing crop production failure and most farmers in the woreda get less food supply due to periodic crop production failure. Purposive sampling method was employed to select 23 rural kebele of Kuyu woreda out of 25 kebeles as crop production activities is no such concern of remaining two urban kebeles of Kuyu the woreda. Yet again, as the population understudies (23 rural kebele) are heterogeneous in exercising crop production activities across dega, woinadega and kola agro-climatic zone of the woreda, the researcher selected five rural kebeles of kuyu woreda that constitute aforementioned agro-climatic setup by purposive sampling method. This was carried out because of the following issue, 1st the selected kebeles constituting all the three (dega, woinadega and kola) agro climatic zones, randomly as proportional as that of the woreda, 2nd

the selected kebeles expected to represent the woreda in terms of socio-economic and biophysical characteristics adequately, 3rd spatial accessibility these kebeles have. From these identified five rural kebeles, two kebeles were selected by using simple random sampling method. This is because it gave equal chance for all population understudies that were selected and the selected kebele was believed to be representing in reflecting the character of the remaining parts of the kebele. Both kebele were stratified into dega, woinadega and kola agro-climatic setups. At this stage, the DAs were consulted to identify the location of each household within each agro-climatic zone of both kebele. Accordingly about 316 households, 621 households, and 155 households were identified in dega, woinadega and kola in climatic setup of *Dubana-agalo* kebele respectively. And also about 543 households, 311 households and 246 households were identified in dega, woinadega and kola climatic setup of *Wuyye-gose* kebele respectively. The sample size was decided to be 100 household intentionally because of budget and time constraints. Through systematic sampling method 100 individual household were derived from these kebeles by the following procedure. 1st The sample size was decided to be 100, 2nd researcher used sample fraction $100/2192 = 1/22$, 3rd every 22nd household were selected from each agro-climatic zone of both kebeles until 100 household respondents reached.

The number of the first household to be included in the sample was chosen randomly by picking one out of the first twenty pieces of paper, numbered 1 to 22 for each climatic setup of woreda.

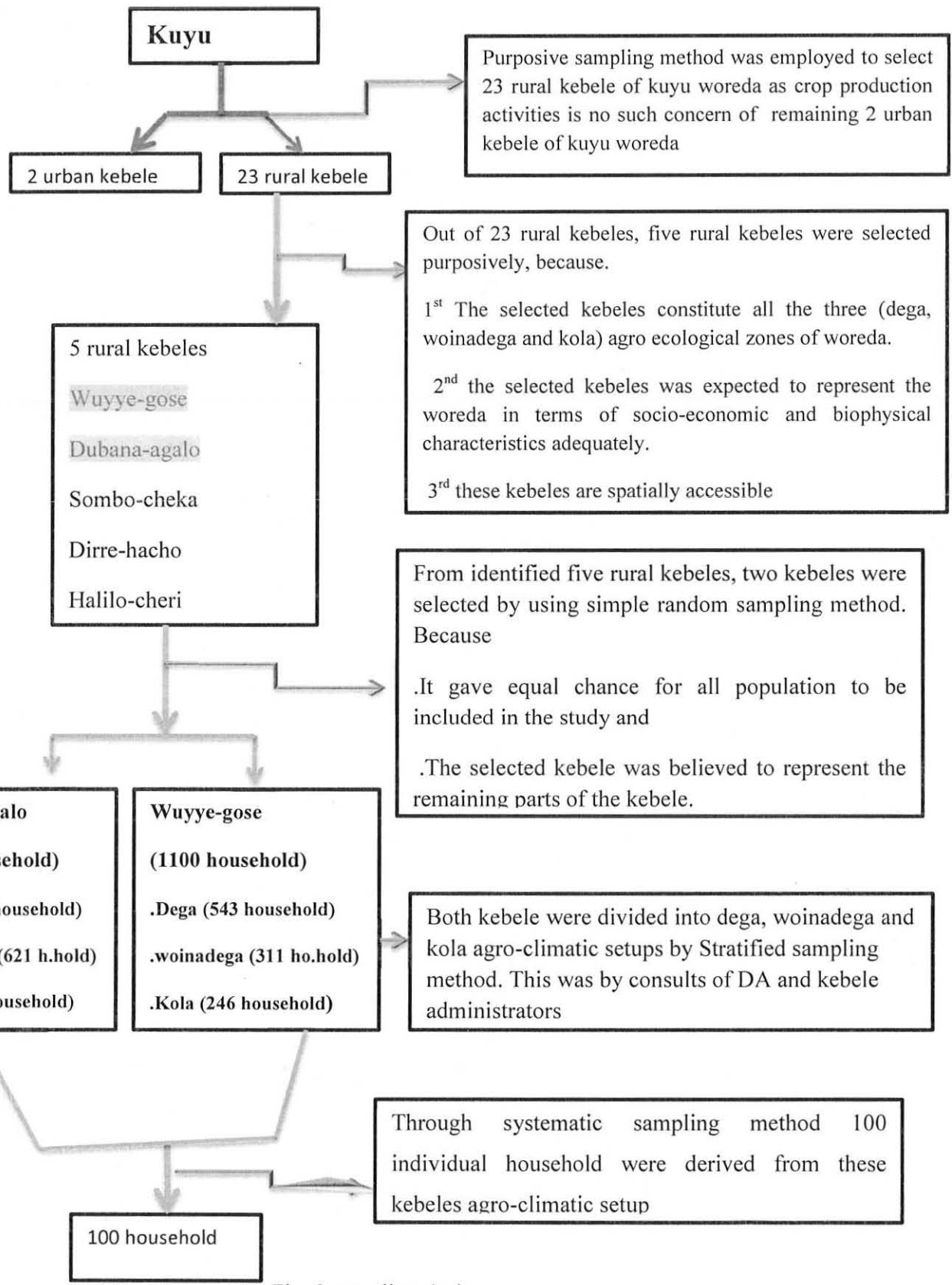


Fig. 9 sampling design

3.2.2. Data type and sources

In this study, the researcher was used both primary and secondary data for the investigation of the problem. This was to make the study all rounded and efficient. In addition, these data was expected to cover the entire problem that was assessed. The primary data was collected from the agrarian households, DA, and key person from woreda agricultural bureau. The secondary data was collected /gathered from websites, central statistical agency document, NMSA, report of ministry of agriculture (published and unpublished) and previous study in which both qualitative and quantitative data was collected to represent different variables of the problem. These data was used for this study because, the researcher aimed to assess the responsible factor for the failure of crop production and identify coping strategies practiced in the study area.

3.2.3. Technique and methods of data collection

Number of data collection technique like key informant interview, personal observation and questionnaire was used to gather relevant and appropriate information about the crop production failure and household coping mechanisms.

I Key informants

The key informant interview was conducted with DA, administrator of kebele and head of agricultural office to get real information about the problem. As it was one method of generating data to understand crop production failure and household effort to overcome problem in the study areas, researcher communicated them smoothly to get expected data. Hence, inhabitants' experiences, opinions, needs, and constraints was collected and discussed with individual and group of interviewee. To make the communication easy and understandable, checklist prepared by English language was translated to Afan Oromo language as all interviewee have the same mother-tongue language (Afan Oromo) with me.

II Focus group discussion

The focus group discussion was held with the kebele elders that were selected randomly to collect the relevant data. This was to collect the data for the problem understudied from their brainstorming. To make the communication easy and understandable, checklist was prepared by English language and was translated to Afan Oromo language. Researcher was facilitating

the discussion. In addition to the discussions, researcher was tried to attend formal meeting that headed by themselves and other government organ to understand the issue of the agriculture. This all was done by announcing and taking permission from kuyu woreda administrative office, because it was the time when national electoral board announces political parties to compete for regional and kebele seat.

III Personal observation

Researcher collected available data by observing situation of agricultural activities, the struggle of the resident to ensure sustainable food supply, activity of the government and nongovernmental organization, different economic activities, how policy programs are working for sustainable crop production and etc. This all was done by using guideline prepared to reduce confusion that might occur during the observation. Researcher also observed special event like the way they pray for their *Waqal/god/* to reduce the risk of different natural storm and the like to increase efficient data on the problem.

IV Review of document

The data relevant to the problem was collected from the web sites, related written material on market, different agricultural office, AAU library to make the study more power full, credible, and acceptable. This review of document enabled the researcher to guide overall framework of the research and enriched the data collected.

VI Questionnaires

The questionnaire was the principal source of the data gathering tools in this research more than the other. It was designed to both close and open ended question by English language and translated to Afan Oromo for the sample respondents aiming for the clarity. Then the questionnaire was distributed to sampled household to gather both qualitative and quantitative data, which was assumed to relevant to the problem under study.

3.2.4. Method of data analysis

In this research, both qualitative and quantitative data analysis methods were used to analyze the data collected. Why mixed method of data analysis was used for this study? The reason was that a quantitative study added to qualitative ones, to gain a better understanding of the meaning and implications of the findings. Accordingly, data gathered from different source was compiled, organized, summarized and interpreted based on descriptive statistics through SPSS 16.0 and Microsoft excel 2010 computer-based statistical package. As well, Kruskal Wallis statistical calculation was used to determine the statistical variation of temperature, rainfall, drought, flood storm, weeds, frost storm, crop pest, hail storm, draft animals, farming labor and farming input in relation to crop production performance across dega, woinadega and kola agro-climatic zone of the kuyu woreda.

Generally, the process of analysis was carried-out by using qualitative and quantitative statistical tools and presented by tables, graphs, percentage, likelihood ratio and chi-square for this study as presented in chapter four.

CHAPTER FOUR

4. RESULT AND DISCUSSION

Based on the objective of the study, the following section discusses about the level of crop production failure, biophysical and socio-economic factor that cause crop production failure, and finally, main households coping strategies to challenge crop production failure in kuyu woreda as follows.

4.1. Level of crop production failure in the kuyu woreda

As crop production is mainstay of this woreda, laterally, you can think that crop production is convinced human activity in the area. But things are different as crop production is unconvinced activity currently. Muller et al (2011) generalized that crop production is inefficient in Africa in relative to other parts of the world. Additionally, Tenna (2012) indicated that Ethiopia was major food aid recipient among sub-Saharan countries due to crop failure. Likely, most respondents showed that crop production is unfortunate deeds as crop yield is less than crop producers' effort in kuyu woreda. In consistence to this, Messay (2011) indicated that crop yields have been getting worsen over year in contrast to some two or three decades back in kuyu woreda. The data generated from the household respondents were also confirmed above statement. According to these collected data, about 100 (99%) of household respondents were facing crop production failure in the kuyu woreda (Table 7). From this one can conclude that the level of crop production failure in kuyu woreda is high. For this high level of crop production failure, the researcher was able to reach on number of indicators as revealed next, *first* low level of household satisfaction to crop production, *second* crop produced/harvested below expectation of peasants, *third* aggregate of household meeting crop failure and *fourth* declining of crop production in the study area. These indicators were organized from household respondents and focus group discussion to justify the presence of the level of crop production failure in the kuyu woreda. The detail of these indicators for the high level of crop production failure in the kuyu woreda is presented as follows.

4.1.1. Low level of household satisfaction to crop production

Crop production is means of livelihood for most of kuyu woreda's farmers. But, crop production failed to meet the interest of most of crop producers currently. Accordingly, level of satisfaction from crop production was very low in this locality. Table 5 reveals detail of this idea.

Major parts of the respondents were not satisfied with crop production in kuyu woreda. Table 5 above confirmed that about 44% of respondents were very much unsatisfied, about 16% of respondents were unsatisfied and about 38% of respondents were indifferent (in and out feeling) for crop production. As figured above, most farmers were dissatisfied with crop production activities in general. This indicated that crop producers of the study area had low interest in producing crops. As the most household respondents and focus group discussion member reason out, they did more, they expected more crop yield, in the contrary they got less crop yield and then dissatisfied with crop production activities. Thus, most farmers of the area lost confidence in producing crops. From these all above ideas, the researcher summarized that low level of household satisfaction with crop production activities could be an indicator for high level of crop production failure in the kuyu woreda.

