ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

IRRIGATION MANAGEMENT AND ITS CONTRIBUTION IN REDUCING HOUSEHOLDS' SOCIO-ECONOMIC POVERTY: THE CASE OF TWO SMALL-SCALE IRRIGATION SCHEMES IN BLUE NILE BASIN OF AMHARA NATIONAL REGIONAL STATE

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BY

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Acronyms

ADC	Agriculture Development Center
AGWARDO	Ankisha-Guagusa Woreda Agriculture and Rural Development Office
ANAZ	Awi Nationality Administrative Zone
ANRS	Amhara National Regional State
APO	Asian Productive Organization
BoFED	Bureau of Finance and Economic Development
BoWR	Bureau of Water Resources
BSHWARDO	Banja-Shikudad Woreda Agriculture and Rural Development Office
CO-SAERAR	Commission for Sustainable Agricultural and Environmental Rehabilitation of Amhara Region
CSA	Central Statistic Authority
DFID	Department for International Development
DSASCE	Development Studying Association Shawel Consultant Entreprise
E.C	Ethiopian Calendar
EAEOD	Ethiopian Agricultural and Environmental Operation Division
ENBI	Ethiopian Nile Basin Initiative
EPRDF	Ethiopian People's Revolutionary Democratic Front
FAO	Food and Agriculture organization
FDRE	Federal Democratic Republic of Ethiopia
FGD	Focus Group Discussion
FIWUC	Fetam Irrigation Water Users Co-operative
FSS	Forum for Social Studies
FSSI	Fetam Small-Scale Irrigation
HHs	Households
IFAD	International Food and Agriculture Development

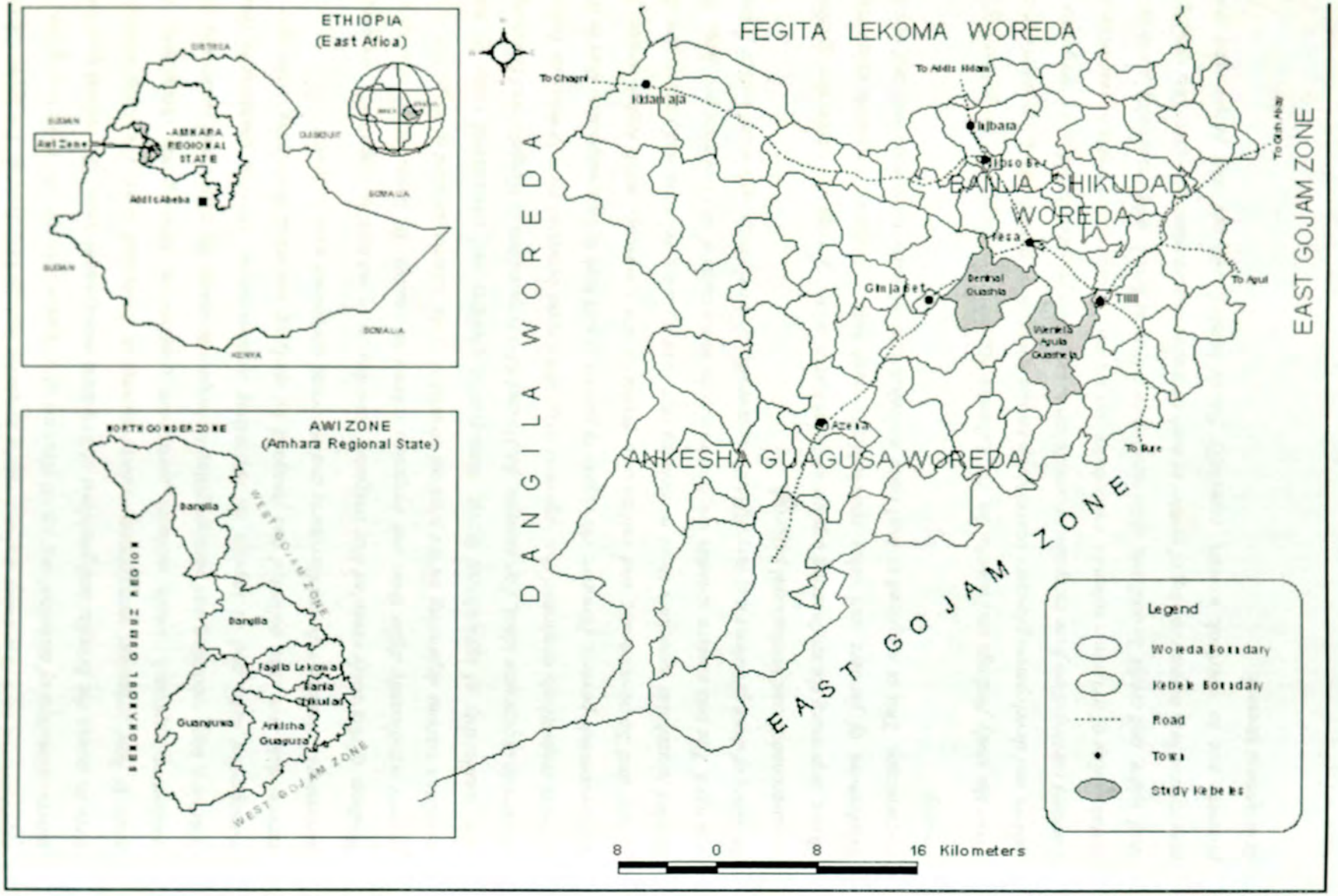
ILRI	International Livestock Research Institute
IWMI	International Water Management Institute
IWUC	Irrigation Water Users Co-operative
M and E	Monitoring and Evaluation
MoFED	Ministry of Finance and Economic Development
MoWR	Ministry of Water Resources
ONCCP	Office of the National Committee of Central Planning
PA	Peasant Association
PC	Producers' Cooperative
SC	Service Cooperative
SNNPR	Southern Nation Nationality People's Region
UN	United Nations
UNECA	United Nation Economic Commission for Africa
WC	Water Controller
ZIWUC	Zingni Irrigation Water Users Co-operative
ZSSI	Zingni Small-Scale Irrigation

Glossary of Local Terms

Aphen	Sheep disease (Ovinepasteurellosis)
Areki	Local liquor to drink
Awraja	Administrative unit above District before EPRDF
Aynu	Main Reservoir
Badema	Homeland
Balabbat	Originally hereditary owner of rist land since 19th century,
Bega	Dry season
Berer	Cattle disease
Birr	Ethiopian currency
Chiqashume	Local chief during Imperial Regime
Dega	A commonly used term for altitude of 2400 m and above
Degegnoch	Highlanders
Desh	Group of hamlets in a rural community
Derg	The Provincial Military government of Ethiopia
Ekub	A kind of informal savings or local rotating savings
Gendi	Cattle disease (anthraces)
Gotera	Traditional Storage
Gott	Village
Gotta	Traditional Storage
Gult	Non-hereditary right to collect tribute; bestowed on members of the nobility and clergy by the king
Gushgusha	Traditional Storage
Idir	A kind of mutual support established to deal basically on burial services and mourning ceremony at the incidence
Injera	Ethiopian flat bread that is made from a mixture of ground cereals and pulses
Kada	Local Unit of Measurement equivalent to 0.25 hectare
Kebele	The local administrative unit of government
Kelikle	"Prohibited" enclosed grassland

Kello	Literally it means "turn"
Kettena	Zonings
Kifelhager	Regional administrative unit above Awraja before EPDF
Kiremet	Wet season
Kommel	Local unit of land measurement introduced in Awi during Emperor Menlike II
Kondye	Socially and economically influential farmers
Kot	Literally "bed" under the roof of a house
Kuriba	Equine disease (African equine sickness)
Maheber	Type of social organization
Marsha	Farm implements
Meberber	Literally "Searching for" or "investigating"
Meher	Ethiopian main rainy seasons from June to September
Mekleft	Piece of bread serves for church attendants
Nefero	Roasted cereals and pulses usually mixed
Nug	Equivalent to Niger Seed or an oil seed
Rist	A lineage system of landownership; the hereditary right of an individual; or land inherited through decent from Mother's and father's lines.
Romani	Red onion
Teff	Grain with a small seed, indigenous to Ethiopia.
Tella	Local beer
Wobera	Collective labour exchange /reciprocal labour exchange
Woina-dega	A commonly used term for altitude between 1800-2400 m.a.s.l
Wonfle	Collective labour exchange/reciprocal labour exchange
Woreda	The District-level government
Yeguroro	Wetting the throat'/ little water to drink
Yewoha Abat	Father of water (water controller)
Zone	Government administrative structure next to Region

Map Showing the Study Kebeles



Source:- GIS Team of ANRS BOFED

Abstract

This study mainly focuses on irrigation management and its role in reducing households' socio-economic and institutional poverty. In this regard, the study attempts to assess the contribution of irrigation and irrigation management and problems associated with it. The socio-technical system approach was used to examine and understand irrigation management systems. The approach shows the interrelationships of technical and social elements of irrigation systems. The objectives of the research were to assess the benefits and problems of irrigation management tasks. The central question of the study is how irrigation management reduces poverty at household level. The study utilized mainly qualitative approach, which includes participant observation, focus group discussions, in-depth interview, tape recording and photographing techniques to assess the nature and patterns of irrigation management tasks and its impacts on minimizing socio-economic poverty. Quantitative (household survey) data was also collected and analyzed by applying statistical descriptive techniques mainly, percentages. Besides, relevant literatures and important documents were reviewed.

Findings of this study revealed that irrigation contribution in minimizing households' socio-economic poverty significantly differ from one irrigation scheme to another. Its contributions also vary across irrigation systems depending on the physical structures of the scheme, amount of irrigation water, plot size, availability of agricultural inputs, management qualities and educational status of individual farmers to accept new ideas. For example, 83.3% and 42% respondents in Wonjella and Deninatquashta Kebeles respectively confirmed that improved irrigation system benefited them to minimize households' socio-economic poverty. However, the degree of poverty is still high in Deninatquashta than in Wonjella Kebele and Socio-economic and institutional problems are commonly much higher among female-headed households especially those households that have no close relatives and farmers are disabled and aged. The two modern schemes are constrained by socio-cultural and technical problems. With the presence of these problems it is very difficult to generalize that irrigation system can reduce households' socio-economic and institutional poverties.

Hence, improving the engineering aspects and managerial issues of irrigation system through the active involvement of farmers and other stakeholders would help to improve irrigation efficiencies and performance. This is supposed to lead rural households to minimize socio-economic and institutional poverty.

From the study findings and conclusion, the following lessons are identified for the concern of policy-makers and development planners interested to reduce households' poverty using irrigation agriculture. Farmers participation from inception to completion of irrigation projects should be a prerequisite for the sustainability of irrigation schemes, equitability and security in access and rights to resources such as land, water, and credit. In addition, skills training contribute to break rural households' socio-economic poverty and help mainstreaming of gender in each irrigation management activities. This would provide planners not to overlook women, especially female-headed, old age and people cast from the development streams.

CHAPTER ONE

1.1. INTRODUCTION

Irrigation is an art as old as civilization (Michael, 1998:1). Historical evidence reveals that humankind resorted to making use of irrigation in the process of food production for his own survival. Ancient World civilization especially that of the Sumerians on the Euphrates-Tigris, is closely related with irrigation development. Irrigation practice gradually expanded to other countries due to the need for crop production (Stern, 1984:15). In such a way, irrigation development at present has become one of the most important components of agricultural production in the World (Nesa, 1970:53).

Worldwide water use for irrigation comprises approximately 70 percent of fresh water withdrawals; in the United States, around 40 percent and in Europe, over 30 percent (Linger, 1995:32). Today, of the 1,500 million hectares of global cropland, some 250 million hectares (17percent) are irrigated .Currently, about 60 percent of the global food crop production originates from rain-fed agriculture and the remaining 40 percent from irrigated agriculture (UN, 2003:24).

According to UN (2003:23), the mean annual rainfall over the African continent is 725mm.The internally renewable water resource in semi-arid areas of Africa is low and the potential contribution of water transfer is limited since very few areas receive more than 1000mm. Much of the rainfall is of high intensity of short duration with high temporal variation and unpredictability. Droughts periodically affect different parts of semi-arid areas. Crop failure every five year is reality, and the risks of yield reduction due to water constraints are high every second year. Of the water diverted for human use in sub-Saharan Africa, 87 percent goes to agriculture.

Arid regions where irrigation plays an important role have the highest level of water withdrawals for agriculture. Out of a total area of 212 million hectares under cultivation in sub-Saharan Africa, an estimated 5.1 million hectares (2.4%) is under irrigation, but this supply accounts for 10 percent of the agricultural production. Traditional forms of small-scale irrigation have been practiced for many years in the arid and semi-arid areas of Ethiopia, especially along the eastern

escarpment of the Highlands (FAO, 1994:5), but modern irrigation technologies were introduced to this country in early 1950s (FAO, 1997:20).

The importance of irrigation development in relation to food production in Ethiopia is of interest in view of recurrent drought and famine conditions experienced by this country during the 1970s and 1980s and the high priority given by the Derg Military Regime to boosting food production and achieving food self-sufficiency. Before this time priority was given primarily to the expansion of commercial agriculture (Kloos, 1990:20, TGE, 1994:1). The current government has also developed water sector development and implementation strategies as a means of combating poverty. Regions also endorsed this policy and strategy accordingly (MoWR, 2001: 46).

Farmers in Awi Zone of Amhara National Regional State have a long experience in traditional irrigation activities. Peasants obtained water using locally constructed temporary canals and diversions of rivers, streams and springs. These water resources are used for farmers as supplementary means to produce different crops to sustain their households (Bekalu, 1994:78).

Prior to the 1970s and 1980s drought and famine in Ethiopia, Awi farmers used these traditional irrigation to improve agricultural production .But in mid1980s, the Derg military regime gave due emphasis to the development of modern irrigation schemes to avert food shortages in the country as a whole. Zingni and Fetame small- irrigation schemes, which were traditional irrigation schemes before the specified years were improved by local administrations in cooperation with the North Korean government to boost up agricultural production. These small-scale irrigation schemes are found in Deninatquashta and Wonjella Kebeles in Ankisha-Guagusa and Banja- Shekudad Woreds respectively in Awi Zone of ANRS.

Therefore, the study presents preliminary results of field research into smallholder irrigation activities and its contribution to minimize households' socio-economic and institutional poverty. The findings are based on a series of different interviews and secondary sources written by different scholars and institutions. The entire thesis of this study consists of six chapters and each chapter deals with interrelated issues.

1.2. Statement of the Problem

In Ethiopia, agriculture is the mainstay of the subsistence of food security, supply of raw materials to industries especially agro-industries and it is a major source of export items in the country (CSA.2005:1 Yibeltal, 1995:43).It provides employment opportunities for more than 80 percent of the working population. The share of agriculture in the country's Gross Domestic Product (GDP) averaged about 52 percent per annum during the last decades (Teressa, 1997, cited in Teressa, et.al.1998:117, MoWR, 1999:88).These facts indicate that agriculture precisely plays a central role in the Ethiopian condition where many farmers are frequently exposed to recurrent drought and famine.

The supply of adequate food to the people in the country entirely depends on the development of agriculture. However, agriculture is constrained by multi faceted problems such as land fragmentation, limited soil fertility, soil erosion and degradation, inaccessibility of inputs, inadequate infrastructure, lack of marketing structures, credit facilities, extension services, supporting research, etc. As a result, its important role is limited to smallholder subsistence agriculture (MoWR, 1999:89-90, Yibeltal, 1995:43).

These limitations forced the Ethiopian government to design policies and implementation strategies to bring change in the agricultural sector of the economy thereby ensuring a steady and adequate supply of food for the people (CSA, 2005:1). Indeed, irrigation was seen as "window of opportunity" to avert food shortages despite decades of traditional efforts in promoting small-scale irrigation (Kloos, 1990:20, McCormick et.al, 2003 cited in Yusuf, 2004:1, 13-14). As a result, the Ethiopian government gave high priority to irrigation development to minimize food shortage since mid 1980s.

According to Carney (1998:184), the sustainability of irrigation schemes are associated more with the level of participatory management issues than to the scale of the irrigation scheme per se. Poor understanding and management of water resources in the past have led to over–extraction and unwise utilization of water resources. Poor management activities and absence of drainage canals have also led to salinity of farmland, water logging and lack of adequate attention to clearing and maintenance tasks. Sometimes poor management of irrigation activities also led to social inequalities by favoring the relatively better households.

The success of irrigation schemes should be vitally evaluated if such infrastructures contribute to minimize households' socio-economic poverty and promote social-wellbeing. However, the socio-economic benefits that are generated by irrigation and irrigation management activities have not been assessed critically whether they achieved the intended results or not by many African countries including Ethiopia (Dessalegn, 1999:30) and Awi Zone in particular.

Quite often national and regional planners and technical experts give less attention to social issues of irrigation as if it is not essential for the success and sustainability of the irrigation scheme (Uphoff, 1986:4 cited in Woledeab, 2003:5). Failure to consider social dimensions in irrigation planning may hold back the efficiency and sustainability of the irrigation schemes. This problem, in turn, may inhibit the involvement of farmers in irrigation management activities.

These shortsighted irrigation planning and other management constraints may in combination adversely affect local farmers not to improve their households' agricultural production. As a result, households may not be able to minimize the socio-economic poverty of each household. Furthermore, assessing irrigation system and its contribution to minimize households' poverty is not yet a common practice for many of the development planners. Therefore, this problem has stimulated the researcher to conduct a study on the contribution of irrigation and its role in reducing poverty in Awi Zone in ANRS.

1.3. Research Objectives

1.3.1. General Objective

- To assess irrigation management activities and irrigation contribution in minimizing households' socio-economic poverty

1.3.2. Specific Objectives

a. To explore irrigation management activities practiced in the study areas;

b. To examine the contribution of irrigated agriculture in reducing households' socio-economic poverty;

c. To investigate how irrigation management activities address gender issues

1.4. Definition of Concepts

- **Irrigation** refers to the practice where an area of land is purposely and actually provided with water other than by rain to improve or increase production of crops (CSA, 2005:9).
- **Poverty** is a situational syndrome expressed in terms of low consumption, poor sanitary condition, illness, high mortality and morbidity rates, precarious housing, low educational levels and marginalization. As poor people perceive, poverty is a social inferiority, physical weakness, and social isolations, powerlessness, humiliation, less social support and little possibilities of finding well-paid employment (MoFED,1992:4).

