

# Addis Ababa University School of Graduate Studies College of Development Studies

The Role of Irrigation Development projects in  
Poverty Alleviation and Food Security Attainment in  
Ethiopia: The case of Small-Holder Irrigation Development projects in  
Fentale Woreda , East Shewa Zone, Oromia Regional State.



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**ADDIS ABABA UNIVERSITY  
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*Title*

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Development Projects in Fentale Woreda, East Shewa  
Zone, Oromia Regional State.*

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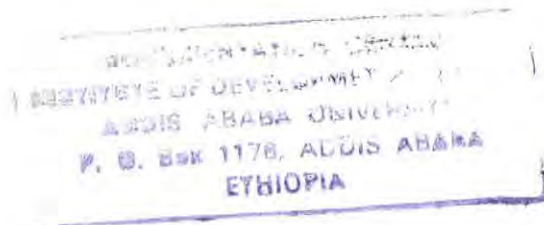
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## Acronyms

ADLI	Agricultural Development Led Industrialization
CSA	Central Statistical Authority / Agency
TCA	Technical centre for Agricultural and Rural cooperation
DA	Development Agent
EVDSA	Ethiopian Valleys Development Study Authority
FAO	Food and Agriculture Organization of United Nations
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focus Group Discussions
FIDP	Fentale Irrigation Development
FSS	Forum for Social Studies
GDP	Gross Domestic Product
GNP	Gross National Product
HA	Hectare
HH	Household
IDP	Irrigation Development Project
IFPRI	International Food Policy Research Institute
IPTRID	International Program For Technology and research in Irrigation Drainage
IWUA	Irrigation Water user Association
KII	Key Informant Interview
LS	Livestock
M.A.S.I	Meter above sea level
MDGS	Millennium Development Goal's

MEDaC	Ministry of Economic Development and Cooperation
MFI	Micro-Finance Institution
MoFED	Ministry of Finance and Economic Development
MoWR	Ministry of Water Resource
NGO	Non-Governmental Organization
OIDA	Oromia Irrigation Development Authority
OWRDB	Oromia Water Resource Development Bureau
OWWDSE	Oromia Water Works Design and Supervision Enterprise
PA	Peasant Association
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
SSSIP	Sara-weba small-scale irrigation project
SDPRP	Sustainable Development and Poverty Reduction Program
UNDP	United Nation Development Program
WB	World Bank
WoFED	Woreda Office of Finance and Economic Development

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## **ABSTRACT**

*This study aims to examine the role of irrigation development projects in poverty alleviation food security attainment in Fentale woreda of Oromia Region. Its main objective being the study of effect of irrigated agriculture and how the out comes are making irrigators are better – off than non- irrigators in terms of access to sufficient food, household income, increased on-farm employment opportunity, and overall resource bases. The study also looks at the major factors that affect the irrigation development in the study area in order to understand how these factors may limit the role of irrigation to improve the livelihoods of the community in the area.*

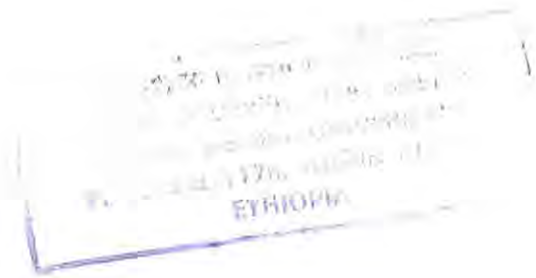
*To serve these objectives, household survey, focus group discussion, key informant interview, and field observation were used to collect data at community, household and individual level. Annual household production, agricultural intensity, cropping pattern, income generated, asset owned and other socio-economic data were collected using structured questionnaire with the help of locally recruited and semi-trained enumerators. Back ground information of the study area, beneficiaries, irrigation potential and other related data were gathered from concerned government line departments and institutions operating in the zone. The analysis is undertaken using statistical tools such average, percentage, and standard deviation, for the quantitative information. SPSS software version 17 was used*

*The Findings of the study high lights the positive effects of irrigated agriculture in that, irrigation helps irrigators to increase agricultural production, generate more household income, possess more productive and non-productive assets, enhanced on-farm employment opportunity, and improved resources for education and health care services.*

*Based on the findings of the study, the researcher recommends that to improve the performance of smallholder irrigation project, a concentrated effort has to be made for the development market promotions and reasonable transportation services that can enable the farmers to sell their products in farther market places where there is fair price. Furthermore, practical effort is also considered necessary to solve the problem of credit rendering institutions and provision of input supply to enhance effectiveness of the small holder irrigation project in the study area.*

# Chapter 1 : INTRODUCTION

## 1.1 Background to the Study



Like any other developing country, agriculture plays significant and decisive role in the social and economic development of Ethiopia. Currently, agriculture is the leading sector in terms of contribution to the overall economic growth and development by supplying food for domestic consumption and raw materials for the domestic manufacturing industries. Therefore, the national economy is highly linked with the performance of the agriculture sector. Accordingly, agriculture dominates the Ethiopian economy accounting for 80% of national employment, 41% of gross domestic product (GDP) and 70% of merchandise exports. More than 80% of these agricultural outputs are generated by subsistence farming system (MoFED, 2008a).

It is common knowledge that the subsistence farming system is dominated by smallholder farmers who own small plots of land. Smallholder farmers held only 10 percent of the total land area of the country (IFPRI/CSA, 2006). However, their production system contributes 90 percent of the total agricultural output and covers 95 percent of total cultivated area under crop (MEDaC, 1999 cited in Belieneh, 2003).

As various studies have indicated (Tewodros, 2000; Dejene, 1995 as cited in Kassa, 2009) rain fed agriculture is the dominant form of farming in Ethiopia and its production fluctuates in association with the amount and distribution of rainfall. The agricultural production function of the country is known to have some distinct features. These include, among others, risks and uncertainties caused by the vagaries of nature, longer gestation period compared to manufacturing industry, nature-dictated sequential pattern of production ( land preparation, planting, weeding, and harvesting), seasonality looms, and time sensitive operations( *ibid*). Indeed, these processes and the existing high level of variations of rainfall are making the sector to perform at a low level.

This low performance level of agricultural sector together with rapid population growth rate of the country directly affects food security and overall livelihood improvements of the society. Currently, about 52% of the populations in 214 districts of the country are food insecure (Daniel, 2007 as cited in Kassa, 2009). Moreover, as United Nations Statistics Division reports (2009), the total populations below national poverty line in Ethiopia were 44.2 in 2000. When we come to rural areas, the populations below poverty line were 45% in the same year. Consequently, in order to increase the food production and there by improve the food security and income / consumption poverty situations of the country the government needs to search alternatives to support rained agriculture. As a result the Ethiopian government has responded to drought and famine through promoting and construction of irrigation infrastructure since the mid 1980's, aimed at increasing agriculture production (Awulachew et al, 2007).

As stated by FAO (1997) irrigated agriculture is one of the critical components of world food production, which has contributed significantly to maintaining world food security and to the reduction of rural poverty. Moreover, investment in irrigation is important for national food supply and food security (Aart, 1993 as cited in Kassa, 2009). Different development researchers and scholars like( Hussein, 2004, Bhattarai et al., 2002, and Dessalegn, 1999) further defined the purpose of irrigation in raising production, lowering the risk of crop failure and generating higher and year round farm and non- farm employment. In addition to increasing crop production and family incomes, improved irrigation access significantly contributes to rural poverty reduction through improved employment and livelihoods within a region (Chambers 1988; Barker et al., 2000).

The current government of Ethiopia has set an agricultural strategy for accelerating agricultural development in its Agricultural led Industrialization Strategy (ADLI). The strategy gives attention to the smallholder farmers. In both government policy documents namely Sustainable Development and Poverty Reduction Program (SDPRP) and Plan for Accelerated and Sustainable to End Poverty (PASDEP) the government has pointed out irrigation as the Key

instrument to achieve accelerated agricultural development through supporting small-scale irrigation and increase area under irrigation through multi-purpose dams and better use of ground water (MoFED, 2002; MoFED, 2006). In line with this, the government has also identified irrigation as an important tool and as a corner-stone for food security and poverty reduction (MoWR, 2002; MoFED, 2006). So in order to improve and sustain food security at the national level and also to improve the food security and livelihoods of the rural population, the government policy has recommended the introduction of irrigation project. It is widely accepted that in country the development of irrigation project is indispensable in order to reduce dependency on rain fed agriculture and thereby increase the opportunities for year round agricultural production.

Fentale woreda is one of the eleven woreda's of East Shewa zone in Oromia Regional State situated about 194 kms from Addis Ababa and it exhibits arid and semi-arid climate. The main livelihood practice of the community is agriculture (WoFED, 2008). Due to the pastoral and agro-pastoral character of the community, both crop production and livestock rearing are evenly practiced in the woreda.

In the woreda, the existing irrigated agriculture is dominantly small-holder irrigation schemes there are six modern irrigation schemes and 10 traditional irrigation schemes having 9242 beneficiary households as per woreda pastoralist office, irrigation unit expertise. It is mainly performed in 14 PA's of the woreda, currently, covering total area of about 7242 hectares. The same source also indicated that of the total area under irrigation, 6000 hectare (82.8 %) is under modern irrigation system and the number of beneficiaries in this category is estimated about 8000 households. On the other hand, 1242 ha of land is used for traditional irrigation system.

Among the modern irrigation projects in the woreda, Fentale Large Scale Farmer Managed Irrigation Development Project (FIDP) and Sara-weba Small Scale Irrigation Development Project (SSSIDP) are the main modern irrigation projects implemented in Oromia Regional State, particularly in Fentale woreda.

However, so far, there was no study under taken on socio-economic, as well as other factor effects of these irrigation development projects of Fentale woreda, Oromia Regional State.

As some researchers indicated (Seid, 2002; Nigussie, 2002) the success of irrigation in ensuring food security and improving rural welfare has been impressive. As a result, irrigation development projects have many positive socio-economic effects while some have adverse effects.

As chambers (1998) indicated irrigation development in various regions has displaced marginal and poor farmers and have made them landless laborers and ultimately driven them to become urban dwellers and increased incidence of water-borne diseases in irrigation commands

Therefore, in this study an attempt has been made to examine the role of irrigation development projects in poverty alleviation and food security attainment at household level in Fentale woreda, Oromia Regional State.

## **1.2 Statement of The problem and Justification**

Although food insecurity and poverty are conceptually and empirically distinct, the overlap between the two is greater in Ethiopia than in most countries (Stephen.d, 2000). The basic distinction between poverty and food insecurity is the latter's focuses on instability. While, poverty indices measures headcounts, depth and severity at a point in time (ibid). Food insecurity incorporates vulnerability as a determinant of ill-being. People are food insecure not only because their food consumption level is low, but also because their access to food is variable and unpredictable overtime.

Various literature on the agricultural sector, food insecurity and poverty situation (indexmundi, 2009; MoFED, 2008a; MoFED, 2002; Dessalegn, 2007; Daniel 2007 as cited in Kassa ,2009 ; Eshetu, 2004; MoFED, 2001) stated that the country has suffered from both transitory and

chronic food insecurities. So, the country could still face cereal deficits of up to 6.25 million tons by the year 2016 (MoWR, 2002).

Consequently, poverty remains widespread in country using consumption-based measure of poverty, 38.7 percent of Ethiopians were poor in 2004/2005, implying that 27.5 million peoples were living below the poverty line. Further, this situation is slightly higher in rural areas (39.3 percent) than in urban areas (35.1percent)(MoFED, 2008). The poverty gap index is also estimated at 8.3% while it is 8.5% for rural areas and 7.7% for urban areas (MoFED, 2005).Poverty and food insecurity in country are caused by poor performance of agriculture which are mainly a result of, recurrent rainfall variability both in amount and distributions (MoFED, 2002).

Hence, in Ethiopia in addition to the poor performance of agricultural sector, the accelerated population growth and the disparity in rainfall, due to climate changes, make the production of sufficient food and food security almost impossible ( MoWR,1999). On the other hand the country is gifted with water resources with an estimated annual renewable surface water potential close to 122 billion cubic meters of water and the ground water potential of about 2.6 billion cubic meters (Tesfaye, 2008).The country has also an estimated irrigation potential of 3.4 to 3.7 million hectares of land (Awulachew et al. 2007, EVDSA, 1990). However, of the irrigation potential of the country only about 5% has so far been utilized (ibid).It is also estimated that out of the total annual production of cereals in the country, only about 3% is produced through irrigation (Encyclopedia of earth, 2009).

A number of studies made on water resource sub- sector confirmed that if the countries water resources are developed to provide for irrigation it would be possible to mitigate the effects of rainfall variability and to improve productivity and the challenges of food insecurity (MoWR, 2002). That's why, the implementation of irrigation development project for increased food production and food security is rational,

Irrigation development is a special case of agricultural development (EVDSA, 1990). Farmers can benefit from on small-scale systems and /or on some farmer plots within larger-scale systems because irrigation secures crop productivity against shortfalls or breaks in rain fall, irrigation extends the area under cultivation and brings more farmers in to production, irrigation raises the number of jobs conducted on the land (irrigating, weeding) and provides for secondary job creation (crop marketing, trading) (Ellis, 2005). In addition to increasing crop production and family incomes, improved irrigation access significantly contributes to rural poverty reduction through improved employment and livelihoods within a region (Chambers, 1988; Barker et al., 2000).

Both government policy documents namely, Sustainable Development and Poverty Reduction Program (SDPRP) and Plan for Accelerated and Sustainable to End Poverty (PASDEP) have indicated that the government has pointed out irrigation as one of the key instrument to achieve accelerated agricultural development and thereby enhance improved food security situations at national level (MoFED, 2002; MoFED, 2006).

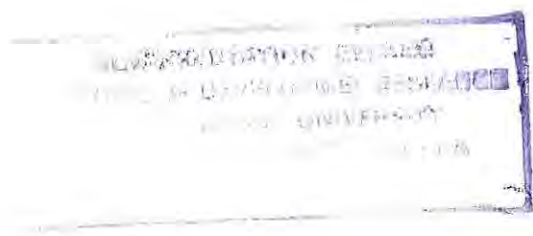
Besides, no study has so far been undertaken in examining the role of irrigation on socio-economic aspects of the community in the study area. Due to wider analytical view, measuring the role of irrigated agriculture in terms of food security only is not enough to show the long term objective that a household expected to seek from this development activity.

Therefore, this study will examine the role of irrigation development projects (IDP) in poverty alleviation and food security attainment at household level in the study area.

### **1.3 General and Specific objectives**

#### **General Objectives**

The general objective of this study is to examine the role of irrigation development projects in poverty alleviation and food security attainment at household level in Fentale woreda, Oromia Region.



### **Specific objectives:**

The study has the following specific objectives

- 1 To assess the food security situation of irrigators and non-irrigators in the study area.
- 2 To examine the role of irrigation development projects in alleviating poverty problems (in terms of consumption and income) in the study area.
- 3 To identify the socio- economic and other factors (in relation to socio-economic aspect) that affects the performance of irrigation development project (IDP) in the study area.
- 4 To sort out the positive and negative effects (in relation to socio-economic aspect) of the irrigation development project (IDP) in the study area.

### **1.4 Research questions**

- 1 What does the food security situation of irrigators and non-irrigators look like after the implementation of IDP in the study area?
- 2 What is the effect of IDP in alleviating poverty (income and/or income) problems at household level in the study area?
- 3 What are the factors (in relation to socio-economic aspects) that affect the performance of irrigation development projects?
- 4 What are the positive and negative effects (in relation to socio-economic) of the IDP in the study area?

## 1.5 Significance of the study

In Ethiopia, most of the lowlands receive very little and erratic rainfall, as a result, subsistence farmers have been suffering from the problem of reliable food supply and deep-rooted poverty (MoWR, 2002). Fentale woreda is one of the chronically food insecure woreda's. Both crop and livestock production were not able to support the food demand of the community and hence the people were forced to rely on food aid (OWRDB, 2009b).

Irrigation has been seen as an option to improve and sustain rural livelihoods by increasing crop production and reduce dependency on rain fed agriculture in drought areas (IPTRID, 2001). Accordingly, in Fentale woreda, Agriculture has to be supported by irrigation as the rainfall distribution is erratic and not promising for usual farming activities. The Oromia Regional Government has intervened in the situation through irrigation based integrated development projects that aimed at improving agricultural production, with a view to realize the objectives of food self-sufficiency and food security (OWRDB, 2009b). Small-holder farmers in the woreda have started small-scale irrigated agriculture using surface water sources from Awash River by employing modern ways (ibid). Intervention of such irrigation projects in such pastoral areas of Fentale plays a greater role in bringing about tangible changes with regard to food security and overall livelihood improvement of the society.

So far, in Fentale woreda there is no study under taken on socio-economic, as well as other factor effects of irrigation development projects of Fentale woreda Oromia Regional State. Therefore, assessing the role of irrigation in food security attainment and poverty alleviating at household level in the area under investigation is crucial and rational because:

- The finding of the study will provide real information on the role of IDP to improve the livelihood of the community in the study area.
- It can be an input to formulate future strategies on irrigation development projects.

Examining the effects of irrigation development on socio-economic condition of the household may also have an important contribution in filling knowledge gap that could be used as a guide by local actors, development agents to formulate area specific and household centered strategies and action plans to improve rural households capacity there by ensure the food security situations and overall livelihood improvements through a sustainable use of irrigation development projects.