Explicitly, farmers' level of satisfaction to crop production is different across agro-climatic setup of the kuyu woreda. As summarized in table 5, the level of farmer household satisfaction with crop production in dega agro-climatic zone was found very low in comparing with farmers of woinadega and kola agro-climatic zone of the area. For instance, about 55% of sampled respondents of dega household were highly dissatisfied to crop farming activities that followed by 38% and 33% in woinadega and kola respectively. From this, the researcher understands that passion of peasant to crop production was low in dega agro-climatic zone than woinadega and kola agro-climatic setup of the area.

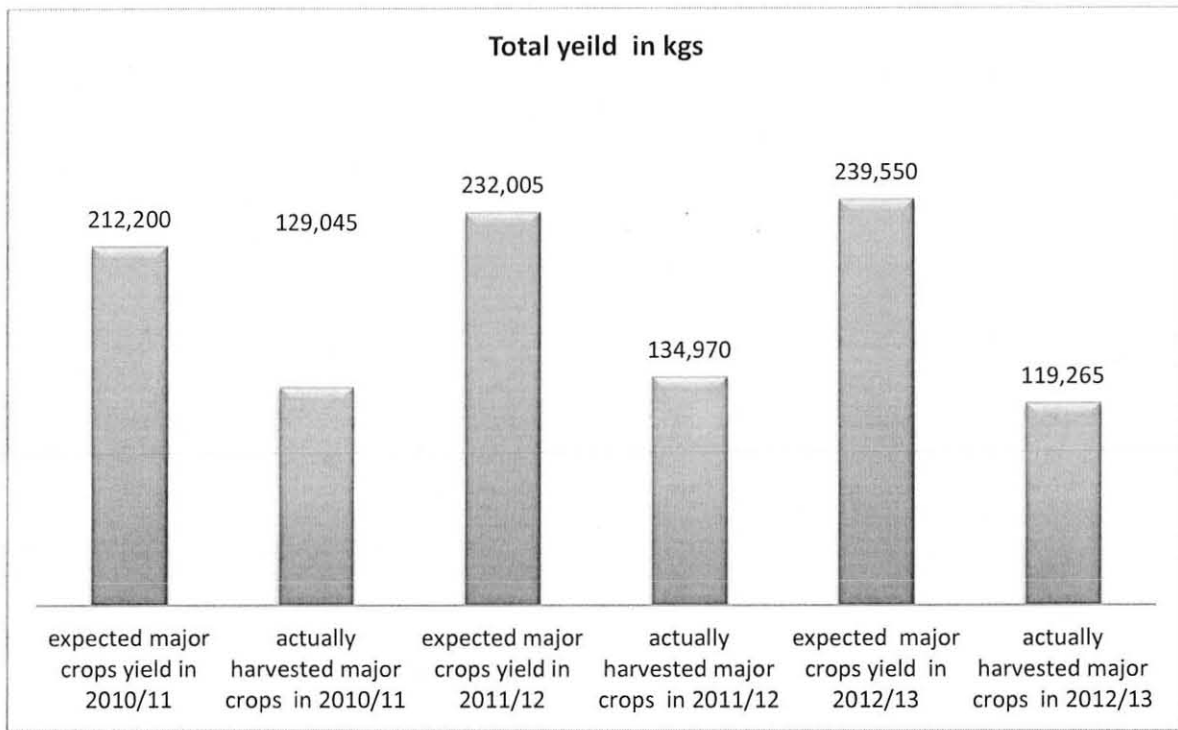
Table5. Level of household satisfaction to crop production across agro-climatic zone of study area (n=100)

Level of household satisfaction to crop production	Agro-climatic zone							
	dega		woinadega		kola		Total	
	N	%	N	%	N	%	N	%
Very much unsatisfied	22	55	16	38.1	6	33	44	44
unsatisfied	7	17.5	4	9.5	5	28	16	16
Indifferent	9	22.5	22	52.4	7	39	38	38
satisfied	1	2.5	0	0	0	0	1	1
Very much satisfied	1	2.5	0	0	0	0	1	1
total	40	100	42	100	18	100	100	100

Source: Field survey, 2013

4.1.2. Crop produced/harvested below expectation of peasants

The summarized data in Fig.10 from household respondents indicated that crop yield was below expectation of crop producers of the area. For example, in 2010/11 the total crop yield expected were about 212,200kgs, in 2011/12 the total crop yield expected were about 232,005kgs and, in 2012/13 the total expected crop yield were about 23,955kgs but only about 129,045kgs, about 134,970kgs and about 119,265kgs were actually harvested by the household respondents respectively. Amazingly, the household respondents did not find any major crop yield (teff, wheat, barley, nug, sorghum and bean) nearly above or equal to their expectation in stated year as presented in Annex 1 (field survey, 2013). This all indicate that most household farmers faced crop failure in kuyu woreda. So, harvesting crop below expectation was best manifestation of high level of crop production failure in the kuyu woreda.



Source: Field survey, 2013

Fig.10 Expected and actually harvested crop yield in 2010/11-2012/13

4.1.3. Aggregate of household facing crop failure

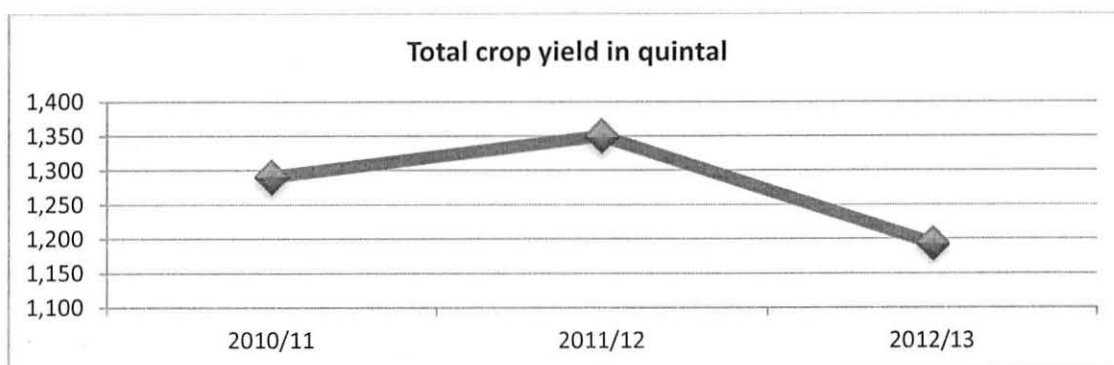
Almost all farmer households in kuyu woreda were faced crop production failure by all or part of crop type they were farming. The result of the present study confirms that almost every farmer in any agro-climatic zone of kuyu woreda was facing crop production failure. For detail see Table 7.

Table6. Aggregate of household experiencing crop failure in the study area (n=100)

Meeting crop failure		
Problem	Frequency	Percent
Faced crop failure	99	99.0
Did not face crop failure	1	1.0
Total	100	100.0

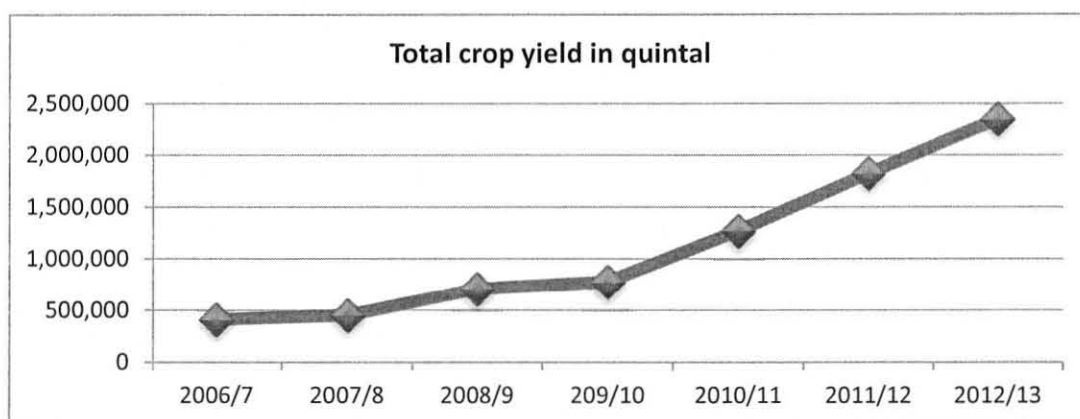
Source: Field survey, 2013

As the collected data from household respondents indicated, almost all household in dega, woinadega and kola agro-climatic setup of the woreda were encountered crop failure in part or all of crop type produced. Summarized data in Table6 confirmed that about 99% of sampled household respondents were faced crop production failure. This figure showed that reduction in crop production and productivity knocked the door of every peasant by some or all variety of crops. Accordingly, the aggregate crop yield of these respondents summarized in fig.17 shows, the household respondents' crop yield was decreased in 2012/13. For instance, total crop produced by respondents were 1,290.45 quintals, 1,349.7 quintals and 1,192.65 quintals in 2010/11, 2011/12 and 2012/13 years respectively (fig.17). This indicates that the crop production failed highly in the year 2012/13. The MoA (2012) forecasted reports settled the above statement. According to this MOA prediction, crops were failed throughout North shewa zone (study area located in) in 2012. In contrary to aforementioned finding (idea), data obtained from agricultural office of kuyu woreda (2013) shows that crop production and productivity increased from year to year (Fig.18). According to this agricultural office, crop production and productivity increased in every agro-climatic setup of the woreda. Most interviewed officers of the woreda assured that most farmer households reached the level of self-sufficiency. But, based on data generated from the heart of sampled farmer households, focus group discussion members, and personal observation and different written material, researcher concludes that most farmer households of the area faced crop production failure. Thus, could be indicator of crop production failure in the kuyu woreda.



Source: Field survey, 2013

Fig.17. Total crop yield in the study area (2010/11 to 2012/13)

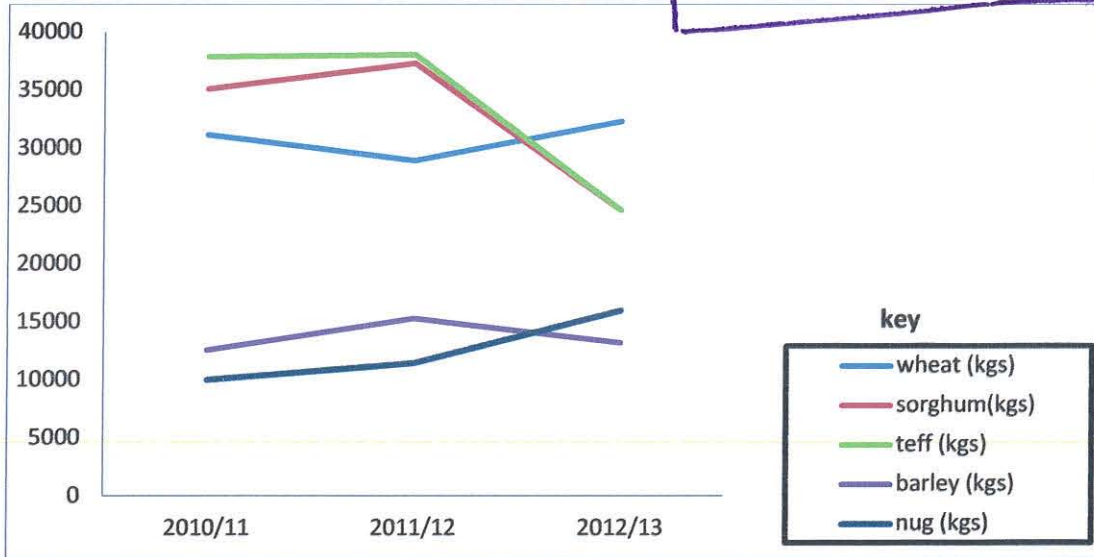


Source: KAO, 2013

Fig.18. Total crop yield in kuyu woreda (2006/7 to 2012/13)

4.1.4. Declining of crops production in kuyu woreda

From the household respondents, focus group discussion and kuyu agricultural office, the researcher found that teff, sorghum, barley, wheat and nug are most dominantly cultivated crops in the kuyu woreda. Especially sorghum and teff are broadly cultivated crops in kuyu woreda as it is most important source of food in kuyu woreda. However, these dominant crops in kuyu woreda were reported to remain declining (see Fig.19).