1.5. Significance of the Study

Zingni and Fetam modern irrigation schemes were introduced in mid 1980s by the local government to combat households' food shortages. Hence, assessing irrigation schemes and its contribution to minimize households' socio-economic poverty is essential for policy-makers to frame policy alternatives and working modalities regarding small-scale irrigation schemes. The study may also provide with some important insights for other scholars who have interests to carry out a study on the same topic.

1.6. Research Methods and Data Collection Techniques

This is the case study of two modern small-Scale irrigation schemes developed by government in two rural Kebeles. The study mainly depends on qualitative approach. In some cases, quantitative techniques were applied as supplementary tool to analyze the research findings. The two modern irrigation schemes were selected by the researcher purposely based on their proximities to transportation facilities, their long age, ecological closeness, and farmers' wealth of knowledge and skills on handling and managing small-scale irrigation schemes.

Before preparing the final proposal, a preliminary visit was carried out in mid August 2006 to get first hand information for the preparation of the proposal. In this short visit, informal discussions were held with Zone and Woreda Agriculture and Rural Development officials, elderly informants, extension workers and Irrigation Water Users Cooperatives' committee members and Kebele

chairpersons. Discussions were also held with regional Bureau of Water Resource (BoWR) on the purpose of the study and they encouraged me to conduct the study. The fieldwork was carried out between March and April 2006 and the main data collection instruments include the following.

1.6.1. Participant Observation

The researcher participated in irrigation management activities by diverting water to the farm plots, collecting harvested onion and potato on the field with plot owners, cutting of grass used for roof making and in crashing of crops. I also had lunch with them, drank local beer, and attended coffee ceremonies of individual houses to understand their economic situations. Every day in the fieldwork was an opportunity to participate in local activities and at the same time to observe the life style of irrigators. This strategy (instrument) enabled me to obtain first hand information about the contribution of irrigation to minimize households' socio-economic poverty. I have also observed meetings on Irrigation Water Users Cooperatives committee members presented in cooperative offices and attended borrowers' quarterly meetings.

1.6.2. Focus Group Discussions (FGDs)

The researcher employed focus group discussion techniques to collect data from farmers to crosscheck the data gathered through household survey techniques. Two separate discussions were held to collect data on the contribution of irrigation in minimizing households' socio-economic and institutional problems. FGD participants included men and women whereby both groups participated together in one FGD while another FGD was held with women. Participants of FGD were recruited from different villages based on their respective residential locations (head end water users, middle water users and tail end water users), their knowledge of past and present history of the study sites, agricultural productions, water management activities and their wealth status (relatively rich, middle and poor farmers). Other two FGDs were held with IWUCs committee members to discuss the present irrigation management activities, institutional issues and problems facing them to run irrigation schemes in the study areas. Women farmers were also selected across the irrigation system. They discussed the existing socio-economic situations and assessed their participations in cooperatives. In all focus group discussions six women and ten men had taken part.

1.6.3.. In-depth Interviews

Key informants and individual farmers (male 7 and female 5 in both irrigation schemes) were interviewed to assess the socio-economic problems of farmers. These farmers also shared their experiences with the researcher about irrigation management activities in the past and present situations and its contributions to improve households' livelihood for about an hour and a half for each interviewee. These interviews also included individuals' opinion about scarcity of irrigation water, complaints and institutional issues. The interviewees were selected based on upstream, middle and down stream water users' categories.

1.6.4. Household Survey

A structured questionnaire was prepared before undertaking the actual household survey. Following this, the questionnaire was pre-tested in the field to understand the manageability of the questionnaire. At the end, the structured questionnaire was designed incorporating some corrections. Next to these activities, data enumerators whose educational level was grade 8 and above were recruited and trained for half a day on the irrigation sites to carry out the household surveys. The interviewees were 120 households (60 HHs from each site) living in the irrigation sites.

Random sampling technique was employed to draw sample households (120 households) based on farmers' specific residential location (from head, middle and tail end water users). The sample households were evenly distributed based on the flow path of the irrigation system. Each division (Head, Middle and Tail) consists of 20 households. Out of 20 sample households in each division, three are female headed households. From the total interviewed households, female-headed households accounted 15 percent (see the details in table 1:1 below). The structured questionnaire consists of household compositions, irrigation management issues, land size, irrigated agriculture production, number of livestock, different agricultural inputs and constraints encountered.

Table 1:0. Sample Distribution of the Study Population

Name of Kebeles	Sample Irrigators selected for household survey across the system								
	Head End water users		Middle water users		Tail End water users		Total Water users		
	MH	FH	MH	FH	MH	FH	MH	FH	
Deninatquashta	17	3	17	3	17	3	51	9	60
Wonjella	17	3	17	3	17	3	51	9	60
Total	34	6	34	6	34	6	102	18	120
									N=120

Note: MH=Male Headed, FH= Female Headed

N = Number of households

1.6.5. Recording and photographing

The researcher used a tape recorder to collect information from interviewees about their agricultural activities, outputs, irrigation management works and problems encountered. Relevant pictures (physical structures of the canals, productions and other peoples' life styles) were also taken when they were watering their plots, ploughing, harvesting potatoes, going to markets and so on to supplement the survey conducted.

1.6.6. Secondary Data Collection

Secondary data were also collected from different relevant institutions. Federal Ministries, Regional Bureaus, Zone and Woreda Offices and Non-government organizations including MoA, MoWR, MoFED, BoWR, BoA, BoFED Office of food security in Amhara region and their subsequent structures were contacted to gather useful information regarding irrigation and poverty issues. Other non- government organizations such as IWMI and FSS were also used as sources of data to complement the primary data. In addition, I have also used A.A.U as a source of books, Journals and Websites.

1.7. Limitations of the Study

In carrying out the study, there were some limitations. It was very difficult to compare the contributions of irrigated agriculture to minimize rural households' socio-economic poverty before and after the introduction of modern irrigation schemes. This was because of lack of recorded data in series of times and farmers were unable to tell in precision their actual agricultural yields and plot size due to fear of government taxes, land redistribution and displacement from their homelands. Consequently, some households restricted themselves to report their actual agricultural productions and farm income levels during the household survey. Besides, key informants inability to recalling time series of data chronologically was a problem while collecting the data. These may put a limit to findings of the study.

1.8. Organization of the Study

The study consists of six chapters. The first chapter includes introduction, statement of the problem, and research questions, objectives, definition of concepts, significance, research methodology and techniques and limitation of the study. The second chapter presents the relevant literatures mainly devoted to irrigation and poverty issues. This literature part also contains the theoretical approaches to analyze irrigation schemes in connection with poverty. Chapter three describes the physical settings and the people of the two study areas. Chapter four and five discuss the central theme of the study. The last Chapter devoted to conclusion and recommendations derived from the study.

CHAPTER TWO

2. REVIEW OF LITERATURE

2.1. Poverty in Ethiopia

Ethiopia is one of the least developed countries in the world .its per capita GNP in 1997 was only $ US 110 among the lowest in the world. (Haileleul, 2001:21) .Hence, poverty is not a new phenomenon in Ethiopia (EAEOD, 1992). Poverty in Ethiopia is widespread and multi-faceted.

Poverty in this country is mainly structural which includes low agricultural productivity, small land holdings, exceptionally low technological base, high population growth, high dependency ratio and a very fragmented domestic markets. It also includes low life expectancy, high infant and maternal mortality rate and land degradations (MoFED, 1994:4, Haileleul, 2001:21).

Majority of Ethiopian people are lacking minimum necessities of life. The 1995/1996 report shows that 45 percent of the country's populations were below the poverty line (MEDAC, 1999, cited by FSS, 2002:2, FSS, 2000:3-4). As Haileleul, 2001:21) cited

> *Those people living below the national poverty line are considered to be living in "absolute poverty." This is defined as a condition in which it is not possible to obtain the basic needs of life or where deprivation is so sever that the basic needs of life can scarcely be met. It is the minimum level required for survival. It is further defined in terms of high malnutrition and infant mortality rates, inadequate housing and pervasive illiteracy (Haileleul, 2001:21-22)*

Some data indicate that poverty is highest in the Tigray, Amhara, and Southern Regions. specifically, North and South Omo, Derashe, Konso, East Gojjam, North Wello and Waghemera Zone (MEDAC, 1999, cited in Tizita, 2002:56).

Poverty was prevalent both in rural and urban areas with coverage of 47 and 33 percent of the respective population. Since the rural areas account for about 85% of the country's population, poverty is primarily a rural phenomenon. The urban areas account for only 15% of the total population but also have a high rate of incidence of poverty. From these facts one can understand that poverty in this country has multi-dimensional features. The majority of the people depend on

subsistence farming. The households' incomes are generated from firewood collection and sale, labor selling to better off families, involving in very minimal petty trading activities, and depend on natural resource-based production (World Bank, 2001).There are very limited social infrastructure like road, electricity, telecommunications, health, school, safe water, market networks and services. Consequently, the majority of rural inhabitants are usually more susceptible to risk factors than people at urban centers (FSS, 2002:2).

Abbay Basin Mater Plan report (MoWR, 1999:88-89) cited that, the basin is dominated by small-scale farmers who produce 97% the total agricultural productions in the country. However, their production and productivity are very low in the basin. Many interrelated factors contribute to this low agricultural production. Theses including:

- Low soil fertility of the region. Red soils are inherently of low fertile to grow crops. This aggravated more by topsoil erosion. Majority of farmers in the basin do not use chemical fertilizers to fertilize their plots.
- Small holding size-plots are typically very small. Farmers' landholding size gradually decreased due to varies reasons such as requirements for maintaining grazing for animals, land redistribution, periodic fallowing, construction of different offices, roads etc. This small size limits the production and productivity of agriculture and reinforces the subsistence production.
- Application of unimproved and low yielding varieties of crops. The uses of improved varieties of seeds are not still common to many of smallholders. This is due to unavailability of improved seeds and their high cost of improved seeds resulting farmers remained on traditional varieties of seeds. Of course indigenous varieties can adapt the existing environments and increase security of farmers.
- Low development of technologies. Farmers use very elementary technologies to grow crops. They use traditional crashing practices and storage facilities which involve high yield losses.
- Grazing land problems for livestock. Ever shrinking grazing land led animals to compete on small size lands

- Weak extension services, lack of trainings (initial and on the job training), inaccessibility of credit and low staffing. Low research support to extension services also contribute for agricultural productivities
- Inadequate development of infrastructures, which includes health. Education, roads market outlets affect farmers' productivity.
- Socio-cultural factors also negatively contribute to not accept some new technologies and ideas thereby affect agricultural production and productivities. These all contribute to low productivity resulting farmers to remain in socio-economic poverty. Poverty traps in Ethiopia are summarized in the box below.

Poverty Traps in Ethiopia

A crucial mechanism, which has perpetuated poverty in Ethiopia, is the interaction of poverty and ***population pressures with the productive resource base.*** *Unprecedented population pressures has resulted in decreasing plot size (average landholdings declined from 0.5 hectares per person in the 1960s. to 0.11 in 1999), making an increasing number of households dependent on inadequately small and unproductive plots, and more vulnerable to the vagaries of unpredictable rainfall, and rendering some traditional farming practices unsustainable. These households are too poor to leave land follow or invest in it, leading to a progressive deterioration of their asset base. In the past moving onto new lands absorbed this additional population growth, but in many areas the limits of useable land have been reached, forcing farmers onto lower productivity, more fragile lands.*

Poverty and ***low investment in human capital*** *present another type of self-perpetuating dynamic. Investing in education may be prohibitive for poor households, due both the direct costs, as well as the fact that all members need to contribute to the family's income, including time-consuming tasks such as collecting water and firewood. Even if returns to education are high, the inability to finance that initial investment means that there is underinvestment. Without significant increases in productively it is difficult for capital to be accumulated, so that returns to unskilled labor are unlikely to grow. Poverty and low education, therefore, reproduce themselves in future generations.*

Low levels of ***infrastructure*** *offer another example of perverse dynamics, as they result in under developed markets high transaction costs and coordination failures. The benefits of exchanges cannot be realized and the economy remains trapped in a largely subsistence-oriented structure. While the large, lumpy nature of infrastructure costs makes it hard to make the initial investments to break out of these traps. In the rugged and difficult geography of Ethiopia, many remote areas see their potential' for dynamic private sector growth and diversification out of agriculture hindered by the lack of basic infrastructure.*

The Low Risk/Low Return Trap: *Small farmers, who constitute the bulk of the population, are often caught in production of low-risk/low-return food grains. With insufficient cash funds, and unpredictable outcomes, they cannot afford to take the risk of diversifying from subsistence food production into potentially higher-return activities (such as growing cash crops for market), or of spending their limited cash on purchased agricultural inputs, because if they fail either because of crop failure, price collapse, or failure of demand, they will not have either the basic food they would otherwise have produced, nor the cash to purchase it, and their families will go hungry.*

The Early-Childhood Trap: *Nutrition offers a similar story, with malnutrition very early in life affecting long-term mental and physical development, and thus limiting lifetime potential and productivity, and creating a low-income, low-consumption household in the next generation.*

Source: MoFED (2005:3).Building on progress: plan for accelerated and sustained Development to end poverty (PASDEP) 2005/06-2009/10 Vol I, Main text, Ethiopia

2.2. Irrigation Development in Ethiopia

Irrigation development in Ethiopian probably predates the arrival of the Semitic-speaking immigrants from Yemen and possibly agriculturalists from Sudan. Both groups may have introduced seed/plough cultivations and irrigation to Northern Ethiopia in the area of the later Axum Empire between 1000 B.C, and 100 BC (Kloos, 1990:23).

According to Kloos (1990: 23), in the 15th and 16th century, the Portuguese missionaries Alverez and Almeida reported the use of irrigation in various localities in the northern highlands, and among the Afar in the lower awash valley. Later, persisting use of relatively advanced irrigation system by various Cushitic and Omotic-Speaking people such as Konso and other southern Ethiopia ethnic groups were identified.

Through time major agreements were reached during the imperial regime with private companies for the development of schemes to produce sugarcane, cotton, and bananas, mainly in awash valley (IFID, 1985, cited in Seid, 2002:24, FAO, 1990 :)

According to Dessalegn (1990:8), prior to the Ethiopian Revolution of 1974, the purpose of irrigation development was to supply cash crops to the growing industries in the country; a great number of these schemes were controlled and managed by outsiders in accordance with their interests.

Following 1974, irrigation was considered as part of the modernization and a means to promote socialist ideology in the rural economy. The Dreg military government of Ethiopia gave due attention to the development of irrigation interventions in the early 1970s. Especially, after 1984/85 drought it tried to enhance rural household economy by brining rural land under irrigation interventions (Dessalegn, 1990:8). At last, due to the recurrent drought and famine, irrigation became the main concern of the government in order to meet national food self-sufficiency and ensure household food security (Seid, 2002:23).

> *Traditional irrigation practice has a history of more than one century in same parts of Ethiopia. However, it is only in the outcome of the 1984 drought that the victimized farmers turned towards irrigation to fight recurrent drought and famine as a possible solution. He added, however, that these local initiatives often suffer from irregular supplies due to frequent flood damages at the canal head works or main canal intake,*

high losses along long and often poorly constructed main feeder canals (Habtamu, 1990:1).

As noted by Ghai et al, (1995:286), the MoA was responsible for the development of small-scale irrigation schemes. The purpose of small- scale irrigation is not to create an alternative to rain fed agriculture, but rather to provide facilities for supplementary irrigation. The water sources used are perennial streams and springs. Initially, the majority of irrigation schemes used for cultivation of cereal food crops, but gradually diversification towards the production of vegetables for sale in the local market has taken place.

The total irrigated crop area in the country is estimated to be more than 121 thousand hectares presently. The farmers who practice irrigation are estimated to be more than 893 thousand (CSA, 2005:12-13). As MoFED (1992:53) stated, expansion of small and medium scale irrigations is essential to break the permanent dependency of farming communities on rain-fed agriculture.

According to MoWR (1999:99), existing irrigation schemes are classified on the basis of the size of hectares of land to be developed in to three classes, as large scale with more than 3000 hectares, medium scale with a command area between 200 and 3000 hectares; and small- scale (Usually called traditional) that covers below 200 hectares.

Large and medium- scale irrigations are built to commercialize rural agricultures. The Government and private enterprises managed these schemes as a tool to boost up production. Indeed, large-scale irrigation schemes are recent (late 1970s) as compared with small- scale and the medium (MoWR, 2002:48)

According to Dessalegn (1999:25), the advantages of small- scale-scale irrigation are:

- They have low investment costs,
- They do not involve dams or storage reservoirs, hence, no inhabitants displacement is involved;
- They are less demanding in terms of management, and operation and maintenance;
- They have no serious adverse environmental impact;

- They allow a wide diffusion of irrigation benefits; and they permit farmers to learn irrigation techniques at their own pace and way.

As noted by FAO (1997, cited in Lemma, 2004:17), many countries have understood the vital roles of irrigation in food production. There are also several problems which have been responsible for slow rate of irrigation development in several countries. These include:

- Inadequate physical infrastructures;
- Poor investment in irrigation;
- Lack of access to improved irrigation technologies;
- Lack of cheap and readily available water supplies;
- Fragmented small size landholdings;
- Poor transportation and marketing facilities.

Ethiopia has a total volume of 123 billion cubic meters of surface water and about 2.6 billion cubic meters of usable ground water. However, the distribution is not uniform allover the country. The western half of the country has many perennial rivers, streams and springs (McCormick et al, 2003, cited in Yusuf, 2004:8, MoFED,2005:62).The following table shows the status and use of water resources and its potential in country.

Table 2:1. Status of Water Use Resource Development and Potential at the National Level.