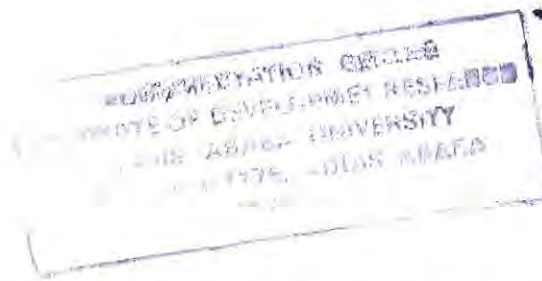
## **1.6 Scope and Limitation of the study**

Since the study focuses on rural farmers, the sample framework includes only farmers from rural kebeles. In order to get the real pictures of the situation the study limited itself on two purposely selected rural kebeles of different projects, to draw a sample of irrigating and non irrigating households.

Measuring of poverty is an important issue but it is complex as defining it. In different literatures, there are different approaches for analyzing poverty and identifying the poor however, given the objectives of this study i.e. the role of irrigation development on enhancing food security and income or consumption poverty, the study focused on the welfare approach of measuring poverty.

## **1.7 Organization of the study report**

This study paper contains six chapters. The first chapter deals with the introduction which contains background to the study, statement of the problem, objectives, significance and limitations of the study. The second chapter tries to review literatures pertinent to the study objectives, definitions of concepts and conceptual framework. Third chapter has been dedicated with the description of the study area the sampled irrigation projects. The fourth Chapter deals with research methodology and research design. Chapter five presents the main findings of the study. Finally chapter six explains the conclusion and recommendations of the study.



## **Chapter 2 : REVIEW OF CONCEPTS, EMPRICAL EVIDENCES CONCEPTUAL AND THEORETICAL FAMEWORK**

### **2.1 Review of Concepts**

For the purpose of this study, the following definitions and concepts of terms are set.

#### **2.1.1 Irrigation**

As (Encyclopedia Encarta, 2009; CSA, 2005) defined irrigation as the act or process of irrigating, or the state of being irrigated, especially, the operation of causing water to flow over lands, for nourishing plants. Moreover, (Ellis, 1996) defined irrigation as: “the use of human technology to increase and to control the supply of water for crop production”. These definitions of irrigation suggests that irrigation is the practice of using water by people to the intended farm land in order to produce crops, especially in dry areas and during periods of inadequate rainfall.

Historically irrigation has originated as a method for improving natural production by improving the productivity of available land and thereby expanding total agricultural production, especially in the arid and semi-arid regions of the world (Bhattarai.et al, 2002). It is agreed that the benefits of irrigation are realized through improvements in agricultural productivity per unit area and overall agricultural production, employment and wages, incomes, consumption, food security and overall socioeconomic welfare. Through these benefits, irrigation water is linked to poverty alleviation both directly and indirectly. Direct linkages operate via localized and household-level effects, and indirect linkages operate via aggregate or sub- national and national-level effects (Ellis, 2000).

According to Ellis (2005), on small –scale systems, and on some farmer plots within larger-scale systems, farmers can be benefited greatly from irrigation. Because:

- Irrigation secures crop productivity against shortfalls or breaks in rain fall;
- By adding more water , irrigation raises crop productivity to profitable levels;
- Irrigation extends the area under cultivation and brings more farmers in to production
- Irrigation raises the number of jobs conducted on the land (irrigating, weeding) and provides for secondary job creation (crop marketing, trading) (ibid).

Ethiopian Valleys Development Study Authority (1996), categorized irrigation schemes in to peasant/ smallholder unit and commercial unit considering mainly the farm management or the principal objective of the farm.

Small holder/peasant irrigation schemes, are large in terms of area but they are made up of many small farms (often less than 2ha) (IPTRID, 2001). They are designed and constructed by government agencies that take over the responsibility for managing the water supply system. Small holder irrigation is similar with “small –scale” or informal irrigation because small farms (often considerably less than 2 ha), privately owned and under the complete control of the farmer with little or no input from external government resources (ibid).

Such private farms have developed where farmers use their own initiative and respond either to their families food needs or to the market.

At Present, small- scale irrigation schemes in Ethiopia take two forms. The first form is traditional small scale irrigation scheme .The second is modern small-scale irrigation schemes irrigating up to 200ha. There is also an intention that small-scale schemes should focus on individual farms producing subsistence food crops. Medium scales produce a mixture of subsistence food and cash crops; and the large-scale schemes could concentrate on cash crops. However, size may not always be a determining factor in the development of irrigation. Small –scale irrigation farmers could participate in the growing of cash crops if there is a ready market out let for their production (EVDSA, 1996)

### **2.1.2 Classification of irrigation schemes**

Irrigation schemes can also be distinguished based on the area irrigated, implementing body, scale of operation, and type of control/ management, but, the consideration of such criteria to draw the line between “large” and “small” scale irrigation varies considerably from country to country. For example, in India an irrigation scheme of 10,000 hectare is small while in Ghana the largest irrigation scheme is 3000 hectare (Smith, 1998). In Ethiopia irrigation scheme is classified as small (up to 200 ha), medium (from 200-3000ha) and large (3000 ha and above) based on the size (FAO, 1994).

### **2.1.3 Food Security / Insecurity**

The concept of food security at household is a recent development of 1980’s. The concept of food security of individuals or household members is even more recent debate. The shift in the concept of food security focused on access to food (the ability to acquire food) as well as on supply (availability) in the household (Maxwell, 2000; Devereux, 2000). The concept of food security involves all aspects of human food system in the household from production, acquisition and asset creation to utilization.

(FAO, 2002) has defined the state of food security as:

*“food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and health life”*. This definition exclusively focuses on four core concepts; sufficiency (defined as the kilocalories required for an active, healthy life), Access to food (through production, purchase, exchange or gift), security (defined as the balance between vulnerability, risk and insurance) and time in countries like Ethiopia food security depends

mainly on a viable and vibrant agriculture by which 85 % of the population derives its livelihood.

It is necessary to have a food security concept defined in the context of Ethiopia, Accordingly, (Degefa, 2005) defined food security in the Ethiopian context as follow:

*“A household can be described as food secure when its livelihood activities allow it to meet its food requirements and other basic needs , either through its own production , or through having opportunities to run own non-farm ventures or to work with some body else”.*

(Getahun, 2003 and Workneh, 2005) are summarized the specific sources of household food security in Ethiopia into five sets of dimensions:

- a. It is related to food production mainly based on crop and livestock.
- b. It is related to cash incomes.
- c. It is related to reserves of food stock or other assets that would possibly be liquidated.
- d. It is related to institutional assistance from formal and mutual basis.
- e. It is related to different forms of remittance.

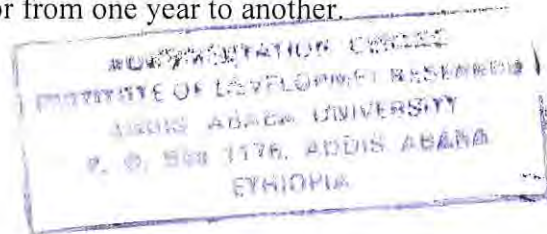
(Devereux, etal. 2000), indicated Four components of the food security status of rural house hold members;

The first one is asset ownership (size and types of productive assets), the second one is income (source of income earning activities and employment), The third component is the availability of active family labor that is able to create incomes and assets, the fourth one is changes in consumption pattern, that is, eating habits and / or creating strategic mix in feeding pattern to stabilize the availability of food, food stocks and income management.

On the contrary, Food insecurity refers to a situation where by a household is not able to feed its members sufficiently, using either its own production or market purchase.

Feeling of being either food secure or food insecure are largely a matter of a household's own perceptions or fears with regard to encountering a food shortage ( Degefa and Tesfaye., 2008). The same source explained that Food insecurity is some times classified based on their persistence to a given area in a certain duration and with negative or positive socioeconomic effects of differing magnitudes; and the two types of food insecurity are: Transitory and chronic. The two types of food insecurity are explained as" transitory and chronic", Chronic food insecurity is a continuous food inadequacy caused by the in ability to acquire food and transitory food insecurity is a temporary decline in a household access to enough food (Eshetu, 2000).

Food insecurity is experienced differently at the household level and at the individual level. The experience differs between adults and children at the individual level while (Degefa, 2005) discusses that a food secure feeling develops for a household when a peasant ensures that he can produce, purchase on market, or obtain food or case in the form of transfer, and that there is little variation in annual food supply at home, or from one year to another.



#### **2.1.4 Poverty**

Poverty is a multi-dimensional concept, extending from low levels of income and consumption to lack of education, poor health and powerlessness (Todaro and Smith, 2009; Tassew, 2004). The first dimension is material deprivation which is measured by an appropriate concept of income or consumption. The second dimension is low capability which is expresses by low achievement in education, health, etc and the third and the fourth dimensions include vulnerability and powerlessness.

Having these definitions of poverty, various literatures (MoFED, 2008b, Tassew, 2004; MoFED, 2002) identified two main approaches of analyzing poverty. These are; the welfare

approach, and the non –welfare approach. However, each approach adopts different ways to define poverty and to identify the poor for the sake of the objectives under investigation i.e. the role of irrigation development projects in food security attainment and poverty alleviation at household level; we are focused on the income /welfare approach of measuring poverty. In the welfare approach, poverty is associated with economic well being according to MoFED(2008a), it assumes that there is a well defined level of standard of living called the “poverty line “below which a person is deemed to be poor. There are three ways of identifying the poor (poverty) in welfare approach (ibid). These are:

- a. The head count Index (incidence of poverty) (Po), it is an index that tells us the proportion of the population for whom consumption/income is less than the predetermined poverty line.
- b. The poverty Gap index (Depth of poverty) (P1), this method provides information regarding how far households are from the poverty line.
- c. Poverty Severity( squared poverty gap) ,this method takes not only the distance separating the poor from the poverty line ( the poverty gap), but also the inequality among the poor, that is a higher weight is placed on those households further away from the poverty line.

## **2.2 Review of Empirical Evidences**

### **2.2.1 Socio-economic Effects of Irrigation Development**

According to (Ellis, 2005) the most important positive effects of irrigation development at household level on small –scale systems, and on some farmer plots within larger-scale systems, would be given as follow:

- a. The increase in production and productivity of agriculture particularly crop production, enables farmers of the area to produce year round and boost agricultural production and there by increase their income;

- b. Irrigation extends the area under cultivation and brings about more farmers in to production;
- c. Job opportunity, irrigation raises the number of jobs conducted on the land (irrigating, weeding) and provides for secondary job creation ( crop marketing, trading);
- d. Irrigation development will bring about an opportunity for social services and infrastructural development in the area

As stated by Mellor (1966), the irrigation induced benefits are not limited to farming households but also affect broader sectors of the economy by providing increased opportunities to growing rural service sectors and other off-farm employment activities.

The total beneficial effects of irrigation development, both direct and indirect; from different literatures, can be summarized under the following categories:

1. Increased crop production (yield improvement) and increased farm income;
2. Increased cropping intensity and crop diversification opportunities;
3. Increased farm employment—more employment opportunities for farming families as well as for hired laborers in the locality;
4. Increased farm consumption and increased permanent wealth (permanent asset accumulation due to irrigation access);
5. Multiple uses of water for bathing, washing, livestock and home gardens.
6. Increased recharge of groundwater, easy access to groundwater and less hard work for women in fetching water for daily household needs;
7. Increased farm income (for farmers) and increased farm and off-farm employment opportunities for rural landless laborers.

All of these direct and indirect benefits achieved through irrigation access are difficult to quantify and value in monetary terms. Many of them are even harder to pin down and they also depend upon several other underlying institutional and structural factors and the benefits vary from system to system.

On the other hand, as different scholars and development researchers like (Bhattarai, et al; 2002; Chambers, 1988; and Tillman, 1981) indicated the success of irrigation in increasing agricultural production and consequently improving the economic and social well-being of the rural populations have been impressive. As a result irrigation development projects have many positive socio-economic effects, but also have some adverse effects. The adverse socio-economic effects of irrigation from different literatures are summarized, as follow:

- a. Changing land use patterns, Small plots, communal land use rights, and conflicting traditional and legal rights all create difficulties when land is converted to irrigated agriculture,
- b. Encourage population densities , either because of the increased production of the area or because they are part of a resettlement project,
- c. work loads resulting from the introduction of irrigation are likely to affect men and women , and social classes unequally,
- d. Water borne diseases: for example malaria , due to poor management of drainage system

### **2.2.2 Factors Affecting Irrigation Development**

The success of irrigation development generally depends on the cooperation among different bodies like government institutions, non governmental organizations (NGO's), beneficiary farmers, financial institutions and planning bodies. Development issues are interconnected and water resource development by nature has interconnected with many internal and external factors. Consequently, irrigation developments are also determined by many factors for their success and some major factors that affect irrigation development are summarized as follow:

- a. Cropping pattern, market accessibility, maintenance and spare parts, social and political and land tenure policies (Brown Nooter, 1995 cited by Nigussie, 2002);
- b. Inappropriate management of irrigation Scheme (FAO, 1996);

- c. Drainage challenges renew ability issues, seepages, canal lining, and theft vandalism of control structures (Donald. C, 1995);
- d. Maintenance challenges and quality of design: the quality of design and maintenance system can also be determining their sustainability;
- e. Pest infestations and input shortages are also some of the areas of concern due to their significant contribution;
- f. Low access to credit facilities;
- g. Water borne diseases (Tillman, 1981).

### **2.2.3 Water resources and irrigation development in Ethiopia**

Water is a renewable natural resource and it is very crucial for sustainable livelihood activities like for household uses (cooking, drinking and sanitation), agriculture, industry and tourism; and its role in sustaining the earth's ecosystems. Irrigation development is a special case of agricultural development in which technology intervenes to provide control for the soil moisture regimes in the crop root zone to achieve a high standard of continuous cropping (EVDSA, 1996).

The production of crop depends, among other things, on such climatic factors as temperature range, length of growing season and the amount, frequency and distribution of rain fall. To control the aspects of these factors, farmers discovered that the moisture plants need could be supplied by irrigation.

This knowledge enabled human beings to become independent of the natural rainfall and enabled them to grow crops in arid and semi-arid regions. There fore, applying water to soil for plant is irrigation.

Ethiopian has an estimated annual renewable surface water potential close to 122 billions cubic meters (MoWR, 1999).

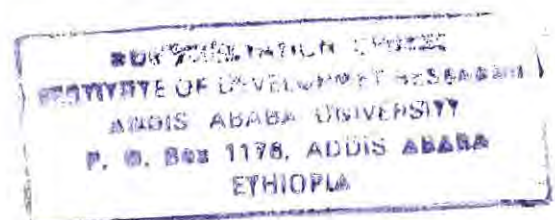
And also the ground water potential of about 2.6 billion cubic meters (Tesfaye, 2008). According to different sources (Awulachew et al. 2007; MoWR, 2006; EVDSA, 1990), the irrigation potential of country varies from 3.4 -3.7 million hectare. However, the area of land under irrigation so far, is about 250,000 hectares (MoWR, 2006) which constitutes about 5% of the potential (ibid). It is also estimated that out of the total annual production of cereals in the country, only about 3% is produced through irrigation (Encyclopida of earth, 2009). Therefore, irrespective of water resources of the country irrigated agriculture is little developed.

#### **2.2.4 Irrigation Development and Food Security in Ethiopia**

In the year 2007, over 3.3 billion people live in rural areas of the world, a quarter of them living in extreme poverty. Some 2 billion people heavily depend on subsistence agriculture. Two-third of the world's poorest people is also located in rural areas and grind out their livelihood from subsistence agriculture (Todaro and Smith, 2009).

Development of agricultural sector in Africa has seen as a pivotal role to combat hunger, reducing poverty and generating economic growth through production of food crops, supplying agricultural inputs for other sectors, and increasing export earnings (FAO, 1996). However, during the last decades per capita of agricultural production has not kept pace with population growth (CTA, 2004). Thus, many development writers underline the importance of irrigation as a vital resource in agriculture, and also as a viable strategy to raise crop yields and to achieve food security and increase economic growth in these third world nations.

Like wise, for Ethiopia, where there is huge water resources and irrigation potential. Irrigation provides a means of maximizing production with double or multiple cropping taking the advantages of modern technologies and high yielding crops (Seid, 2002 as cited in Mengistu, 2009). As discussed in the above sections , irrigation is a vital tool to achieve food security and reducing poverty via increasing agricultural production, intensifying the cropping pattern, increasing income by producing high value crops, creating job opportunities, etc. in developing countries including Ethiopia where its economy has highly based on agriculture.



## 2.2.5 Poverty and Food Security Situation in Ethiopia

Ethiopia is basically an agricultural nation. Therefore, agriculture dominates the country's economy accounting for 80% of national employment, 41% of gross domestic product (GDP) and 70% of merchandise exports. More than 80% of these agricultural outputs are generated by subsistence farming systems (MoFED, 2008a). 'Though the subsistence farming system is the dominant suppliers of agricultural out put to the country's economy; it is also the major source of vulnerability to poverty and food insecurity(Stephen and Bruce, 2007 as cited in EEA, 2008),. This statement shows that despite its overall contribution for the Socio economic development, the subsistence farming system is faced multidimensional problems. As a result, there is a serious food security problem in the country year after year.

As stated by Stephen(2000), in Ethiopia poverty and food insecurity are deeply inter related phenomena, and caused by many interrelated and complex factors such as climatic change, poor performance of agriculture, high rate of population growth which is not pace with the existing natural resource, civil conflict and poor development policies.

Consequently, according to (MoFED, 2008a), poverty remains widespread in Ethiopia using consumption- based measure of poverty, 38.7 percent of Ethiopians were poor in 2004/2005, and implying 27.5 million people were living below the poverty line and the situation is slightly higher in rural areas (39.3 percent) than in urban areas (35.1percent).