Source: Field survey, 2013

Fig.19 Showing, declining of crops production in the kuyu woreda

As the data generated from the household respondents shown on the above (Fig.19), yield of key crops to the study area like barley, teff and sorghum declined in 2012/13. Thus, the farmers of the area were not harvested crops at expected level that contradict government plan and interest. By indicating governments interest, MoFED (2006) report revealed that like other few areas, North Shoa zone (kuyu woreda is located in) has been identified as crops growth corridor for its comparative advantages. But things were not as expected; rather most dominantly known crops to the Kuyu area failed to give yield (see Fig.19). So, this increased food aid beneficiaries in the area as crop production is means of livelihood in the woreda. In line with this MoA (2012) report indicate that about 3,301 beneficiary farmers were projected to get 367MT in kuyu woreda in 2012.

Which crop variety was failed more than the other in the study area? The crop production failures were varying among crop varieties in the kuyu woreda. Summarized data obtained from household respondents in Table 7 shows, crop productivity per hectare owned by sampled household in 2012/13 year. Accordingly, this table portrayed that sorghum gave less yield of 249.2kg/ha, which followed by teff, barley, nug and wheat with 289.8kg/ha,

304.8kg/ha, and 341.4kg/ha respectively. From this figure one can confidentially say that sorghum was number one crop at risk in relative to other crops in this woreda.

What is the condition of crop production across agro-climatic zone of the study area? An effort was also made to display the dissimilarity in crop yield by agro-climatic zone in Kuyu woreda and it was found that more proportion of the peasants in kola had less fortunate to suitable crop production than those living in woinadega and dega climatic setup of the area(see table8) .For instance, from about 44.6 hectare of farm land, household respondents were harvesting 8675kg crop yield (by ratio of 194.5kg/ha) in 2012/13 that followed by 68740kg from 235.5 hectare (by ratio of 291.9kg/ha) and 38100kg from 105.33 hectare (by ratio of 361.7kg/ha) in kola, woinadega, and dega agro-climatic setup of the area respectively. From this one can confidentially say that the lowlanders (kola) faced crop production failure than those crop producers living in dega and woinadega agro-climatic zone of the woreda in 2012/13 year.

Table7. Homestead yield and cultivated land across agro-climatic zone of the study area, 2012/13.

Crop variety	dega		woinadega		kola	
	Cultivated land (ha)	Harvested crop yield (kg)	Cultivated land (ha)	Harvested crop yield (kg)	Cultivated land (ha)	Harvested crop yield (kg)
wheat	22.9	9850	61	18750	11.3	3900
barley	11.3	5400	32	7800	0	0
nug	7	2400	33.5	11640	6.8	1925
sorghum	31.13	9400	47.25	13950	20.5	1300
teff	33	11050	61.75	16600	6	1550
total	105.33	38100	235.5	68740	44.6	8675

Source: Field survey, 2013

4.2. Causes of crop production failure in kuyu woreda

One of the research objectives was to identify major cause for crop production failure in the kuyu woreda. This section presents household farmers' viewpoints of why they encounter crop production failure. Hence, factors that caused crop production failure were grouped into biophysical and, socio-economic factors based on the nature of their occurrence. Not all factors have similar influence on crop production across dega, woinadega and kola agro-ecological zone. Hence, Kruskal wallis statistical calculation was used to see if biophysical and socio-economic factor causing crop production was vary across these agro-climatic set up of the study area.

The question needed to be answered in this study was that what were the major causes of crop production failure in kuyu woreda? The succeeding sections give a detail answer for this question.

4.2.1. Bio-physical cause for crop production failure

Farmers are vulnerable against crop losses caused by hail storm, drought, extreme temperature, excessive rainfall, frost storm, pests and flooding (DPPC, 2003; DPPC, 2006; Degeffa, 2005; FAO, 2008). Similarly, the researcher finding also shows that these aforementioned factors were causing crop production failure in the study area as discussed here under. To identify whether the influence of these factors are significant difference or not among agro-climatic zone of the study area, Kruskal Wallis statistical calculation was used in addition to cross-tabulation displayed.

A. Extreme temperature

The crops failed to give required yield in kuyu woreda. The household respondents felt that temperature was one among other that caused the crop failure. Accordingly, Iglesias et al (2009) indicated that high temperatures during developmental stage of crop are injurious that results for crop yield drop. Data summarized from household respondents in the table 8 below supports above idea.

Table 8. Incident of extreme temperature on crop production in the kuyu woreda (n=100)

Agro-climatic zone	Incident of extreme temperature on crop production				Kruskal wallis test result
	Low	Medium	High	Total	
Dega	N	2	17	21	<div style="border: 1px solid black; padding: 10px; margin: 10px;"> <p style="text-align: center;">Normalized residual</p> <p>Chi-Squar _____ 4.122</p> <p>df _____ 2</p> <p>Asymp.Sig. _____ 0.127</p> </div>
	%	5	42.5	52.5	
Woinadega	N	10	22	10	
	%	23.8	52.4	10	
Kola	N	0	0	18	
	%	0	0	18	
Total	N	12	39	49	
	%	12	39	49	
No significance difference at (χ^2 , $p > 0.05$)					

a. Kruskal Wallis Test
b. Grouping Variable: Agro-climatic zone

Source: Field survey, 2013

When the Kruskal Wallis statistic was calculated to determine whether there was any statistically significant difference in the voting of household respondents for the impact level of temperature incident on crop production across agro-climatic setup of the area ($\chi^2 = 4.122$, $\rho = 0.127$), no statistically significant difference was found among dega, woinadega and kola agro-climatic zone of the area (Table 8). From this one can conclude that the household respondents felt the incident of extreme temperature on crop production across agro-climatic setup of the area. In supporting above idea, the Mohr (2010) indicated that crop yield dropped when the threshold of temperature values for a crop in a given region is exceeded only. This indicated that crop production failed when temperature became above or below the potential of the crop in any agro-climatic zone. So, the researcher decided to saw the aggregate vote of all sampled household on incident level of temperature impact on crop production. Accordingly, About 49%, 39% and 12% of (100) total household respondents believed that incident of extreme temperature on crop production was high, medium and low in the study area respectively (Table 8). Furthermore, the interviewed household, Focus group discussion members and DA of the selected kebele's felt that the temperature hindered

effectiveness of crop production in the area. From this the researcher achieved that temperature caused crop production failure in the study area.

B. Extreme Rainfall

Kassahun (2011) and Wairiu et al (2012) finding shows that change of rainfall amount and pattern significantly reduce total crop yield through affecting planting time, growing stages, and harvesting periods. Similar to the above finding, the researcher was able to find negative impact of the rain fall on the crop in kuyu woreda. The table 9 below indicates the summary of the sample household response.

Table 9. The incident of the extreme rainfall on crop production in the kuyu woreda (n=100)

Agro-climatic zone	Incident of the extreme rainfall on crop production								Kruskal wallis test result
	Low		Medium		High		total		
	N	%	N	%	N	%	N	%	
Dega	1	2.5	15	37.5	24	60	40	100	<div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p style="text-align: center;">Test Statistics(a)((b)</p> <p style="text-align: center;">Normalized residual</p> <p>Chi-quar_____ 0.375</p> <p>df _____ 2</p> <p>Asymp.Sig._____ 0.829</p> </div>
Woinadega	3	7.14	20	47.6	19	45.2	42	100	
Kola	11	61.1	2	11.1	5	27.8	18	100	
Total	15	15	37	37	48	48	100	100	
No significance difference at (χ^2 , $p>0.05$)									

a. Kruskal Wallis Test
b. Grouping Variable: Agro-climatic zone

Source: Field survey, 2013

Table 9 shows that about 60% of dega household respondents were felt high incident of rain fall record on crop production than the woinadega (45.2%) and kola (27.8%) agro-climatic zone. But, Kruskal Wallis statistical test result ($\chi^2=0.375$, $p=0.829$) showed that there was no significant difference at ($p=0.05$) significance level among group of household responses to the incident of rain fall record on crop production throughout dega, woinadega and kola agro-climatic zone of the study area. This finding showed that the extreme rainfall adversely affect

crop production in every agro-climatic setup of the study area. In line with this Siefu (2004) and Dida (2013) finding also showed that extreme rainfall negatively affect crop production as crop production is suspended to rain fall in Ethiopia. Therefore, the researcher concludes that extreme rain fall that occurred was causing crop production failure across agro-climatic zone of the study area.

C. Drought

Dida (2013) and Iglesias et al (2009) indicated that drought is extreme climatic events that adversely affect the crop production. Crop yields are most likely to suffer if drought occurs during critical developmental stages of the crop. In most grain crops, flowering, and grain-filling are especially sensitive to drought. The researcher finding from household respondents also showed that drought was one among other that affect crop yield in the kuyu woreda.

Table 10 The incident of drought on crop production in the kuyu woreda (n=100)

Agro-climatic zone	Incident of drought on crop production								Kruskal wallis test result
	Low		Medium		High		Total		
	N	%	N	%	N	%	N	%	
Dega	3	7.5	16	40	21	52.5	40	100	<div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p style="text-align: center;">Normalized residual</p> <p>Chi-Squar _____ 4.022</p> <p>df _____ 2</p> <p>Asymp. Sig. _____ 0.134</p> </div> <p>a. Kruskal Wallis Test b. Grouping Variable: Agro-climatic zone</p>
Woinadega	3	7.5	23	54.8	16	40	42	100	
Kola	5	27.8	1	5.6	12	66.7	18	100	
Total	11	11	40	40	49	49	100	100	
No significance difference at (χ^2 , $p > 0.05$)									

Source: Field survey, 2013

As highlighted on the table 10 above, the drought problem on crop production was felt strongly by group of household respondents in kola (66.7%) that followed by dega (52.5%) and woinadega (40%) agro-climatic zone of the area. Laterally, this table indicates that drought caused crop production failure throughout agro-climatic setup of the area differently.

But, when Kruskal Wallis statistics was calculated to determine whether there was statistically significance difference or not in sounding of household respondents to the level

of drought impact on crop production across agro-climatic setup of kuyu woreda, no statistically significance difference ($\chi^2=4.022, p=0.134$) between dega, woinadega and kola agro-climatic setup of the woreda was found. Thus, the researcher identified that drought caused crop production failure in the study areas. Yergalem (2009) finding supports this idea. According to his finding, drought is the major factor that causes crop production failure. Additionally, IFAD (2009) report also indicated that drought is principal sources of risk and uncertainty in crop production agriculture in the world. Therefore, from all these information, the researcher concluded that drought played key role in causing crop production failure across agro-climatic zone of the study area.

D. Flood storm

According to Devalsam et al (2011) and IFPRI (2010), flooding has significant impacts on crop production. In the same way, the researcher ascertained that flooding was critical factor that caused crop failure in kuyu woreda. The influence of the flood on the crop was high at early stage of crop growing. It was also observed that the impact of flooding on the crop production was vary from place to place based on nature of the topography, the nature of vegetation cover and human interventions in the drainage area. The vote of household respondents on the flooding summarized in the table 11 showed as impact of flooding on the crop was varied across dega, woinadega and kola agro-climatic zone of the kuyu woreda.