Regions	Population in million	Potential	Tradition irrigation	Current irrigation development status		
				SSI	Medium &large Ir.	Regional enterprise
Oromia	22,354	1,35,000	56,807	17,690	31,981	2,614
Amhara	16,295	500,000	64,035	5,757	—	—
SNNPR	12,515	700,000	2000	11,577	6,076	800
Tegray	3,694	300,00	2,607	10,000	—	
Afar	1,216	163,554	2440	--	21,000	2000
B/gum	0,537	121,177	400	290	—	–
Gambala.	0,210	600,000	46	70	—	—
Somalia	3,698	500,000	8,200	1,800	2000	—
Hareri	0,160	19,200	812	125	—	—
DeriDaw	0,318	2,000	640	860	—	—
A/A	2,495	526	352	—	—	—
Total	63,493	4256,417	138,339	48,074	61,057	5,414

Source: MoWR (1993 E.C) Irrigation Water Development and Utilization in Ethiopian panel Discussion paper proceeding page 364, A.A Amharic version.

2.3. Irrigation Development in Amhara Region

Amhara region has much water resources. The Abbay, Tekeze, some part of Awash River basins and the Afar drainage are the four principal sources of water in Amhara. The Abbay river basin is one of the major basins of Ethiopia and it has about 199,812 Km^2 of area. Of this figure, 159,849.6Km^2 falls within the ANRS region (MoWR, 1998, cited in BoFED, 2004:3, DSASCE, 2005:11).

Table 2:2. Surface Water Resource of Amhara National Regional State by Rivers

No	Rivers	Total catchments area (Km2)	Catchments Area in the region (Km2)	Total annual flow (BM3/s)	Annual flow with in the region (Bm3/s)	Specific discharge (1/s/ Km2)
1	Abay	199,812	159,849.6	52.6	24.2	7.8
2	Tekeze	89,000	7120.0	7.63	.61	3.2
3	Awash	112,700	2254.0	4.6	.1	1.4
4	Afar drainage	74,000	928.4	086	.01	--
	Total	475,412	170,152	65.69	24.92	

Source: Water resource potential assessment survey in ANRS by Development Studying Association Shawel Consultant Enterprise (DSASCE).(2005)

There is no well-documented evidence about the development history of irrigation practice in the Amhara region. However, some studies revealed that irrigation practices carried out in the low land areas of the region dated a while back. The practices of these irrigation schemes were limited to the bank of the rivers and around the streams. The constructions of the canals are mainly practiced during dry seasons. Canals are very simple and without permanent control and measuring structures. However, these construction materials were damaged by heavy rain and runoff during wet season (BoFED, 2004:5). The diversion structures are mostly made of locally available construction materials such as stone, grass, logs, and leaves and soil. Modern irrigation, currently Practiced in the region, has been in place since 1979; however, these schemes have highly suffered from many difficulties and associated problems (MoWR, 1998, cited in BoFED, 2004:3).

However, these days there are very important efforts to develop small-scale irrigated agriculture by regional government and non- government organizations particularly in drought prone Zones of the region (DSASCE, 2005:11).

2.4. Irrigation Contributions to minimize Households' Socio-economic Poverty

Irrigation contributes to productive and livelihood activities. Consequently, with common understanding on the vital role of irrigation in agricultural development, many developing countries such as Ethiopia have promoted the expansion of irrigation in the last several years to meet the intended agricultural production growth and thereby to minimize food insecurity by preventing drought and famine situations.

Conceptually, 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 socio economic welfare. The benefits tend to be interrelated and reinforce the impact of one on the other. Through these benefits irrigation practice is linked to poverty reduction (alleviation) both directly and indirectly. Direct linkages work via localized and household-level effects, and indirect linkages work on subsequent national level impacts. Irrigation can benefit the poor by increasing agricultural production, and by generating higher and year-round farm and non-farm employment opportunities. Irrigation enables smallholders to adopt more diversified cropping patterns and to escape from low-value subsistence production to high-value market-oriented production (Hussain, 2005:1).

> *"... Irrigation can influence poverty through three pathways a) micro-path way through increasing returns to physical, human and social capital of the poor households (productive path way); b) meso-pathways-through integrating the poor into factor product and knowledge information markets (market participation pathway) and c) macro pathway-through improving growth rates and creating second generation positive extradition (growth path- way" (Hussain, 2005:1).*

Drought and famine have affected the vast majority of Ethiopia people for many years. This posed a question to mitigate poverty issues in rural households mid 1980s. As a result, irrigation development was considered as a means to sustain rural agriculture production and thereby ensuring poverty alleviation. Therefore, in Ethiopia government bodies, development workers, planners and practitioners have given due attention to the assessment of water resource potential

and make use of water resources as a tool to enhance and stabilize food production in countryside.

As available data indicate, in countries, which have arid and semi arid agro-climatic zones, insufficient rainfall and rapid population growth negatively affect rural livelihoods. At times, irrigation has the potential to enhance and sustain rural livelihood by reducing poverty (Elahi, 1985 cited in Seid, 2002:19).

In irrigation agriculture has four interrelated mechanisms that facilitate rural inhabitants to sustain their livelihoods (Hasnip, et al, 2002:6). These including:

- Improvement in the level and security of productivity, employment, and incomes for irrigated farming households and farm labour;
- The linkage and multiplier effects of irrigation development (as part of wider agricultural growth) for the wider economy;
- Increased opportunities for rural livelihood diversification; and
- Multiple use of water supplied by irrigation infrastructures. [1]

According to Carney (1998:183), poverty is one of the factors that negatively affects rural livelihood. Hence, irrigation can play role by increasing households' agricultural production Increased production positively contribute to households' to alleviate socio-economic problems. "In 1998, irrigated land occupy about one-fifth of the total arable area in developing countries and produced two-fifths of all crops and close to three-fifths of cereal production" (FAO, 2003:18). Besides this contribution, irrigation also contributes to the possibility of the intensification of agricultural production and outputs in areas where agricultural land is very limited. Modern technologies like varieties of seeds, fertilizers, Pesticides, extension inputs and services can improve agricultural yields for households. These would give an opportunity to farmers to generate sustainable income for their livelihoods (IFAD, 1985, cited in Seid, 2002:19).

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[1] Hasnip, N. et.al, (2002), *Contribution of Irrigation to Sustaining Rural Livelihoo* DFID:www.hrwallingford.co.uk/downloads/publications/d

Currently, the Ethiopian government gave due attention to the development of irrigation to reduce poverty and thus to ensure households' food self-sufficiency. The government envisaged that, the development of irrigation will generate export earnings and it also satisfies the raw materials demand by local industries (MoWR, and 2001:46).

2.5. Types of Irrigation Management Systems

According to Aheeyar (2004:18), there are three types of irrigation management models currently. These include:

Farmers-Managed Irrigation system (FMIS)

This irrigation system is entirely operated and maintained by irrigation community members without the interference of external bodies and assistance. These systems include both traditional systems and the systems which are diverted by the state for farming localities.

State Managed Irrigation systems (SMIS)

This type of irrigation systems constructed and managed by the government or relevant responsible agencies. Such systems are technically very complex compared from farmer managed irrigation systems. Sometimes it also financially and organizationally autonomous from the central government or dependent on government control.

Co-Management of Irrigation systems (CMIS)

This model of irrigation management systems have become more popular after1980s.the management responsibility at head level of the main canal lies on the government or agency whereas the secondary and tertiary canal operation and maintenance and water distributions are the responsibility of water user Water users' associations are formed at users' level to perform the management activities at field level. However, the participation of different stakeholders in irrigation management under this model varies from one place to another. [2]

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[2] Aheeeyar, M. (2004),*Measures to Improve Linkages Between Main System Management and Farm-Level Management*, Wijayaratna, C.M (eds), Linking Main System Management for Improved Irrigation Management, APO:www.apo.tokyo.org,

2.6. Socio-Technical Systems Approach

Primarily, irrigation research has tended to be mono- disciplinary in many part of the world. Many researchers were mainly interested in the physical and engineering parts of irrigation by ignoring its socio-anthropological dimensions.[3]

According to these perspectives, the mismatch conversation between the engineering and social science perspectives adversely affects the efficiency of irrigation systems. Currently, many researchers used the socio-technical systems approach to investigate, and analyze the dynamic interaction between social and technological variables in irrigation systems. These approaches also advocate the importance of farmers' involvement in all stages of irrigation activities.

These approaches promote systems thinking and analyze parts within in the system. They provide ideas beyond events and looking for interrelationships between human behaviors and the technologies. Hence, this frame provide for the researchers to have a wider perspective to diagnose and understand irrigation management systems.[4]

> *"... the concept of the socio-technical system was established to stress the reciprocal interrelationships between humans and machines and to foster the program of shaping both the technical and social conditions of work, in such a way that efficiency and humanity would not contradict each other any longer."* [5]

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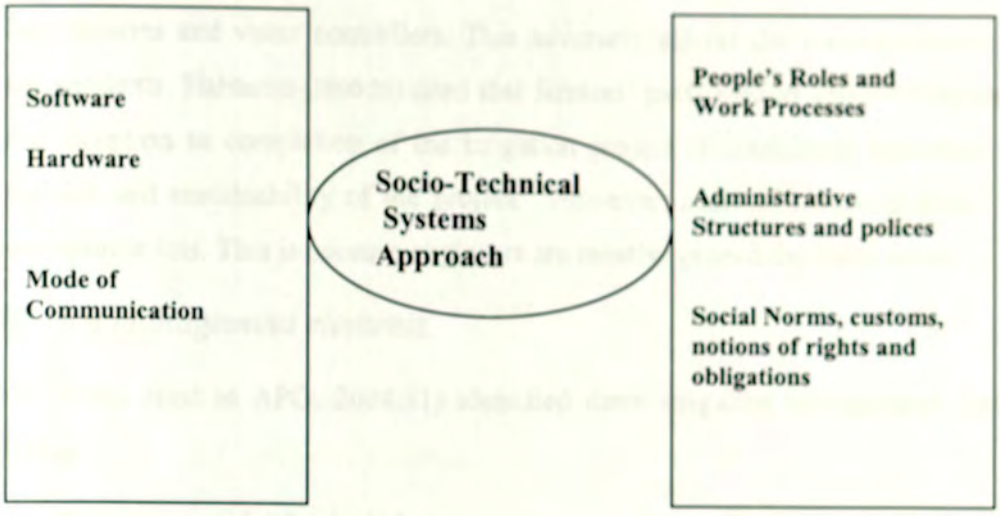
[3] [4]*Irrigation Project as Socio-Technical Systems: Poverty Impacts, Participation and the Emerging Political Economy in Six Western Indian Medium Irrigation Projects*, IWMI: www.iwmi.cgiar.org/tata/ STS. Pdf #

[4] [4]*Irrigation Project as Socio-Technical Systems: Poverty Impacts, Participation and the Emerging Political Economy in Six Western Indian Medium Irrigation Projects*, IWMI: www.iwmi.cgiar.org/tata/ STS. Pdf #

[5] Ibid

Figure 2:1 Socio-Technical Systems Approach



Source: Adapted from Water Policy Research Program, IWMI: www.iwmi.cgiar.org/tata/STS. Pdf # [6]

Mollinga (1998, Cited in Woldeab, 2003:7), cited three important concepts in relation with irrigation management systems. These are:

- **Social construction** includes the concept of both technology development and design works that require the involvement of many stakeholders to interact, communicate, negotiate and take decision in the social process and the nature of technologies that shape the attitude and the behavior of the "owners" and interests of the involving parties.

- **Social requirements for use** are mainly associated with the social domain of artifacts. The sources of water and canal system in the project area limit the type of organization and institutions in irrigation management activities.

[6] Opcit

‣ **Social effects**, as the name implies, irrigation has socio- economic effects on people's life. If irrigators do not have access to water on time to their crops on the bases of the required amount, difficulties may arise on farmers' livelihood. A faulty designed structure limits farmers' access to water; this, in turn, creates disputes among beneficiaries and water controllers. This adversely affects the socio-economic ties of the residents. Habtamu (1990:26) cited that farmers' participation and involvement from the inception to completion of the irrigation project is considered important for the success and sustainability of the project. However, most of irrigation study fails to incorporate this. This is because engineers are mostly ignored the local views.

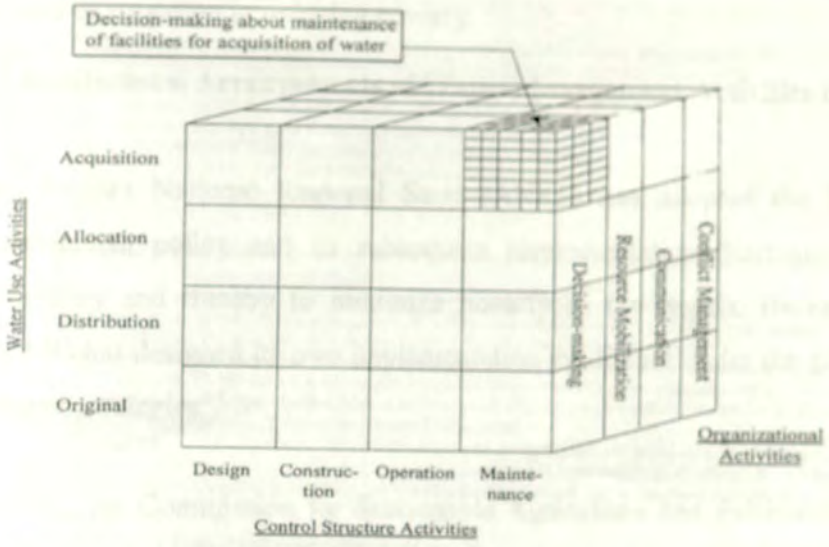
Irrigation management elements

Upoff (1986, cited in APO, 2004:31) identified three irrigation management elements. These including:

- **Water use activities** include acquisition, allocation, distribution and drainage of excess supply of water
- **Physical structure** activities consist of design, construction, operation and maintenance structures for efficient and optimum use of water to irrigate crops; and
- **Organizational activities** comprise decision-making for water use, design structure, construction, operation and maintenance of physical structures. This category also includes communication and coordination of resources mobilization and conflict resolution rising from water use activities.

As noted by him, these tasks are not independent by themselves, rather they function one with another in the system. Each element has its sub- activities in the irrigation systems.

Figure 2:2. Matrix of Irrigation Management Activities



Source: Adapted from Uphoff, N (1986)

Hupper (1989, in Mollinga, 2002, cited in Lemma, 2004:11), noted that, irrigation is not simply a technical work of delivering water to crops. It is also embedded in human socio-cultural action. This is because households function within the large framework of socio- cultural, economic, institutional and political environments.

Mollinga (1998, cited in Chidenga, 2003:8), "a compressive understanding of irrigation system requires a framework that integrates technical and social perspectives." This is because technical issues alone cannot support the system to function well. The integration of technical elements with institutional issues is vital for the sustainability and proper function of irrigation systems.

Therefore, socio-technical systems approaches are significantly important because of the following well-stated reasons.

- They enable the researcher to visualize in a wider perspective and multidisciplinary systems context;
- They are uniquely well-matched with farmer participatory research method and institution;
- They permit combining several research methods; and

- They are ideal to produce guidelines for action on irrigation managements.

Hence, the socio-technical system approaches seem plausible for irrigation management and impacts of irrigation in reducing poverty.

2.7. Institutional Arrangements of Water Management Activities in ANRS

The Amhara National Regional State (ANRS) has adopted the National Water Sector Development policy and its subsequent implementation Strategies to ensure food self-sufficiency and thereby to minimize poverty in the region. Bureau of Water Resources (BoWR) has designed its own implementation guidelines under the general framework of the National strategies.

In 1996, the Commission for Sustainable Agriculture and Environmental Rehabilitation of Amhara Region (CO-SAERAR) has established as independent Commission aiming to carry out small-scale irrigation and irrigation related issues in the region. As a result, the Commission constructed and scaled up about 37 small-scale irrigation schemes and designed 89 projects. In the construction of SSIs, about 5,531,751 farmers were participated. Of these, female accounted for 33.9% (ANRS Five Years Implementation summery Plan, 1996-2000). However, the regional government dissolved the commission and merged with the Amhara Bureau of Water Resources since 2005.And staff members were assigned to different institutions in the region.

Currently, the Regional Bureau of Water Resource is responsible to carry out issues of water resources in the region. The Bureau has structure up to the Woreda level. Its structure is limited to Desk at Woreda level hoping Woreda Agriculture and Rural Development Office takes over water resource and irrigation management activities.

According to Bureau's Planning and Program Department, the existing structure has immense problems such as absence of data and communication flows, allocation of Woreda expertise in unrelated activities (example tax collection), unattractiveness of salary at the Woreda level, no accountability in subsequent structures and lack of proper reporting systems between Woreda and the Bureau. Sometimes the Bureau could not find expertise to train on irrigation

management activities. The researcher, however, found that the Bureau is working out new organizational structures to resolve the existing problems since 2006.

The regional Bureau of Water Resources has the responsibility to study, approve design and give technical assistance to Zonal offices that lack design staff members. The Zonal offices are also responsible for feasibility study, design and close technical assistance to the Woreda offices, which hindered by lack of design staff.

The Woreda has also the responsibility of assisting irrigation and water related issues to IWUC at the Kebele level. The Kebele Administration on the other hand, has the responsibility to administer the overall situations of the setting including water resources.
There are four Agriculture and Rural Development Staff members with different professions (plant science, general agriculture and crop science) in the two irrigation sites. These trained personnel have responsibility both the Kebeles. Nevertheless, the researcher found out that, none of them were trained in irrigation activities even at the Woreda level. This in, in turn, has contributed its own bottleneck problems to carry out irrigation management activities to improve food productions for local households.

CHAPTER THREE

3. PHYSICAL SETTINGS AND PEOPLE OF DENINATQUASHTA AND WONJELLA KEBLES

3.1. Deninatquashta Kebele

Deninatquashta Kebele is found in Ankisha-Guagusa Woreda of Awi Zone. It is located about 5 kilometers Northeast of Gemjabeit and 5 kilometers away from the Bahir Dar - Addis Ababa asphalt road to the west.

The Kebele has a total land area 2046 hectares of which 1740 hectares used for agriculture. The remaining land is serving for private and communal grazing purposes, the other covered with shrubs and bushes, offices, religious purposes, forests, and wasteland for gully/cave formation

This Kebele is located at an altitude of 2300-2400 meters above sea level. Mean monthly temperature of the site ranges from 15-23 degree Celsius and the recorded annual rainfall in the area reaches about1632 mm, which is uni-modal in its character.