According to (MoFED, 2002; FDRE, 2001; MoWR 1999; Dejene et al., 1995), food security is also one of the defining features of rural poverty affecting millions of people, particularly in moisture-deficit and pastoral areas of the country. Hence, MoFED (2006) identified that, in the year 2006, there are 8.29 and 6.71 million people were facing chronic and transitory food security problems respectively. Further as stated by (indexmundi, 2009), each year 4 to 4.9 million people, and particularly in the rural areas have got the problem of getting enough food. Ethiopia has been faced food deficit since at least 1980, the food gap rose from 0.75 million tons in 1979/80 to 5 million tons in 1993/94, falling to 2.6 million tons in1995/96(Befakdu and Berhanu, 2000).

On the other hand, as stated by different government documents like (MoFED, 2002/03; MoFED, 2008b) poverty and food insecurity situations have been improving. The reports on these documents identifies that the existing food insecurity and poverty as follow:

“Ethiopia is addressing reducing hunger and food poverty of millennium development goals (MDGs) through agricultural development led industrialization (ADLI) strategy and consequently, remarkable progress has been made compared to the 1980’s.”

### ***2.3 The current Agriculture and Agricultural development policy in Ethiopia***

In Ethiopia economy agriculture is the dominant sector. It affects the path of the economy both in terms of overall out put and employment, agriculture contributes about 50% of gross domestic product (GDP), generates 90% of export earnings and supplies about 70% of raw materials to the secondary activities and about 80% of national employment(MoFED,2008a). The primary sector is the primary source of food supply for the rural as well as urban people. Hence, Agriculture plays significant and decisive role in the social and economic development of the country.

Morethan 80% of the agricultural output is generated by subsistence farming systems (MoFED, 2006). It is common knowledge that the subsistence farming system is dominated by smallholder farmers farming on small plots of land. Studies depicted that smallholders only held 10 percent of the total land area of the country (CSA, 2006), however, their production system contributes 90 percent of the total agricultural output and covers 95 percent of total cultivated area under crop (MEDaC, 1999 cited in Belieneh, 2003).

Despite the main actors in agricultural development of Ethiopia, the smallholders agricultural production and productivity are very low both in crop and livestock enterprises (Ibid). Due to climatic conditions, unavailability of improved agricultural tools, agricultural equipment and machineries, modern inputs and poor institutional and infrastructural development, etc. the interaction between these factors has been made the rural community to stay in poverty.

As (MoFED, 2008a; index mundi, 2009) reports indicated peoples in the country live below poverty line are slightly higher in rural areas than in urban areas i.e., 38.7 percent of Ethiopians were poor in 2004/2005 at national level and in residential areas 39.3 % and 35.1% live in rural and urban areas, respectively.

Despite all these problems, it is self evident that agriculture should be in the forefront of the development process because of the countries huge agricultural potential such that the soil fertility, the excellence of her climate and the abundance of her resources for example water resource with huge potential for irrigated agriculture. Using agriculture as the basis for economic growth requires a productivity revolution in small holders farming. Thus improving the productivity, profitability and sustainability of smallholders farming is the main pathway out of poverty in using agriculture for development (WB, 2008).

In line with the sectors potential, the current government of Ethiopia has given policy consideration's to the agricultural sector through the formulation of Sustainable Development and Poverty Reduction programme, the government issued the SDPRP programme to guide development between 2002/03 and 2004/05 and Plan for Accelerated and sustained Development to End Poverty (PASDEP) as the guiding strategy for poverty reduction over the

five years period, from 2005/06 to 2009/10. The main objective of SDPRP is to reduce poverty by enhancing economic growth. It is based on four supporting pillars,

- Agricultural Development Led Industrializations (ADLI) strategy.
- Justice system and civil Service reform
- Decentralization and empowerment
- Capacity Building in public and private sectors

Agricultural Development Led Industrializations (ADLI) is one strategy pillar among the four strategy pillars of SDPRP. It focuses on increasing agricultural productivity to raise the incomes of peasant farmer households by giving emphasis on provision of infrastructure, including roads and water control for irrigation.

The main focus of the strategy is “agriculture should be the starting point for initiating the structural transformation of the economy”. The strategy was believed to ensure rapid and sustainable growth by widely utilizing the abundant resources and economizing the scarce ones (MoFED, 2002).

Plan for Accelerated and Sustained Development to End Poverty (PASDEP), was formulated as a guiding strategy for poverty reduction over the five years period from 2005/06 to 2009/10(MOFED, 2006). It advocates continuing to persevere the strategy of ADLI; and it calls for the development of appropriate human resources; provision of an expanded and improved supply of agricultural inputs and adaptation and introduction of high yielding technologies. It also gives a due emphasis for the establishment of appropriate marketing systems; as well as expansion of small and medium scale irrigations.

The central plank of the policy was that the country’s over all development was to be agriculture and rural centered while the base for rural sector was to be agriculture-led development (FSS, 2008). Thus the policy environment is conducive towards the development of the sector and thereby to reduce the wide spread poverty and food insecurity.

## **2.4 Conceptual and Theoretical Framework**

The conceptual framework shows that household level food security attainment and poverty alleviation is mainly determined by household’s access to different productive resources. Thus among other factors, irrigated agriculture plays a crucial role to sustainable improvement of socio-economic conditions of the rural household.

According to Ellis( 2005) and Bhattarai et al(2002), there are two ways in which access to irrigation water can benefit poor farmers at household level i.e., direct and indirect. The total beneficial effects of irrigation development, both direct and indirect, can be summarized under the following categories:

1. Increased crop production (yield improvement) and increased farm income;

2. Increased cropping intensity and crop diversification opportunities and the possibility of year round crop production activities;
3. Increased farm employment—more employment opportunities for farming families as well as for hired laborers in the locality;
4. Increased farm consumption and increased permanent wealth (permanent asset accumulation due to irrigation);
5. Increased farm income (for farmers) and increased farm and off-farm employment opportunities; through these benefits irrigation development is linked to food security attainment and poverty alleviation directly through localized and household effects.

It is not viable to generalize that only access to irrigation water to rural poor solves the problems of food insecurity and poverty. Moreover, there are other factors like household characteristics (demographic, socio-economic) and external factors like policies and macroeconomic environment that determine household's food insecurity and poverty.

To this end the following conceptual framework (see figure.1) is adapted from Intizer.H and Munir A.H, 2004), to show the process in which irrigation development is linked with food security and poverty alleviation at household level. Access to irrigation creates an opportunity for farmers:

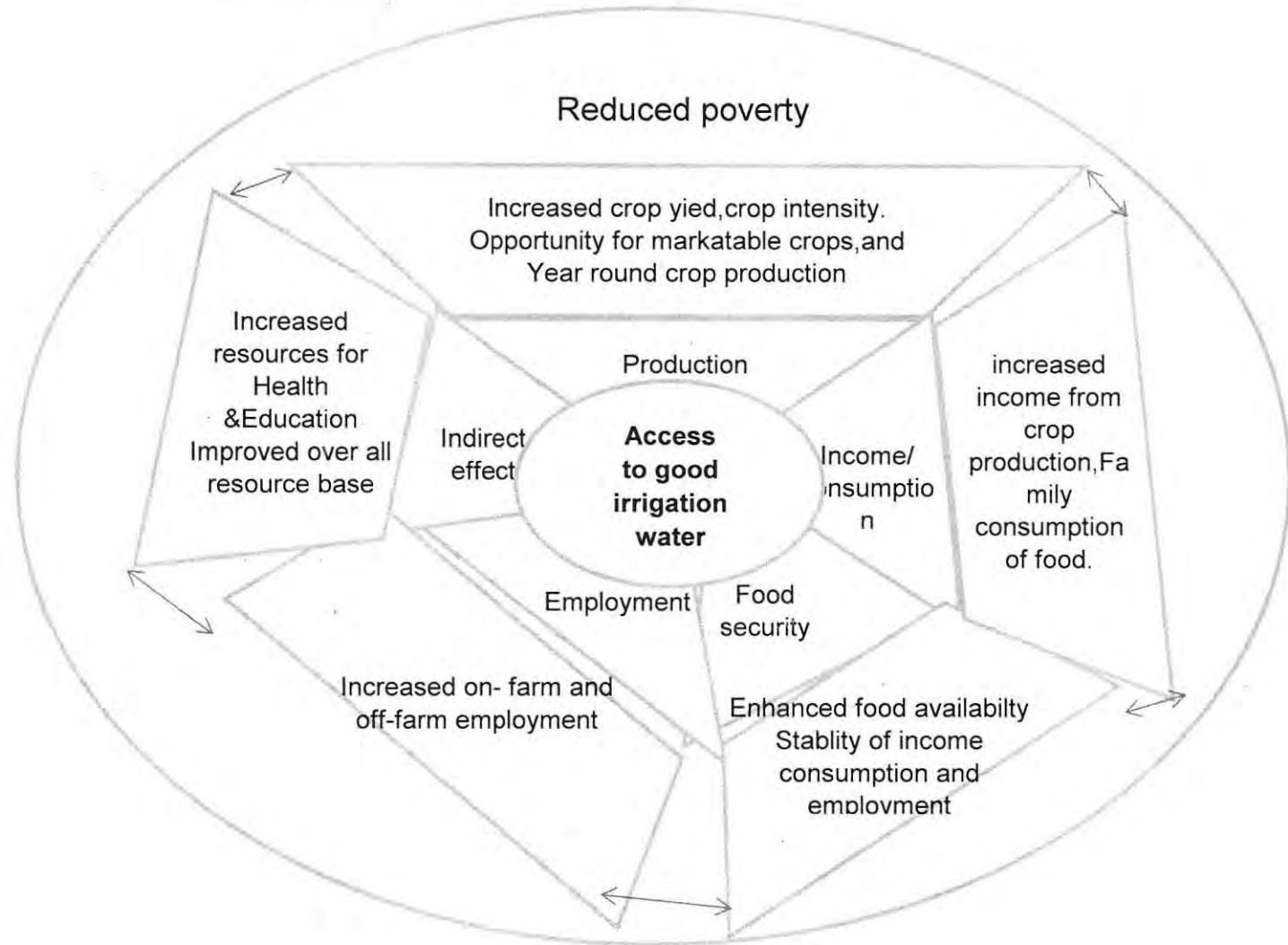
- to increase production by increasing crop yield, crop intensity,
- to increase income/ consumption through increased income from crop production, family consumption of food ,
- to increase food security through, enhanced food availability, reduced level of consumption short falls, risk of crop failure and seasonality effect,
- Employment opportunity through increasing, off farm and on farm employment and,
- Improved overall resource bases.

Moreover, the complex and interrelated demographic, socio-economic and institutional variables that are expected to determine food security and income/ consumption poverty at household level are explained in the methodology section.

Figure 1 Irrigation and Food Security and Poverty Linkage

Figure1:Irrigation and Poverty and Food Security Linkage

**Irrigation and Poverty Linkages**



Source :Adapted by researcher from <http://www.iwmi, cgirar.org/>

## **Chapter 3 : RESEARCH METHODOLOGY AND RESEARCH DESIGN**

### **3.1 Description of the Study Area and the Sampled Irrigation projects**

#### **3.1.1 Biophysical, demographic and socio-economic condition**

According to the data obtained from Fentale Woreda Administrative Office, Fentale Woreda is one of the eleven woreda's of East Shewa zone in Oromia Regional state. It is located at about 194 and 94 Km from Addis Ababa (city) and Adama (Town) respectively. Methahra town is the capital of the woreda.

As indicated by CSA (2008), the total population of Fentale Woreda is 82225 (both rural and urban population), out of which, 43510 (53%) are male while the female constitute about 38715(47%) of the population in the Woreda. Considering place of residence 20517 (25%) are urban dwellers while 61708(75%) are rural dwellers. The woreda is dominantly inhabited by Oromo (Karrayu and Itu ) people. There are other ethnic groups like Amhara, Tigry, Gurage and Walayta in the woreda town Methara. In the woreda, Orthodox Christian and Islam are the two religions that have great followers.

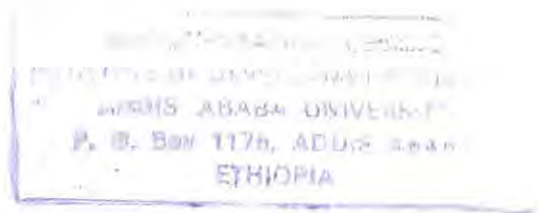
As socio- economic profile of the Woreda indicated, the total area of the woreda is about 133964 hectare of land with hot and dry agro-climatic zone ranging its elevation from 910m to 2007 m above sea level and is characterized by arid and semi-arid weather conditions.

The mean annual temperature ranges from 36oc -40oC. And its physical setting extends between 8°42-9°09 latitude and 39°-4°e' longitude. The mean annual rainfall is about 630 mm. The woreda is situated in the upper awash valley, a portion of the great East Africa Rift valley. The physical feature of the area is mainly extensive plain land and is situated along the Awash River. Awash and Kesem Rivers are the main sources of water for humans and cattle in the area.

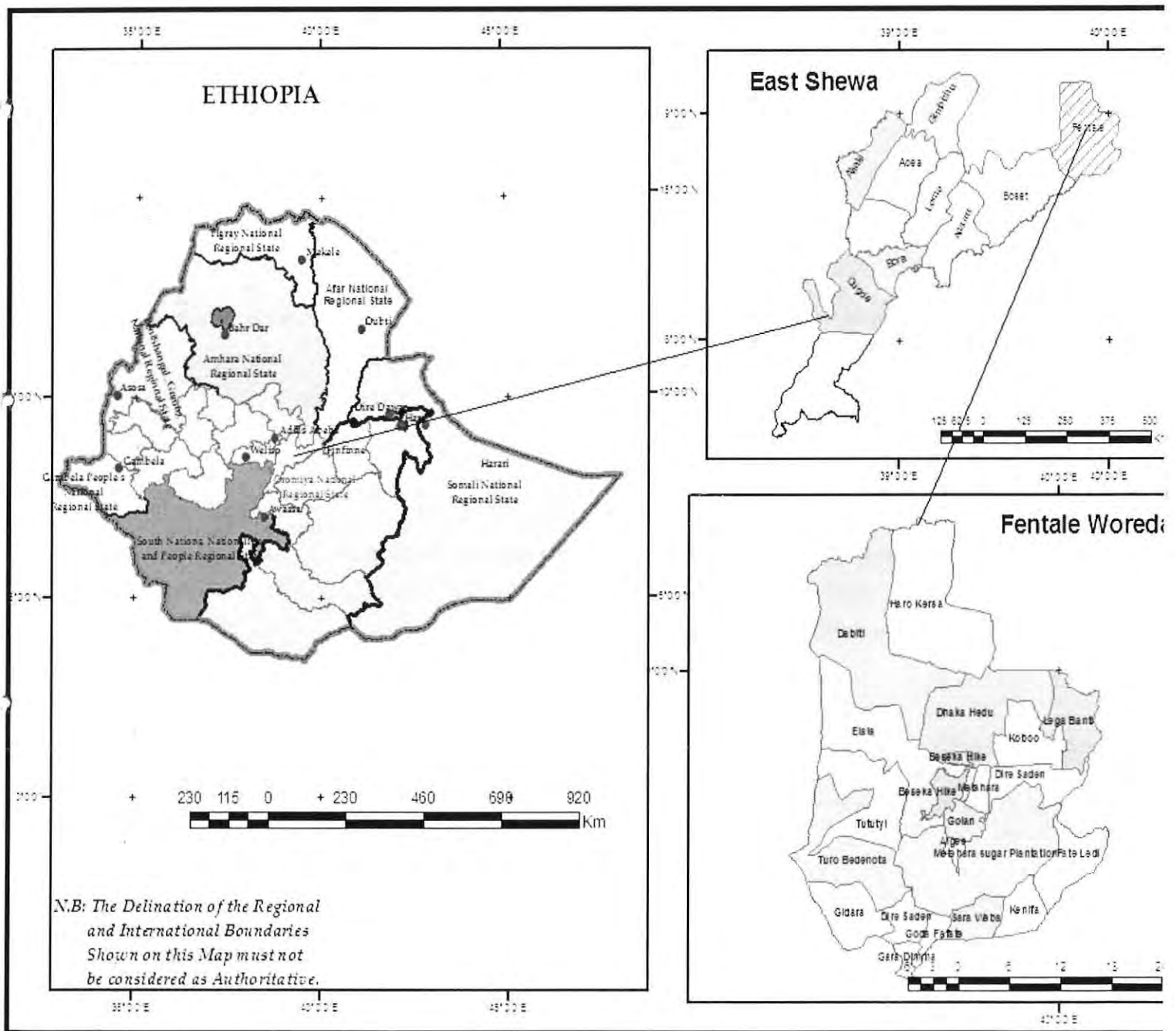
The current land use, as recorded by Fentale woreda agricultural development office, Of total area of the woreda 133964 hectare, arable land accounts for about 14.84% (19885 hectare), cultivated land constitute around 5% (6845 hectare), grass land about 7% (9239 hectare), national park cover 3850 hectares or 3 %, unusable land in the area constitutes the highest (28.03% or 37544 hectares) and others.

Concerning the sources of the livelihood income, agriculture is the main livelihood activity for the majority of the people living in the woreda. According to Fentale woreda Pastoralist office head, the major farming systems being practiced in the area are pastoralist and mixed farming.

According to the discussion held with DA's ( Development agents) in the area, Farming system to some extent appears to be clan specific, in which the majority of the Karrayu clan has been engaged in pastoral way of life, while the Etu are mostly agro –pastoralists.