Table 11 The influence of flooding on crop production in the kuyu woreda (n=100)

Agro-climatic zone	Influence of flooding on crop production					Kruskal wallis test result	
		Low	Medium	High	total		
Dega	N	4	11	25	40	<div style="border: 1px solid black; padding: 5px; margin: 10px;"> <p style="text-align: center;">Test Statistics(a)(b)</p> <p style="text-align: center;">Normalized residual</p> <p>Chi-Squar _____ 6.064</p> <p>df _____ 2</p> <p>Asymp. Sig. _____ 0.048</p> </div>	
	%	10	27.5	62.5	100		
Woinadega	N	4	20	18	42		
	%	9.5	47.6	42.9	100		
Kola	N	2	3	13	18		
	%	11.1	16.7	72.2	100		
Total	N	10	34	66	100		
	%	10	34	66	100		
significance difference at (χ^2 , $p < 0.05$)							<p>a. Kruskal Wallis Test</p> <p>b. Grouping Variable: Agro-climatic zone</p>

Source: Field survey, 2013

The voting of household respondents for high level flood storm influence in kola areas was (72.2%) that followed by dega (62.5%) and woinadega (42.9%) agro-climatic zone respectively (table 12). The test result from Kruskal wallis statistical calculation showed that level of flood storm influence on crop production was high in kola climatic zone areas significantly ($P < 0.05$) higher than flood storm influence in dega and woinadega areas (table 11). Interviewed household and focus group discussion members ascertained that vegetation cover, nature of the topography and human intervention in kola area is responsible for high risk of flood on the crop. The researcher also observed that kola area is full of cliff (sirti local name), valley (sulula in local name), hills and steep landscape that exposed to flood more than the other area. Relatively dega and woinadega is gentle slope that rarely exposed to the high level of the flood storm. These simply indicate that crop production in kola area is more vulnerable to flood storm than the other zone in kuyu woreda. From this discussion, the researcher understand that the negative impact of the flood on crop is high in kola that followed by dega and woinadega respectively in kuyu woreda.

E. Hail storm

According to Nicolaides K.A (2009) finding, hail is a harmful weather element that can cause considerable damage to crop production. Hence, the impact of hail on the crop is directly related to its severity. In the view of this Changnon et al (2009) indicated that the amount of crop loss per storm event is based on the frequency of hail, the size of the hailstones that fall, the number (volume) of hailstones that fall and the speed of the wind when hail falls. In fact, nobody was following the nature of the hail rather than observing the impact level of hail on the crop in kuyu woreda and also it is out of scope of this study. Accordingly, household respondents realized that hail was one among physical factor that damaged crop in their locality in general (table 12).

Table 12 The influence of the hailstorm on crop production in the kuyu woreda (n=100)

Agro-climatic zone	Influence of the hailstorm on crop production					Kruskal wallis test result	
		Low	Medium	High	total		
Dega	N	3	12	25	40	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Normalized residual</p> <p>Chi-Squar _____ 2.238</p> <p>df _____ 2</p> <p>Asymp. Sig. _____ 0.327</p> </div>	
	%	7.5	30	62.5	100		
Woinadega	N	6	24	12	42		
	%	14.3	57.1	28.6	100		
Kola	N	0	16	2	18		
	%	0	88.9	11.1	100		
Total	N	9	52	39	100		
	%	9	52	39	100		
No significance difference at (χ^2 , $p > 0.05$)							<p>a. Kruskal Wallis Test</p> <p>b. Grouping Variable: Agro-climatic zone</p>

Source: Field survey, 2013

The summarized data in the table 12 revealed that about 62.5% of dega household respondents felt high negative impact of hail on the crop that followed by 28.6% and 11.1% household respondents in woinadega and kola agro-climatic zone respectively. But, Kruskal Wallis test result presented on table 12, indicated that with a significance level of 0.327

which is greater than 0.05, the voting by the household respondents across agro-climatic setup (dega, woinadega and kola) of study area on the impact level of hail storm on crop production is not statistically significantly different. Statistically identified uniformity among the dega, woinadega and kola agro-climatic zone of the woreda regarding influence of hail storm on the crop production indicate that hail storm is not one agro-climatic zone limited in the woreda. Koriri k (2011) finding indicated that farmers are threatened against crop losses caused by hail storm. Similarly, the researcher found that hail was one of the critical factor that damaging crop in the study area. This all reveal that hail was damaging crop throughout agro-climatic setup of kuyu woreda.

F. Frost storm

According to FAO (2005) report, frost damages the crops since the first crops were cultivated. This report also indicates that one night of freezing temperatures can lead to complete crop loss. This shows how far the frost harms crop production and productivity. Consistently, data generated from the household respondents showed that frost was critical problem to crop production in kuyu woreda (table 13).

Table 13. The influence of the frost storm on the crop production in the kuyu woreda (n=100)

Agro-climatic zone	Influence of the frost storm on the crop production								Kruskal wallis test result
	Low		Medium		High		total		
	N	%	N	%	N	%	N	%	
Dega	2	5	15	37.5	23	57.5	40	100	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <p style="text-align: center;">Normalized residual</p> <p>Chi-Squar _____ 0.771</p> <p>df _____ 2</p> <p>Asymp. Sig. _____ 0.680</p> </div>
Woinadega	7	16.7	20	47.6	15	35.7	42	100	
Kola	4	22.2	11	61.1	3	16.7	18	100	
Total	13	13	46	46	41	41	100	100	
No significance difference at (χ^2 , $p > 0.05$)									

a. Kruskal Wallis Test
b. Grouping Variable: Agro-climatic zone

Source: Field survey, 2013

Laterally, frost pressure on crop production was different across agro-climatic zone (dega, woinadega and kola) of the study area as shown in table 13. In dega areas 57.5% of

household respondents felt as frost causes crop failure as compared to woinadega (35.7%) and kola (16.7%) agro-climatic zone of the woreda respectively. These indicate that household respondents in each agro-climatic classification felt frost pressure differently according to their agro-climatic setup.

However, Kruskal Wallis statistical test result contradicts this statement. Thus, Kruskal wallis statistics calculated for this purpose was determined that there was no statistically significantly difference across agro-climatic setup of kuyu woreda's household respondents in voting for impact of frost that cause crop production failure in the area. From this one can understand that frost was severe problem of dega, woinadega and kola climatic setup that causes crop production failure. But, as Degeffa T (2005) study in kamise zone indicate, negative impact of frost on crop production is limited to high altitude areas. Anyway, the researcher finding indicate that frost storm is seasonal limited than altitudinal limited in kuyu woreda. Accordingly, most household informants and focus group discussion members also realized that the damage of the frost to the crop was observed from about mid of September to October in dega, woinadega and kola agro-climatic setup of the kuyu woreda. Once crops are attacked by frost, it is simply left for caws as fodder.

G. Pest pressure

Table 14 The influence of the crop pest on the crop production in the kuyu woreda (n=100)

Agro-climatic zone	Influence of the crop pest on the crop production								Kruskal wallis test result
	Low		Medium		High		total		
	N	%	N	%	N	%	N	%	
Dega	10	25	16	40	14	35	40	100	Test Statistics(a)((b) <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p style="text-align: center;">Normalized residual</p> <p>Chi-Squar _____ 1.897</p> <p>df _____ 2</p> <p>Asymp. Sig. _____ 0.387</p> </div>
Woinadega	8	19	17	40.5	17	40.5	42	100	
Kola	11	61.1	4	22	3	16.7	18	100	
Total	29	29	37	37	34	34	100	100	
No significance difference at (x^2 , $p>0.05$)									

a. Kruskal Wallis Test
b. Grouping Variable: Agro-climatic zone

Source: Field survey, 2013

In woinadega areas about 40.5% of household respondents were felt high pest damage to crop as compared to dega and kola with 35% and 16.7% respectively (table 14). To justify this, test of significant difference among groups of households that vote for pressure of pests on crop in dega, woinadega and kola was made as summarized in Table 15. Accordingly, with the 0.05 level of significance, Kruskal Wallis test result ($x^2= 1.897$, $p=0.387$) shows that there was no statistically a significant difference among household respondents' of dega, woinadega and kola agro-climatic setup of the kuyu woreda. Even at 0.10 significant levels, there was no statistically significant difference in the voting of household respondents for the pest pressure on crop production across agro-climatic setup of the area. This shows that pests was nearly equally harming crop in any agro-climatic setup of the area in general. The negative impact of pest on the crop production in kuyu woreda is similar to Barker .K.R and Sorenson C, (2003) finding. According to their finding, the crop pest is most damaging crop once it happened.

H. Weeds pressure

It was expected that weeds caused considerable loss of crop. Consistently, Reddy K.N. (2012) finding indicated that effects of weeds on crop yields are unquestionable because weeds cause significant crop losses in each year. Similarly, the researcher found that weeds were causing crop production failure in the kuyu woreda. Data summarized from household respondents in the table 16 below realized above discussion.

Table 15 The influence of the weeds on crop production in the kuyu woreda (n=100)

Agro-climatic zone	Influence of the weeds on crop production					Kruskal wallis test result	
		Low	Medium	High	total		
Dega	N	8	12	20	40	<div style="border: 1px solid black; padding: 10px; margin: 10px;"> <p style="text-align: center;">Normalized residual</p> <p>Chi-Squar_____2.522</p> <p>df _____2</p> <p>Asymp. Sig._____0.283</p> </div>	
	%	20	30	59	100		
Woinadega	N	10	14	18	42		
	%	23.8	33.3	42.9	100		
Kola	N	12	6	0	18		
	%	66.7	33.3	0	100		
Total	N	30	32	38	100		
	%	30	42	38	100		
No significance difference at (χ^2 , $p>0.05$)							<p>a. Kruskal Wallis Test</p> <p>b. Grouping Variable: Agro-climatic zone</p>

Source: Field survey, 2013

Cross –arrangements of household responses to agro-climatic zone presented in table 15 above shows, the household response regarding the crop production failure that caused by weeds across agro-climatic setup. Accordingly, crop producers of dega (59%) felt high crop damaged by weeds than woinadega (42.9%) and kola (0%) agro-climatic setup. In another way, table 15 depicted that none of kola's the sample households reported their crop was highly damaged by weeds. These indicate that the negative influence of weeds on crop production was varying throughout agro-climatic setup of the area.

However, result from Kruskal Wallis statistical calculation ($\chi^2=2.522$, $p=0.283$) revealed that there was no significant difference at $p=0.05$ and even 0.10 significance level among group of household responses to influence of weeds on crop production throughout dega, woinadega and kola agro-climatic division of the study area. Nearly equally, crop production in dega, woinadega and kola agro-climatic zone was affected by weeds. These indicate that weeds severely affected crop in kuyu woreda. Similarly, Kostov T and Pacanoski Z (2007) have found that weeds are the main limiting factors in profitable crop production as the presence of weeds is relatively constant. From this all, one can understand that weeds were one among the other critical factor that causing crop production failure in the study area.

4.2.2. Socio-economic cause for crop production failure

Fekadu N (2008) indicate that the availability of sufficient labor, animal power, and farming inputs are playing a pivotal role for crop production status of the household . Hence, the crop production status of the household is expected to be progressing with availability of aforementioned factor than lowering or nothing of these factors. The researcher also found that these factors were causing crop production failure in the study area as discussed here under. To see if there was significance deference among dega, woinadega, and kola agro-climatic zone of the area, Kruskal Wallis statistical calculation was used as follows.

I. Draft animals

Table 16. The availability condition of draft animals in the kuyu woreda (n=100)

Kruskal wallis test	Availability of draft animals	agro-climatic zone															
		dega		woinadega		kola		Total									
		N	%	N	%	N	%	N	%								
Test Statistics(a) (b) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Normalized residual</td> <td></td> </tr> <tr> <td>Chi-Squar</td> <td style="text-align: center;">0.347</td> </tr> <tr> <td>Df</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Asymp.Sig</td> <td style="text-align: center;">0.841</td> </tr> </table> <p>a. Kruskal Wallis Test b. Grouping Variable: Agro-climatic zone</p>	Normalized residual		Chi-Squar	0.347	Df	2	Asymp.Sig	0.841	adequate	24	60	23	54.8	17	94.4	64	64
	Normalized residual																
	Chi-Squar	0.347															
	Df	2															
	Asymp.Sig	0.841															
sometimes in adequate	11	27.5	8	19	1	5.6	20	20									
always inadequate	5	12.5	11	26.2	0	0	16	16									
Total	40	100	42	100	18	100	100	100									

No significance difference at (χ^2 , $p > 0.05$)

Source: Field survey, 2013

As indicated in table 16, about the 94.4% of kola's household respondents felt the availability of the draft animals that followed by 60% in dega and 54.8% in woinadega agro-climatic setup of the area. But, Massay (2011) indicate that animal power is inadequate and even the existing draft animal is inefficient for farm in kuyu woreda. Thus, this high proportion of household respondents felt to adequacy of the draft animal power is not due to adequacy of draft animals at each household level but it is due to best social teamwork they have (see page 64-65) and hoeing practice they developed. This indicates that best social teamwork they formed and hoeing practice they developed enable them to forget the negative impact of the draft animals on crop production. In another way, the above cross-tabulation shows, 26.2% of woinadega household respondents were felt the crop failed due to extreme inadequacy of draft animals. When Kruskal Wallis statistics was calculated to test if any statistically significant difference in the voting of household respondents for availability of draft animals across agro-climatic setup of the area ($\chi^2 = 0.347$, $\rho = 0.841$), no statistically

significant difference was found among dega, woinadega and kola agro-climatic zone of the area (table 16). From this, the researcher understands that the draft animal unavailability that causes crop production failure was fairly similar throughout dega, woinadega and kola agro-climatic setup of the area.