The nature of the soil in the Kebele ranges from brown clay-loam to black light-clay soil. The soil types are 4 % black, 29 % red, and 70 % brown-loam. The property of the soil in the area has good drainage status, moderate land fertility, high soil depth, and moderate topography (Matebie, 1997:4, ADC, 2006). In the Kebele soil erosion is a serious problem to the farming communities especially for Mengula and Dangula sub-*gotts*. The erosion is caused mainly by flood that starts from nearby hills during the rainy season.

The Kebele has two main seasons, *Kiremt* (wet) and *Bega* (dry). Kiremt season is a long rainy period, which mainly lasts from the end of May to September. It has two agro- climatic zones, namely, highland (*Dega*) midland (*Weinadega*) and they occupy 90 % and 10 %of the total area of the Kebele respectively.

The Kebele has a population of 6229 and its annual growth rate is 4.4% per year. Of these, females and males are 3291 and 2938 respectively. From the total population 1332 people are heads of households (ADC, 2006).According to the survey result, the People in Deninatquashta

Kebele are followers of the Orthodox Christian church. Every *Desh* in the Kebele has its own church, which is encircled by fencing wall made of stones and indigenous trees. The community is relatively homogenous in their cultural tradition and life styles. People settled in the study area based on their kin system. Of 60 sample households in the Kebele 88% and 12% are belongs to Awi and Amhara Nationality respectively. Among the sample households, 58% and 42% live in traditional houses with a roof made from straw, wood and corrugated iron sheet houses respectively. From these samples, 30% of the respondents are found in the age range of 41-50 and 28% of the samples are in age range 31-40. Others belong to the age below and equal to 30 and above 51.A majority of the sample heads found in the productive age to run their agricultural activities. With regard to education status, 45% of the heads are illiterate and 35% the heads of the households could read and write. The remaining 8.3%, 3.3%, and 8.3% of the households attained elementary, secondary and high school education level respectively.

3.2. Wonjella Kebele

Wonjella Kebele is located in Banja-Shekudad Woreda in Awi Nationality Zone on Addis Ababa-Bahir Dar road some 7 Kilometers west of Tilili town. Wonjella Kebele has a total land area estimated 2417 hectares of which 1998 hectare is used for farming. The other holdings used for grazing, others occupied with shrubs and bushes, public services, forests, and wasteland for gully/cave formation

The Kebele is located at an elevation of 2400 meters above sea level (FAO, 1994:15). It is surrounded by a chain of mountains at the Eastern edges of the Kebele and indigenous trees partly cover these mountains. Agro ecologically, the area is classified as highland (*Dega*) and midland (*Weina Dega*). *Kirem*t is a wet season, which lasts from June to September. The *Bega* season ranges from October to April. During the Kiremt season, most of the central area of the Kebele is flooded with water and turns swampy at the center. This flood comes from the highlands of Aguta sub-Kebele. In the same Kebele, 60 households are negatively affected by flood during wet season. Its monthly temperature ranges from 19-25 degrees Celsius and the annual rainfall reaches up to 1300mm. The nature of rainfall in the areas characterized as uni-modal (one season rainfall). In the Kebele, soils are reddish clays and loams with natural fertility and high sub-soil acidity (FAO, 1994:15). As far as the soil types in the Kebele are concerned 80 % red- clay, and 20 % is blue-black.

Wonjella is home for 6755 people. Out of the total population 1640 are heads of households. Its annual growth rate is 3.9%. Out of these people, females account 3454 and males are 3301(ADC, 2005). The people of the Kebele are followers of the Orthodox Christian religion and each *Desh* has its own church-fencing wall made of stones and indigenous trees. The Kebele residents are homogenous in their traditional life style. From 60 households in the sample 80% belongs to Amhara Nationality whereas 20% are Awi Nationality. Inhabitants of the Kebele are settled based on their kin systems. Out of the sampled 60 households, 90% and 10% live in corrugated iron sheet houses and houses made of straws, soil, stones and wood respectively. The data obtained from the sample population shows that, the great majority of the farmers in the Kebele have corrugated iron sheet houses. The large majority of respondents (37%) are found in the age bracket of 41-50. Seven percent, 33% and 12% are found in the age range ≤ 30, 51-60, and 61-70 respectively. The remaining 3% found above and equal age 71. From the total 60 households 37% are illiterate and 35% could read and write. The remaining 15%, 5% and 8.3% attained elementary secondary and high school education respectively

As noted by extension workers, farmers in Deninatquasheta and Wonjella Kebeles are practicing mixed farming. The major crops grown in the areas are barley, wheat, and other root crops such as potato, Onion, Garlic. However, barley and potato are considered the most important rain-fed and irrigated crops in the two Kebeles. In addition, they are the staple food for the inhabitants. Few model farmers grow very limited vegetables and perennial fruits.. Farmers plant trees such as eucalyptus, *Korch (*Erythriana abyssinica*), Semiza (*Adhathoda Schimperana*)*, Sasepania, Bamboo, 'Gesho' (hops) and other indigenous trees in their homesteads and plot boundaries. Forests are found at the top and the foot of mountains and in church compounds. These forests are owned either by the state or by the communities. Privately owned trees are used for sale, firewood, farm implements and housing construction. Sometimes farmers use logs for communal purposes such as for the construction of schools, health posts, bridges, stores, offices and aqueduct for water transfer to their plots. Reforested trees for timber wood and charcoal production is also found along the roadside from Bahir Dar to Addis Ababa adjacent to the asphalt road

Both Kebeles have access to all- weather roads, though it has not been maintained for many years. On average, 6 kilometers away from each respective site, there is an asphalt road, which is a part of the Trans Africa highway that joins Sudan with Addis Ababa via Metema crossing Gonder and Bahir Dar.

3.3. Zingni and Fetam Small-Scale Irrigation Schemes

Zingni Small-Scale Irrigation scheme (ZSSIs)

Zingni modern SSI is located in Deninatquashta Kebele 5 Km from the main asphalt road. The river comes from the *Gebbaba- Bahunic* area in Banja-Woreda as a small stream and grows to a big river after passing from Kosober, the capital city of Awi Zone. The river is supplied by other streams and springs when it reaches Chewessa and Gessa sub- Kebeles. In the end, it crosses the boundary of Banja Woreda and enters Ankesha –Guagusa Woreda. The river passes through the middle of Deninatquashta Kebele and flow towards Abbay River to the west. The scheme improved by local government in collaboration with Korean's government during Derg regime in mid 1980s and constructed under the close supervision of North-West Kettena Agriculture Office. The scheme has two major canals that extend in the right and left sides. These main canals stretch for 5 to 7 kilometers to reach fields. Each main canal has its own secondary and tertiary canals that allow water to enter individual fields. There is also one tertiary canal which passes through Dangula sub-Kebele. This canal is very shallow to pass through water into farming plots. It also percolates water some where at the middle.

About 636 farmers have benefited from this irrigation schemes. Of this, few households are receiving inadequate water from the schemes due to topography constraints. Farmers call it *Yeguroro* (Serving only for drinking for both humans and animals).

Fetam Small-Scale Irrigation scheme (FSSIs)

Fetam modern SSI is situated in Wonjella Kebele and it serves for five sub-*Kebeles*. The river starts from the highlands of West Gojjam Zone as a small stream and grows to big river while it crossing different Kebeles of the West Gojjam administrative Zone. This river passes on eastern parts of Wonjella Kebele and goes to the low land areas of Abbay to the West. This irrigation

scheme also came into existence in cooperation with North-Korean's government. The construction was carried out under the responsibility of North-West Kettena Agriculture office during Derg regime on the same year. Its physical structure and the design work seem "identical" with that of the Zingni irrigation scheme. However, its construction is different. The majority of the canals are not constructed well with cement. The scheme has one major and one secondary canal to supply water to the cultivable lands in the Kebele. The secondary canal which is located in the left stretched towards the east and delivers water for five months only because water volume decreases since January result much water cannot flow into the canal. According to the IWUC chairman, about 1200 irrigators are expected to serve water in the command areas. Of this, about 575 irrigators are living in Wonjella Kebele in which this study is conducted. The remaining resides in adjacent Woreda that demands another study.

The following table illustrates the source, and estimated length of the two rivers of the two Kebeles.

Table 3:3. The Source and estimated length of Zingni and Fetam rivers

No	Name of SSI	Source	Estimated Length in Km
1	Zengni	Gebaba Bahunic	59
2	Fetam	Surta Miechael	39

Source: Adapted from Awi Zone socio-economic assessment profile, August, 1990, Injebara, (Amharic Version)

CHAPTER FOUR

4. FINDINGS AND DICUSSIONS OF DATA ON ZINGNI AND FETAM SMALL-SCALE IRRIGATION SCHEMES

4.1. IRRIGATION WATER MANAGEMENT ACTIVITIES

4.1.1. Irrigation Management before Government Intervention in Zingni and Fetam SSI

According to key informants, irrigation practice in Awi has a long ago. The practice was mainly associated with the first settlers of the Awi people. In fact, the availability of many rivers, streams, and springs in the areas made the farmers able to develop irrigation practices. This is because farmers diverted water easily to their arable farm without exerting too much labor and energies.

Local chief

As noted by key informants and FGD participants, prior to the 1975 land reform, rural land and water resources were controlled and managed by landlords(*Balabbats).*The Balabbat assigned the local chiefs(*Chiqashums*) mainly to administer land and water issues. The chiefs had several duties and responsibilities for the localities. First, they were appointed by landlords to keep peace and order to the inhabitants. Second, they had the authority to collect taxes from land use and water flour mill services. The chief collected these taxes through commel (unit of measurement) systems. Third, the *chief* also serve as an intermediary to communicate the administration order with the local residents and vice versa. As explained by key informants, prior to the diversion of the river into the irrigation canals, farmers fetched water from the river beds. But, later local farmers diverted the river into their settlements for domestic and irrigation purposes. Balabbats established grinding mills following the main canals to generate power for flour mills. For example, the presence of 13 non-functioning grinding mills in Zingni irrigation site witnessed these facts. Currently, farmers do not use these grinding mills because there are many modern mills in adjacent sub- urban centers.

According to key informants, irrigation practices gradually adopted by local residents to grow crops using water that come out of the pipe of the grinding mills. These practices through

time got attention by property owners to expand further by farming communities to supplement their livelihood.

Initially, water users were limited in number. However, their number increased gradually. This was because many farmers were motivated by irrigation practices as additional sources to sustain their household. This in turn, increased water demand for water users, resulted in setting "appropriate mechanisms" for water allocation and distribution activities by local chief in the localities. Consequently, water fathers were elected as water controllers in each respect villages during the feudal system.

For example, inhabitants meet at the end of every September to elect their local chiefs. The election of the local chief takes place in church compounds. First, churches are believed to safeguard residents from evils. Second, many inhabitants of the Kebele can be found together in one place at a time. Local chiefs (usually elderly men) were selected for the position by referring their lineage systems. At times, tenants did not have the right to reject the nominated local chiefs rather they simply accept. The chief serves for one or more years according to his fairness or diligence.

The local chief had one canal of water for his personal use. As reported by key informants, the chief had the authority to manage water allocation and distribution activities alone for about 15 days until water fathers replace him.

In both areas, election ends up by ceremony held adjacent to the diversion of the irrigation schemes. Every tenant participated in the ceremonial activities due to two main reasons. First, to beg their God to have good harvest seasons. Second, to give due respect and honor for both Balabbat and the *Gul*t owner.

Tella and *Araki* to drink and *Injera* to eat used to be served to the participants in the ceremonial custom. At the end, farmers depart to their home taking their own share of water based on their holding sizes.

Water Controller

As reported by key informants, following the election of the local chief, tenants also elect their representatives to assist the local chief on behalf of them. Villagers call these individuals water fathers *Yeweha abat* or sometimes they also used to call them *Yeweha Tecotatari*, literally means 'water Controller'. These water controllers serve as mediator between the local chief and water users. They were supposed to serve for about one to two years. Water users elect water controllers if they are fair or careful in assisting the farmers. According to key informants, sometimes tenants served labour for the water controller fearing some penalties being absent from public meetings or communal labor works.

Water Allocation and Distribution

According to key informants, before government irrigation intervention in Deninatquashta Kebele there were about 7-8 small irrigation canals that delivered water for local farmers. One small canal served for about 10-15 households for five to six hours at a time. This is because, irrigators were very insignificant in their number and water was significantly adequate to irrigate individual plots. Water controllers were responsible to allocate and distribute water to the beneficiaries under the close supervision of local chiefs.

In Wonjella Kebele, each village had one water controller to allocate and distribute water according to the needs of local farmers. These water fathers were controlled by local chiefs. A single canal served for 20-25 households for six to eight hours in the Kebele. The water was comparatively very adequate for their agricultural activities. Farmers were happy on the amount of water found in the canal to irrigate their irrigated land.

Canal Cleaning and Maintenance Activities

As it was reported by key informants, 62% of the irrigators participated in canal cleaning and maintenance activities in every year. These activities usually start at the end of September and beginning of October because rain season remains until end of September. Inhabitants assigned in the canal cleaning and maintenance activities according to their respective *Deshes* (villages). According to key informants, on average 100 to 200 villagers were participated in the canal cleaning and maintenance tasks. Female-headed households were involved in the construction by carrying soil on their backs.

As explained by these informants, farmers used their farm implements and household utensils such as axes, plow hoes, sickles, and small baskets for the construction of irrigation canals. Irrigators used plough to dig the soil and refer to such type of work as *Derffe Menikenek.* The term Derffe is derived from an Amharic word, *Erffe,* which *is* a type of farm tool used for ploughing. *Menikenek* literally implies "movement". The expression *Erffe Menikenk* thus, explains pulling and pushing of *Erffe* to dig out the soil. This type of work is used for farmers to produce 'flat layer' from the soil, which is used to block the flow path of the water. Farmers also use locally available materials such as grass, stone, straw, and leaves to maintain the canals. Big logs protect the canal from being damaged by the rivers.

As noted above, this canal cleaning and maintenance traditional irrigation works, however, serve only a dry season. During the wet season, the rivers wash all the materials and the structures away. Farmers follow the same type of work for the following year for such activities. The task was very tedious to farmers. It demands more labour and time to divert the river from the riverbed.

An irrigator who did not participate in canal cleaning and maintenance activities is fined from 0.25 to 0.50 cents. The collected fine is used to buy local drinks such as *Areki* and *Tella* for the farmers who are involved in canal cleaning and maintenance tasks. This system has existed for long and continues till the present with little modification. As noted by one key informant,

> *Co-operation and social unity for canal cleaning and maintenance activities were difficult before government irrigation intervention. But, their unity and cooperation to divert the water into the canal was strong. These unity and cooperation between irrigators made the activities very simple. However, these unity and co-operation gradually have degraded due to increase of demand on limited water resource result conflict among and between beneficiaries. This, in turn, adversely affects our sense of unity and mutual cooperation in irrigation management activities.*

4.1.2. Irrigation Management after Government Intervention in Zingni and Fetam SSI

Farmers' organizations

According to key informants, the feudal system came to an end by the Derg in 1974.Farmers' organizations were established by the Derg regime in the following year as a tool to disseminate socialism in rural localities. It gradually reinforced by the establishment of villagization and collectivization program in the Kebeles. The responsibilities of farmers' organization include organization and mobilization of farmers for the construction and maintenance of canals, determining of irrigation schedules, setting water priority, settling water conflict among irrigators and managing land and water resources.

Key informants reported that, water controllers continued in Derg Regime too. They were elected by local farmers every year under the close supervision of committee members of farmers' organizations in their specific villages. Water controllers have responsibility to run irrigation management activities in their respective villages (*Desh*). They were also acting as mediator between or among irrigators in each village. However, majority of water fathers lack formal training in irrigation management activities.

Zingni Small-Scale Irrigation,

According to FGD participants Korean's experts jointly with Ethiopian professionals carried out the feasibility in mid 1980s. However, farmers, especially, elderly men were not consulted by experts in the feasibility study. This created problem to mobilize and organize farmers for the construction of canals assuming the project would displace them from their localities.

As explained by these key informants, meetings were arranged by the Kebele to discuss the problem with the local residents in church settings. However, the task was so tough to the local administrators to "influence" the farmers, especially the elderly men in the localities. Nevertheless, the construction started following the discussion.

However, about 38.3% of the households participated in canal construction for several days though they lacked trust on the promise of the local government leaders. The Youth were "voluntarily" engaged in the canal construction earning 3.00 Birr per day. The scheme began

operation in 1983. The rural Infrastructure Development Department of the former Northwest *Kettena* Agriculture Office was assigned to monitor the construction on behalf of the Office.

Table 4:4. Shows Farmers Participation in Canal Construction at Deninatquashta Kebele during Derg Regime

Did you participate in canal construction?	Deninatquashta Kebele	
	N=60	%
Yes	23	38.3
No	35	58
I do not know	2	3.3

Source: Survey findings/2006

According to IWUC chair man and FGD participants, besides, the preparation of the design, the local government allocated budget for the construction, man power and different construction materials for canal works immediately. Irrigators also came to work with their own hand tools. The construction work, however, ceased in1991 due to government change. As a result, all of the construction materials such as cement, iron, shovels, corrugated iron sheets and different size hammers were looted by thieves and robbers. Robbers also took electric generator and dismantled central storages.

Extension workers explained that, the scheme was primarily designed by the local government to irrigate 350 hectares of land. The land was owned by local cooperative. They added that, however, the scheme irrigates up to 508 hectares of land currently because many new farmers at the tail end were incorporated in the commend areas by local government to irrigate their plots.

The researcher requested water users to explain the constraints of irrigation scheme, from 60 households taken as sample, 52% of the respondents explained that, the scheme has different problems whereas 45% households, however, reported that, the scheme has no problem in it. The remaining 3% of the respondents said, "I do not know."