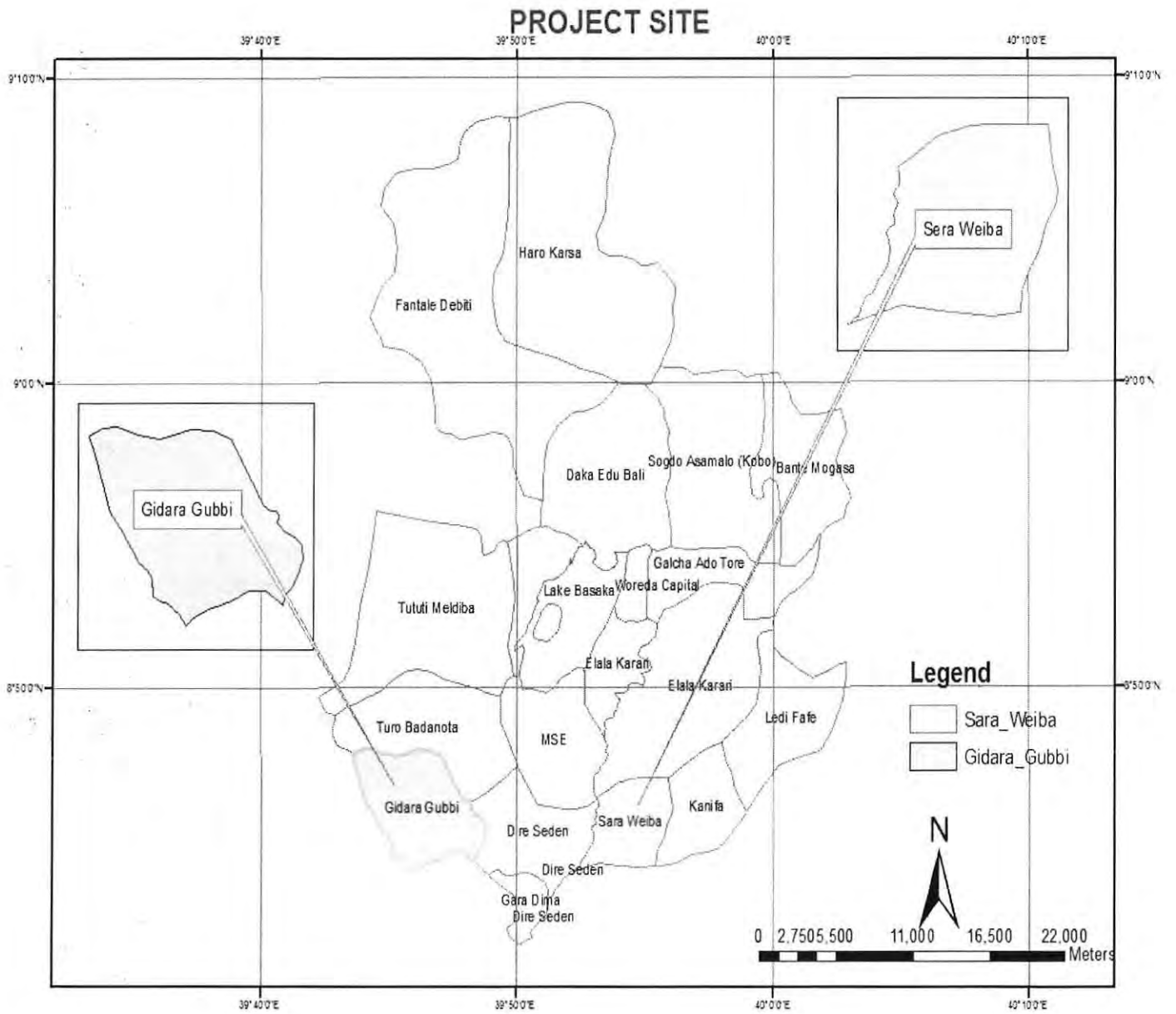


**Figure 2:** Location of the Study Area, Fentale Woreda, Oromia Regional State



Source: OFEDB, 2010

**Figure 3: Location of Study Sites**



Source: OWWDSE, 2010

### **3.1.2 Basic Social Services, Infrastructures and Facilities**

In relation with education, according to Fentale Woreda Education Office data 2008, there are about 28 schools of various levels in the woreda, which include 26 primary and 2 secondary schools. The numbers of students attending in the schools indicated above are about 14402 students (8297 male and 6105 Female).

As per woreda health office data there are about 35 health service rendering institutions in the woreda in 2009 as a whole. Accordingly, there are eighteen health posts, (one health post for each PA in the rural area), 1 health center, 9 clinics, 3 pharmacies and 4 rural drug vendors. The woreda health office also provided data on ten top diseases in the year 2009. Accordingly, respiratory tract infection, malaria, intestinal parasites, urinary tract infection and gastritis were the five major diseases that affected the health of the population in the woreda.

Potable water availability in the project area is very poor and access to water is the main concern for the community in the project area. Through intensive and utmost efforts were made at different times to supply potable water for the community in the area, the people in the area are still suffering from high scarcity of water both for them selves and their livestock( OWRDB,2009). As per woreda socio-economic profile data (2008), the main sources of drinking for human and animals are Awash River. The same source also indicated, the drinking water is raw water, which is exposed to contamination. As a result the communities in the area suffer from water born diseases.

Concerning infrastructures of the woreda, The main asphalt road from Addis Ababa to Eastern part of the country passes through the woreda capital town, Methara There are also all wether roads in some PA's and dry wether roads in almost all PA's of the woreda. Thus, new roads are needed for better market access for both crops and livestock production. Adama Town is one of the major market centers in the area.

Facilities such as telecommunication service, electricity and postal service including cellular telephone are also available in Methara town. One commercial Bank of Ethiopia is also serving in the capital of the woreda.

### **3.1.3 Irrigation Practice in the woreda**

The main livelihood activity of the community is agriculture. Due to the pastoral and agro-pastoral character of the community, crop production and livestock rearing have practiced evenly. Majority of the farmers are smallholder that use traditional plough methods and by using oxen.

Regarding land holding, the woreda has a total area of about 133964 hectare of land, of which cultivated land accounts about 6845(5%) hectare for both rain-fed and irrigated farm before the intervention of Fentale large scale irrigation development project. Of the total cultivated land 759.1 hectare (8.4%) accounted for irrigated agriculture and the average irrigated land holding per household was 0.5 (before the intervention of Fentale irrigation development) and after the intervention of Fentale irrigation development project this irrigated land holding increased to 0.75 hectare through the distribution of land under taken on un used agricultural land existed in the woreda.

The major crops grown on rain fed land are maize, teff, and haricot beans while onion, tomatoes and maize are the most common crops produced using irrigated agriculture. Among cereals maize mainly produced both by rained and irrigated agriculture. In the woreda, the existing irrigated agriculture is dominantly smallholder irrigation schemes. Currently it is performed mainly in 14 PA's of the woreda however latter it is expected to be practiced in all PA's of the woreda when Fentale irrigation development project entirely completed.

According to the Woreda Agricultural/ Pastoral Development Office, irrigation unit data, in the woreda the total area under irrigation has extended from 759.1 hectares to 7242 hectares from 2007 to 2009 because irrigated agriculture has been expanded on un used agricultural

land existed in the woreda due to the intervention of Fentale irrigation development project. And also in the area when the irrigation development project entirely completed in recent years, the irrigated area in the woreda will be expected to increase even more than 7242 hectare (ibid). Currently, of the total area under irrigation 6000 hectare (82.8 %) is used for modern irrigation system and the number of beneficiaries in this category is estimated about 8000 households. On the other hand, 1242 ha of land is used for traditional irrigation system.

Until the year 2009 there are about 10484 beneficiaries households in 14 kebeles which have been practiced traditional and modern irrigation system as the woreda Agricultural/ Pastoral Development Office, irrigation unit data the number of these beneficiary farmers also expected to increase when the irrigation development project entirely completed. . The woreda is lucky for its huge water resource, large scale commercial irrigation farming and for its well developed irrigation systems. But smallholder irrigation is practiced mostly by lower level local tools and in addition by poor experience and skill of smallholder farmers to irrigation practice. Therefore, effective and efficient utilization of resources (land and water) is not undertaken based on detail studies.

## **3.2 Description of the Sample Irrigation Projects**

### **3.2.1 Sara-weba Small - Scale Irrigation Project**

#### **3.2.1.1 Size, location, demographic condition and farming system**

Sara-weba small scale irrigation project is found in rift valley along the Awash River in Fentale woreda Sara and Weba peasant associations, latter the two PA's become one administrative unit called Sara- weba PA which is adjacent to the Methara Sugar Factory. The project is situated to south of Mathera town, Capital of the Woreda, at about 30kms.

The water source for the project is Awash River and the project is wholly gravity system. The initial investment cost of the project was 5094847.25 Eth. Birr. At present the total irrigable area of the scheme is 336 hectares. According to the information obtained from DA of the area, there are about 829 beneficiary households with an average farm size of 0.5 hectare.

Concerning beneficiary populations, as per discussion held with DA (Development agent), the traditional character of the population is pastoral. They came originally from the eastern part of the Oromia region and the majorities are known as the Etu Oromo Tribe. As the result of the nomadic nature of their activity through movement from one place to another they settled in these area long years before.

The demographic data obtained from socio-economic profile of the woreda (WoFED, 2008) depicted that the total population of the area is 2653 out of which male constitute 1320 while female constitute 1333. As to the irrigation development experience of the Sara-weba farmers according to the information obtained from elders, the very nature of the Etu Oromo is that they are well experienced in agricultural production. Thus, the farmers have good information about irrigation project, how it saved the human and animal life.

### **3.2.1.2 Management and operation of the Scheme**

In Sara-weba small-scale irrigation project, Irrigators have organized themselves in to water users association (WUA). It is legally organized and has agreed laws and regulations. However, it has established legally, it is not functional. For example, the maintenance of physical infrastructure of the scheme, the supply of agricultural inputs especially, fertilizer and improved seeds are beyond the capacity of this association currently, as stated by some focus group discussants during focus group held in the area.

## **3.2.2 Fentale Irrigation Project**

### **3.2.2.1 Size, location, demographic, and farming system**

Fentale irrigation development project is large scale farmers managed irrigation development project constructed by the Oromia regional government. The project area is located at about 194 and 94 Km from Addis Ababa (city) and Adama (Town) respectively. The project area is about 940 to 960 m.a.s.l and is characterized by hot and dry climate.

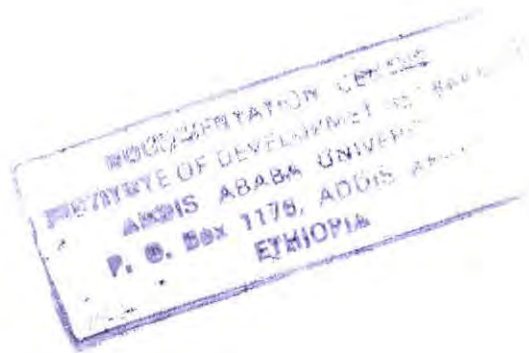
The project comprises eighteen (18) rural PAS from the main intervention woreda, Fenetale, and two PA's (named Qawamirgisu and Huluqo hurata) from adjacent Boset woreda.

The total populations FIDP comprise are all populations from Fentale district and some populations from adjacent Boset district. According to Oromia Water Resource Development Bureau (2009) data, the total populations in the project area are 70228 while assumed beneficiaries are 11116 households.

### **3.2.2.2 Management and operation of the scheme**

Fentale irrigation development project is farmer self managed large –scale irrigation based development project. As management and operation of the scheme, theoretically, irrigation water users' association (IWUA's) or farmers are responsible for management, operation and maintenance of irrigation infrastructure: water distribution and system maintain; assessment and collection of water charges or similar fees; and assistance and extension to farmers on water management. However, in view of the magnitude of the irrigation project complexity, self –management is not currently possible in particular in the project area and in general in Oromia due to lack of knowledge and experience of large scale irrigation scheme management as a whole (OWRDB, 2009b).

As a result the main irrigation system is managed by government institutions and the tertiary, and quaternary canal system is controlled by the farmers' association. So an irrigation scheme is termed as jointly managed irrigation schemes (ibid).



## **Chapter 4 : SAMPLING AND METHODOLOGY**

### **4.1. *Study sites and sample selection method***

As per Fentale woreda pastoral development office irrigation unit, there are six modern irrigation projects. Among these two irrigation projects, namely Sara- weba irrigation project and Fentale farmer self managed large –scale irrigation project are purposely selected. Because, however, the two irrigation projects are found in similar agro-climatic zones and geographical set ups, the two projects are different in terms of size and age. Moreover, the beneficiary farmers of the two projects differ in the farm activity.

Consequently, the findings obtained from one project may not be representative for the other. On the other hand, the findings that can obtained from the two projects would be representative for the other modern irrigation projects in the woreda, although, it was consumed more resources (time, money and personnel).

From the two irrigation Projects, a total of two PA's from both projects have purposely been selected based on the discussion held with Woreda Pastoralist office, irrigation unit expertise and DA's of the two project areas.

In order to compare and contrast, agricultural productivity, food security and poverty status of irrigators with that of non-irrigators, representative samples of both groups from the two PA's were taken ; access to irrigation being the only difference.

Therefore, individual households being the unit of analysis, stratified simple random sampling was employed to obtain study population from the two groups of households from the two PA's. Hence, after stratifying the households in two irrigators and non irrigators equally, 8% of the sample households were drawn and also additional strata was made based on sex of the household head with the aim of promoting gender sensitiveness of the research work.

Finally, 150 household units were drawn from a total sample population of 1870. From the 150 total sample household heads 21(14%) are female while 129(86%) are male headed household.

**Table 1: Sampling method and sampling size**

	Sara- weba Study site			Gidara study site			Both study sites		
	Irrigator	Non-Irrigators	Total	Irrigators	Non-Irrigator	Total	Irrigators	Non-Irrigators	Total
Population SIZE (N)	820	170	990	695	185	880	1515	355	1870
Sample Size (n)	66	14	80	55	15	70	121	29	150
Male	68	6	74	42	13	55	110	19	129
Female	4	2	6	7	8	15	11	10	21

Source: Development Agents of the Sara - weba and Gidara PA's Februray, 2010

#### 4.2. *Data Collection Methods and Process*

The study methodology used in this research is survey methodology. Both qualitative and quantitative methods were applied as a basic instrument of research for the collection of primary data. By integrating this method and secondary data, information has been collected from each sample PA's using various data collection methods which includes: household/sample survey, key informant interview, focus group discussion, direct observation and document review. A brief description of each of the methods will be made herewith.

##### **i. A household survey method**

This method was used to collect pertinent primary data from 150 sample household heads. Both open and closed ended questionnaires were designed and administered to irrigators and non-irrigators. For successful data collection process four trained enumerators from the locality were employed to enumerate the questionnaires from 150 selected households in the two study

sites and collected data accordingly. Moreover, the quality of data was also controlled by the researcher by making a random supervision of the enumerators.

The primary data has been generated by conducting interviews with house hold heads, focus group, key informants, and through observations. Further elaboration about the generation of primary data is set in the following sections.

#### **ii. Key informant interview (kII)**

The researcher has administered interviews with individuals who are supposed to have adequate information about the irrigation activity and the socio economic back ground of the study community like administrators, officials and experts/ professionals drawn from pertinent offices of the woreda and the sample sites. Accordingly, an interview was held with Fentale woreda pastoralist office officer, Fentale woreda irrigation development unit expertise, Fentale woreda Land Use and Environmental Protection office officer, woreda education office expertise, woreda health office expertise, administrators of the sample kebeles, and with development agents of the two study sites (PA's). In general fourteen (14) key informant interviews were administered with different individuals drawn from woreda line departments and study sites.

#### **iii. Focus Group Discussion (FGD)**

Focus group discussion would widen the research problem, and derive alternative valuable solutions from the discussants for the study. As a result, it had been as a vital alternative, which made the gathering of wide and comprehensive information possible. To this end, two focus group discussions were held in the two study sites. The group comprises 10 and 8 group members, in Sara-weba and Gidara study sites respectively. In each group two female household heads are included to make the discussion gender sensitive.

#### **iv. Observation**

In the study area the researcher has systematically applied formal and informal types of descriptive observations mainly focusing on general living conditions of the community,

agricultural marketing, management of the irrigation development project and the like. The data obtained in this method is more of qualitative and it was conducted based on check lists.

#### **v. Secondary data**

Secondary data of various kinds which contributed much for the case under study like the water resource and irrigation development in Ethiopia the situation of irrigated agriculture in Ethiopia, household food security and poverty in Ethiopia in general and in study areas in particular were referred and reviewed.

#### **4.3. Analysis of Data**

Concerning to data analysis , the quantitative information gathered through different methods were presented and analyzed using descriptive statistics tools including , average , percentage, frequency distribution , standard deviation , graphs and charts. For the analysis of the descriptive statistics, SPSS software Version “17 “was used. On the other hand qualitative data obtained through various instruments were categorized and analyzed by giving attention to local situations, opinions and presented using narratives of expirations, opinions and suggestions.

#### **4.4. Variables to be measured**

In this study, our interest is to examine the role of irrigation development in poverty alleviation and household food security attainment in drought prone areas of Fentale woreda. Irrigation is, one of the basic agricultural inputs used to increase agricultural production. It is also labor intensive activity through which it creates employment opportunity. In this context, it is understood that the high yield obtained in irrigation together with other benefits will improve

food insecurity and poverty at household level. Therefore, various household characteristics and socio –economic variables are used to measure household food insecurity and household poverty mainly related with agricultural production, household incomes and productive and non-productive household assets. Accordingly, the following variables / indicators are used in tabular association.