II. Farming labor

Table 17. The availability of the farming labor in the kuyu woreda (n=100)

Agro-climatic zone	availability of farming labor				Total	Kruskal wallis test								
		adequate	Sometimes inadequate	always inadequate										
Dega	N	19	16	5	40	Test Statistics(a) (b) <table border="1"> <tr> <td colspan="2">Normalized residual</td> </tr> <tr> <td>Chi-Squar</td> <td>2.707</td> </tr> <tr> <td>Df</td> <td>2</td> </tr> <tr> <td>Asymp.Sig</td> <td>0.258</td> </tr> </table>	Normalized residual		Chi-Squar	2.707	Df	2	Asymp.Sig	0.258
	Normalized residual													
Chi-Squar	2.707													
Df	2													
Asymp.Sig	0.258													
%	47.5	40	12.5	100										
Woinadega	N	16	13	13	42									
	%	38.1	31	30.9	100									
Kola	N	0	10	8	18									
	%	0	55.6	44.4	100									
Total	N	35	39	26	100									
	%	35	39	26	100									

No significance difference at (χ^2 , $p>0.05$)

Source: Field survey, 2013

Table 17 above shows that always kola's household respondents did not felt the availability of the farming labor for crop production than the dega and woinadega climatic zone. This indicated that household respondents of kola, woinadega and dega agro-climatic zone was felt the adverse impact of farming labor on crop production. But the inadequacy of farming labor variation across agro-climatic zone of the kuyu woreda was not statistically significant difference. Kruskal Wallis test result ($\chi^2=2.707$, $p=0.258$) showed that there was no significant difference at ($p=0.05$) significance level among group of household responses to situation of farming labor impact on crop production throughout dega, woinadega and kola agro-climatic zone of the study area. This outcome shows that the shortages of farming labor

adversely affect crop production in every agro-climatic setup of the area in a very similar atmosphere. The finding of the Wilhemina (2008) also supports this idea.

Most informants revealed that crop production process in kuyu woreda was totally depending on the extensive human labor. So, about 100(39%) and 100(26%) sampled household respondents from selected kebeles of kuyu woreda felt that farming labor was sometimes inadequate and always inadequate for crop production respectively. Thus, from this one can understand that unavailability of farming labor highly affect crop production as it happens. Consistently, the finding of TAWS, (2004) and Devendra, et al (1997) indicated that many developing regions, especially sub-Saharan Africa are highly dependent on extensive human labor for crop production. Thus, the unavailability of human labor highly reduces crop production in this region. So, the unavailability of farming labor was causing crop production failure in kuyu woreda.

III. Availability of farming inputs

Table 18. The situation of farming inputs in the kuyu woreda (n=100)

Agro-climatic zone	Situation of farming inputs								Kruskal wallis test								
	adequate		sometimes inadequate		always inadequate		Total										
	N	%	N	%	N	%	N	%									
Dega	18	45	12	30	10	25	40	100	Test Statistics(a) (b) <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2" style="text-align: center;">Normalized residual</td> </tr> <tr> <td>Chi-Squar</td> <td>2.031</td> </tr> <tr> <td>Df</td> <td>2</td> </tr> <tr> <td>Asymp.Sig</td> <td>0.362</td> </tr> </table>	Normalized residual		Chi-Squar	2.031	Df	2	Asymp.Sig	0.362
Normalized residual																	
Chi-Squar	2.031																
Df	2																
Asymp.Sig	0.362																
Woinadega	19	45.2	7	16.7	16	38.1	42	100									
Kola	0	0	0	0	18	100	18	100									
Total	37	37	19	19	44	44	100	100									
									a. Kruskal Wallis Test b. Grouping Variable: Agro-climatic zone								

No significance difference at (χ^2 , $p>0.05$)

Source: Field survey, 2013

Table 18, above display that about 100% of kola crop producers faced farming inputs shortage always, that followed by woinadega(38.1%) and dega(25%) agro-climatic setup of

the study area. This indicates that kola agro-climatic setups of the area were faced crop production failure due to shortage of farming inputs.

Kruskal Wallis statistical calculation result was used to assured whether there was significant difference among dega, woinadega and kola agro-climatic setup of the area concerning the voting of household respondents for availability of farming inputs for crop production. The Kruskal Wallis statistical test result showed that there was no statistically significantly difference($\chi^2= 2.031$, $p= 0.362$) even at 0.10 significant level among dega, woinadega and kola household voters for influence of farming inputs on crop production. This indicates that farming input related crop production problem was nearly similar across agro-climatic setup of the area understudy. This gave the way for the researcher to saw household respondents' reflection from different agro-climatic setup as exclusive concerning impact of farming inputs on crop production. As summarized on table 18, about 44% of 100 total household respondents fingered that farming inputs was inadequate always that harms crop production and productivity in the area. Similarly most interviewed household and focus group discussion members thought, most common farming input like high yielding crops variety, fertilizer and herbicide was inaccessible to their area due to the following reason, 1st low buying capacity of the farmer , 2nd delaying of farming inputs at time it required for farming activities and 3rd low delivery of farming inputs. From this one can conclude that crop production hampered due to inadequacy of farming inputs to crop producers in the study area.

4.3. Household coping strategy to tackle crop failure in kuyu woreda

Farmer's knowledge is the preliminary element in searching solutions for crop production failure. Thus, the significance of local knowledge must be recognized because of its role in combating/reducing crop production failure. Therefore, investigating what coping strategies households employ during crop production failure was one of the research objective identified at the outset of the study. The household coping strategies depend on the perception of the farmers about how to escape from the crop production failure. So, to meet the objective, Coping strategies household used to cope with crop production failure were organized to problem focused and emotional focused coping strategies as it discussed here under.

4.3.1. Problem focused coping strategies

In this study, problem focused coping strategy is altering the source of the crop production failure directly by using different coping techniques at farm level. Consistently, OECD (2009) indicated that risk management starts with peasants household decisions at the farm level. Thus, problem focused coping strategies are managing identified key biophysical and socio-economic factors that causes crop production failure in the kuyu woreda. As the researcher realized from interviewed households and focus group discussion members of different agro-climatic zone of the selected kebele, crop producers have almost the same traditional and scientific problem focused coping strategy against crop production failure. The problem focused coping strategies was devoted on the already identified key biophysical and socio-economic factors like temperature problem, rainfall problem, flood storm, frost, pests, weed, draft animals, farming labor and farming input that caused crop production failure. For each of the identified and discussed root factors that caused crop production failure earlier, more or less the crop producers have traditional coping strategies. These coping strategies were identified through focus group discussion, key informants and household respondents. Some of these coping strategies were scheduled and executed by the government and non-governmental organization and other are owned and performed traditionally by crop producers of the study area without any intervention. Each recruited problem focused strategies for each of identified source of crop production failure was discussed as follows.

A. Practice of farmers to alters/reduce incident of extreme temperature on crop production in the study area

The respondents underlined that extreme temperature turned out to be the crucial problem of their area by harming crop as it was discussed earlier. Actually it is not the only problem of the study area. In line with, WMO (2007) reports indicated that current temperature abnormality at low latitude has negative impact on crop production in general. To end/reduce this problem, different section of the world tried their best according to their country conditions. Like other countries, the household respondents, key informants and FGD members indicated that in advice of developmental agent (DA) they were covering land by

trees in thinking of cooling their locality and getting underground water for their crop and livestock in nearby future. But, most key informants and FGD members thought that temperature could not have artificial coping strategies. They confirmed that thinking to regulate temperature by human being is like confronting with *waqa* (god) and so praying for *waqa* (god) is the only solution.

B. Practice of farmers to alters/reduce the incident of the extreme rainfall and drought on crop production in the study area

Concerning of combating extreme rainfall and drought , the household respondents, key informants and FGD members indicated that covering land by tree, building water ponds for irrigation (especially in *dubanna* agalo kebele), sowing short growing crop were exercised by some peasants with active consultation of developmental agent to cope with the influence of rain fall and drought on the crop. As some key informants indicated, this is to regulate/cope extreme rain fall and drought which mutilate their crops. Like for extreme temperature, most household informants thought that any action taken by human being in thinking to suit drought and rainfall abnormality to the crops is comparable with attacking *waqa* (god). So, as they pointed out, praying god for solution is enough.

C. Practice of the farmers to alters/reduce incident of the frost and hail storm on crop production in the study area

As already discussed earlier, the frost was another factor that caused crop production failure in the study area. The crop producers of the study area specified that the frost action on the crop observed from about the mid of the September to October months. According to household informants and FGD members, these months are flowering season for most of the crop grown in their locality. As most household informants and FGD members indicated desist to move in the cropped land (it is not to crash frost crop and to reduce the accumulation of ice crystals in walked area) and watering frosted crop (in thinking to washout frost from the crop) can cope /reduce the impact of the frost on the crop. So, cease to move in the frosted crops and watering frosted crops are best techniques to safe crop from the influence of the frost. Out of thinking of kuyu woredas' farmers, FAO (2005) approved

that watering frosted crop can enable energy transfers from the water to the frosted crop and so the negative impact of the frost can be reduced.

Household respondents and FGD members voiced that another factor that caused crop production failure was hail storm. Hail harms the crop during summer season at the early stage of crop growing. It harms the crop through cutting down the leaf and stem of crop, and by heaping on the crop (so, crop is buried under the hail). To save the crop from this problem, protecting few broad leaf tree in the cropped land and building canon in the cropped land (to drain hail out) is very crucial. As told by most informants, hail storm is god response for curse done by human beings. So, praying for god is another solution.

D. Practice of the farmers to alters/reduce negative impact of flood pressure on the crop production in the study area

Flood gate more attention by government of Ethiopia as it is the most dangerous for the crop production. Currently, it is declared at national wide to stop flood storm not to erode fertile soil which is suitable to the crop. Accordingly, high number of farmers moved to the field in group to make tracing, and planting tree by guidance of DA and other government bodies to stop flooding in most part of their area. Moreover, the farmers told to the researcher that there is traditionally known coping strategies against flooding from crop called *kokobi*. *Kokobi* (in Afan oromo) is building huge flood canal at the border of cropped land to block incoming flood to the cropped land. Additionally, small canal building (*boyi* in oromo language) and contour plough in opposite to flooding direction in the cropped land is also well known to the area. These three coping strategies were early practicing of the crop producers in the study area.

E. Practice of the farmers to alters/reduce negative impact of weeds on the crop in the study area

Weeds were also another factor that caused crop production failure in the study area. As the key informants, household respondents and FGD members voiced to researcher, the weeds reduced or removed from crops through different weeds managing system in addition to

herbicide. Identified traditional weeds managing strategies includes intensive hand weeding, *garagalchu*, *gulgalu*, and *sirribsisu* to safe crop (table 20).

Intensive hand weeding: - it is traditional managing system of weeds. As the informants told to researcher, it is the dominant practice of managing weeds in kuyu woreda's crop producers. The intensive hand weeding is practiced in the study area in group or individually.