Table 4:5. Shows Farmers' Response towards Scheme's Problems at Deninatquashta Kebele

Does the scheme have problem?	Deninatquashta Kebele	
	N=60	%
Yes	31	51.66
No	27	45
I do not know	2	3.3

Source: Survey findings/2006

These problems include:

- Design problem such as seepages;
- Cracking due to plant roots passing through the canals;
- Percolation along the tree roots that were not properly cleared before construction;
- Damaging of canals by few farmers and animals;
- Damaging by illegal lining;/breaching of canals
- Sanitation around the reservoirs and canals;
- Improper design of alignment and breaking of tubes;
- Erosion of canals due to heavy rain and run off;
- Improper crossing of animals and accumulation of leftovers, stones, grasses, leafs, silt, etc, in the canals; and
- Non- functioning of sluice and checkpoints. These constraints hold the system back to deliver adequate water to the farmers. As cited by agronomist expert, these problems were exacerbated by lack of commitment and sense of ownerships because there are unfair water allocation and distributions, resulted poor irrigation management.

Fetam Small-Scale Irrigation

According to FGD participants, Korean's government professionals conducted the feasibility of study Fetam's irrigation scheme. And its construction stated in 1981.

They also reported that, farmers ware not participated in the study. As a result, farmers refused to participate in the construction of the project fearing the dislocation of residents from their homelands. At the end, the *Awraja* administrator came to the study area and had a discussion with residents about the objective of the project. In fact, the task was very difficult to the local leaders to influence the localities.

Although inhabitants lack confidence on the local administration on the promise on the effects of the project, after having long discussion with the residents, about 87% of the sampled households 'agreed 'to engage in the construction activities.

Soon, the Awraja administration offered materials for the construction work such as cement, sand, iron, sacks, hammer, shovels, spade, hoe, and manpower for the construction. Local farmers also delivered their farm implements like axes, sickles, plow, to support the construction work. Since then, however, local farmers have suspicion on government because of fear of displacement.

Table4:6. Shows Farmers Participation in Canal Construction at Wonjella Kebele during the Derg Regime

Did you participate in the canal construction?	Wonjella Kebele	
	N=60	%
Yes	52	86.66
No	5	8.3
I do not know	3	5

Source: Survey findings/2006

Selected key informants and FGD participants noted that, about 110-115 residents participated in the construction work more than 25 days. The local administration supplied food (*Neffero)* for farmers as lunch based on food for work program.

As cited by key informants and FGD participants, a farmer who did not participate in the construction would be fined. The money collected from the absentees would be used to buy local drinks for the irrigators who involved in the construction. The construction of the

scheme was "completed" in 1983, but many physical structures left behind due to change of government.

The chairmen of IWUC explained that, the project was commenced by the local government to develop 400 hectares of land owned communally by cooperative. Of these, 314 hectares of land was developed in Wonjella Kebele. The remaining hectares of land are located in adjacent Woredas.

The researcher requested households to explain the problems of the irrigation scheme; hence, 67% of the respondents from 60 households explained that, the scheme has different problems whereas 32% heads said that the scheme had no problems.

Table 4:7. Shows farmers' Response towards Scheme's problems at Wonjella Kebele

Does the scheme have problem?	Wonjella Kebele	
	N=60	%
Yes	40	66.66
No	19	31.66
I do not know	1	1.66

Source: Survey findings/2006

These problems include seepages, reservoir siltation, and improper alignment on the surface, non-functioning of sluices and checkpoints, and cracking of canals due to the long size of roots of eucalyptus trees, few individuals and domestic animals also damaged the canal while they crossing.

Seepage is considered the most serious problem in Fetam irrigation scheme. The researcher asked the IWUC committee members to elaborate the problem more and they reported that,

> *"We as cooperative members have made an effort to stop the seepage using our labour and local materials deep into the ground but we can not hold it back completely. It is impossible to stop using our capacity. Indeed, we have not seen the problem carelessly. We have informed the problem to the concerned organization for several times and Co-SAERAR came and attempted to repair the canal of the seepage but the problem still persists. Consequently, much of the water flows into the riverbed resulting scarcity of water. It needs urgent solutions."*

Water Distribution in Both schemes

In both irrigation sites, irrigated land was divided into different gotts. Each *gott* has its own Water controller to allocate and distribute water to individual plots.

In Deninatquashta Kebele, irrigation is carried out 24 hours. Each *gott* receives water in rotation for a period of 2 to 6 hours per day. One water controller supervises 25 to 30 households at a time. Of the 60 households interviewed, 88.3% were reported that the rotation system is suitable for them to irrigate their crops whereas 11.66% said that it is not suitable.

Table 4: 8. Shows the Suitability of the Rotation Schedule at Deninatquashta Kebele

Is the Rotation Schedule Suitable for your agricultural farm?	Deninatquashta Kebele	
	N= 60	%
Yes	53	88.3
No	7	11.66

Source: Survey findings/2006

Those households who said that it is not suitable are female headed households who have no son and close relatives to irrigate their plots in their turn and farmers found at the tail end of the irrigation scheme. They also reported that the schedule did not consider the distance from the canal to the plot resulted crop failure. During night, some farmers used flashlights to irrigate their crops. But, female-headed households did not use it due to fearing abuse. Tail end farmers are also victim of scarcity of water (the issues will be treated in detail in the next section).

The Water controllers encounter strong complaint from beneficiaries from February to April because of lack of water from the main sources. During these months, high water dispute occurs between and among irrigators and water controllers as well.

Table 4:9. Time Allocation for Crops in Deninatquashta Keble

Unit	Crop type	Hours	Days
1*kada*	Potato	3-4	Every 11 days
1*kada*	Barley	3-4	Every15/20days
1*kada*	Onion/Garlic	3-4	Every 11 days
1*kada*	Wheat	3-4	Every15 days

Source: Survey findings /2006

In Wonjella Kebele, irrigation is performing 24 hours. In this Kebele, one water controller supervises 25 to 32 households in one *Kettena* at a time. Of the 60 households interviewed in the Kebele 83.3% of the respondents approved the suitability of the rotation schedule to irrigate their plot whereas 16.66% did not.

Table 4:10. Shows the Suitability of the Rotation Schedule at Wonjella Kebele

Is the Rotation schedule suitable for your agricultural farm?	Wonjella Kebele	
	N= 60	%
Yes	50	83.33
No	10	16.66

Source: Survey findings/2006

Those farmers who did not agree on the rotation system reported that "farmers who have relatively large irrigated land took much of the water in our turns. Once their turn passed they have to wait up to fifteen days to get it back". Some farmers located at the head end did not like the schedule because they are unable to get water as needed.

A farmer who has more plot of land can have much access to water than others and vice-versa. Inhabitants called such farmers as *Kondye* (socially and economically influential farmers) because they have the power and wealth to influence others in water allocation and distribution activities. As a result, they can obtain much water to irrigate their crops from the canal and conversely there are poor farmers like female-headed households who suffer much due to water shortages.

As noted by key informants, very few farmers at the center of Wonjella Kebele did not use their turns to irrigate their plot in the night. This is because first, the topography of the area helped them to have access to water to their crops. Second, water that comes through seepage provides them to have access to irrigate crops all the time. Hence, these farmers are happy to irrigate their crops through out the year resulting relatively good food production.

However, many of the local farmers have encountered difficulties from February to April because the volume of water reduces in the river bed during these months resulting frequent conflict among irrigators and water controllers.

Table 4:11. Water Schedule in FSSI Scheme.

No	Days	Sub-Kebele	Hours	Woreda
1	Monday	Wonjella (3-gotts)	36	Banja area
2	Tuesday	Wonjella (4-gotts)	36	Banja area
3	Wednesday	Marita	24	Ankesha area
4	Thursday	Shema	12 (night)	Ankesha area
5	Friday	Zagera	12 (night)	Ankesha area
6	Saturday	Baguna	12 (night)	Ankesha area
7	Sun day	Wonjella (1-gott)	12 (night)	Banja area

Source: Survey findings/2006

Maintenance Activities in Both Schemes

Operation and maintenance are some of the elements of irrigation management works in both study areas. The IWUCs executive committee set the specific dates for canal clearing and maintenance at the end of September and beginning of October.

IWUC committee members reported that, canal cleaning and maintenance activities are carried out in October. This is because water volume starts to decrease since this month. In both irrigation sites these activities are mainly the responsibilities of all irrigators. In ZSSI and FSSI every farmer spent some 1 to 2 days with cleaning and maintaining irrigation activities. These activities include cutting of different grass, removal of accumulated

sediments from the main reservoirs and canals, and carrying soils to repair canals damaged by run off during the heavy rainy seasons.

The cleaning and maintenance works are carried out in two ways; first, the main reservoirs (*Aynu*) and then secondary canal cleaning and maintenance works are carried out by all irrigators. The tertiary canal maintenance is the responsibility of respective *gotts*. In both schemes about 200-300 farmers must participate in canal cleaning and maintenance works whether they are members of IWUC or not on different days.

According to committee members, female-headed households participate in canal cleaning and maintenance activities though men commonly do the work. Farmers who are busy with their own private activities can hire labour for 4 to 8 Birr a day to carry out the activities. Able-bodied children can participate in task on behalf of their families. In both study sites, farmers pay maintenance fees annually. However, the fee does not consider the size of the plot. It rather gives due attention to the types of the crop. Data for maintenance fee are illustrated below.

Table 4:12. Maintenance Fees by Type of Crops at Deninatquashta and Wonjella Kebeles.

Irrigated crops (in **kada**-local unit)	**Deninatquashta**		**Wonjella**	
	Birr	Cents	Birr	Cents
1 **kada** Onion	10	---	6	---
1 **kada** Potato	10	---	5	-----
1 **kada** Wheat	2	50	4	------
1 **kada** barley	2	50	3	------

Source: Survey Findings/2006

The IWUC the committees reported that, a farmer who did not participate in the cleaning and maintenance work would be fined four to five Birr. If a farmer refuses to pay the fine, the water controller will stop water distribution to the disobedient farmer. All water users living in the areas under study passed this decision but as some of the respondents explained it,

some water controllers sometimes break water distribution procedures by themselves to irrigate their plots. Therefore, it becomes difficult to put the decision into effect.

As explained by IWUCs executive committee members, Co-SERAR tried to finalize the unfinished and maintenance works in 1996 and 1994-1995 in ZSSI and FSSI respectively. After repairing the major canal and few tertiary canals the Commission also left the scheme behind due to financial constraints. This resulted poor performance of the irrigation scheme and low crop returns for the irrigators.

The researcher observed that, Wonjella's IWUC spent 8000 Birr from its treasures for operation and maintenance activities in 2004. Consequently, it maintained two pocket areas that leak much water to non-irrigable areas. However, canal seepage still persists in the area under study. This problem of course needs assistance from external bodies.

Currently, Deninatquashta's Cooperative also collected 8000 to 9000 Birr from its members and non-members to maintain the canals. This money, however, is not sufficient to rehabilitate the entire structures that are damaged by run off and animals. Hence, it needs due attention by other stakeholders to overcome the problem.

Water Conflict and Conflict Resolution in Both Schemes

Water Conflict:

FGD participants explained that, in earlier times water resource was relatively abundant because the number of beneficiaries was limited. As a result, very minimum conflicts were occurred among and between water users. Conversely, however, conflicts are growing more alarmingly since 2004.This is because new demands are increased on irrigation from neighboring Kebeles such as Injebara, Gessa, Chewessa, Tilili and Aguta.

Table 4:13. Causes of internal Conflict at ZSSI and FSSI Schemes.

Causes of conflicts	Deninatquashta		Wonjella	
	N=60	%	N=60	%
Stealing	29	48.3	33	55
Unfair water distribution	2	3.3	-	-
Both stealing and unfair water distribution	29	48.3	18	30
No Answer	-	-	9	15

Source: Survey Findings */2006*

Table 4:13 shows that, 48.3% the sample households reported that, stealing and unfair water allocation and distribution caused serious conflict among Deninatquashta Kebele farmers whereas 55% of the respondents explained stealing is serious cause of conflict in Wonjela.This imbalance water allocation and distribution adversely affects their social unities of the framers.

In Mungula, Dangula and Baguna sub-*gotts* the problem is more pronounced by farmers than others. This is because they are victims to this unjust water distribution, especially during peak season.

With reference to the above cases, one key informant said that, "*Ahun Inde Watet Yetseda Meri Yinoral Bileh New?*" It means roughly one cannot find a leader who is free from water corruption and nepotism and leaders always favored themselves to their relatives and friends.

Table 4: 14. Irrigators' Perception with regard to more access to water in Deninatquashta and Wonjella Kebeles

Access to more water	Deninatquashta Kebele		Wonjella Kebele		Both Kebeles	
	N=60	%	N= 60	%	N=120	%
Executive committee	18	30	1	1.7	19	15.8
Water controller	5	8.3	8	13.3	13	10.8
Politician	-	-	1	1.7	1	0.8
All of the above	32	53.3	50	83.3	82	68.3
No Answer	3	5	-	-	3	2.5
I do not know	2	3.3	-	-	2	1.7

Source: Survey Findings/2006

The researcher asked the households about the fairness of water allocation and distribution in the study areas, 68.3% from the total 120 households reported that, executive committee members, team leaders, water controllers and few politicians have more access to improved water resources than ordinary irrigators. A substantial number of respondents associate this problem with the power they have in Water Users' Cooperatives and Kebele administrations.

Consequently, it becomes very difficult to take action frequently on water thieves though the by-laws specify a fine of 10 Birr for out of turn water breaching. These circumstances made them to lose their credibility and unable to enforce the laws.

Water Conflict Resolution

In the past, '*Higu kedeje neber'* literally it means justice was found around homesteads.

Key informants said that, most of water conflicts were resolved by *Shemagles* (elderly men) in the village. For example, a farmer can appeal the case to the close relatives and Shemagles to resolve. Individuals would be elected, usually 3 to 5 on both sides to handle the case. Since their election, the Shemagles start to deal with the issues at the presence of the conflicting

individuals. Farmers were happy with the decision because cases were resolved by *Shemagles* without spending much labour and time in their localities.

However, since the introduction of the government irrigation intervention many stakeholders such as Kebele administration, IWUC executive committee members, social and Woreda law court members and water controllers are involving themselves at all levels depending on the case of conflict.

According to the FGD participants and extension workers, until now, simple cases are treated through customary ways. But, sometimes an individual farmer can appeal the case to the IWUC office for decision when the case is crop failure. The IWUC tries to resolve the case peacefully depending on the by–laws.

However, the victim very often refuses to accept the cooperative' decision. Hence, the case will be presented to the Kebele administration for another decision. The Kebele tries to resolve the case in cooperation with cooperative's executive committee members. If a farmer rejects the verdict passed by the Kebele, he/she could appeal to the Kebele's Social Court again for decision. A farmer has also the right to appeal to the Woreda court, agriculture and rural development office if he/she disagreed in all decisions. The Woreda court is the highest body to give a lasting solution for the cases. Some cases of conflict resolution processes are illustrated as follows:

Case 1.

A female headed household living in Deninatquashta Kebele whose age is 46 reported that a man living near her house took the water to irrigate his plots on her turn at the night. As a result she remained without getting water in her turn. As a result her potato and barley got dried. Then she appealed to the IWUC chairman seeking solution and the IWUC referred her case to the Kebele administration for decision. But, since the damage of the crops was serious the Kebele chairman also transferred the case to the Kebele's Social Curt for decision and the court fined 25 Birr and double water for a day to irrigate her crops and gave a word of warning to the accused farmer.

Case 2.

The focus group discussion participants reported that there is water always conflict between farmers living at the head end, middle and tail end water users. Scarcity of water at tail end aggravated the conflict more in 2004 to 2006 due to increase of new water users As a result, farmers in Baguna appealed their problem to the Ankisha-Gugusa Woreda Agriculture and Rural Development office to find solutions for the problem encountered. The Woreda inform the problem to Banja-Shekudad Woreda to look for remedies. Both Woredas agreed to discuss the issues with farmers. *At last IWUC was established and Farmers assigned their representatives to give a lasting solution for the water conflicts among irrigators. However, the water conflict continued. Farmers' representatives appealed the case to the Zone Agriculture and Rural Development Office. The Office decided the water should share between farmers living in both Kebeles. While the Baguna farmers accepted decision, Wonjella farmers rejected the decision immediately. This is because they considered themselves, as the sole owners of the water resources.*

Again, tail end farmers' representatives appealed problem to ANRS. The regional office decided to farmers share irrigation water for common purposes. The head end farmers in Wonjella accepted the ANRS's and the Zone's decisions and farmers got access to water for their crops.

Case **3.**

Ato Tagel, age 38 was born in Deninatquashta Kebele.He attended school up to grade 8 and withdrew in 1986 due to National Military Service but he went to other areas where he could not be easily identified. Currently, he is living with his family members in a tukule ('Gojo') in his birth place and has three children. He has possessed sheep, cattle, and horses. He also has owned 5 kadas of rain-fed land and 0.5 kadas of irrigable land. The Rain- fed land is infertile and does not grow crops but is used for animal grazing. Whereas in his irrigable land, he cultivates two times a year. Above all, much of his benefit comes from his sharecropping and land renting produce. Crop production that is obtained from the sharecropping and land renting benefits him much to sustain his household.

On one occasion, the Kebele cabinet called the farmers for a meeting to establish Irrigation Water Users' Cooperative in 2002. In the meeting some of the farmers participated voluntarily whereas others attended the meeting forced. Tagel was invited by the cabinet to attend the meeting where he

was elected by the participants to represent his respective village (Gott) and was assigned as kettena leader and member of the IWUC executive committee. He said, "I accepted the position because I believed that the local government would assist me to have a share from different irrigation benefits vested by the Kebele administration such as training, inputs and so on to increase agricultural productivity. He argued that he had a vision to reduce poverty by changing these rudimentary agricultural practices into better and more advanced market- oriented crops."

After having a meeting, he and his four friends went back homes. Few farmers who were not at the meeting considered them as enemies saying, "You came back home after establishing a producers' cooperative that brings back the old system". That bad experience was highly pronounced by few relatively rich farmers who did not attend the meeting.