- a. Household characteristics like; sex, age, educational status of the household and household size
- b. Agricultural production: amount of production with regard to Meher and Belg harvest.
- c. Household income: agricultural incomes( income from cereals, cash crops and sell of livestock ) , off -farm incomes ( labor wage, petty trade, etc)
- d. Household assets: productive assets such that livestock possession and farm land and other non- productive household assets like radio, tape bed , etc

It can be understood that any one variable alone could not show the reality in the given household, in order to see the effect of irrigation more clearly, a comparative analysis of households based on the above variables is undertaken between irrigators and non –irrigators more over, before and after irrigation analysis would be undertaken.

## Chapter 5 FINDINGS AND DISCUSSIONS

This chapter will be dealt with the analysis, and interpretation of the data collected. The undertakings of analysis and interpretation of the findings will be presented in five sections as follow:

### 5.1 General Background of Sample Households

The survey result in the Table 2 shows that the farm lands of all respondents are found in identical agro- ecological zone that is arid or semi arid zones. As the focus group discussants and key informants, the dominant section of local population is (90%) Muslims and ethnically they are all Oromo's. Regarding gender of the sample household heads, of the total household heads 129 (86%) are male, while 21 (14%) are female. Of the total female -headed 15 (71.4%) are in irrigator's group. while 6 (28.6 %) are non irrigating households; this indicates that pastoralist women have participated and benefited from irrigation based farming system. In general the background data indicates the communities in the study area have similar socio-cultural characteristics.

Table 2: Sex of the HH's by study sites and by Farming system

SEX OF THE HH HEAD	HH'S BY STUDY SITES		HH'S BY FARMING SYSTEM		TOTAL
	GIDARA	SARA- WEBA	IRRIGATORS	NON -IRRIGATORS	
MALE	55(78.5)	74 (92.5)	106(87.6)	23 (79.3)	129( 86)
FEMALE	15(21.4)	6(7.5)	15(12.4)	6 (20.7)	21(14)
<b>TOTAL</b>	<b>70 ( 100)</b>	<b>80( 100)</b>	<b>121( 100)</b>	<b>29( 100)</b>	<b>150( 100)</b>
AGRO-ECOL ZONE	ARID/SEMI-ARID		121	29	150
TOTAL			121	29	150

Source: own survey data, February, 2010.

### 5.1.1 Demographic Characteristics of Sample Households

As shown in Table 3, the average family size of the respondents in the survey area ranges from 4.95 to 5.02 by the study site while it ranges from 5.0123 (for non- irrigators) to 5.1512 (irrigators) by household types. As we have seen from the table both sample areas have almost equal average family size where as the average family size slightly varies between irrigators and non- irrigators in which it is less for non-irrigators. In general the average family size of the study area is almost similar with the regional rural average family size i.e. 5 (CSA; 2007).

**Table 3: Average Family size of the sample households by site and farming system**

	Average size by study sites		Average size by Farming Group		Total Average family size
	Gidara	Sara-weba	Irrigators	Non -irrigators	
<b>Mean</b>	5.02	4.95	5.15	5.012	5.10
<b>Std. Deviation</b>	1.33	1.54	1.23	1.032	1.22
<b>Total</b>	<b>70</b>	<b>80</b>	<b>121</b>	<b>29</b>	<b>150</b>

Source: own survey data, February, 2010.

### 5.1.2 Age Category

As illustrated in Table 4, out of the sample household heads 53.3 % of HH heads are from Sara-weba and 46.6% are from Gidara, while the active working age for both study sites are 43(61.3), 43( 53.7) for Gidara and Sara-weba study sites respectively ( 34-64 years) and dependent age group (above 64 ) are 12 out of 70 ( (17.1%) and 8 out of 80( 10%) in Gidara and Sara-weba study sites

respectively. From the total sample HH heads only 13.3% are categorized under dependent age group and 86.7 % of the household heads are categorized under an active labor group. Thus, this figure indicates that there is more active age group in Gidara study site than Sara-weba study site. In relation to study sites, in both study sites about 80 % of the HH heads are categorized under active labor group. Hence, there is no shortage of labor in both study sites.

**Table 4: Age Category by sample site and household group**

Age category ( In years)	Gidara	Sara weba	Irrigators	Non irrigators	Frequency
18 -35	15(21.4%)	29(36.2%)	39(32.2%)	5(17.2%)	44(29.3%)
36-64	43(61.4%)	43(53.7%)	67(55.3%)	19(65.5%)	86(57.3%)
above 64	12(17.1%)	8(10%)	15(12.4%)	5(17.2%)	20(13.3%)
<b>Total</b>	<b>70( 100)</b>	<b>80(100)</b>	<b>121( 100)</b>	<b>29( 100)</b>	<b>150( 100)</b>
<b>N</b>	<b>150</b>		<b>150</b>		

Source: own survey data, February, 2010.

## Education

Education is the core parameter for socio economic transformation of a society as the level of education, know how, skill and awareness in the community determines the technology use in all sectors. And also determines the speed with which the irrigation development project would bring about a change. Moreover, education facilitates information dissemination regarding modern agricultural technology, input utilization, technical know-how, environmental preservation and sustainable development among others. In this regard people engaged in pastoral and agro-pastoral way of life like those in Fentale district do not have adequate access to education owing to their livelihood condition, which is mostly mobile.

Most of the peoples dwelling in Fentale district are either pastoralists or agro pastoralists as per focus discussion. Due to the high demand of child labor in this pastoral area, a large number of children in Fentale district in particular look after livestock rather than going to school, moreover, problems related to food deficit and scarcity of potable water supply obviously affected school enrollment and attendance in the area.

Thus, as the evaluation of the survey in Table 5 depicts, high percent of illiterate peoples are found in the Gidara study site about 37.3 %, while 26.6 % of illiterate household heads are found in Sara-weba study site. In relation with farming system, out of total sample irrigator HH heads 71 (58.7%) are illiterate. while out of the total non irrigator sample HH heads 25 (86.2%) are illiterate. In contrast more than 30 % of irrigators can read and write. As shown in survey data Table (5), in general in the study area there is low level of education. However, respondents from Sara Weba are in a good position in educational level (hence majority of the respondents are able to read and write), than respondents from Gidara study site this is due to the long age of irrigation practice in Sara-weba study site. In general, irrigator household's relatively in higher level in education than non-irrigator counterparts because their farming practice (irrigation) has given a chance to use different technologies and exposure to different trainings and demonstrations.

**Table 5: Educational Status of the Sample Household Heads by Sample Site and Farming System**

Educational level	HHs by Sample site		HHs by farming system		Freq.	%
	Gidara	Sara weba	Irrigators	Non Irrigators		
Illiterate	56(37.3)	40(26.6)	71( 58.7)	25(86.2)	96	64
Read and write	14(9.3)	35(23.3)	46( 38)	3(10.3)	49	32.7
Prim. school	0	5(3.3)	4(3.3)	1(3.4)	5	3.3
<b>Total</b>	<b>70</b>	<b>80</b>	<b>121( 100)</b>	<b>29( 100)</b>	<b>150</b>	<b>100</b>
<b>Total</b>	<b>150( 100)</b>		<b>150</b>			

Source: own survey data, February, 2010.

### 5.1.3 Livelihood Activities and Main Sources of Livelihood Income

The major livelihood activities and the main sources of livelihood income for the peoples in the woreda in general and in the study sites in particular are agriculture. Both livestock and crop

production are equally important in the area due to pastoral and agro-pastoral character of the community.

Accordingly, agriculture is the most important economic activity in the study area. However, crop production and animal rearing are practiced in the area. Crop production dominates in all rounds. As the data in Table 6 shown, 68(45.3%) of the households' first source of livelihood income is income generated from crop production. Based on this, the average annual income of a household is about 4719 birr per year, where crop production stands first, accounting for 45.3%, followed by sale of livestock and livestock products and crop production (both) 62 (41.3%) and 20 (13.3%) depend on sale of livestock and livestock products only

**Table 6: Household Source of Livelihood by sample site and Household Group**

Livelihood Activity	HHs by Sample site		HHs by farming system		Total
	Gidara	Sara weba	Irrigators	Non -Irrigators	
<b>Crop production</b>	18(25.7%)	50(62.2%)	66(44%)	2(6.8%)	68(45.3%)
<b>Livestock production</b>	12(17.1%)	8(10%)	0	20(68%)	20(13.3%)
<b>Both</b>	40(57.1%)	22(27.5%)	55 43.8)	7(24.1%)	62(41.3%)
<b>Total</b>	<b>70(100)</b>	<b>80(100)</b>	<b>121( 100)</b>	<b>29( 100)</b>	
<b>N</b>	<b>150</b>		<b>150</b>		<b>150</b>

Source: own survey data, February, 2010.

## ***5.2 The Role of Irrigation in the Study Area***

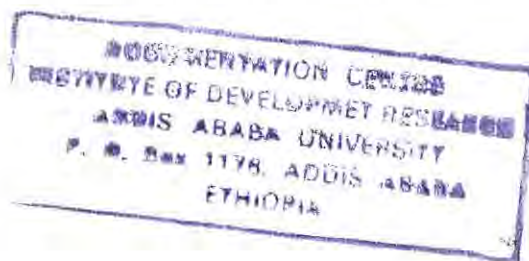
### **5.2.1 Irrigation and Better Crop Production**

The major crops grown in the study area include, maize, teff, and haricot beans on rain fed agriculture while onion, tomato and maize are the major crops produced using irrigated farming. Among cereals maize is produced both by rain fed and irrigated agriculture in both study sites because it is the main food crop used in the area.

According to the findings, as shown in Table (7) below, there is a remarkable difference between irrigators and non- irrigators in the type of crops and intensity of crop produced per year. All sample irrigators are engaged in producing marketable vegetables such as onion, tomato, haricot bean, pepper using irrigation in addition to maize and teff produced using rain fed farming. While non irrigators are dependent only on the production of cereal crops, mainly maize, by rain fed agriculture.

As the survey result shows, out of the sample (121) irrigator households 108(89.2%), 13(10.7%) have produced both cereal and vegetables, and vegetables respectively. While all non- irrigator sample households have produced cereals mainly maize. Of the total irrigators 80(66.1%), 37(30.5%) of sample households produce twice and three times respectively per year. whereas all sample non- irrigators produce only once.

As the survey result in Table 8 reveals, the amount of crop produced after irrigation in all irrigators is higher when compared to the amount that was produced before irrigation. But, all non-irrigator households indicated that the quantity of their recent food crop production has shown no visible differences from that of crops produced before irrigation rather it has shown a visible decrease as indicated by 17(58.6%) sample non irrigator households. The production decrease, as observed by the non-irrigator sample households, it is mainly due to erratic rain fall.



**Table 7: Crops Grow By Sample HH after Irrigation**

Household group	Crops produced			Intensity of Production			Total
	Cereals	Vegetables	Both	Once	Twice	Three times	
<b>Irrigator</b>	<b>0</b>	<b>13(10.7)</b>	<b>108(89.2)</b>	<b>4(3.3)</b>	<b>80(66.1)</b>	<b>37(30.5)</b>	<b>121(100)</b>
<b>Non irrigator</b>	<b>29(100)</b>	<b>0</b>	<b>0</b>	<b>29</b>	<b>0</b>	<b>0</b>	<b>29(100)</b>

Source: own survey data, February, 2010.

As depicted in Table (8) , currently, the main reasons for production increase as out of 99 sample irrigator households 54( 54.5 %), 35(35.4%) and 10 (10.1%) replied, the use of modern irrigation water, multiple-cropping and use of inputs respectively. This implies that irrigated farming has benefited the irrigators through improved production while the non-irrigators have no-chance.

**Table 8: Sample HH's Trend, Pattern, and Intensity of Production**

Production		Household group		
		Irrigator	Non-irrigator	Total
Trend	Decreasing	19(15.7)	17(58.6)	36(24)
	Increasing	102(84.2)	5(17.2)	107(71.3)
	the same	0	7(24.1)	7(4.6)
Pattern	Mono cropping	88	22	110
	Multiple cropping	33	7	40
<b>Factors for increase in production</b>				
	use of irrigation	54((54.5%)	0	54(54%)
	two or more crops produced	35(35.4%)		35(35%)
	use of inputs	10(10.1%)	1	11(11%)
<b>Total</b>		<b>99</b>	<b>1</b>	<b>100</b>

Source: own survey data, February, 2010.

## 5.2.2 Food and Cash Crops Production and Augmented Income Sources

Agriculture is being the dominant livelihood activity; it is the major sources of food and income to the households in the study area. Irrigators produce cash crops and food crops on their irrigated and rain-fed farm lands. As Shown in Table (9), the mean and the maximum income gained by irrigators and non- irrigators from rain fed farm during the last year (2009/10) harvest was 4608 and 11100 Eth. birr respectively.

**Table 9: Sample household's maximum and mean income gained from sale of cereals and cash crop (In birr)**

<b>Income in Birr</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>Income from cereals</b>	100	1000.00	11100.00	4608.910	2544.97
<b>Income from Cash crop</b>	121	1500.00	93000.00	23394.58	16068.76

Source: own survey data, February, 2010.

On the other hand, in the same production year, irrigators were able to receive additional income from the sale of cash crops they have produced on irrigated farm land. This implies that irrigators are in better-off in terms of household's cash income than their non- irrigator counterparts. As Table 10 depicts, irrigator households have augmented sources of income from the sale of marketable cash crops namely, tomato, onion, pepper and haricot bean which non-irrigators have no access for producing them. Therefore, in 2009/10 production year irrigators were able to gain 93000 birr, 23393 Eth birr, maximum and mean income respectively from the sale of tomato and onion that they were produced on average of 0.75ha irrigated land.

Onion: is one of the most common vegetables produced by the irrigator households in the study sites, as shown in Table (10) onion was produced by 121 irrigator sample households and produced an average of 90 quintal. Moreover, they have gained an average income of 21185 Eth.birr from the total onion sold in that year.

**Table 10: Production of Cash Crops in Quintal and Income Obtained In Eth birr.**

<b>Production of cash crops in quintal and income in birr</b>	<b>N</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Sum</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>Onion</b>	121	18	360	9776	90.01	60.97
<b>Tomato</b>	69	10	120	3267	47.35	24.12
<b>Income from Onion</b>	121	4500	90000	2394000	21185.84	15434.1
<b>Income from Tomato</b>	69	1000	18000	443900	6433.33	3386.33

Source: own survey data, February, 2010.

**Table 11: Sample households mean income generated from livestock and on- Farm and off- farm activity during 2009/10.**

<b>Household group</b>		<b>Income from cereals</b>	<b>Income from Cash crop production</b>	<b>Income from LS and LS products</b>	<b>On-farm income</b>	<b>Off-farm income</b>
Irrigator	Mean	4719.38	23394.58	6866.20		2399.05
	N	95	120	117		19
	Std. Deviation	2547.36	16068.76	8677.35		996.33
Non-irrigator	Mean	2510		2914.77	2246.67	2283.33
	N	5		26	15	6
	Std. Deviation	1418.80		1554.24	652.32	813.43
<b>Total</b>	<b>Mean</b>	<b>4608.91</b>	<b>23394.58</b>	<b>6147.75</b>	<b>2246.66</b>	<b>2371.28</b>
	<b>N</b>	<b>100</b>	<b>120</b>	<b>143</b>	<b>15</b>	<b>25</b>
	<b>Std. Deviation</b>	<b>2544.96</b>	<b>16068.76</b>	<b>8017.11</b>	<b>652.32</b>	<b>940.68</b>

Source: own survey data, February, 2010.

Price of the products is calculated at farm gate price obtained from sample household.

I.e. Tomato per kg   Varies from 1---1.5 birr  
Onion per kg       varies from 2   2.50 birr  
Maize               varies from 3- 3.50 birr

Besides, the rural farmers have also produced income from livestock and livestock products and other off-farm activities. As shown in Table (11) irrigators have produced an average income of 6866.2 birr from livestock and livestock products while non-irrigator households have got 2914.7 birr of average income from this activity. In general, irrigator households generate an annual mean income of 37278 Eth birr from all income sources while non- irrigator households generate 9953 Eth.birr of an annual mean income accordingly.

### 5.2.3 Irrigation and Employment Opportunity

Agricultural wage labor: is an important source of income for many poor households who are often land less or land short (Matlon 1979; Ellis, 2000 as cited in Yared, 2002). Accordingly, as depicted in Table (11) wage labor is one of the most important sources of income for poor non irrigator farmers and about 15 non irrigator sample households generated an average income of 2246 birr during 2009/10 production year. In contrary, as we can seen from the Table (11), that all of sample irrigator households have generated no income from wage labor in the same year. Because irrigation activity is labor intensive so all the productive family members would be engaged in their own irrigation farms. Hence, they will have no extra time to be engaged in other activities. Likewise, non-irrigator households generate 2246 birr of income on average from wage labor. Therefore, this indicates that irrigation can be considered as an important means of off- farm employment opportunity for non-irrigator households and it enhance on-farm employment chances for irrigators.

## 5.2.4 Irrigation and Patterns of Household Expenditure

It is fact that as the household income increases; the tendency to save money or invest on important household resources will increase, as discussed in the above section income of irrigators are improved due to access to irrigation water. As a result irrigators are opposed in their type and level of expenditure on productive and non productive resources. As Table (12, 13, 14 and 15) depicts almost all irrigators have spent their income on important resources purchase of animals, Fanons, radio, tape, and mobile and construction of new improved houses.