Garagalchu (in oromo language):- it is turning over weeds by harrowing weedy land sometime before sowing of crop to manage weeds and so, weeds are dried. This technique is aimed to damage weeds before sowing seeds. Informants confirm that *galagalchu* is advisable in the weedy farm land.

Sirribsisu (in oromo language):- it is making calf and other small animals moving on the early germinated of weeds before seed germination. It is advisable for very weedy cropped land. The crop producers of the study area were used this technique to reduce weeds if the proportion of the weeds are assumed to be high in comparing with sowing crop. And finally new seed is added to crop land if earlier sowed crop is sparse.

Gulgalu (in oromo language):-the crop producers of the study area used this technique to collect the ruminants of past crop and weed that can harm coming new crop. This also includes cutting out unnecessary plant from the farm land. After they collect these ruminants from farm land, they take it out to farm land border or burn in the farm land. This is done not to see re-growing of weeds in the cropped land.

F. Practice of the farmers to alters/reduce shortage of draft animals that cause crop failure in the study area

The oxen-poor crop producers were found to have engaged a variety of traditional teamwork to access draft animals in the area. Some of the identified traditional teamwork includes *Sijalle*, *Dabo*, *Wanfala*, *Higni*, *Kitira* and *Makanajo* as locally named in Afan Oromo Language.

Sijalle: - it is best traditional gadgets to access to the draft animals in the study area. This is the mechanisms by which oxen-meager crop producer let one honest neighbor/fellow to beseech oxen-rich cultivators from nearby neighbor to plough all the farm land prepared for the crop on the given season. Mostly, this accessing means to oxen is reported to be practiced for widow and very poor farmer in the study area. Additionally, the researcher informed that this traditional system is used to finish weeding and harvesting crop in the study area. Labor unavailability in the study area was also solved by this traditional team work.

Dabo:-this is the mechanisms by which oxen-poor farmers beseech many oxen-owners to prepare farm land on time. As reported, this accessing means to enough oxen is practiced by any kind of the farmer in the study area. As verbalized, one who requests *dabo* is expected to give services in turn by same way or another. Additionally, *dabo* is arranged to finish weeding, harvesting and any other economic activities in the study area. Furthermore, the farming labor deficit crop producer used *dabo* traditional system to access to farming labor as like that of accessing to oxen power/labor

Wanfala: - it is the practice of group of nearby neighbor farmers to help each other turn by turn to farm their farm land. This kind of traditional teamwork is practiced among oxen-rich farmer in the study area. Furthermore, the researcher informed that the *wanfala* traditional teamwork is used to finish weeding and harvesting of crop in the study area. And also, this system used to solve the shortage of farming labor.

Higni:-it is well known traditional system that enables the oxen-meager farmer access to the oxen. In this system, oxen-meager crop producers use oxen labor for one day to farm crop land in response to give two days same service for oxen-rich farmer mostly. And also, *higni* practiced according to the agreement between oxen-meager farmers and oxen-rich farmers in kuyu woreda.

Kitira: - it is renting one or two oxen by grain transactions. The amount of grain paid for each of the oxen is averagely ranged from 175kg to 300kg per oxen annually, based on two

side agreement. As reported, most of oxen- meager farmers use this traditional system to access to the required oxen labor for their farm land.

Makanajo: - it is another traditional means to access to oxen in the study area. This is the deal between oxen deficit farmers each having only one ox, and or between farmers having one extra ox, and or between farmers having only one ox and one extra ox to use turn by turn based on their agreement in the study area.

G. Practice of the farmers to alters/reduce unavailability of farming labor that causes crop failure in the study area.

Farming labor unavailability was another factor that caused crop production failure in the kuyu woreda. In order to escape this problem, the crop producers of the study area were used different traditional team work coping strategies. Some of this teamwork includes *Gabare* , *Dabo*, *Wanfala*, *Kira* and *sijalle* as locally named by Afan Oromo. *Dabo* ,*wanfala* and *sijalle* traditional teamwork of the study area were discussed earlier as it solves the unavailability of farming labor in the study area.

Gabare: - This traditional system involves a direct hiring of cultivator's labor from poor family through grain transaction. The amounts of grain paid for the cultivator's labor vary between 250kg to 350kg per year based on the agreement between laborer and employer. The researcher found that taking *gabare* is the most widely used to fill the gap of the farming labor deficit in the study area.

Kira: - it is direct hiring of daily laborer from poor family by money. The amount of money paid for these laborers is varying between 20 birr to 40 birr per day based on the personal agreement between laborer and employer. As the researcher informed, daily laborer hired to finish or accelerate farming activities like farming, weeding, harvesting and threshing.

H. Practice of the farmers to alter/ reduce the impact of the farming input shortage on crop production in the study area

Already, it was identified that farming input, particularly fertilizer inadequacy caused crop production failure in the study area. In order to escape from the problem, crop producers made farm land fertile through compost, cow dung, burying weeds in farm land and threshing crop in farm land. As reported, crop producers used it, especially for infertile farm land to increase soil fertility in thinking to harvest good crop.

Generally, the problem focused household coping strategies discussed above was summarized in the table 20 below.

Table 19. Demonstrating the summary of the problem focused coping strategies practiced by farmers of kuyu woreda

Source of crop production failure in the study area	Identified coping strategies to alter/reduce source of crop production failure for crop production success in the study area.
Extreme temperature	-Covering land by tree and Praying for <i>waqa</i> (god)
Extreme rainfall	-Covering land by tree, Building water ponds for irrigation, Harvesting crop on time, Praying for <i>waqa</i> (god) and Sowing short growing crops
Drought	-Covering land by tree, Building water ponds for irrigation, Sowing short growing crops, Using river water and Praying for <i>waqa</i> (god)
Frost	-Cease to move in the cropped land
Hail storm	-Conserving few tree in the cropped land and Building canal in the cropped land.so ,hail drained out
Flood storm	-Tracing ,Tree planting, Contour plough, <i>Kokobi</i> (in Oromo language) and <i>Boyi</i> (in Oromo language)
weeds	-Intensive hand weeding, Herbicides, <i>Garagalchu</i> (in Oromo language), <i>Sirribisusu</i> (in Oromo language) and <i>Gulgalu</i> (in Oromo language)
pests	-Pesticide
Draft animals	- <i>Sijalle</i> , <i>Dabo</i> , <i>Wanfala</i> , <i>Higni</i> , <i>Kitira</i> , and <i>Makanajo</i> in Oromo language
Farming labor	- <i>Gabare</i> , <i>Dabo</i> , <i>Wanfala</i> , <i>Kira</i> , and <i>sijalle</i> in Oromo language
Farming inputs	-compost, cow dung, burying weeds in farm land, and threshing crop in farm land

Source: Field survey, 2013

4.3.2. Emotional focused coping strategies

Emotional focused coping strategies are smoothing the stress by using different coping technique at household level. In this study, emotional focused coping strategies are smoothing stress of crop production failure in the study area. As already discussed earlier, crop producers of the study area were faced crop production failure. Thus, attempts were made to identify key emotional focused coping strategies that believed to smooth stress of crop production failure through FGD members, key informants and most dominantly household surveys in the study area. So, the main effort of the researcher in this topic is to differentiate main existing household emotional focused coping strategy used to smooth the stress of crop production failure in the study area. Likely, the main coping strategies identified in kuyu woreda were liquidity, hedging, selling fire wood, engaging in wage labor, reducing amount of food, eating crop reserved for seed, requesting food aid, moving to other area for temporary employment, sending household member to live elsewhere, reducing amount of food for adult and adding for child and borrowing money. Consistently, it is the same with the research conducted in Ghana (Amisah et al, 2007), in Sudan (FAO, 2011) and in Ethiopia (Tenna 2012). Aforementioned identified emotional focused household coping strategies generated from household respondents are considered hereunder.

4.3.2.1. The Proportion of crop production performance to emotional focused coping strategies

To see when to use these identified emotional focused household coping strategies, analyzing proportion of each identified coping strategies to crop production performance (crop failure and success) is found to be essential. Thus, the results in Table 21 indicated that the proportion of crop production failure was higher among households who used liquidity coping strategies (71.4%). About 72.4% of household crop producers who faced crop production failure were among household who used hedging coping strategies. The proportion of crop production failure was higher among households who sell fire wood (64%). The proportion of crop production failure was higher among household who engage in wage labor (56.5%). The proportion of crop production failure was higher among household who reduce amount of food (69.7%). About 63.3% of household crop producers

who faced crop production failure was eating crop reserved for seed. The proportion of crop production failure was higher among household who request food aid (68.9%). The proportion of crop production failure was higher among household who move to other area for temporary employment (72%). The proportion of the household who send household member to live everywhere (30.8%) and reducing amount of food for adult to feed the child (49.1%) was low among the household who faced crop production failure. The proportion of the household crop producer who borrows money was high among household (62.3%) who faced crop production failure.

The chi-square and likelihood Ratio (LR) test results presented in table 21 were used to test whether or not there was a systematic association between crop production performance and each household coping strategy. These tests revealed that except hedging, sale fire wood, reduce amount of food, request food aid and move to other area for temporary employment , all other household coping strategies showed statistically a significant relationship with crop production performance in the study area. This all figure indicate that most household crop producers used these identified household emotional focused coping strategies during crop production failure in the kuyu woreda. See table below.

Table 20 The proportion of crop production performance to emotional focused coping strategies in kuyu woreda

Coping strategies		Performance of crop production in kuyu woreda		Pearson chi-square	LR
		Crop failure%	Crop success%		
Liquidity	No	70.4	29.6	.918 ^a	.918
	yes	71.4	28.6	(.011)	(.011)
Hedging	No	60.0	40.0	.673 ^a	.637
	yes	72.4	27.6	(.412)	(.425)
Sale fire wood	No	73.6	26.4	.835 ^a	.813
	Yes	64.0	36.0	(.361)	(.367)
Engage in wag labor	No	84.3	15.7	9.098 ^a	9.287
	Yes	56.5	43.5	(.003)	(.002)
Reduce amount of food	No	74.2	25.8	208 ^a	.210
	Yes	69.7	30.3	(.649)	(.647)
Eat crop reserved for seed	No	79.2	20.8	2.986 ^a	3.019
	Yes	63.3	36.7	(.084)	(.082)
Request food aid	No	78.3	21.7	.746 ^a	.776
	Yes	68.9	31.1	(.388)	(.378)
Move to other area for temporary employment	No	70.8	29.2	.012 ^a	.012
	yes	72.0	28.0	(.912)	(.912)
Send household member to live everywhere	No	77.4	22.6	11.912 ^a	10.717
	yes	30.8	69.2	(.001)	(.001)
reducing amount of food for adult and adding for child	No	100	0	30.058 ^a	40.356
	yes	49.1	50.9	(.000)	(.000)
Borrow money	No	92.9	7.1	9.046 ^a	10.75
	Yes	62.3	37.7	(.003)	(.001)

Source: Field survey, 2013

4.3.2.2. Key emotional focused household coping strategies

As was described in the previous sections, farmers in the study area faced crop production failure. Thus, it was not questionable to find emotional focused coping strategies that enable the crop producers to smooth stress of crop production failure in the study area. Attempts were made to identify the most often employed emotional focused coping strategies through household surveys. Accordingly, more than 50% of household respondents in each of agro-climatic zone (dega, woinadega and kola) were fingered for each of hedging, liquidity, request for food aid, borrowing money, and reducing amount of food emotional focused household coping strategies as well known crop production failure stress smoothing throughout agro-climatic setup of the study area in general (table 22). This indicated that these household emotional focused coping strategies were used across agro-climatic setup of the study area to smooth stress of crop production failure. Specifically, as illustrated in table 22, the usability of some emotional focused coping strategies identified in the study area was varied across agro-climatic zone of the study area as discussed here under.