The effects of these grievances were:

- *The farmers in the gott passed social sanctions on him and his extended family members. They were almost excommunicated from Idirs, Mahebers, etc. Flat bread ('Mekleft) like a pancake, which was prepared by his wife for church ceremony, was not eaten by the church attendants assuming that it has poison in it.*
- *The same measures were also taken on his parents and close relatives. As a result, they outcaste them from every socio-economic activity such as Idir, Equb, Maheber, Tsige and so on*
- *His and his parents' livestock were also prohibited from grazing with the rest of the livestock in the community.*
- *At the end, his father and uncles were requested by the elders (Shemagles) to bring him and his four friends to the church compound for a promise not to involve in the cooperative.*

They came and swore to the attendants, with the bible in hand facing them to the KidaneMihirt (covenant of mercy) church saying "I and my friends promise not to go to the co- operative office and attend meetings any longer. We request an excuse from the attendants". Expressing their promises just this way they saved their life from danger.

Although he and his friends asked excuses Tagel said, "they would continue to participate in the cooperative secretly". Of course, he spent a year sleeping out of his home fearing personal attack on his house and animals and to protect them from fire by his enemies. His parents also spent one year without participating in any social activities. All these had posed a threat on him and his

parents and friends. He sadly explained "because I swore my cow, which I bought 1400 Birr died due to delivery complications, my child's leg was broken while he was playing in the field and one of my friend's wife died during that bad occasion." For him all these happened due to the vow they had in the church compound. So, he said, "my parents, relatives and I felt guilty. This of course occurred to us due to curse from God because the farmers were sad and blamed us for all what we did ("Yehizebu Eroro ena Melas lezih Dargegn"). This meant farmers' curse and bad prophecy exposed us to these crises.

According to him, relatively rich farmers and Derg officials were behind this hostility. He said first, rich farmers who owned relatively more cultivable land through renting and sharecropping agreements from poor farmers did not want the existence of the cooperative because they thought that the Cooperative might take and confiscate their lands for communal purposes. Second, these farmers had more access to water legally or illegally by exerting their social power to the institutions. Third, majority of farmers hated producers' cooperatives established during the Derg regime because they had affected much the lives of the farmers by taking their produces and plots Fourth, cooperatives during the Derg regime had forced a substantial number of farmers to migrate to neighboring Kebeles leaving their homeland ('Badema) to look for jobs. This has negatively affected farmers' attachment with their Badema. Rich farmers thought that these constraints could hold back farmers from membership into the cooperatives. Hence, they preplanned to harass farmers before the cooperative was able to take roots. Consequently, they organized an intrigue to ridicule him and his friends who participated in the foundation of the cooperative. They assumed that this objection could serve as a lesson for those farmers who had the intention of being a member of the cooperative.

According to Tagel, the case was beyond the capacity of the peasant Association to control. Therefore, the Kebele administration reported the case to Woreda administrative office to handle it. As a result, relevant stakeholders from the Woreda came and organized a public meeting to discuss the problem. A meeting was held with the presence of inhabitants from different gotts in the Kebele. At the end, farmers and officials reached a consensus not to create similar problems and few troublemakers were taken away by Woreda administration to Gemjabeit for advice. He remarked that the intrigue was not easy; however, it was settled peacefully.

Conflict resulted from poor irrigation management activities. Hence, the above three cases clearly revealed how conflict affects the social relations and affiliations of individuals upon which they draw their livelihood. This situation indirectly led to low food production and income to sustain households. This, in turn, discourages farmers to enter into crop diversification and land intensifications resulted farmers unable to minimize households' poverty. Hence, conflict as part of poor irrigation management tends to increase poverty.

4.1.3. IWUCs in Zingni and Fetam SSI Schemes

Zingni and Fetam irrigation schemes were managed by the Peasant Associations (PA) and producers' cooperatives (PC) during the Derg regime.

Both key informants and focus group discussion participants said that, water controllers did not have much power and responsibilities to mange irrigation management activities during Derg regime. However, that does not mean water controllers do not have a role to play in water management tasks in their respective villages. In the Derg regime, institutions such as PAs, Producers' cooperative, and Agriculture offices sometimes interfered in water management activities.

Deninatquasheta Keble's IWUC

According to IWUC committee members, this Kebele Cooperative obtained its legal status to run this modern irrigation scheme in 2004.One hundred thirty farmers were attended the meeting on its establishment. Prior to its establishment Kebele administration was responsible to manage the irrigation scheme. The Kebele handed over the scheme to IWUC verbally with the presence of concerned organizations. Currently, this cooperative has 207 irrigators of which only 8% are female headed.

The IWUC has nine executive committee members, three auditing committee members for about forty two - forty seven Water Controllers up to the lowest level, i.e. *gott*. Irrigators are organized in nine *Kettenas*. Each *kettena* has one *Kettena* leader and significant numbers of water controllers to allocate and distribute water.

The committee has a woman executive committee member assigned to follow issues of gender and irrigation. However, the gender division is not strong to defend for the right of women. Except a woman, the researcher could not find another woman in decision-making position.

These executive members lack gender knowledge because no training was given to them. Consequently, the cooperative is unable to mainstream gender issues in irrigation management activities. This all resulted women to have less access to irrigation water.

Wonjella Kebele's IWUC

According to the Key informants, before the establishment of Wonjella's IWU cooperative the Kebele administration was responsible to manage the irrigation activities. This IWU cooperative obtained its legal entitlement in 2001. The Kebele handed over the scheme to IWUC in words with the presence of relevant stakeholders. The cooperative has 573 members of which 76.6% are male headed. This Cooperative consists of eleven executive committee members, three controlling committee members, eleven *Desh*, twenty nine *Desh* leaders, and twenty nine water controllers.

The researcher could not find a woman in decision-making position in all organization's structure. This is because husbands do not allow their wives to be member of cooperatives. As a result, Women are unable to participate in decision- making activities. This problem aggravated more by socio- cultural, economic and religious influences. These structural problems made women to be invisible from public affairs.

For example, in one of the focus group discussion, women participants were two in their number. These women were female headed in their marriage status. The researcher asked these women to say few things about their role in decision–making positions/ participation in irrigation management activities; however, they spent their time very quietly. This is because women lack experience to speak publicly. However, at the end of the discussion, the researcher found they were very frank and cooperative to express issues of irrigation management tasks by themselves. Hence, they confirm that lack of opportunities to participate in decision making on irrigation managements inhibited them to benefit from water resources. These situations negatively affected the improvement of their livelihood.

The IWUC chairman said that, majority of the irrigators are not members of the cooperative. This is because many farmers had bad experiences about producers' cooperatives during the Derg regime. Their produces such as teff, barley was taken by Agriculture Marketing Corporation and their fertile lands were confiscated by producers' cooperative for communal uses. These situations led local farmers unable to sustain their households resulting displacement of farmers from their home lands to distant areas to look for temporary jobs.

The Focus group discussion participants explained that, in both irrigation sites, people's religion was adversely affected by the doctrine Derg Regime. They said that inhabitants were forced by cooperative committee members to work on religious Days, which was not the habit of the localities. These situations have created suspicion on local residents to be the members of IWUCs.

According to IWUCs committee members, many of non-members do not obey rules and regulation of cooperatives. This problem inhabited a large number of farmers to a member of Irrigation Water Users Cooperatives resulted IWUCs unable to manage water resources according to the needs of irrigators. This problem some times led to crop failure. In line of these constraints a canal guard reported that,

"Prior to the establishment of the IWUC; there were farmers who used force illegally to obtain water for their plots. There are also farmers who behave similar in our vicinities today. These farmers are not the members of the cooperative. They come and distribute the water to them during the night. For example, in April 2006 they came and took all the water by breaching the canal illegally at twelve mid nights. My friend and I could not safeguard the canal and we from that kind of incidences because they were many in number (estimated about40 individuals). These resulted in the drying of the water canal being taken by the farmers through the main canal. The next day, I appealed the case to the cooperative office but no corrective measure was taken about the water thieves. These farmers of course came from the tail end which the PA-chairman lives in."

Participants of focus group discussion and members, cooperatives committee, cabinet members often interfere in their private institutional affairs, especially at the time of water scarcities. This of course, according to them, affects their water management activities.

4.1.4. Perception of Irrigators about IWUCs

Head end farmers

According to executive committee members, few farmers located at the head end do not want the existence of IWUCs. Because they have suspicion that if cooperatives exist in the localities head end farmers will loss all the benefits which obtain from water resources through breaching the canal walls. This is because cooperatives have full legal responsibilities to block irrigation water while they are stealing it. Head-end farmers also do not want to loss this sense of ownership by cooperatives on water resources. Hence, they did not want the establishment of cooperatives in the localities. These farmers irrigate their crops more water legally or illegally using their relative location opportunities. This over water sometimes led to crop failure.

Middle end farmers

As noted by IWUCs committee members, middle end farmers are not sensitive towards the existence of IWUCs. This is because they are advantageous from two contexts. First, the location of their village provides them to have adequate water to irrigate their crops. Second, the location also helped them to have close access to different institutions such as IWUC, DAC, PA, Service Cooperative, This, in turn, made possible to create access to information, trainings, extension and advisory services easily to increase fairly their households' food production and farm income.

However, there are some complaints from other farmers who have not got access to training services and saying that "a handful farmers are always selected by extension workers to train in irrigation management activities and these farmers lack abilities to manage irrigation schemes rather they are running to obtain per diem to their own benefits."

Tail end farmers

According to key informants, individuals were assigned by tail end farmers following the irrigation water flow paths to safeguard the water from thieves prior to the establishment of cooperatives. Literally local farmers called this system as *Kello* (watching turn). These

individuals look after their turn carefully from thieves. These farmers were injured physically (eyes, knees and broken legs) while they used to run at night to defend water from stealing.

Currently, tail end farmers, however, have got some relief because cooperatives have attempted to minimize farmers' difficulties by taking corrective measures on the defaulters. Hence, tail end farmers have positive attitude towards the establishment of IWUCs in both irrigation sites. However, they are not strong to stop water thieves and unfair water distributions from defaulters.

Although, tail- end farmers receive disproportionately very little amount of water to their plots, they are very conscious to use that minimal water to their crops. However, less access to irrigation water led tail end farmers to low productivity and farm incomes to sustain their households. These problems compounded more by the emergence of new upstream water users resulting conflict between head and tail end water users.
The existing kin systems and marriage affiliations also hold back some committee members to take corrective measures on water thieves and unfair water distributions.

According to Key informants, these situations, as whole inhibit tail end farmers to adopt high value crops and agricultural inputs compared to their neighborhood upstream irrigators. This in turn, resulted less crop production and farm incomes to the households.

Duties and Responsibilities of IWUCs

The IWUCs have various duties and responsibilities in the management of the SSI schemes. Duties and responsibilities of IWUCs, adapted from cooperatives' by-law and International food and Agriculture Development, Monitoring & Evaluation system study, 2005, pp 5, are cited as follows:

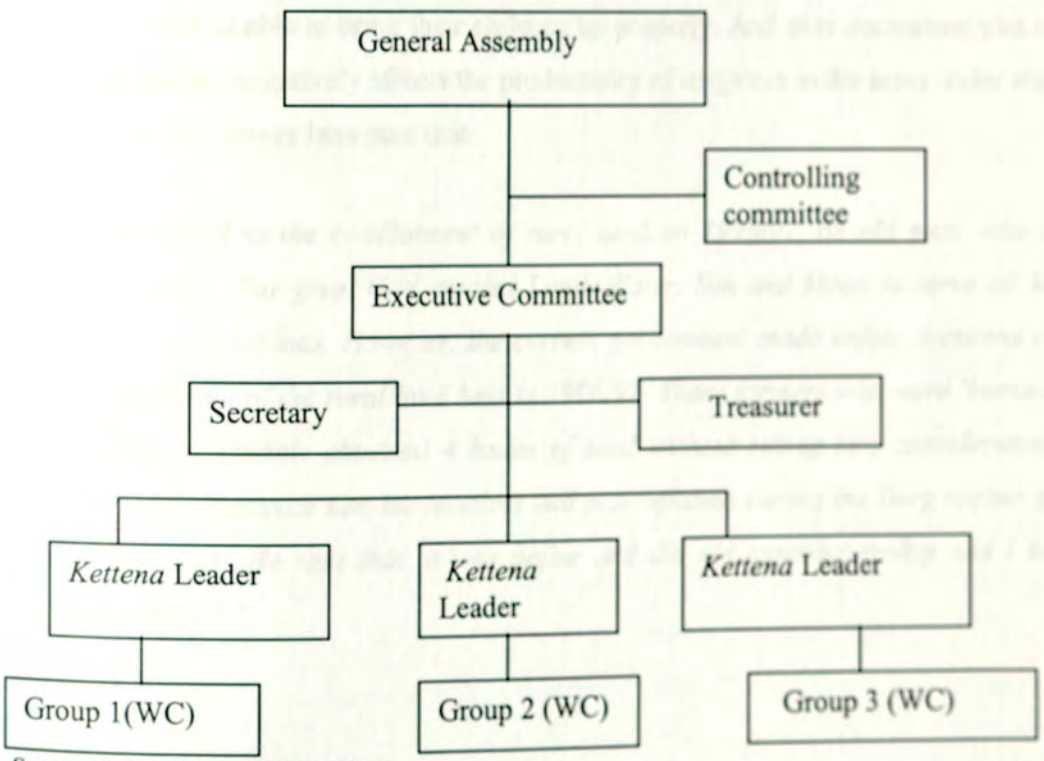
- Coordinate the participation and involvement of the owners in resource identification, data collection, and provision;
- Process and carryout the fund requirements for the project funding like strengthening IWUC, ensuring free labour contribution, registration, legalization of the IWUC and Cooperation with other stakeholders;

- Liaison between the SSI scheme with other stakeholders and make collaboration with different stakeholders;
- Establish Operation & Maintenance costs of the scheme;
- Update the registration of landholders;
- Prepare and maintain a registration list of cooperative members;
- Mediate and conduct conflict resolution to ensure reconciliation;
- Raise resource and maintain accounts;
- Assist in the functioning duty of elections to the management committee members; and
- Regular water budgeting and periodical social audit.

The Organizational chart of IWUC

IWUCs have their own clear duties and responsibilities which generated from their legal status. To run these functions according to the need of the irrigators, the cooperatives established organizational charts.

Figure 4:3. Organizational Chart of IWUC in the Study Area



Source: Adapted from IWUC (2004)

CHAPTER FIVE

5. ECONOMIC AND SOCIAL ASPECTS OF FARMING HOUSEHOLDS

5.1. Economic Aspects of households

5.1.1. Land Holdings in the Study Areas

The study finding revealed that, on average a farmer has 0.625 hectares of irrigable and rain-fed land holdings both in Deninatquashta and Wonjella Kebeles,. Land possession rate ranges from landless households (mostly youth) to those landholders. According to key informants, very few farmers possess more than 10 *kadas* of land. However, the overall average holdings vary from farmer to farmer in both study areas.

Those farmers who owned four *kadas* (1ha) of land complained much about the land redistribution of 1996/1997 because their land was taken by the government and was redistributed to the landless peasants. These section of the farmers reported that shortages of land made them unable to bring their children up properly. And ever decreasing plot size due to several reasons negatively affects the productivity of irrigators in the areas under study. For example one the farmer lamented that:

> *With regard to the re-allotment of rural land on 1996/97, an old man, who is 70, explained, "Our great God created Land, Water, Sun and Moon to serve all human beings with no bias. However, the current government made unfair decisions on the re-allocation of the rural land held in 1996/97. Those farmers who were 'bureaucrat' and Derg officials obtained 4 kadas of land without taking into consideration our family size whereas non-bureaucrats and non- officials during the Derg regime got up to 12 kadas. He said that, it was unfair and did not consider reality and I have a remark on it."*

Table 5: 15. Irrigated land holding size in the Study areas

Land holdings(ha)	Deninatquashta		Wonjella	
	N=60	%	N=60	%
0.25	12	20	13	21.7
0.5	34	56.7	16	26.7
0.75	6	10	20	33.3
1	8	13.3	10	16.7
No Answer	-	-	1	1.7

Source: Survey Findings/2006

As it is indicated in table 5:15, out of 60 households interviewed in each scheme, 57% and 33.3% of the respondents in Deninatquashta and Wonjella Kebeles have 0.5 and 0.75 hectares of irrigable land respectively.

Table 5: 16. Rain fed land holding size in the study areas

Land holdings(ha)	Deninatquashta		Wonjella	
	N=60	%	N=60	%
0.25	11	18.3	33	55
0.5	27	45	6	10
0.75	19	31.7	4	6.7
1	3	5	2	3.3
No Answer	-	-	15	25

Source: Survey Findings/2006

Table 5:16 shows that, out of 60 households interviewed in each irrigation scheme, 45% and 55% of the respondents in Deninatquashta and Wonjella Kebeles have 0.5 and 0.25 hectares of rain-fed land respectively.

According to the survey result, 96.7% and 80% of the sample households in Deninatquashta and Wonjella Kebeles obtained land through the land readjustments of 1996/97 respectively. 20% of the surveyed households in Wonjella Kebele got land by inheriting from their parents. In both Kebeles, Shortage of arable land seems a serious problem for tillers because their plot size has diminished for the last ten years.

Table 5:17. Shows Sources of Land Ownership at Deninquashta and Wonjella Kebeles

Source of land ownership	Deninatquashta Kebele		Wonjella Kebele	
	N=60	%	N=60	%
Through land Reform of 1996/97	58	96.66	48	80
Inheritance from Family	1	1.66	12	20
By timad	1	1.66	-	-

Source: Survey findings/2006

Table 5:18. Shows households' landholding size at Deninatquashta and Wonjella Kebeles for the last ten years

How is your landholding size for the last ten years?	Deninatquashta		Wonjella Kebele	
	N=60	%	N=60	%
Decreased	49	81.66	26	43.33
Increased	-	-	12	20
No change	8	13.33	18	30
I do not know	3	5	3	5
No answer	-	-	1	1.66

Source: Survey findings/2006

As table 5:18 reveals, majority farmers' land has decreased for the last ten years because of two reasons. First, they usually share their small plot to their children when they got married and secondly, their land was redistributed to other landless farmers due to land redistribution proclamation carried out in 1996/97 in the region.

5.1.2. Farming

Farming is the main economic sector of local irrigators. According to the survey result, 96% of the farmers produce crops two times a year using irrigation schemes. These produce include cereals and cash crops. But, lack of market networks, fragmentation of land size, water scarcity, and inaccessibility of agricultural inputs remained these farmers to stay at subsistence.