### 5.2.4. Irrigation and Improved Household Resources

#### A. Livestock Resources

Livestock production has almost equal importance in every farming household as source of livelihood income for the community in the study area. Almost all types of livestock are reared in the study area. As the survey data in Table 12 depicts, there are significant difference in herding practices between the two study sites and, between irrigators and non –irrigators. And we clearly observe that most irrigator households have owned relatively large number of livestock's. Therefore, the use of irrigation enabled them to possess larger number of live stocks, than their irrigator counterparts. Because irrigation will ensure availability of fodder for livestock which results in a household to possess more number of live stocks. a household with more number of livestock obtain more milk, milk products and meat for direct consumption, particularly during food crisis as a result large size of livestock contribute to food security condition of the households in addition to generate higher income source. Moreover, the livestock resources in the household indicate the wealth status of the households. Accordingly, *"The household with a number of camels ( 50-80), oxen( 80-110) ,caws (15-25),goats( 60-80) and with 4-5 plowing oxen identified as rich , with a number of camels (15-40), oxen (10-30), caws (7-15), goats (15-50) and with 2-3 plowing oxen identified as medium, and a household with no camel, oxen, caws and plowing oxen only with few numbers of goats (10-15) and sheep (5-10) identified as poor."* As focus group discussants in Sara Weba study area.

**Table 12: Mean livestock possession by household groups**

Household group		Oxen	Camels	Caws	Goats	Sheep	Donkey
Irrigator	Mean	2.25	11.26	4.76	19.21	11.47	1.46
	N	110	58	117	121	80	83
	Std. Deviation	1.192	9.85	4.25	15.73	22.15	0.72
Non-irrigator	Mean	2.1	4.62	3.33	13.24	6.38	1.25
	N	21	13	27	29	26	12
	Std. Deviation	1.091	3.82	2	7.50	3.03	0.45

Source: own survey data, February, 2010.

## B. Farm Land

The farm type and size of irrigators and non irrigators shows variation. As the Table 13 depicts irrigator households have owned rained farm lands in addition to irrigated farm. Out of 121 sample irrigator households 70(57.8%), 51(42.1%) have owned irrigated, and irrigated and rain fed (both) farm lands respectively while all non irrigator households have owned rain fed farm land. Regarding farm land size, of total sample irrigator households 82(54.6%), 39(26%) have owned 0.5-0.75 ha of farm land, above 0.75ha of farm land respectively. While 5(3.4%), 15(10%) and 9(6%) non-irrigators have owned below 0.5ha, 0.5-0.75 and above 0.75ha of farm land respectively. The reason for this difference is obvious; it could be due to the access to irrigation water.

**Table 13: Type of farm land and farm land size owned by household group**

Household group	Farm land type			Farm land Size( in hectare)			Total
	irrigated farm	rained farm	Both	(below 0.5)	( 0.5-0.75 )	( above 0.75)	
<b>Irrigator</b>	70(57.8%)	0	51(42.1%)	0(0)	82(54.6%)	39(26%)	121( 100)
<b>Non irrigator</b>	0	29(100%)	0	5(3.4%)	15(10%)	9(6%)	29( 100)
<b>Total</b>	<b>70</b>	<b>29</b>	<b>51</b>	<b>5</b>	<b>97</b>	<b>48</b>	<b>150</b>

Source: own survey data, February, 2010.

### C. Irrigation and House Conditions

The level of household income is directly related with household's housing type, and household material's used in the household. In this view, the sample households were evaluated in respect to houses they are used to live before and after irrigation and also the farming households (irrigators and non- irrigators) were compared in respect to the type of households they are living in now, household materials.

As shown in Table 14 we haven't seen a big difference among households in their housing conditions before irrigation almost all farming communities have lived in grass roof house. Moreover, none of the households used modern household materials like tape recorder, fanos, separate kitchen and toilet, and modern technology like cell phone. The reason for this would be the study area is one of the repeatedly drought affected areas in the region and that they couldn't able to manage even the food security problems.

According to the survey result (Table 14) shown, out of the 121 irrigated households 59(48.7%) have lived in a house roofed with corrugated iron sheet, while all non-irrigators have been living in a grass roofed houses.

**Table 14: Housing conditions by Household group**

Housing condition	Constructed year	Household group		Total
		Irrigator	Non-irrigator	
Grass Roofed House	Before 1997	63	7	70(46.6)
	From 1997-1998	38	11	49(32.6)
	From 1999- 2001	20	11	31(20.6)
<b>Total</b>		121	29	150(100)
Corrugated Iron roof	From 1997-1998			6
	From 1999- 2001	41		41
	After 2001	12		12
<b>Total</b>		<b>59(48.7)</b>		<b>59(48.7)</b>

Source: own survey data, February, 2010.

Sara weba SSIP was started in 1997

FIDP was started in 1999 in some selected PA's including Gidara.

#### D. Irrigation and Other Household Assets

As indicated in Table 15, the majority of irrigator households identified that they possess more household items like fans, radio, tape, bed, and other items like plastic jug than non-irrigator households. As shown in Table 15 out of the sample households 109 (72%), 54(36%), 87 (58%) irrigators owned radio, tape recorder, fans respectively. The remaining 12 (8%), 0, and 12 (8%) of non-irrigators own radio, tape recorder, fans respectively. This figure indicates that access to irrigation water has enabled the irrigators to invest more in these household materials than their non-irrigator counterparts by enhancing their income.

**Table 15: Household Asset by Household Group**

Household asset	Household group				Total
	Irrigator		Non-irrigator		
	Yes	No	Yes	NO	
Radio	109(72.6%)	12(8%)	12(8%)	17(11.3%)	150
Tape recorder	54(36%)	67(44.6%)	0	29(19.3%)	150
Bed	49	72	4	25	150
Fans	87(58%)	34(22.6%)	12(8%)	17(11.3%)	150
Others( Plastic jug,)	52	56	3	26	150
cell phone	30(20%)	91	6(4%)	23	150

Source: own survey data, February, 2010.

#### 5.2.5. Irrigation and Households Access to Educational Facility

Education has a significant role in enhancement and development of human capital. It is readily understood that it has got a paramount importance in enhancement of development activities at large. It is also fundamental instrument for the improvement of the quality of human life and ensuring social and economic progress. Moreover, education facilitates

information dissemination regarding modern agricultural technology, input utilization, technical know-how, environmental preservation and sustainable development among others. In this regard people engaged in pastoral and agro-pastoral way of life like those in Fentale district do not have adequate access to education owing to their livelihood condition, which is mostly mobile.

### **Child Education and Educational Attendance**

As per the discussion held with focus groups in the study sites, child educational attendance in the area is very poor. Because many children haven't gone to school for different reasons including low awareness of the advantages of education and the need for children to look after livestock, and low financial capacity to cover educational expenses moreover, problems related to food deficit and scarcity of potable water supply. As depicted in the Table 16 it was found that in 76 households (50.6 %) of the total households have had school age children and all households haven't sent them to school. As shown in the Table 16, out of 76 households with school age children 42 (55.2%) sample households have sent their children to school, of which, 38 (50%) are from irrigator households and 4(5.2%) are from non irrigator households. This result indicates that more irrigator households have sent their children to school than their non-irrigator counterparts. The main reason for this is that due to access of irrigation water irrigators have improved their income from cash crop production and improved livestock rearing.

On the other side, as the data on Table 16 indicates, out of 34 households who haven't sent their school age children to school, 16 (47%), 14 (41.1%) and 4 (11.7%) identified financial problems, demand of child labor and cultural influences respectively as the main household problem.

**Table 16: Households with school age children and HH sent the children to school**

Household group	HH with school age children		Tot.	HH's sent their children to school		Tot.	Reasons for not sent			Tot
	Yes	No		Yes	No		Financial problems	demand of child labor	cultural influences	
Irrigator	61	60	121	38 (50%)	23 (30.2%)	61	5 (14.7%)	14 (41.1%)	4 (11.7%)	23
Non-irrigator	15	14	29	4 (5.2%)	11 (14.4%)	15	11 (32.3%)	0	0	11
<b>Total</b>	<b>76</b>	<b>74</b>	<b>150</b>	<b>42 (55.2%)</b>	<b>34 (44.6)</b>	<b>76 (100)</b>	<b>16 (47%)</b>	<b>14 (41.1%)</b>	<b>4 (11.7%)</b>	<b>34</b>

Source: own survey data, February, 2010.

### 5.2.6. Irrigation and Improved Household Health Condition

Health is a prerequisite for increase in productivity (Todaro, 2003). It is readily understood that, access to quality of health care is one of the major factors determining the ability of individuals and communities to obtain a secured livelihood.

Access to health service determined by access of health service and household's income level to cover fees required by health service. As per the focus group discussants, the health problem of the area especially before irrigation, is associated with the drought problem repeatedly occurred in the area. It was identified that the impact of drought in area has aggravated the incidence of common diseases, the insufficiency of basic and additional food supply related directly with susceptibility of farmers to disease. Moreover, the major cause of health problem in the area is the prevalence come from the utilization of non-potable water for domestic consumption. As indicated by focus group discussants, all the dwellers of the area are used raw water from Awash River and canal irrigation water which is exposed to contamination.

As per the data obtained from the survey indicated in Table 17, 25 (86%) of non irrigators had faced health problem in the year 2009/10 only 4 (16%) were treated. While 69(57 %) of irrigators faced health problem 51(73.9%) were treated. This figure indicates that the frequency

irrigators faced health problem is much lower than that of non irrigators. In the contrary, the frequency of irrigators treated is much higher than the non-irrigators. This is due to low susceptibility to disease caused by lack of basic and additional food supply of the households.

**Table 17: Household's faced health problem 2009/10 and treated by farming system.**

HH Group	HH's faced health problem 2009/10			HH's Treated		
	Yes	NO	Total	Yes	NO	Total
Irrigator	69(57%)	52(42.9%)	121(100%)	51(73.9%)	18(26%)	69(100%)
Non-Irrigator	25(86%)	4(13.7%)	29 (100%)	4(16%)	21(84%)	25(100%)
<b>Total</b>	<b>94(62.6%)</b>	<b>56(37.3%)</b>	<b>150(100%)</b>	<b>55(58.5%)</b>	<b>39(41.4%)</b>	<b>94(100%)</b>

Source: own survey data, February, 2010.

### **5.3 Irrigation and Household Food Security**

#### **5.3.1. Household Food Security**

##### **i. Food Availability in the Study Area.**

Crop and income sufficiency for basic needs of the household, as the data in the Table 18 depicts all households replied that their annual crop production and income were not sufficient for the household's food requirement before the intervention of irrigation projects, out of the total sample households 78 (52%), 72(48%) replied that from 1-4 months, and 5-9 months of crops produced and income have been sufficient, respectively. This figure indicates that how much the problem of food insecurity was serious in the area before the intervention of irrigation projects.

**Table 18: Annual crops produced and income sufficiency for households basic need requirement before and after irrigation.**

Crop and income sufficiency	Month	Household group		Total
		Irrigator	Non-irrigator	
<b>Before irrigation</b>	1-4 months	56(46.2%)	22 (75.8%)	78(52%)
	5-9 months	65(53.7%)	7(24.1%)	72(48%)
<b>Total</b>		<b>121(100)</b>	<b>29(100)</b>	<b>150(100)</b>
<b>After irrigation</b>	1-4 month	0	15(51.7%)	15(10%)
	5-9 months	13(10.7%)	10(34.4%)	23(15.3%)
	10-12months	66(54.5%)	4(13.7%)	70(46.6%)
	>12months	42(34.7%)	0	42(28%)
<b>Total</b>		<b>121(100)</b>	<b>29(100)</b>	<b>150(100%)</b>

Source: own survey data, February, 2010.

Currently (After irrigation) in the study area, both irrigators and non-irrigators produce food crops such as maize using rain fed agriculture in addition irrigators produce other marketable vegetables which helps the irrigators to satisfy their food demand from his/her own produce. As indicated in Table18, crop produced and income sufficiency of the households has shown remarkable improvement.

Accordingly, out of sample irrigator households 42(34.7%), 66(54.5%), and 13(10.7%) indicated that their crop's produce and income self sufficient for more than a year, 10-12 months, and 5-9 months respectively. While of the sample non-irrigators 4(13.7%), 10(34.4%) and 15(51.7%) crops produced and income sufficient for 10-12 months, 5-9 months, and 1-4 months of the year respectively. Therefore , these result indicates that the intervention of smallholder irrigation projects have brought a significant improvement in the food availability of the area and there by a significant effect on decreasing the number of households who are suffer from food security in the area. Access to irrigation water has enabled the households to increase production, to generate income from the sale of cash crops, and better ownership of resources; all these are ways to realize greater food availability.

## ii. Production Sufficiency of the Household

As the data in Table 19, depicts, the households were asked about the sufficiency of the current annual production to assure household's food requirement. Accordingly, 102(84.2), 4(13.7) of irrigators and non irrigator households respectively have answered enough production for their household's food requirement. While 19(15.7), 25(86.2) of irrigators and non-irrigators respectively replied that their annual production and income are not enough for their family food requirement's.

This result shows that, certainly access to irrigation water is the most important factor to determine the production and income sufficiency shown between irrigator and non irrigator households.

**Table 19: Production and income sufficiency for HH consumption by Household group**

Production sufficiency for HH consumption	Household group		Total
	Irrigator	Non-irrigator	
Yes	102(84.2)	4(13.7)	106
No	19(15.7)	25(86.2)	44
<b>Total</b>	<b>121 (100)</b>	<b>29 (100)</b>	<b>150</b>

Source: own survey data, February, 2010.

## iii. Consumption Proportion of Annual Production

As discussed in the previous section, there was no visible difference in the consumption proportion of annual production between household groups and among households before the intervention of the smallholder irrigation project.

According to the group discussions held in both study sites, there is a significant difference between irrigators and non-irrigators in the consumption proportion of their annual production after irrigation. All sample non- irrigators have consumed all of their production, however, irrigator households have consumed at least  $\frac{3}{4}$  of their produce and have saved the rest or support their relatives with the rest production.

#### iv. Household Meal Type

Currently, as the data in Table 20, shown, 77(63.6%), of irrigator households have consumed food crops (maize, sorghum), animal products (mainly milk, butter, yoghurt) and vegetables and fruits. While of sample non irrigators 18 (62%) were depend on cereals such as maize and sorghum for their usual consumption and 11(37.9%) of this group have got the chance to consume grains and animal products. This figure shows that, however, there is an improvement in the household's meal type in both household groups still in irrigator households it shows more observable. And the main reason for this is also access to small holder irrigation projects.

**Table 20: Usual meal type of the households after using irrigation by Household group**

Usual meal type After using irrigation	Household group		Total
	Irrigator	Non-irrigator	
Food crops( maize, sorghum)	8(6.6)	18(62)	26
Food crops and animal products	36(29.7)	11(37.9)	47
All	77(63.6)	0	77
<b>Total</b>	<b>121(100)</b>	<b>29(100)</b>	<b>150</b>

Source: own survey data, February, 2010.

### 5.3.1. Households Food Shortage Experience and Coping Strategies

At present, in the study area the farming households face food shortage due to various reasons such as erratic rainfall availability, low experience in crop farming, low soil fertility and Pests. Thus, households face problem of getting adequate production that fed the family year-round. The problem may be varying between farming households. To this end to review the role of irrigation on food security of the households of irrigators and non –irrigators were compared based on the frequency of food shortage they have faced and how they have overcome the food shortage.

As Table 21 ,indicated, of non-irrigator sample households about 28 (96.5 %), have faced food shortage while 13(10.7 %) of irrigators have faced food shortage problem as the data indicated , the problem of food shortage in non-irrigator households is relatively sever than the one in irrigators.

Concerning the coping mechanism for the food shortage faced, all of the irrigator households have answered that they manage the food shortage by purchasing grains from the market. While 18(64 %), 10(35.8%) of non irrigators overcome the food shortage through government relief and purchase of grains from the market respectively. This indicates that irrigation would have contributed in combating the problem of food security as already stated in the previous section by enhancing income of the household from the sale of cash crops.

**Table 21: Households food shortage coping strategy by household groups**

Coping strategy	Household group		Total
	Irrigator	Non-irrigator	
From relief	0	18(64%)	18(43.9%)
From market	13	10(35.7%)	23(56%)
<b>Total</b>	<b>13</b>	<b>28 (100%)</b>	<b>41 (100%)</b>

Source: own survey data, February, 2010.

### **5.3.2. Identifying Poverty and Food Insecurity of Households Based On Income Cost of Basic Needs**

Apart from qualitative measures of household poverty and food insecurity, poverty can be measured by consumption based poverty measurement methods known as the cost of basic needs (MoFED, 2008b). Consumption is used as a better measure of long term household welfare because it is subject to less temporal variation than income poverty measurements (ibid). The cost of basic needs measures the minimum threshold cost of basic need as set out by MoFED on the 1999/00 HICE survey. This cost includes the minimum expenditure requirement of the household for both food and non food items. To see the effects of irrigation on household poverty alleviation and food security attainment, this study uses the poverty line used in the Ethiopian poverty analysis report of 1995/96 measured at 1995/96 national average prices. Accordingly, as household income consumption expenditure(HICE) survey result the mean per capital consumption expenditure of Ethiopia for 1999/00 is estimated at 1057 Eth birr in constant prices of 1995/96. While real per capital consumption expenditure of rural people was 995 and that of urban people was 1453 (MoFED, 2002).

According to the poverty line set by MoFED based on residential area, birr 995 is the minimum requirement to cover the cost of food and non food requirements of the household's in the rural area of the country. This birr becomes 1234 birr when adjusted by 24% inflation rate which was prevalent during the study period. Finally, the total income of each household is divided by the adult equivalent size of the household and compared with the calculated minimum income requirements of the household.

Based on this calculation, out of 121 irrigator households 108(89%) households have annual income above minimum income requirements of the household ( poverty line ). while of 29 non irrigators households only 4(13.8%) households are able to have income above the minimum income requirements of the household (poverty line).