Differently, in dega agro-climatic setup, about 55% of the household respondents were voted for engaging in wage labor that followed by 50% of eating crop reserved for seed to smooth crop production failure stress in the area (table 22). Except aforementioned household coping strategies and already identified dominant households coping strategies practiced across agro-climatic zone of kuyu woreda(hedging, liquidity, request for food aid, borrowing money, and reducing amount of food) , each of household emotional focused coping strategies summarized in table 22 was used by less than 50% of household respondents. This figure indicate that more than 50%of dega crop producers were used hedging, borrowing money, requesting food aid, reducing amount of food, liquidity, engaging in wage labor, and eating crop reserved for seed to smooth crop production failure stress in dega agro-climatic setup of the study area.

Whereas in woinadega agro-climatic zone of the study area, uniquely, about 66.7% of the sampled households were voted for restricting consumption of adult to feed child to smooth crop production failure in the study area. This indicate that, in addition to household emotional focused coping strategies practiced (hedging, liquidity, request for food aid,

borrowing money, and reducing amount of food) across each of agro-climatic setup of the study area, restricting consumption of adult to feed the child coping strategies was used by most of crop producers of woinadega agro-climatic zone. The rest of emotional focused coping strategies summarized in the table 22 were voted by less than 50% of sampled household in woinadega agro-climatic zone. This means, these coping strategies were not dominantly used to smooth crop production failure stress in the woinadega agro climatic zone.

Different from other agro-climatic zone of the study area, about 50% of the sampled households were voted for moving to other area for temporary employment and also 50% for selling of fire wood to smooth crop production failure in the kola agro-climatic zone of the study area. This figure indicated that they have used these coping strategies to smooth crop production failure stress most dominantly. With the exception of aforementioned household coping strategies and identified dominant households coping strategies practiced across agro-climatic zone of kuyu woreda(hedging, liquidity, request for food aid, borrowing money, and reducing amount of food) , households coping strategies summarized in the table 22 were used by less than 50% of household respondents in kola agro-climatic zone of the study area.

Table 21 Displaying the key emotional focused coping strategies practiced by the farmers of the kuyu woreda to smooth crop production failures.

Emotional focused coping strategies	Dega		Woinadega		kola		total	
	N	%	N	%	N	%	N	%
Liquidity	23	57.5	40	95.2	10	55.6	83	83
Hedging	37	92.5	37	88.1	15	83.3	89	89
Sale fire wood	10	25	6	14.5	9	50	25	25
Engage in wage labor	22	55	18	42.9	8	44.4	48	48
Reduce amount of food	28	70	30	71.4	10	55.6	68	68
Borrow money	35	87.5	22	52.4	12	66.7	69	69
Eat crop reserved for seed	20	50	25	59.5	6	33.3	51	51
Request for food aid	35	87.5	29	69	11	61.1	75	75
Move to other area for temporary employment.	8	20	9	21.4	9	50	26	26
Migrate to other area permanently	6	15	6	14.3	2	11.1	14	14
Migrate to other area temporary	12	30	6	19	3	16.7	23	23
Send household member to live everywhere.	3	7.5	4	9.5	6	33.3	13	13
Restrict consumption of adult, so child can eat	19	47.5	28	66.7	11	61.1	58	58

Source: Field survey, 2013

CHAPTER FIVE

5. Conclusion and recommendation

5.1. Conclusion

The following conclusions can be drawn from the present study on the household coping strategies against crop production failure in the kuyu woreda. Accordingly, in this study area, the level of crop production failure was high. For this high level of crop production failure, the researcher was able to reach on number of indicators. Thus, 1st low level of household satisfaction to crop production, 2nd crop produced/harvested below expectation of peasants, 3rd aggregate of household meeting crop failure and 4th declining of crop production in kuyu woreda were identified to indicate the presence of crop production failure in the kuyu woreda.

It was already identified that biophysical and socio-economic factors like temperature, rainfall, drought, hailstorm, frost storm, pests, weeds, flood, unavailability of farming labor, unavailability of draft animals and farming inputs were causing crop production failure in the kuyu woreda. For better understanding, the Kruskal Wallis statistic was calculated to determine whether there was any statistically significant difference for each of identified key biophysical and socio-economic factors on causing crop production failure throughout dega, woinadega and kola agro-climatic setup of the kuyu woreda. Accordingly, except flooding, all factors aforementioned were not statistically significance difference among dega, woinadega and kola agro-climatic setup in causing crop production failure in the kuyu woreda. In any of agro-climatic zone of kuyu woreda, these identified factors were causing crop production failure currently. Generally, temperature, rainfall, drought, hailstorm, frost storm, pests, weeds, flood, shortage of farming labor, shortage of draft animals and farming inputs were causing crop production failure in the kuyu woreda.

Coping strategies household used to cope with crop production failure were organized to problem focused and emotional focused coping strategies for this study. Accordingly, problem focused coping strategies are managing/altering each of aforementioned biophysical

and socio-economic factors that causes crop production failure at farm level to found crop success in the study area by using number of traditional coping strategies. Whereas emotional focused household coping strategies are smoothing stress of crop production failure at household level. Concerning problem focused household coping strategies; crop producers took different coping strategies according to each of the biophysical and socio-economic factors the caused crop production failure in the study area (Table 19). Vis-à-vis of emotional focused household coping strategies, crop producers were taking different measure to smooth stress of crop production failure. These coping strategies were liquidity ,hedging, sale fire wood, engage in wage labor, reduce amount of food, borrow money, eat crop reserved for seed, request for food aid, move to other area for temporary employment, migrate to other area permanently, migrate to other area temporary, send household member to live everywhere and restrict consumption of adult, so child can eat. The proportion of the crop production failure were high among household who used above listed emotional focused coping strategies except household who used to cope crop failure stress by sending household member to live everywhere and reducing amount of food for adult to feed the child in the study area. Crop producers in each of agro-climatic zone (dega, woinadega and kola) were used hedging, liquidity, request for food aid, borrowing money, and reducing amount of food emotional focused household coping strategies dominantly to cope crop production failure stress in the study area in general.

5.2. Recommendation

The following points are recommended for the future based on the researcher understanding from whole section of the study.

- Surveys for this study reveal that the level of crop production failure was high in kuyu woreda. But as MoFED (2006), report indicated, north shoa zone (kuyu woreda is located in) is identified as crops growth corridor for its comparative advantages. Therefore, great attention should be given for this woreda to enhance crop production as vital as expected.
- The discussion in the preceding sections indicates that crop producers of the kuyu woreda were facing crop production failure due to drought, extreme temperature, flooding, hail storm, frost storm and rainfall extreme. It is clear that these factors are weather extremes. Thus, crop producers should access to local based information about these weather extremes through mobile SMS, radio and the like on the time necessary.
- The study indicates that weeds and pests were causing crop production failure in the kuyu woreda. Hence, attempt should be made to access the crop producers to pesticide, herbicide and to any other managing system by nearby concerned body.
- In this research, it was indicated that most common farming input like high yielding variety crops and fertilizer was inaccessible to crop producers due to low buying capacity of the farmer, delaying of farming inputs at time it required for farming activities and low delivery of farming inputs. Thus, crop production was failed. Therefore, the woreda's agricultural office should pay attention on the provision of these farming inputs on time required with amount desired.
- It was reached that the kuyu woreda's farmers have number of traditional knowledge to cope with crop production failure. Fore examples, to overcome problem related with weeds the crop producers' use intensive hand weeding, *Garagalchu* (in Oromo language), *Sirribsisu* (in Oromo language) and *Gulgalu* (in Oromo language).

Concerning with shortage of the draft animals, the crop producers' access to animals' power through *Sijalle*, *Dabo*, *Wanfala*, *Higni*, *Kitira*, and *Makanajo* in Oromo language. And also if the farmers faces shortage of farming labor they access to the labor through *Gabare*, *Dabo*, *Wanfala*, *Kira*, and *sijalle* in Oromo language. In case they face shortage of fertilizers, they increase the fertility of their farm land through making compost, cow dung, burying weeds in farm land, and threshing crop in farm land. Therefore, any concerned bodies should recognize and encourage this best traditional knowledge.

- Finally, the detail of how, why, when biophysical and socio-economic factors that affect crop production in the kuyu woreda was not studied as it was not scope of this study. So, further study should be carried out regarding aforementioned for further clarification.

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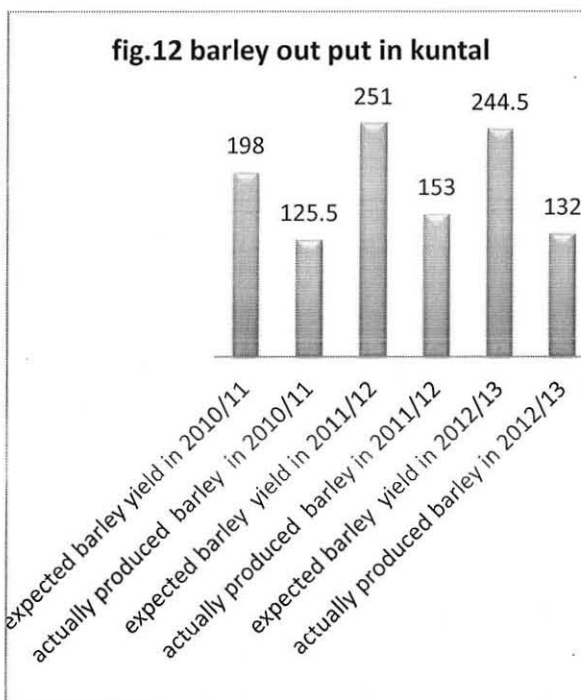
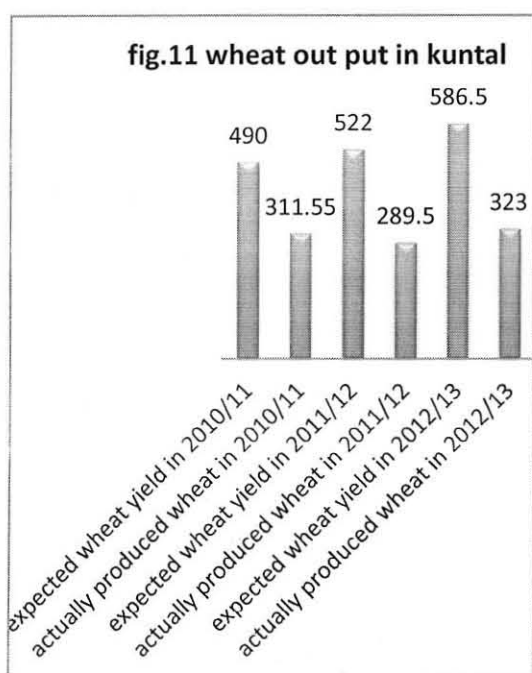
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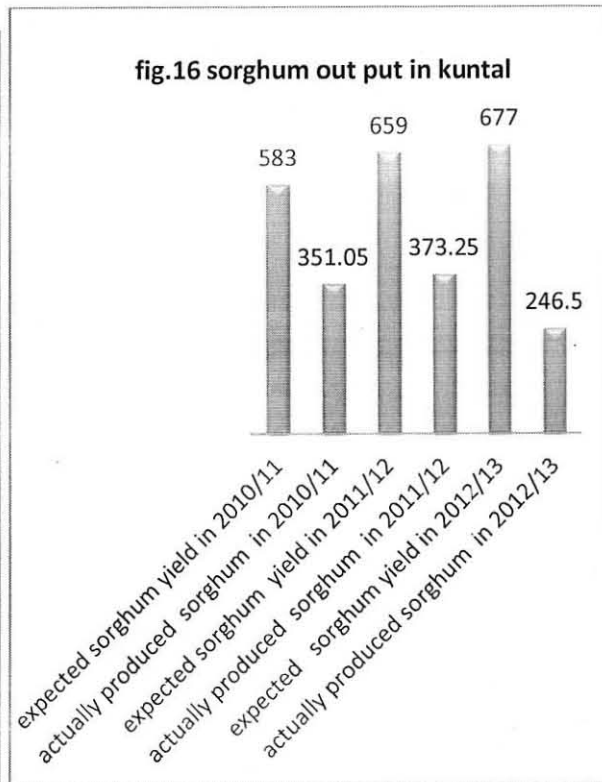
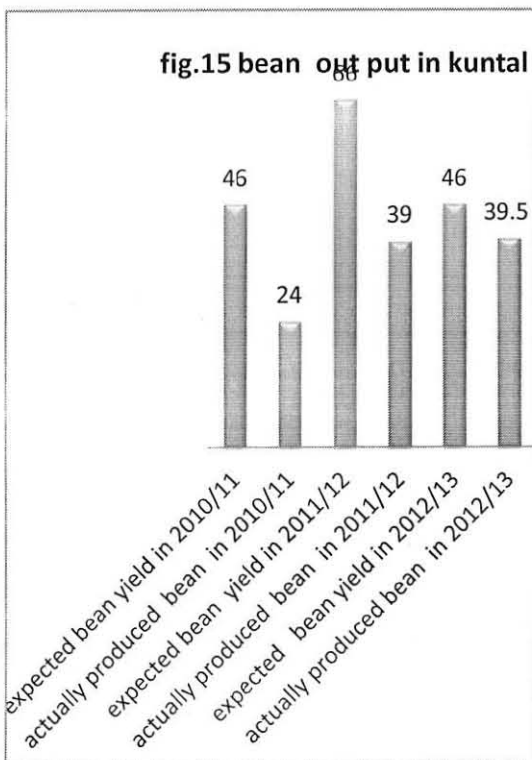
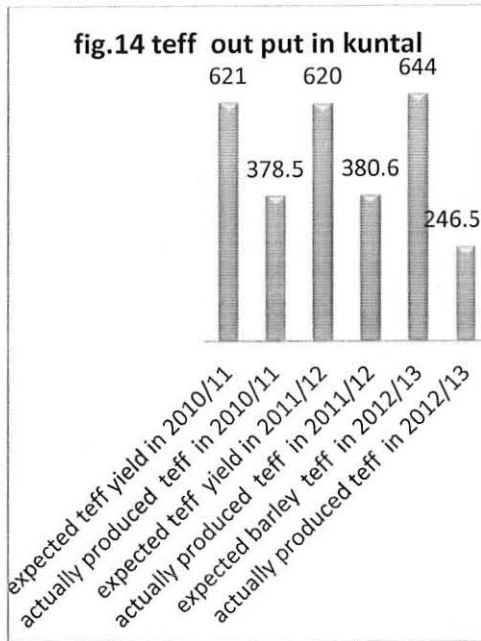
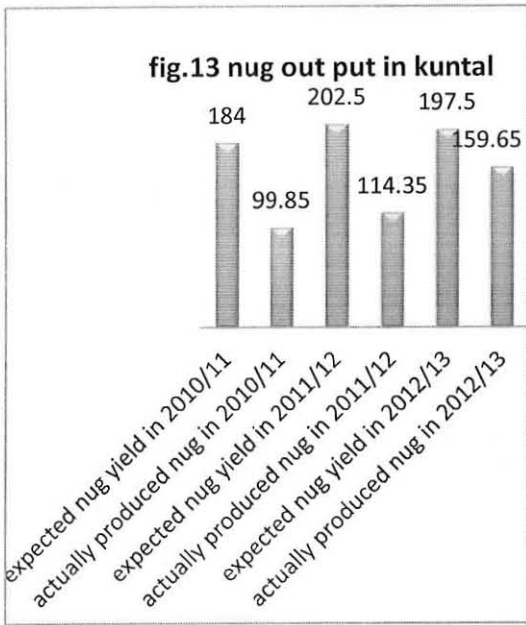
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Annex I