Table 5:19. Shows frequencies of Irrigation Production at Deninatquashta and Wonjella Kebeles

How many times do you produce using irrigation?	Deninatquashta Kebele		Wonjella Kebele		In both Kebeles	
	N=60	%	N=60	%		
1 times	-	-	-	-	-	-
2 times	55	91.66	60	100	115	95.83
3 times	5	8.33	-	-	5	4.16
					N=120	%=100

Source: Survey findings/2006

According to FGD participants, cropping pattern is changing from year to year due to crop diseases and complementary problems. The major constraints affecting the variability of crop patterns in the areas include market, pest incidence, dumping off and root rots. As noted by key informants, for instance, before 1992, farmers in Deninatquashta Kebele were used to produce about 15 to 20 quintals onion per hectares. However, currently they are unable to produce onion in their plots because of dumping off and root rot diseases. Local farmers called such disease as '*AIDS*' (root rots). Consequently, farmers forced to limit themselves to barley and potato crops to sustain their households.

> *"Some common crop diseases like smut, resolute and early blight and root rot are causing considerable crop yield loss annually. Especially, hate blight is the very problematic crop disease that causes devastating effect on potato. Sometimes it causes complete crop failure. On the other hand, early blight is also one problem for shallot production and is aggravated by irrigation water as farmers reported"* (Matebie, 1997:12).

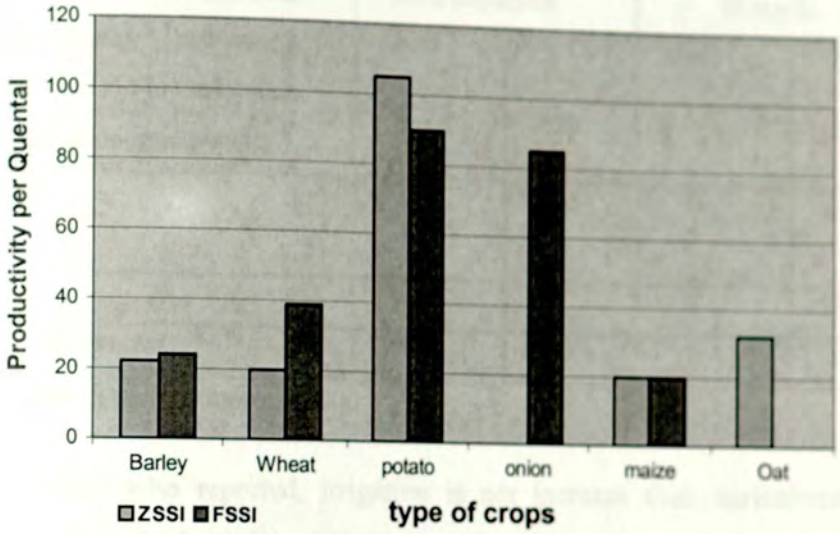
As noted by key informants and focus group participants, although the production of major irrigated crops was relatively better before government irrigation intervention in the study areas, households' production improved moderately after the operation of the government irrigation intervention. This is because substantial number of farmers uses modern agricultural inputs to boost up irrigated agriculture productions, and extension workers support farmers living with them. Besides, their educational level helps them to accept new technologies and services in the study areas. Of course the presence of crop and animal diseases in the study areas adversely affect the production and productivity irrigated agriculre.

Table 5:20 Shows Households' view towards irrigated agriculture production before and after government irrigation intervention in the study areas

How do you evaluate irrigation production before and after government intervention?	Before Government Irrigation Intervention				After Government Irrigation Intervention			
	Deninatq uashta		Wonjella		Deninatq uashta		Wonjella	
	N=60	%	N=60	%	N=60	%	N=60	%
Very Good	18	30	2	3.3	-	-	5	8.33
Good	25	41.7	8	13.33	5	8.33	30	50
Satisfactory	8	13.3	12	20	20	33.33	20	33.33
Fair	-	-	-	-	30	50	3	5
I do not know	9	15	38	63.3	5	8.33	2	3.33

Source: Survey findings/2006

Figure5:4.Current majore crop productivity per hectare per Quintal by Irrigation schemes



Source: Deninatquashta and Wonjella Agricultural Development Centers (2006).

Figure 4, indicated that, large majorities of households in both sites produce more potato (90-105q/ha) using irrigation. More Onion produced by the Wonjella farmers though there is same crop disease. Oat is not produced much by majority of farmers in their irrigable land instead they attempt to grow oat in their rain fed land because it takes much time (5 to 6 months) to mature and be cultivated. This of course is a problem for farmers who have small size of land to wait for such a long time. As a result, they produce crops that mature in short period.

According to the survey result, Out of 60 households interviewed in Deninatquashta Kebele 50% of the households reported that, irrigation did not improve their agricultural production and incomes whereas 42% of the respondents explained irrigation reasonably increased their productions. In Wenjella, out of the 60 households requested, 83.3% of the households reported irrigation positively improved their agricultural production and 13.3 % explained irrigation is not moderately improve their production and farm incomes to sustain their livelihood. The remaining household heads responded "I do not know".

Table 5: 21. Irrigation Contribution in minimizing households' Poverty

Does irrigation contribute agricultural production for HHs' to minimize socio-economic poverty?	Deninatquashta		Wonjella	
	N=60	%	N=60	%
Yes	25	41.66	50	83..3 3
No	30	50	8	13..3
I do not know	5	8..33	2	3..3

Source: Survey Findings/2006

Those households, who reported, irrigation is not increase their agricultural production explained that, less productivity of land, scarcity of water, powerlessness/lack of respect, presence of crop and animal diseases, absence of draft power (oxen or horses) and lack of different agricultural inputs are the factors that negatively affect these households .

Households who reported irrigation positively increased their households' farm production verify that, relatively good access of water to irrigate their plots, application of agricultural technologies and natural fertilizers, sharecropping and land renting from poor farmers are the means to increase their productivity. In addition, these groups of farmers verified their opinion explaining their access to information and training to run their agricultural activities and home management issues. These brought difference between farmers in the study areas.

5.1.3. Livestock

Farmers are practicing animal rearing as part of farming. According to extension workers, these animals provide the local farmers with draft power, transport, natural fertilizer and fuel. They also generate Varieties of consumable and saleable items such as milk and milk products, egg, skins and hide. These animals used also for households to keep wealth in times of shocks and for some social obligations like marriage, *Mahaber, Ider* and funeral purposes. However, the relative contribution of these livestock to the households is very low due to partly inadequate grazing

land, which exacerbated by the widespread of incidence of animal diseases locally called *Berir, Aphen, kurba, Fengel, Gendi,* and others internal and external parasites.

According to the survey result, both cattle (37.3%) and sheep (36.8%) ranked first and second in their order of importance for the farmers. And much of the households' income comes from sheep and cattle sales. Small animals such as chicken and beehives are also generating income for households

Farmers sold more sheep and chickens to generate households' income. Next to these; oxen and cows are ranked second on sales. Horses sold by farmers are so small because these animals serve for ploughing and transportation purposes in both the study areas.

5.1.4. Marketing Activities

According to key informants and focus group discussion participants, there are four market places in a distance of 5 to10 kilometers. These are Gemjabeit, Kessa, Tilili and Kosober. Culturally, most exchanges took place on a particular day of the week. Saturday and Tuesday are market days of a week in majority of urban centers.

As IWUC committee members reported, local merchants around Tilili town and its adjacent urban centers fix the price before farmers bring their agricultural produce to the markets. Consequently, farmers who travel 5 to10 Kilometers on foot with their pack animals to sell their agricultural products will be forced to sell with very low prices. This is due to the fact that root crops such as onion and potato are perishable to store long time in house.

Table 5:22 Shows Farmers' Response towards Market Problems at Deninatquasshta and Wonjella Kebeles

Do you have market problem to sell your agricultural products?	Deninatquasshta Kebele		Wonjella Kebele	
	N=60	%	N=60	%
Yes	25	41.66	48	80
No	35	58.33	12	20

Source: Survey Findings /2006

Farmers of course tried their own means to cope up with this problem by looking for alternative markets going to distant areas, but the problems still persist in the study areas. The IWUC tried to stabilize the existing market by purchasing farmers' products. However; due to lack of capital and organizational inefficiencies they have not satisfied the need of the farmers. As result, a large majority of the farmers still complained about the price of their products.

Table 5: 23. Market Places Farmers sell their yield at.

Market	Denianatquashta		Wonjella	
	N=60	%	N=60	%
Open Market	58	96.7	8	13.3
Cooperative	-	-	2	3.3
Both areas	2	3.3	50	83.3

Source: Survey Findings/2006

Table 5:23 testify that, a substantial number of households in Deninatquashta Kebele sell their agricultural products in open markets because there is no well-organized cooperative service that is able to purchase their produce in the Kebele. As a result, a great majority of the households are forced to sell their products in open markets. As it is clearly seen in the table above, large majority of households in Wonjella sell their product on both open and cooperative markets. This is because, in Wonjella, IWUC is relatively better organized to purchase farmers' product than Deninatquashta.

5.1.5. Storage Facilities

According to the data obtained from key informants, focus group discussion participants and my personal observation, irrigators in both study areas are using their own traditional storage facilities. These facilities include *Kot, Gotta, Gotera, and Gushegusha* for their cereal and cash crops. Most of the storage facilities are made from mud and bamboo trees. Nevertheless, teff, maze, wheat and barley are stored in traditional storages, which are exposed for insect pests and rats. Potato and onion (*Romane)* products are stored on open beds and floors, which expose them for mice and other insect pests. Sometimes they are simply left in the field even after harvesting time

In addition to traditional storage facilities, a centralized storage house is also found in each Peasant Association run by the Irrigation Water Users Cooperatives. However, the Deninatquashta's communal storage facility is under construction during the time of this study. According to IWUC executive committee members and experts, the unavailability of modern storage facilities in both Kebeles and lack of handling and packaging facilities contribute a lot for yield loss in general and of root crops in particular.

5.1.6. Road and Transportation Facilities

As it is indicated in table 5:24 below, 90% of inhabitants use pack animals (mainly horses) and human heads and back to transport their products to the market places. Households in the study area reported that, under the prevailing situation, production of perishable crops such as potato and onion are mainly restricted to urban skirts and roadside small towns. Farmers cannot use trucks to transport their products to distance areas, because they cannot afford it but very few farmers use local cart pulling by horse.

Table 5:24. Shows Means of Transport Systems in the Study Kebeles

Means of transport system	Deninatquashta		Wonjella		In both Kebeles	
	N=60	%	N=60	%		
Equine	8	13.33	-	-	8	6.66
Human	2	3.33	-	-	2	1.66
Car	-	-	2	3.33	2	1.66
Equine & Human	50	83.33	58	96.66	108	90
					N=120	%=100

Source: Survey findings/2006

Currently, both Peasant Associations (PA) gained access to wireless telephone technology, which will help farmers to look for market and related information in distant areas.

PA employed 6 youth on contract bases to run the telephone service. These employees obtain their salary on the bases of income they collected from the customers.

5.1.7. Agricultural Inputs

Farmers have experience in using modern agricultural inputs. Service cooperatives (SC) in both study area are the main providers of inputs such as chemical fertilizer, improved seeds, and pesticides. According to the service cooperatives chairmen, much of the inputs often target the domain of rain-fed production seasons, which is dominated by grain production. Fertilizers frequently were made available only for rainy seasons. This created a problem for irrigators to use chemical fertilizer during the dry periods. The price of fertilizer is also another problem faced by local farmers. For example, in 1997 and1998 the price of one-quintal of fertilizer was 400 and380 Birr. These situations forced the local farmers to shift from chemical fertilizer to compost and *fagullo* (oil residuals) to fertilize their plots. Compost is a natural organic made from cow-dung, plant leftovers, ashes, sheep and horse residuals, and other decay materials. Besides, compost, few farmers in Wenjella also used *fagullo* to fertilize their holdings. Some merchants who have small oil factories in Tilili sell *fagullo* to the farmers for 20-25 Birr per quintal. In Wonjella, farmers have the opportunity to purchase *fagullo* according to their needs. This is because the size of the land and individual financial capacity can determine the amount of fertilizer to purchase. Beside, farmers also apply intercropping and crop rotation techniques to fertilize their holdings.

5.1.8. Credit Facilities

According to the survey result, there are formal and informal institutions to provide credit services for householders in both irrigation sites. These credit sources includes, ACSI, IWUCs, Service cooperatives, informal moneylenders, kin groups, neighborhoods and self- help groups such as *idir and equb* for immediate and long term needs. Each lender has its own rules and objectives to provide loan for borrowers.

The loan is used to buy oxen, to pay taxes, to purchase agricultural inputs and animal feeds. It also used for households as a start up capital for small businesses and to cover miscellaneous expenses such as to by food items, to pay membership fees.

A farmer can obtain a loan from ACSI up to 1500-2000 Birr. However, the farmer can borrow 1000 Birr from ACSI in one term. The loan is served to purchase an ox, fattening of animals and to purchase selected seeds. This farmer is expected to save 20 Birr per month to payback the loan. Its interest rate accounts 18%. But, a substantial numbers of farmers have complained on the amount of interest rates saying that it is too much to pay back. As a result, many of the borrowers prefer the IWUC and SC to get credit because their interest rates are very small and its period to payback the loan is relatively long.

Service Cooperatives deliver loan to its members on short and long-term basis. A farmer can borrow 720-1000 Birr for five years. For the short term, a farmer can obtain 120 Birr to buy seeds for vegetables. This credit period stays from January to the end of May. For the long term credit, a farmer can have access up to 280 Birr in advance to purchase sheep and cattle. The second phase of the loan will be released through the approval of credit committee members and experts. The majority of the farmers prefer to take short-term loans because it is easy for them to pay back.

Besides, Credit Service Cooperatives also deliver goods (salt, fertilizers, sugar, and soap) and agricultural inputs. Non-members have access to purchase agricultural inputs except credit loans from service cooperatives in the study areas.

Irrigation Water Users Cooperatives (IWUCs) are also other source of credit for the study areas. These cooperatives provide loan up to 150 Birr for their members. This loan serves to purchase vegetables such as onion, carrot, head cabbage, potato, and dominant cereal crops. Land ownership, ability to payback and the habit of hard work of a farmer are the main criteria to get loan from IWUCs. Cooperatives also used these loans for the following purposes;

- To attract new members from non-irrigators;
- To undertake follow up and monitoring activities; and
- To use cooperative as collaterals.

Consequently, non- members do not have the opportunity to borrow loan from irrigation water user cooperatives.

water for relatively rich families, plastering houses, Weaving, Tanning, Smithing, Wood working and Shopping.

Table 5: 26. Households Engaged in Off-farm Activities by Sites

Do you work off-farm activities?	ZSSI	FSSI	Both sites	
	N=60	N=60	N=120	%
Yes	27	19	46	38.3
No	33	41	74	61.7

Source: Survey Findings/2006

As it shown in table 5:26, out of the total 120 households 61.7% of the respondents are not engaged in off-farm activities whereas 38.3% respondents are engaged in off-farm activities to supplement their households' food consumption and incomes. Households who engaged in off-farm activities are mostly poor and very poor households whose farm income lack to satisfy their annual needs. As it is revealed in the data above, majority of households are not involved in off-farm activities because irrigation does not give them enough time to spend on these activities. They devoted their time in land preparation, ploughing, sowing, weeding, watering and harvesting of crops all the year. Besides, the existing business activities do not encourage households to participate in off-farm activities.

5.1.11. Copping Strategies against hard times

Copping strategies are ex-post responses to shocks or unanticipated livelihood failure (Ellis, 2000, cited in DFID, 2001:13).

In line with this, the researcher requested households to explain their copping strategies in time of difficult situations. In both sites, 51% of the households reported that, October to December they often faced temporary food shortages due to the following reasons.

- Farmers spend the existing crops for sowing for next production;
- Crops in the field are not mature for food consumption; and
- Debts and miscellaneous expenses are expected to pay during these months.

Table 5:27. Shows temporary food shortages of households at Deninatquashta and Wonjella

Do you have food shortages?	Deninatquashta Kebele		Wonjella Kebele		In both Kebeles	
	N=60	%	N=60	%	N=120	%
Yes	35	58.33	26	43.33	61	50.83
No	25	41.66	34	56.66	59	49.16
					N=120	100

Source: Survey Findings/2006

Respondents explained their copping strategies as follows:

- Reducing different M*ahebers,* for example from 4 to 1;
- Reducing the amount of expenses for wedding ceremonies;
- Selling eucalyptus tree to generate income for households;
- Cutting and Chopping of logs for housing construction;
- Herding animals such as sheep on equal sharing;
- Borrowing food from kin groups, friends, and neighborhoods;
- Taking credit from informal and formal money lending institutions;
- Exchanging crops in kind going to distant areas, example potato by maize, potato by millet and potato by Barely, etc;
- Changing cropping patterns, Example, onion by potato;
- Working in constructions as daily laborers;
- Leasing out land for unspecified period usually for three years
- Allowing, children usually boys, to work in relatively rich families as daily labour by taking a male child out of school; fore a year or more;
- Migrating of male for labour leaving women lonely and with heavy workload to distant places such as Addis Ababa, Wollega, Shashemene, Pawe, Jawe, Humera, Womberma, Bersheleko for weeding and harvesting of crops;
- Working as daily labourers in nearby urban centers such as fetching water, mud plastering, cloth washing, etc;
- Working as daily labourers in their settings in *Kutequato* weeding, carrying crop residuals (leftovers), etc; and

- Selling animals.

5.2. Social Aspects of Households

5.2.1. Education

Deninatquashta Kebele has one public elementary school having classes up to grade seven. The school attracts students from Deni-Zuria, Dangula, Mengula gotts and other adjacent sub-Kebeles. Those students who completed their elementary education would go to Gemjabeit high school to peruse their education.

At present, the school has expanded to grade eight. According to the school director, inhabitants and members of the school community contributed some money for the expansion of the school. The Finish International Development Agency (FINDA) in cooperation with the local administration had constructed the school toilets.

According to the school director, enrollment of girls in the school is relatively better than boys. First, boys are forced to work in the irrigation farms by their parents. Second, early marriage, has reduced due to continuous education of parents through parent-teacher agreement in the study area.