**Figure 4 Households income above poverty line**



Source: own survey data, February, 2010.

### **5.4 Factors Affecting Irrigation Development in the Study Area**

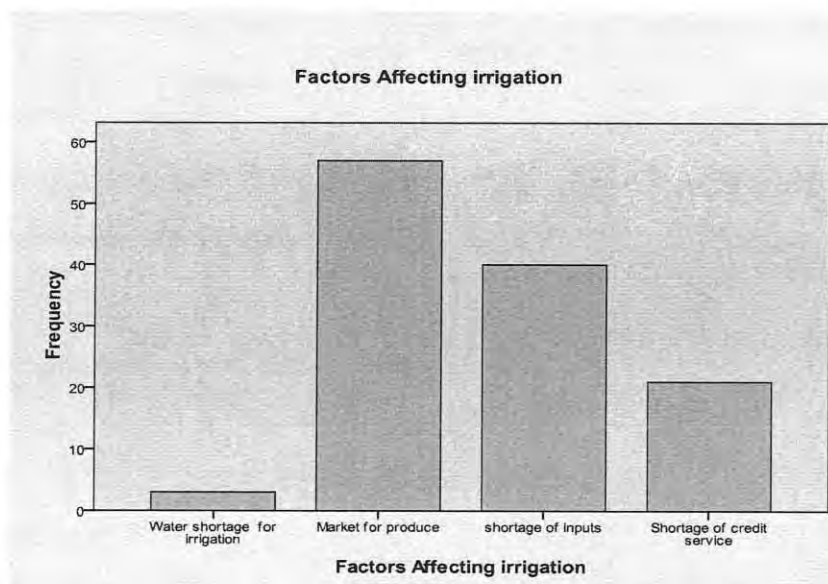
The contribution of irrigation to household food security and livelihood improvement in general is paramount as it enhances agricultural production in general and crop production in particular. However, there are many factors adversely affect the irrigation development projects in the study area like issues related to low marketing process; low credit service, inadequate input availability and poor operation and management of the scheme. As the data in Table 22 illustrates, out of 121 sample irrigators households 57(47.1%), 40(33%), and 21(17.3%) households identified low marketing process , inadequate input availability( in time and amount), and poor credit services respectively, as the main problems affecting irrigation development in the study area .

**Table 22: Factors Affecting irrigation development**

Household group	Factors Affecting irrigation				Total
	Water shortage for irrigation	Market for produce	shortage of inputs	Shortage of credit service	
Irrigator	3(2.3%)	57(47.1%)	40(33%)	21(17.3%)	121(100)
Total	3	57	40	21	121

Source: own survey data, February, 2010

**Figure 5: Factors Affecting irrigation development**



Source: own survey data, February, 2010.

### 5.4.1. Marketing Problem

As indicated in (MoFED, 2006) marketing is one of the main drivers of agricultural development. It includes marketing place, channel and the price in which goods and

services bought and sold. This occurs when the farmers expected to reap the benefits of their improved yield, find that either they can not sell the addition quantity produced or the price obtained does not cover the cost of additional inputs.

In this case, the message the farmers receive from the market place is that there no economic reason to make any effort to increase production.

Marketing constraints are often mentioned as constraints to agricultural development and indeed, they are so if the marketing problems are neglected in many cases, the marketing system becomes the “bottle neck” when farmers are able to increase production.

With this view, as the survey data on Table 23 depicts, out of the total sample households 134 (89.3%) confirmed that marketing problem is one of the major problems of their produce. Out of 135 sample households 68(50.4%), 52(38.5%) replied that low price for the product and lack of transportation systems respectively, are the main marketing problems shown in the study area. As one respondent from Gidara study site narrate the marketing problem in his locality:

*He can not be certain that he will get market to his produce and it is hardly possible even to take the produce to the near by market because of poor transportation system. As a result, he forced to sell the produce on the farm field with low price.*

**Figure 6: Marketing of Tomato on The farm field (Gidara study site)**



Source: own survey data, February, 2010

**Table 23 : Marketing Problems by household group**

Types of market Problems	Household group		Total
	Irrigator	Non-irrigator	
Low price for the product	59(49.5)	13(81.3)	68(50.4)
Lack of transport facilities	51(42.8)	3(18.7)	52(38.5)
Low demand	5(4.2)	0	3(2.2)
lack of storage	4(3.4)	0	2(1.5)
<b>Total</b>	<b>119(100)</b>	<b>16(100)</b>	<b>135(100)</b>

Source: own survey data, February, 2010.

#### **5.4.2. Low Credit Services**

Credit services play an important role in agricultural production. Farmers who have access to credit will be able to increase production due to use of agricultural inputs and hence improve

food security of the household and by increasing income of the household's directly influences household poverty. The availability of appropriate credit rendering institutions would have a positive effect on the agriculture and rural development of an area. There are a number of institutions in the region that provide micro –finance services, their purpose is to reach with finance those groups that have a difficulty to access finance because of collateral and distance problems.

As the data on Table 23 shows, out of the total sample households 127 (84.6 %) have no access to credit service, only 24(15.3%) of the sample households have got access to credit service. Of these households accessed with credit service more than 50% are from informal credit rendering institutions in the locality and from relatives. This figure shows that agricultural activities in the area are constrained by the absence appropriate credit rendering institutions such as micro finance institutions (MFIS). As a result cash requirement for agricultural activities have to be met from agricultural income sources of the household.

**Table 24: Sample Household's accessed credit service and credit rendering institutions by farming system**

Credit service user	Household group		Total
	Irrigator	Non-irrigator	
Yes	22( 18.1)	1(3.5)	23(15.3%)
No	99(81.8)	28(96.5)	127(84.6)
<b>Total</b>	<b>121(100)</b>	<b>29</b>	<b>150(100)</b>

Source: own survey data, February, 2010.

### 5.4.3. Inadequate Input Supply

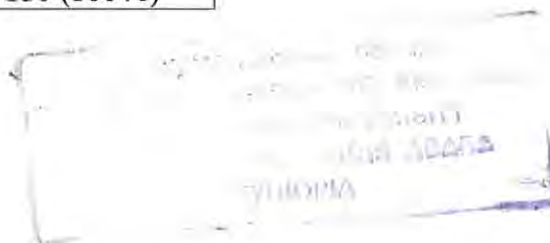
As the survey data in Table (25) shown, the current utilization of agricultural inputs such as fertilizes, improved seeds, agrochemicals is impressive. Of the total sample households 137(91.7 %) were used agricultural inputs of various types, mainly fertilizer. The supply of inputs in the required quantity and time is crucial for enhanced agricultural production. As some key informants stated agricultural inputs like fertilizers and chemicals for pest control have not supplied in time with required quantity.

As the survey data indicated in figure 25, from the total households 40 (33 %) replied shortage of input supply (in time and quantity) as one factor that hinder irrigation practice in the area. Therefore essentially, crop production and productivity are a function of increased utilization of the inputs and the utilization of inputs are highly affected by timely availability of these inputs there fore a concert effort should be made to ensure increased timely availability of inputs together with the required amount.

**Table 25: Households used Agricultural Inputs**

HH's used agricultural inputs	Household group		
	Irrigator	Non-irrigator	Total
Yes	121( 80.6)	16(10.6%)	137(91.3%)
No	0	13	13
<b>Total</b>	<b>121</b>	<b>29</b>	<b>150 (100%)</b>

Source: own survey data, February, 2010.



#### **5.4.4. Lack of Infrastructure**

The infrastructure development in an area determines the rate with which social and economic services are provided. With this view, the major infrastructure problems indicated by focus group discussants are lack of accessible roads that uses for public transportation, and lack of storage facilities.

#### **5.4.5. Poor Management and Operation of the Scheme**

The water management of the irrigation schemes, particularly small scale, is mainly the responsibility of the farmers them selves, through informal/ traditional community groups and formal water users association (WUA'S). WUA's are formal entities formed by households who have access to irrigation to strengthen the bargaining power. However, as the focus group

Discussions, there are formally registered water users associations in the study area but they are not actively charged its responsibility. As a result, there are some operational and technical problems have shown in addition to poor credit and input supply duty of the association's. Therefore, government should give technical and financial support to strengthen the WUA's in order to enhance and sustain irrigation practice in the area.

**Figure 7: Shows Maintenance challenge of a canal (Picture taken from Gidara study site)**



Source: own survey data, February, 2010.

#### **5.4.6. Lack of Safe Drinking Water**

As indicated by focus group discussions in both study sites, all the dwellers of the area have used raw water from Awash River and canal irrigation water for domestic and animal consumption. Thus, the farmers of the study area are exposed to different water born diseases

as a result large proportion of the farmers are failed to make their agricultural activities properly.

#### **5.4.7. Lack of Experience and Skill in Irrigated Farming**

Crop production is a new livelihood activity for the pastoralists in general and for the Kerrayu pastoralists in particular. As per the focus group discussants in Gidara study site, a number of farmers have little knowledge of basic crop farming, and in particular, irrigation practices. Thus, this may affect irrigator's total agricultural production and income (by increasing cost of production incurred for wage labor).

**Figure 8: Shows poorly cultivated farm field. (Picture taken from Gidara study site)**



Source: own survey data, February, 2010.

## **5.5 Socio-Economic Effects of Irrigation Development project in the Study Area**

Irrigation development projects have many positive socio-economic effect and also some adverse effects. Accordingly, the socio-economic effects of irrigation development projects at household level in the study area would be given as follow:

### **5.5.1. Increased Agricultural Production and Productivity**

It is certain that irrigation development has increased production and productivity through increase cropping intensity and crop diversification opportunities and through the possibility of year round crop production activities.

As the case in point, as reveled in Table 8, out of the total sample households asked about their production trend after the intervention of irrigation project 107 (71.3%) households have answered that their agricultural production would be increased. Of these households 102(95.3%) are irrigators and 5(17.2%) are non- irrigator counterparts.

These households have also asked the main reasons for their production increase and as shown in the same Table, 54.5%, 35.42 % , and 10.1% of irrigator households have answered that the main reason for increased agricultural production and productivity in the study area is the use of irrigation water( intensity of production) , Patterns of production , and use of improved agricultural inputs respectively according to their importance. As a result development of small holder irrigation project in the study area enabled farmers to produce year round, and improved agricultural production and productivity and there by increase the income of the household.

### **5.5.2. Ensure Food Supply and Food Security**

According to the sample household survey result shown in Table 18, households have asked about their production and income sufficiency of the family in the 2009/10, 78 (52%), 72 (48%) of the households answered that their annual production and income were sufficient for the family for 1-4 months, and 5-9 months respectively before the intervention of small-holder irrigation projects in the area. While after the intervention of the irrigation project, 42 (28%) of the households identified that their annual production and income was sufficient for more than a year, 64 (44.6%), 26 (17.3%) and 15 (10%) households answered that their annual production and income was sufficient for 10-12, 5-9 and 1-4 months respectively.

Therefore, development of small-holder irrigation projects in the area would enable farmers to produce sufficient amount of agricultural products and generate incomes and thereby ensure food sufficiency of the household. As one respondent from focus group discussion in Gidara study site related food availability situations after irrigation:

*“Currently, no women sale fire wood for household's food requirement. Thanks to God in this dry area we could able to see irrigation water for agricultural activity and for our livestock. We could produce enough crops for our family need. We could eat different types of meal; teach our children, our children eat meal twice or more. “*

### **5.5.3. Create Job Opportunity in the Study Area**

Irrigation farming by virtue, its nature is more labor intensive and hence can absorb high number of skilled and unskilled labor. Accordingly, as the survey result indicated in Table 26, out of the sample irrigator households 66 (54.5%) hired wage labor for their irrigation practice especially during the long, slack dry seasons of the year and 47 (38.4%) are engaged on their own farm activity.

**Table 26: Household Sources of Labor in Irrigation Practice**

HH Source of labor in irrigation practice	Household group	Total
	Irrigator	
Family	47(38.8%)	47
Relatives	4(3.3)	4
Daily laborers	66(54.5)	66
Family and relatives	4(3.3)	4
<b>Total</b>	<b>121(100)</b>	<b>121</b>

Source: own survey data, February, 2010.

#### **5.5.4. Changing Way of Life from Pastoralism to Sedentary Agro-Pastoralism**

The communities in the study area are in transition from a nomadic way of life to permanent settlement. Especially the Karrayu Pastoralists are engaged in farming activity with the intervention of smallholder irrigation development project in the area and become agro-pastoralist. Moreover, they have applied modern way of livestock production and management, and fattening activities, as a result, irrigation development project enabled them to make their settlement in one area and to send their children to school to attend formal schools than keeping livestock. Accordingly, as the data on Table 16 depicts out of 76 sample households who have school age children 42 (55.2%) have sent their children to school. of these more households are from irrigators.

#### **5.5.5. Loss of Grazing Land**

As the focus group discussants, due to pastoral and agro- pastoral nature of the society large numbers of the communities have practiced livestock rearing before irrigation in large communal grazing land.

Currently, with irrigation development project large area of grazing land have taken for crop production, which was served as the major dry and wet season pasture for livestock's of local community. The expansion of farm lands by implication leads to decrease in grazing land. This would imbalance the farming system in study area and affect income generated from the sector.

#### **5.5.6. Leasing Out Of the Farm Land**

As we have discussed in the methodology section farming system in the study area appeared to be clan specific, consequently, crop production for the Karrayu pastoralists is a new livelihood strategy and farming activity. Irrigation farming needs good experience and skill but these societies lack experience and skill in crop production, particularly in irrigated farming. As some key informants indicated, to manage this problem, communities either lease out their farm land or engaged in share cropping with other individuals who come from abroad. Thus, Leasing out the farm land may expose the land owners to exploitation and weakens the low working culture of the pastoralists in relation to crop production.

## **Chapter 6 : CONCLUSION AND RECOMENDATINS**

### **6.1 Conclusion**

The population of the woreda and that of the study sites are largely rural and make their livelihoods from agriculture. However, the agricultural activity in the area is constrained by erratic and uneven rainfall distribution impairing the requirements of the farming communities. Both crop production and animal rearing are practiced by the population in the study area, both activities are equally important in the area due to pastoral and agro-pastoral farming systems of the community.

As a result of the absence of rain fall and the occurrence of recurrent drought in the study area rain fed crop production remained unrewarding. Moreover, the traditional production system together with poor agricultural support services contributes to poor productivity and production of the sector. As a result, the majority of the people inhabiting the woreda have been enforced to encounter food insecurity problems and conduct poor living conditions.

Fentale woreda is one of the chronically food insecure woreda's in Oromia Region. Both crop and livestock production were not able to support the food demand of the community and hence the people are forced to depend on food aid. As a result, the regional government has started to intervene in the situation through irrigation based integrated development projects that aimed at the improvement of agricultural production and productivity, with the intent to realize the objectives of food self-sufficiency, food security. Intervention of such smallholder irrigation projects in such pastoral areas of Fentale plays important role to bring about tangible changes with regard to food security and overall socio- economic development of the society.

So far, in Fentale woreda, no study has been undertaken on socio-economic as well as other factor effecting irrigation development of Fentale district Oromia Regional State

Therefore, this study has been conducted to examine the role of irrigation development in the study area to food security status and household poverty. The main reason for this study was that many of the studies, in addition to the government policy document, that have examined the role of irrigation in prospect of wider household livelihood security have failed to go beyond food security. Thus this study is used to fill this gap by analyzing the relationships of irrigated agriculture and household food security and poverty status of irrigating and non irrigating household in the study area and by making a comparative analysis on the household living conditions of the irrigators and non-irrigators before and after starting of irrigation practice.

Accordingly, the study has examined the main effects of irrigated agriculture and how the outcomes are making irrigators better-off than non- irrigators in terms of access to sufficient food, income, over all resource base (productive and non-productive resources like livestock, housing conditions and household assets), improved resources for education and health care services and increased on-farm and off farm employment opportunity. Moreover, the study has tried to analyze the major factors that affect the irrigation development in the study area in order to understand how these factors may limit the role of irrigation to improve the livelihoods of the community in the area.

The study was able to show that in the study area irrigator households were found to be better off in respect to crop production, household income, and possession of productive and non productive resources, and increased on-farm employment opportunity, improved resources for education and health care services and enhanced food security situation. Almost all irrigators were able to increase crop production in quantity and range by producing two or more times per year using irrigation than before. Thus, all irrigator households' crop production has increased from what it was before irrigation while the crop production of non- irrigators were found to show no significant change. All irrigators were able to generate higher income by

producing cash crops like (onion, tomato and pepper) after irrigation, in addition to food crops they produced with rain fed agriculture.

Moreover, irrigators were found to have higher annual average incomes of 33922 birr from their production of cash crop and food crop, sale of livestock and livestock products, and off-farm activity.

The realization of better economic outcomes of irrigators has direct effects on improved household resources and asset creation like livestock possession, better housing conditions and better household assets. In line with this, the study shows, on average irrigator households have higher number of live-stocks such as oxen, camel, cow, goat, sheep and donkey. With respect to housing condition and household furniture, the study result shows that more number of irrigators (from Sara -weba study site), were able to build better houses after irrigation. In relation to household furniture, all of sampled households answered that their household furniture was very poor before irrigation however most of irrigator households put their opinion in that their furniture's used in the household would be improved.

To see the effects of irrigation on improving housing conditions and household furniture of sampled households of Gidara study site appears to be less worth mentioning due to short lifetime of irrigation project.

It is fact that, irrigation activity creates on-farm and off-farm employment opportunity for both non -irrigator and irrigator farming households. In this regard, the study shows, of the sample irrigator households, 66 (54.5%) have hired wage labor for their farming activity. on the other hand, out of sample non -irrigator households 15(51.7%) generated their income from wage labor on average 2246 birr per production season.