Data generated from the household respondents in 2013 indicate that farmers harvested crop below their expectation in kuyu woreda as presented below.





Annex II

Household survey questionnaires

Household coping strategies against crop production failure in kuyu woreda, North shoa, Oromia regional state, Ethiopia

DEAR RESPONDENTS!

This is to politely request your cooperation to fill the questionnaire as detail as provided; I would like also to insure you that the personal data you will provide will be kept confidential and will not be used for other purpose other than for the intended thesis research.

Questionnaire No ___ Date ___, ___, 2005 E.C Kebele _____

Enumerator _____, _____, occupation _____ sign _____

I Background

1. Family information

Family members	sex	Age	Education level	Main source of income	Main occupation
.					
.					
.					

II Farm land related question

2. Do you own farm land?

[1] Yes [2] No

3. What is the total area of your cultivated land? _____ (timad)

4. Are you cultivating all your farm land every year since 1998 E.C?

[1] Yes [2] No If the answer is No, why? _____

5. What happened to your farm land holding size since 1998 E.C?

[1] Increasing [2] Decreasing [3] Increasing /Decreasing [4] No change

6. Based on question number 5, please fill the following table. (**Hint.** Dear enumerator, all farm land size at hand of respondents owned by any means in any time should be included)

Year of farm land endowments	Size of farm land (timad) at hand	Reason and source of farm size increment
Year of farm land loosed	Size of farm land (timad) at hand	Reason for farm land loosing

III Crop production performance related question

7. If you compare crop production of one year to another, what do you think is general crop production performance since 1998 E.C? [1]Success [2] Failure
8. If the answer for the question number 7 is **failure**, what happen to your family?

9. Based on question number 7 fill the following table

Year of crop success	Farm size	Amount of Crop produced in (kuntal)	Major crops	Reason for crop production success
Year of crop failure	Farm size	Amount of crop produced in (kuntal)	Major crops	Reason for crop production failure

10. Have you ever met to crop failure?

[1] Yes [2] No

11. What do you think is the major cause for crop failure?

Please specify the main reason by severity level as nil, moderate and severe .put in the box the severity level as 0=nil 1=moderate and 2=sever, in the box	Drought		Lack of draft animals	
	Flood storm		Lack of labor	
	Rain fall problem		Lack of farming inputs	
	Temperature problem		land security	
	Hail storm		-other	
	Frost		-	
	Pest pressure		-	
	weeds			

12. Is the response of the all the crop the same for any crisis?

[1] Yes [2] No

13. If the answer for question number12 is **No** , fill the following table

Major crops	Most frequently failed crops in order	Main causes for crop failure in order
1.Teff	1 st	1 st _____ 2 nd _____ 3 rd _____
2.Wheat	2 nd	1 st _____ 2 nd _____ 3 rd _____
3.Barley	3 rd	1 st _____ 2 nd _____ 3 rd _____
4.Nug	4 th	1 st _____ 2 nd _____ 3 rd _____
5.Sorghum	5 th	1 st _____ 2 nd _____ 3 rd _____
6.	6 th	

14. What happen to crop production since 1998 E.C?

[1] Increasing [2] Decreasing [3] Increased/decreased [4] Stagnant

15. What do you expect about changing of crop production in coming 8 year?

[1] Increasing [2] decreasing [3] No change

16. In general, how do you rate your level of satisfaction about crop production?

[1] Very much unsatisfied [2] Unsatisfied [3] Neither satisfied nor unsatisfied

[4] Satisfied [5] Very much satisfied

17. Please tell me the cultivated land size and crop production for given year

Major crops	2005 E.C				2004 E.C				2003 E.C				2002 E.C			
	Farm land (timad)		Crop production (kuntal)		Farm land (timad)		Crop production (kuntal)		Farm land (timad)		Crop production (kuntal)		Farm land (timad)		Crop production (kuntal)	
	01	02	03	04	01	02	03	04	01	02	03	04	01	02	03	04
1. wheat																
2. barley																
3. nug																
4. sorghum																
5. teff																
6.																

On the above table use

01 = potential of farm land (timad) *and* **03 = expected total crop production (kuntal)**

02 = actually cultivated land (timad) **04 = observed total crop production (kuntal)**

IV Biophysical related question

18. How do you evaluate the sufficiency of the rainfall and temperature for crop production of your area? To answer the question, please use the following table

Write if excess=1, sufficient=2, insufficient=3, and very low=4 in shaded box		specify year	Indicator of its presence
	Temperature		
	Rainfall		

Is there any record of crop production failure in your area since 1998 E.C, due to the following variables	1,yes 2,No	Rank order based on the stress on crop	How often it happened in each Year? Write if Always=1 rarely=2, never=3	In what level you found these variables. write if Low =0 Medium =1 High =2	Specify year
Variables					
1.Temperature problem		1 st			
2.Rainfall problem		2 nd			
3.Drought		3 rd			
4.Flood storm		4 th			
5.Hail storm		5 th			
6.Frost		6 th			
7.crop pests		7 th			
8.weeds		8 th			

19. If the answer for question Number 19 is yes, fill the following box

Affected crop	Cultivated area(timad)	Total production (local unit)		Causes of crop failure	Year of crop failure
		expected	actual		
Wheat					
Barley					
Nug					
Sorghum					
Teff					

20. If the answer of question number 19 is yes, what do you expect the influence of these elements on crop production in the future?

[1] Increase [2] Decrease [3] No change

21. How do you identify the presence of the following problem?

Variables	Indicators	Specify year
1.Temperature problem		
2.Rainfall problem		
3.Drought		
4.Flood storm		
5.Hail storm		
6.Frost		

7.Pest pressure		
8.weeds		

V Socio-economic related question

22. How was the availability of the following element since 1998 E.C?

Elements	Use 0=adequate 1=sometimes inadequate 2=always inadequate	Reason for each	Specify year of event
1.Draft animals			
2.Farming labor			
3.Farming inputs			

23. Do you ever face your crop reduced/affected by any of the listed factor since 1998E.C?

Variables	1 yes	Rank order according to its stress on crop	Specify year
	2 No		
1.Lack of draft animals		1 st	
2.Lack of farming labor		2 nd	
3.Lack of farming input		3 rd	
4.Land security problem		4 th	

24. If the answer of question Number 24 is yes, fill the following box

Crop affected	Cultivated area (timad)	Total production (local unit)		Identified causes/reason	Locate year
		expected	actual		
Wheat					
Barley					
Nug					
Sorghum					
Teff					

25. If the answer of question number 24 is yes, what do you expect the influence of these elements on crop production in the future?

- [1] Increase [2] Decrease [3] No change

26. Do you have enough labor and draft animals for your farm? please fill the following table

variables	In 2005 E.C amount				In 2004 E.C amount				In 2003 E.C amount			
	Required		Available		Required		Available		Required		Available	
	Hired	Family owned	Hired	Family owned	Hired	Family owned	Hired	Family owned	Hired	Family owned	Hired	Family owned
Farm labor												
Draft animals												

27. What type of rights do you have on your land?

- [1] Use for any purpose [2] Use for specified purpose [3] Right to sell
 [4] Right to transfer [5] Right to lease out

28. How long do you think all the farm land you have will remain yours?

- [1] Forever [2] until next redistribution [3] Until I pass it to my children [4] I don't know

29. Do you use farming technology every year since 1998 E.C.?

- [1] Yes [2] No

- a. If the answer is No, why? _____
 b. If the answer is yes, list them? _____

VI Coping strategies related question

30. In case you face the following problem, what coping strategies you follow?

- a. Temperature related problem _____
 b. Rain fall related problem _____
 c. Drought _____
 c. Flood storm _____
 d. Hail storm _____
 e. Frost _____
 f. Pest pressure _____
 g. Weeds _____
 h. Lack of draft animals _____

- i. Shortage of farming labor _____
- j. Shortage of farming input _____

31. What did you do in case you face crop failure?

Coping option	1 yes 2 No	If the answer is yes, for which severity level of problem you use coping strategies? Put 1 for less, 2 for moderate, 3 for severe crop failure.
<u>Problem focused coping</u> 1. Taking direct action on the stress----- 2. Seeking assistance to reduce stress----- 3. Planning for stress----- 4.-----		
<u>Emotional focused coping</u> 1. Liquidity ----- 2. Hedging ----- 3. Sale fire wood----- 4. Engage in wage labor----- 5. Reduce amount of food----- 6. Borrow money----- 7. Eat crop reserved for seed----- 8. Request for food aid----- 9. Move to other area for temporary employment. 10. Migrate to other area permanently----- 11. Migrate to other area temporary ----- 12. Send household member to live everywhere. 13. Restrict consumption of adult, so child can eat. 14.-----		

THANK YOU!!