Concerning the human capital aspects, the study shows that out of the sampled household 38(50%) of irrigator households able to sent their children to school and also characterized by low drop outs. In relation to health problem as the survey data shows, out of the sample households 94 (62.6 %) had got health problem in 2009/10., 55 (58.5%) were treated. Of these treated households large share, 51(73.9%) was from irrigator households. Therefore, irrigator households are in a better position to cover health service fees due to their relatively higher household incomes.

The study was able to see the effects of irrigation on household food security. The data indicates that majority of the irrigators have produced sufficient food crops and income for their household food requirements after irrigation. Accordingly 42 (28%) irrigators have responded that their crop production and income generated from various sources (2009/10) is

Sufficient for more than 12 months and 70 (46.6%) of the sample households stated their production and income is sufficient for household food requirement for 10-12 months. Of these, 66(54.5%) are irrigators. Moreover, the study reveals that irrigator households have better family meal types and improved daily food intake patterns than non –irrigator households.

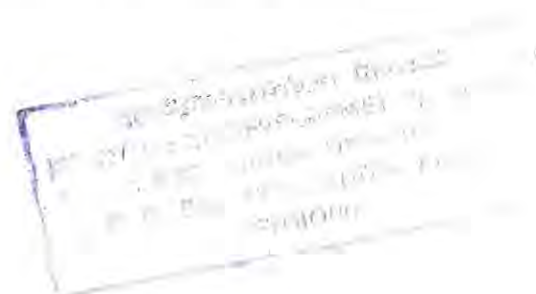
On the other hand , the findings of the study reveled major factors that affect the irrigation development in the study area such as poor access to credit services, input supply, low price of the product during harvesting period, shortage of transportation facility and, shortage of storage facility, and lack of potable water, and operational and technical problems ( which is associated with cutting and stealing of gate valves from the irrigation field and lack of technicians to timely repair irrigation systems/canals during damage .

## **6.2 Recommendations**

Finally, based on the major findings of the study, the following issues are identified for successful performance of smallholder irrigation schemes in the future.

- It will be tough Coordination among different bodies in the intervened irrigation projects as this will be helpful to maximize the essential contribution of the irrigation activity.
- Marketing constraints are often mentioned as major constraints to agricultural development. So, it will be advisable for any concerned institution to put effort in facilitating marketing promotion, and reasonable transportation services that can enable the farmers to sell their products in farther market places where there is fair price in the short run.

- As shown in the study, WUA has the responsibility given by proclamation 147/97 to engage in provision of credit, agricultural input supply and facilitating of output marketing to the members, in addition to operation and management of the scheme. There is formally registered water users association in the area however, they are not functional. Therefore, it is worthwhile for the government to give technical and financial support to strengthen the water user associations (WUA's) in order to improve smallholder irrigation practice in the area.
- Credit services play an important role in agricultural production. Farmers who have access to credit will be able to increase production due to the use of improved agricultural technology. The availability of appropriate credit rendering institutions would have a positive effect on the agriculture and rural development of an area. It will be logical to set appropriate credit rendering institutions and provision of inputs to enhance effectiveness of the small holder irrigation project,
- Training of irrigators in water management, general crop production, input application and product handling are important for valuable performance of the smallholder irrigation project.
- It will be rational to arrange demonstration works on irrigation practice, irrigation schedule and patterns of cropping to improve the performance of smallholder irrigation project.
- Leasing out the farm land may expose the land owners to exploitation and weakens the low working culture of the pastoralists in relation to crop production. It will be advisable to formulate rules and regulations to prevent such action.



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## Annexes

### Annex 1: Household survey questionnaire

Questionnaire Designed for examining the Role of Irrigation Development projects in Poverty Alleviation and Food Security attainment at household level in Ethiopia: The case of Fentale district.

#### I. Introduction

1.1 Kebele \_\_\_\_\_

1.2 Agro-ecological zone \_\_\_\_\_

1.3 Name of respondent \_\_\_\_\_

1.4 Sex of the respondent (HH head) 1. Male 2. Female

1.5 Age of the respondent \_\_\_\_\_ year

1.6 Respondents Marital status 1. Married 2. Single 3. Divorced 4. Widowed

1.7 Educational status of the respondent 1. illiterate 2. Read and write 3. primary school completed 4. diploma

1.8 Family size \_\_\_\_\_ and Sex composition of the household members 1. Male \_\_\_\_\_ 2. Female \_\_\_\_\_ 3. total \_\_\_\_\_

1.9. Indicate the age composition of the household members

No.	Age category( Years)			
	18-34	35-64	Above65	Total
Household- members				

1.10. Do you use irrigation now 1. Yes 2. No.

1.11. If your answer to question” no.10” is “yes”, when did you start?

2. 5 years ago                      2. 4 years ago                      3. 2 years ago

4. Others specify \_\_\_\_\_

1.12 If your answer to question No.1.10 is “no”, what are the possible reasons?

1. Insufficiency of irrigation schemes

2. No farm land near by irrigation project

3. Others (specify) \_\_\_\_\_

## II. Agricultural production, Income and Asset owned

2.1. What type of crops you often grow using irrigation?

1. Cereals (maize, Sorghum, Teff)

2. Pulses (chickpea, Bean, Haricot bean)

3. Vegetables (Tomato, onion, garlic, potato) 4. Others (specify) \_\_\_\_\_

2.2. Indicate the total agricultural production produced using irrigation in 2008/ 09(2001)?

No.	Type of crops	unit	Amount of yield (in Qt).
1	Maize		
2	Teff		
3	Sorghum		
4	Others ( specify)		

2.3. If you sold any type of your production produced using irrigation, indicate the amount and income received from the sale of the product in 2008/ 09(2001)?

No.	Type of crops	Unit	Amount sold (in Qt).	Price (Birr/Qt)	Income in birr
1	Maize				
2	Teff				
3	Sorghum				
4	Others ( Specify)				

2.4. Indicate the total of agricultural production in 2008/ 09(2001) me her season?

No.	Type of crops	unit	Amount of yield (in Qt).
I	Cereals		
1	Maize		
2	Teff		
3	Sorghum		
II	Pulses(Bean, Haricot bean, )		
III	Others( Specify)		

2.5. Which type of cash crops mainly produced using irrigation?

1. Sugar cane
2. Vegetables (onion, Garlic, cabbage, Tomato , Pepper)
3. Chat
4. Fruits
5. Others (Specify) \_\_\_\_\_

2.6. Indicate the type and amount of cash crops you produced and the income received from the sale in 2008/09 (2001) production Year?

No.	Cash crops	unit	Amount produced	Amount sold	Unit price	Total income in birr
1	Sugar cane					
2	Onion					
3	Garlic					
4	Potato					
5	Tomato					
6	Chat					
7	Banana					
8	Papaya					
9	Others					

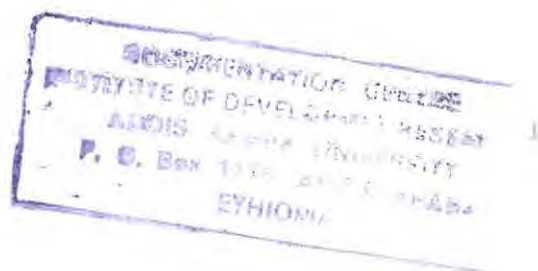
**Household Asset holding**

2.7. How did you describe your household asset before using irrigation project?

1. Good 2. Fair 3. Poor

2.8. How do you describe your household asset at present?

1. Good 2. Fair 3. Poor



**2.9. Indicate your housing conditions and when you owned with the approximate value?**

No	Housing conditions	Quantity	When Owned (Years)	Approximate value in birr	Any Remark
1	Corrugated with Iron roof				
2	Electric line				
3	Toilet				
4	Grass roof house				
5	Separate kitchen				
6	Single room				
7	Wood and mood roof				
9	Others				

**2.10. Indicate if you have the following household utensils and equipments?**

No.	Items	Quantity	When Owned (Years)	Approximate value in birr
1	Radio			
2	Tape recorder			
3	Bed			
5	Fanons			
6	Kerosene store			
7	Cart			
8	Other ( Specify)			

2.11 Indicate the number of cattle and other animals you owned with their approximate market value?

No.	Types of animals	Quantity(Number)	Approximate cost ( in birr)	Remark
1	Oxen			
2	Cows			
3	Camels			
4	Goats			
5	Sheep			
8	Donkey			
9	Others (Specify)_			

2.12 Indicate the land holding of the family?

No.	Land holding	Quantity in ( hectare)	Rented in	Rented out	Total cult. area	Rented value in (birr)
1	Irrigated land					
2	Rain fed land					
3	Pastureland/grazing land					
4	Total					

One hectare of land \_\_\_\_\_ local unit

Rented Value (birr)/Timad/ year \_\_\_\_\_

1.13. Do have school age children?

1. Yes      2.No

2.14. Do you send your school age children to school?

1. Yes      2.No

2.15. The answer to question no. 2.14 is no what are the possible reasons?

1. Financial problem      2. Demand of child labor      3. Cultural influence

2.16. Did you face health problem in the year 2008/09?

1. Yes      2. No

2.17. If your answer to question no.2.16 is yes have you treated in health centers?

1. Yes      2. NO.

### **III. Household Food Security Situation before and after using irrigation**

#### **A. Food Availability**

3.1. Did you produce enough food for your family consumption from Meher, and irrigation?

1. Yes                      2. No

3.2. If the answer is “no “to question no. 3.1 your production is enough for \_\_\_\_\_ months consumption?

3.3. In which months do you face serious food shortage?

1. December – February      2. March – May      3. June \_ September

3.4. How do you overcome the food shortage?

1. From relief      2 from market      3. By borrowing from relatives

4. Others \_\_\_\_\_

#### **B. Household food consumption situation**

3.5. What proportion of your production was consumed by the family before using irrigation?

1. All              2.  $\frac{3}{4}$  th of the production      3.  $\frac{1}{2}$               4.  $\frac{1}{4}$

3.6. What proportion of your production is consumed by the family now?

1. All      2.  $\frac{3}{4}$  th of the production      3.  $\frac{1}{2}$       4.  $\frac{1}{4}$

3.7. What were your usual meals before using irrigation?

1. Cereals      2. Animals and its products      3. Vegetables and fruits  
4. All      5. others (specify) \_\_\_\_\_

3.8. What are your usual meals at present?

1. Cereals      2. Animal and its products      3. Vegetables and fruits  
4. All      5. Others (specify)

3.9. How many times did you eat per day before using irrigation in a day?

1. 3 times      2. 2 times      3. Once

3.10. How many times do you eat per day in the present time?

1. 3 times      2. 2 times      3. Once

3.11. For how many months your production was your annual production and income enough for your family consumption?

1. 1-4 months      2. 5-9 months      3. 10-12months      4. >12months

#### **IV. Agricultural extension, Marketing, and Credit Services**

4.1. Did an extension agent visit you last year?

1. Yes      2. No

4.3. Have you applied chemical fertilizers on your farm for the last five years?

1. Yes      2. No

4.4. Indicate the average yearly amount if you use all or any one of the following agricultural inputs?

No.	inputs	Unit	Amount in respected units	Price in birr/unit
1	Fertilizer			
2	Improved seed			
3	Pesticides			
4	Herbicides			

4.5. Where did you get price information for your agricultural product?

1. From merchants
2. from dealers
3. From Radio
4. From an extension agent

4.6. Where do you sell your agricultural product?

1. In the near market \_\_\_\_\_
2. Merchants buy from the farm
3. Others (specify) \_\_\_\_\_

4.7 How does the local price of your product during harvesting seasons?

1. Very Cheap
2. Cheap
3. Fair
4. Expensive

4.8. How do you evaluate the local price of your product some months after harvesting seasons?

1. Very expensive
2. Expensive
3. Fair
4. Cheap
5. Very cheap

4.9. Have you ever faced any problem in selling your agricultural produce?

1. Yes
2. No

4.10 If your answer is yes to question no. 4.9, what problems faced in selling your product?

1. Low price
2. Lack of transport facilities
3. Low demand for the produce
4. Brokers interference

4.11. Are you regular user of credit service for your agricultural activities?

1. Yes
2. No

4.12. If the answer is “yes” to the above question, where did you get the credit service?

1. From service cooperatives
2. From local money lender
3. from relatives
4. Others (Specify) \_\_\_\_\_

#### **V. water management and Irrigation Practices issues**

5.1 .Which season do you make your irrigation practice?

1. Summer
2. Spring
3. Bega
4. Maher
5. All Seasons

5.2. If your answer to question no. 5.1 is different from no. 5 why do you choice that particular season ?

1. Water shortage
2. Farm land shortage
3. Labor power shortage
4. Others (Specify) \_\_\_\_\_

5.3. What are the major sources of labor power in your irrigation practice?

1. Family
2. Relatives
- 3 Daily laborers

5.4. How much money do you pay for daily workers per day?

1. 10-15
2. 15 - 20
3. 20 - 25
4. Above 25 birr

5.5. How many daily workers do you employ on average per production season?

1. 10    2. 15    3. 25    4. Above 25

5.6. How do you plow your irrigation land?

1. Oxen    2. Tractors    3. Others (specify) \_\_\_\_\_

5.7. What is the water delivery method from the source to the field?

1. Concert canal    2. Earthen canal    3. High density PVC    4. Others (Specify)
- \_\_\_\_\_

**VI. Household Incomes and Expenditure**

6.1 Indicate annual income from animals and animal's product?

No.	Types of animals/ products	Unit	Number sold /Rented			Total income	
			sold	rented	total	From sell	From rent
1	Oxen						
2	Cows						
3	Bulls						
4	Calves						
5	Heifers						
6	Camels						
7	Goats						
8	Sheep						
11	Donkey						
12	Honey						
13	Milk and milk product						

6.2 .Indicate the non- agricultural sources of income of the family (From September.2008- Aug.2009)

No.	Activities	Income received in birr
1	Labors wage	
2	Petty trade ( of any)	
3	Sale of firewood , charcoal	
4	Sale of crop( residence/straw/hay/stalks	
5	Pottery	
6.	Others	

## **Annex 2: Focus group discussions (FGD) Chick list**

1. What are the major development opportunities in your area?
2. What are the main development problems in the area?
3. What are the major problems of the irrigation production and productivity? What are the possible solutions?
4. How do you evaluate the benefit of irrigation development project in your area?
5. How do you evaluate your food security situation and economic status before and after the implementation of IDP?
7. What are the major problems of the irrigation development in the area?
8. What are the benefits of the irrigation development in the area?
8. What are the development potentials regarding livestock production after the implementation of irrigation project in the area?
9. What are the major problems regarding livestock production? What are the possible solutions?
10. Are there any problems in relation to range land (such as over grazing, agricultural land expansion and grazing land conflict)?
11. Are there any land use conflicts in the area? If so, what are the main causes of these problems?
12. Is there any conflict resolving mechanisms?, traditional and or formal / in relation to land use conflicts in the area?
13. What are the major social problems regarding, health, water, and sanitation and the like in the study area?
14. What are the local land resource administrations and management practices?

15. Is there any sort of transformation with regard to farming system in the area? If so why?
16. How do you compare your present production (crops, livestock) to that of 5 years ago or before irrigation?

### **Annex 3: key informants interview Checklists**

#### **I. With district Agricultural /pastoralist development office (ADO)**

1. Which kebeles of the district are predominantly pastoralists, agro-pastoralists and which ones are engaged in mixed farming activities?
2. What are the major livestock species existed in the area?
3. What are the major problems that hinder agricultural development in the area?
4. How do you relate the irrigation development with livestock production and range land management in the area?
5. How do you evaluate the total number of people with problem of food security in the area before and after the implementation of irrigation development project?

#### **III. With irrigation officials/, Agricultural Development officials**

1. What are the major objectives of irrigation development project (IDP)?
2. What is the area coverage of IDP?
3. Can we get the lists of HH's that have access to irrigation development project?
4. What are the major crops grown in the irrigation development project?
5. Who decides the cropping program in irrigation project?

6. Are there irrigation water users association and other associations in relation to irrigation development project? If so
  - i. how did they selected
  - ii. What is their role?
  - iii. How do you evaluate their effectiveness?
6. Which organizations have involved in the irrigation scheme management? How do you evaluate their management towards improvement of the scheme?
7. What are the problems and opportunities of IDP in the area?
8. What are the problems that hinder irrigation development in the area?
9. How do you state the benefits of irrigation development in the area?
10. What is the average holding of cultivated land (hectare/ household)
11. What is farming system in the district?
12. What is the proportion of rain-fed and irrigation crop production area in hectare, yield in quintals in the district?
13. What is farming system in the district? crop in percentage \_\_\_\_\_, livestock in \_\_\_\_\_ % and mixed farming in \_\_\_\_\_

### **III. With the development agents, (DA)**

1. How did the management and operation of the scheme undertaken?
2. What type of cash crops are grown on the irrigation development project?
3. How do you evaluate the marketing of cash crops? how is the difference from the farm gate price for such crops in 2008/2009
4. How was the price of food crops before the irrigation development in the area?
5. How is the price of food crops and cash crops in the area?
6. What is the irrigation potential of the scheme?

**IV. With woreda Education and Health office**

- 1 how many school are in the woreda up to 2009?
2. How many students have been attending in these schools in the year 2009?
- 3 what is the number of health institutions in the woreda in the year 2009?
4. What is health problems usually appeared in the woreda?



## Declaration

I declare that this thesis is my original work and has not been presented for a degree in any University; and all sources of materials used for the thesis are duly acknowledged.

Declared by:

Abeba Alemayehu



Confirmed by:

Tesfaye Tafesse



Advisor