The school lacks access to clean water. As a result, teachers and students suffered a lot from lack of potable water. This situation obliged teachers to fetch water from their houses in urban centers in which they live

The acting head of the school said that, Wonjella Kebele has one elementary school that gives classes up to the 6^{th} grade. The school draws students from Wonjella, Shemamarita and its adjacent *gotts*. Students will go to Tilili town after they complete their elementary education.

According to the school head, farmers are positive towards education. For example, the school community in collaboration with the parents built one block having three classes for their students in 2005. However, the school has many problems such as lack of books, seats, desks, teachers and access to potable water. Indeed, the school has about 20-25 *kadas* of *irrigable* land to generate farm income for different purposes.

5.2.2. Health

According to the health extension workers and FGD participants, the major health problems the Kebeles are intestinal parasites, diarrhea, malaria, coughing, stomachache and water borne diseases. Participants ranked, water borne diseases first in affecting the health of the inhabitants. Next to water borne diseases, they categorized the type of diseases based on the seriousness of the problems as sanitation problem; diarrhea, coughing, and malaria respectively.

As the researcher observed, three health extension workers have assigned in both Kebeles to assist farmers on health and related issues. Health workers provide health education such as family planning, personal hygiene, and sanitation, sexually transmitted diseases, malnutrition, etc. to the irrigators. In Wonjella Kebele medical services are also delivering to the residents.

Thirty- seven local trainees on heath issues are working in the two sites. These trainees teach local residents walking on house-to-house bases. Their training includes family planning, sanitation, nutrition, prenatal and postnatal complications and the use of having private toilets.

According to the health extension workers, however, the trainees have faced difficulties from local residents for two reasons. First reason was that, farmers do not like to build a toilet on their small plots because it shares much of their small farm land. Second, they think that, the land has hard rocks in the ground, that makes it difficult to dig, and this, in turn, demands too much labour from the farmers. Out of the reasons, the first reason was pronounced more by the localities.

5.2.3. Gender Issues

According to key informants, both men and women farmers are participating in different activities. Women and girls are solely responsible for domestic activities, such as water fetching, , food preparation, grinding, taking care of children, and cleaning the house. These domestic chores take a major share of the daily work throughout the year. Men are mainly

participating in productive and community activities such as ploughing, sowing, decision-making, conflict management, etc.

Although women work as hard as men on the fields, local residents considered agriculture activities as men's work, Women, along with men, participate in productive activities which include weeding, land cleaning, threshing, piling the hay, chasing away grain eating birds and carrying of grain residues, and storing the harvests. Both men and women take care of watering the crops in the field on their turn although men allocate more time for canal cleaning and maintenance activities. And they are responsible for the overall coordination of irrigation activities.

Key informants said that, both men and women are responsible to collect animal feeds in the field or around the homesteads. Children are responsible for herding animals on the private and communal grazing lands. They are also participating in chasing away grain eating birds.

According to women FGD participants, married men and women have equal right to decide on household properties verbally. However, women lack access to control big assets such as land, oxen and agricultural tools in practice. The only properties belonging exclusively to women in the areas under study are household utensils. In the same way, men own the agricultural tools over which women have no control. Women market the small items such as eggs and dairy produce while men deal with the sale of big stocks of grain and animals. Women also spend their daily earnings directly on basic needs for the households.

As the researcher observed, extension workers lack commitment to address women's needs as farmers. As a result, many of the extension services and irrigation management activities directed towards male farmers. For instance, out of 89 farmer trainees, women were three in irrigation management trainings in the two irrigation sites. These constraints have mainly emanated from the power relations that existed between men and women based on socio-cultural, economic and institutional influences. This, of course, is a disadvantage to poor women farmers to improve their livelihood.

Female-headed households

Since1996, female-headed households have equal access to land resources. As a result, female-headed households have the right to lease out their lands to sharecroppers on the agreement of equal share on crop yields and leftovers. These sharecroppers are mostly relatives and farmers having marriage affinities. If this does not happen, the plot holder will be obliged to lease out her plot to other sharecropper to plough and sow it.

A few female-headed households who have a pair of horses produce their crops by hiring daily laborers paying for 6 to 8 Birr per day. However, the majority of female-headed farmers who have no relatives and marriage relations are highly exposed to several socio-cultural and economic problems. Furthermore, the workloads of female-headed households are consider the highest, since they are responsible for almost all productive, domestic and community activities. The following three cases may illustrate some of the constraints faced by female-headed households in both study areas.

Case: 1

W/o Alemnesh Hailu; Sex: female

Alemnesh Hailu, 33, reads and writes. She has four children. Three of them are attending school and the eldest got married. She lives at the tail end of the irrigation scheme in Deninatquashta. Her husband joined the Ethiopian army in 2000 during the Ethio-Eritrean war. He died leaving his family behind in 2001. The woman has a hectare of land, of which 0.5 ha is irrigable. The rest rain-fed land is not fertile to grow crops on for her household. She left the rain-fed land for about three or four years in the hope that it would recover. During this time the land served for animal grazing. On her irrigable land she produces barley, wheat, maize and potato. She owns 2 cows, 4 sheep, and 2 horses. She bought these animals with the money she got from the army as blood compensation. The remaining money was used for schooling, food and clothing purposes. She also receives a 70 Birr pension.

She sustains her family by leasing out the irrigable and rain-fed lands to a sharecropper on the agreement of half the yield and crop residuals. Sometimes she also gives her horses to the sharecropper to plough his own plot. In turn, the sharecropper ploughs her plot on equal footing. If she does not get a sharecropper, she will hire a daily laborer for 4 to 8 Birr to plough

her land using her horses. Her problem is lack of access to water in her turn to irrigate her plot. This is because rich and troublemaking farmers who are assigned with her on the same gott take the water even when it is in her turn. The distance of the plot from the diversion has also influenced her to get less water. As a result of these factors her crops fail most of the time. In the absence of moonlight, she does not use a flashlight for fear of abductors. She always appeals her problems to the water controller but the water controller has done nothing. Instead he abuses her by saying

"Wuha satsechign wuha Titayikialesh" literally it means

"You always request water without giving me water"

This implies that, the water controller wants money from her as a bribe.

The woman does not use new technologies except compost and crop leftovers to fertilize her irrigable plot just because of lack of money. Like other farmers she also uses intercropping to keep the fertility of the soil in tact.

Case: 2

W/o Ayehu Tayhu, Sex female

Ayehu Tayhu, 47, illiterate, has seven children. Four migrated to urban center in search of a job. Three children live with her. Her husband was a guard for the Fetam irrigation scheme. When the husband retired and got blind he left his family behind and went to live with his eldest son in another urban center. Twelve years passed since the woman has started living alone. All responsibilities fell to nurture her children on her shoulders. She has 0.75ha of irrigable land. She has no horse, ox or sheep. She cannot afford to hire labour to plough her plot. She lives in a house with a very old corrugated sheet. She leads her life leasing out her plot to a sharecropper on the agreement of half of the yield and the leftovers. The sharecropper gives her teff or barley once a year to 'sustain' her family members for only six or seven months but the plot can produce two times a year using irrigation. She said," when I request him to sow potato or onion on the plot he always refuses to do so by saying 'the land cannot grow such root crops because it is infertile, so, if we sow such crops we may fall in crises'. By saying this, the sharecropper has always irritated me not to request him on the same issues". She said that, "I do not have the right to control and decide on my plot. He

dose not always give to me the chance to say few things about, when and what to sow on my plot. He does not also accept my ideas all the time." He always gives less attention to my plot. I have a doubt that he gives priority to the development of his own plots".

She further said," when I thought to change my sharecropper with an other person, he gives me little money (20 to 30 birr) in advance as credit in times of my difficulties. To pay back that money to the sharecropper my family members and I may fall in difficulties. As a result my plot still remains in his hands. My little plot, which produces potato and maize for my homestead, is also taken by the kebele for the construction of an office. Of course, the kebele gave me a small land as compensation. That might serve for the construction of my dwelling unit". However, she strongly complained about this issue too. She said," They took my land for I am a woman. These situations forced me to engage in petty trade activities such as selling tea and Areki in my birthplace to supplement my very little produce. All these together lead me an unhappy life in my place."

Case: 3

W/o Yenatfenta Ferdu, Sex: female

She is born and brought up in Wonjella Kebele. She is fifty years old, illiterate and has 5 children- of whom two attend school. The elder son, who is 40 and unmarried, lives with her. Her husband passed away six months ago. She has 4-kadas of irrigable lands. She grows potato, onion, barley and wheat on her plot. The woman has also one very weak horse and one calf. She does not lease out her land to the sharecropper because her elder son ploughs the land for the household. Her problem is lack of access to water in her turns. She said," Although the water turns is mine, most of the time water controllers give water to the rich and trouble-making farmers". People call them 'Kondye' (trouble- maker). "These individual farmers who have large land take the whole water to their own advantages within the allocated times. These farmers give me water after they assure their land is well irrigated. Due to this, most of the time, my land does not produce what is expected from it. This, inurn, negatively affects my life and my children too. At present, I have a problem to manage my household properly and to send my children to school". She said, "I do not have access to new agricultural technologies because I am not educated to use them. I cannot take loan from

credit providers such as IWUC, SC because I am not a member and I fear I may not be able to pay back the loan".

5.2.4. Labor Organization

"Mesno lemat masno meblat." Literally, 'irrigation development requires more labour to benefit from it'

As the researcher observed, households' labour is important for agricultural activities. This is because available holdings are too small to request more labour. Household members are mainly participating in farming activities. The husband has power on his wife and children to manage and control their labor. He provides direction and guidance to his wife and children.

Sometimes the head requests kin groups to assist in weeding, sowing and cutting of crops. Those farmers who have more land (6-8kadas) use labour exchange arrangements between relatives and neighborhoods to gain help during harvesting seasons. Farmers call such labour organization *Wobera* or *wonfel* (reciprocal labour exchange). This labour group usually consists of about 10-15 persons. However, since farmlands are too small in size, the value of large labour groups is diminishing through time. Only relatively rich farmers can do this labour organization to harvest their crops. A household requesting the *Wobera* or *Wonfel* prepares food, especially roasted grain and *Tella* to labour participants.

Farmers are often participating in building of bridges, schools, health posts, church, terracing, and plantation of trees, etc, as communal works in both Kebeles.

Maheber

According to key informants, this social organization has a religious base and generally performs a lot of social functions. Central of this is the celebration of a day representing a saint together every month. It is often family or friendship based. Members of such group most of the time belong to one neighborhoods/kin groups and are generally more or less the same socio-economic status. About 10 to 25 persons are members of a maheber. They meet regularly and share food or *Tella* depending on the social status of the households. According to the survey result, 98% and 90% households have their own Maheber in Deninatquashta and Wonjella Kebeles respectively. Maheber plays a vital role in both Kebeles. The main functions are:

- Fund raising when members face financial difficulties;
- Support members in terms of labor when one gets sick or need supports;
- Mutual support in times of death and wedding ceremonies; and
- Celebrating Saints' days together

Limitations of becoming a member of a maheber group are poor families may not be able to afford the expenses of preparing food, beverages or financial fees. Poor households do not have wide system of support to sustain their lives because they do not have the resources to help other too.

5.2.5. Holidays

Table 5: 28. Working days and Holidays in both irrigation sites

Name of Irrigation scheme	Working days in a month	Non-working days in a month	Working days except ploughing and land preparation	Total days
Fetame Small-scale Irrigation	12 days	Sunday(4) Saturday(4) Sillasie (1) Micaheal(1) Gabriel(1) Mariam (1) Medhanialem(1) Baal-Egziabher(1) Total=14days	Baata(1) Abbo (1) KidaneMihret(1) St.Giorgis (1) Total=4 days	30days
Zingni Small-Scale irrigation	12 days	Sillasie (1) Micaheal(1) Mariam (1) Baal-Egziabher(1) Sunday(4) Saturday(4) Total=12 days	Baata(1) Abbo (1) KidaneMihret(1) Gabriel(1) St.Giorgis (1) Medhanialem(1) Total=6 days	30 days

Source: *Survey Findings/2006*

Table 5:28, shows that, farmers work for 16-18 days a month in both irrigation sites. Of these days 4-6 days do not include ploughing. Non working days account 14 and 12 days in Deninatquashta and Wonjella Kebeles respectively. During these days farmers spend their time on non- farming activities dictated by social and religious obligations. In the remaining 10 days farmers fully engage in agricultural activities with the exception of ploughing and land preparation. In both sites, there is variation in working days. The variation is due to individual perceptions towards holidays. Although the working days are few, that does not mean farmers are non-working farmers. They work their agricultural activities intensively during working days. Sometimes they employ *Wonfel* or *Wobera* to accomplish the farming activities (see Annex 1 the meanings of Saint Days :).

5.3. IRRIGATION - POVERTY LINKAGES

According to FAO (2001:4-5) irrigation water is a very important resource for several productive and livelihood activities. As a production input for agriculture, irrigation water is a key socio-economic resource to benefit farmers, with a positive role in reducing poverty. Irrigation has also destructive effects when it leads to problems such as water borne diseases, land degradation, water logging and farmland salinity, water pollution and so on.

The benefits of productivity growth spread across other sectors depending on linkages with the rest of the economy and the magnitude of national multipliers. Higher real agricultural income generates demand for goods and services both within and outside this sector. Better agricultural yield/supply stimulates the creation of non-farm activities such as employment, income, etc, by backward and forward linkages to the services and manufacturing industries (Thirtle, et al. ,2001). In connection with the above general ideas, the researcher has attempted to assess the forward and backward linkages in terms of supply and demand issues.

Forward linkages for this study mean the practicality of other economic activities on the supply side of irrigation benefits. The backward linkages focused on demand sides of farmers to increase agricultural outputs and other sectors. These linkages are categorized as production/income, consumption, employment, investment, food security and other social outputs. These links help to observe impacts of irrigation to reduce households' poverty.

Production Linkages

The researcher did not find significant forward linkages in both irrigation schemes since there are no small-scale processing industries that utilize irrigation products as raw materials. What the researcher observed were solely backward effects that is demand for agricultural inputs such as improved seeds, chemical fertilizers, pesticides, and credit facilities, especially for Wenjella's irrigators.

However, this is not the case for the majority of the Deninatqueshta's Kebele farmers because irrigation has not yet stimulated production/ farm income to the residents. As a result, their demands to agricultural inputs are minimal. This problem compounded by high prices of chemical fertilizers and the 'bad' effects of chemical fertilizers to their plots. Indeed, extension workers have tried much effort to 'convince' farmers to accept the agricultural inputs but a substantial number of irrigators prefer to use composts and *fagullos* to fertilize their plots. Consequently, very few farmers in Deninatquashta and in Wonjella Kebeles benefited from modern inputs. This constraint limited farmers to move into crop diversifications and intensifications. As reported by a farmer in Deninatquashta Kebele:

> *Those farmers who have large irrigable land and are able to use agricultural inputs get opportunities to produce relatively better crops .Because they produce two to three times a year. As a result, irrigation and agricultural inputs benefited them more by increasing their farm incomes and food consumption. An expert who works with the Deninatquashta Kebeles said that, "Although farmers' crop productions are not over flowing to markets adequately, the irrigation scheme enabled the farmers to produce food consumption for their households."*

Consumption Linkages

According to IWUC committee members and FGD participants, farmers sell their cereal and cash crops in Tilili, Kessa, Kosober, and Gemjabeit markets. Farmers exchange their produce in these towns. However, the outflows of the produce in both irrigation sites are very insignificant. This is because much of the produces that come from irrigated agriculture use for family consumptions. Only very small amount left for out flows to nearby urban centers.

According to informants, farmers produce potato and onion on varying proportion. Few model farmers also started to grow some vegetables (carrot, head cabbage, and tomato) using

irrigation as additional cash crops. These situations positively affected these few farmers to enter into market-oriented productions. For example, one household obtained about 1500 Birr from selling of vegetables during harvesting time. This, in turn, led very small farmers to adopt crop diversification. However, dumping off and root rots disease are inhibiting Deninatquashta Kebele farmers not to produce root crops such as onion. As a result, irrigation schemes unable them increase reasonable returns to farmers' livelihoods, especially in Deninatquashta Kebele.

As backward linkages, the FGD participants explained that, irrigators purchased small –scale industrial items such as edible oil, Kerosene, Salt, Soap, Sugar, Umbrella, thread, and clothes and farm tools. As an elderly man explained it,

> *Good access to irrigation water benefits very few smallholders to have adequate shelter and very neat cloths. In a hectare of irrigated land onion production by a farmer can earn about 1000-6000 Birr when the market price favors it. Potato production also sustains the households. A large majority of the farmers consume potato as a staple food to sustain their life. Currently, a substantial number of farmers are obliged to shift from onion production to potato due to market constraints and some farmers try to produce their own selected seeds.*

The key informants said that, irrigation benefits few farmers to produce animal grazing. A substantial number of the farmers have piles of straws (crop residuals) in their backyards. These crop residuals serve as pastures to animals especially during dry seasons. Few farmers also grow *Kelikel* (small privately enclosed grassland) using irrigation for housing and animal feeds.

According to these informants, some individual farmers, especially female-headed households, generate small income by selling crop residuals to highlanders. These highlanders have strong social tie with irrigators in terms of marriage and other socio-economic activities. They also obtain crop residuals to their animals during hard time.

Improved access to irrigation water provides farmers to plant trees around their backyards. Trees use for firewood, as constructions items, to protect their land from erosion. They also serve for farmers as landmarks to identify plot boundaries.

Investment linkage

The researcher has not observed issues on investment of forward linkages. This is because majority of the irrigators are relying on subsistence activities. Consequently, no significant progress has been observed in investment in both areas under study.

As it is clearly seen in the site, few shops, drinking houses and power grain mills are found in Wonjella Kebele. These services came to exist with the presence of irrigation schemes. These small-scale business services have backward linkages with irrigation schemes. Teachers, health and extension workers, farmers and some outsiders are enjoying with these services.

The establishment of different social services such as health, school and farmers' training centers, storage facilities, and working offices following irrigation schemes attract few people to live in the areas. These in turn, helped for the emergence of semi urban centers on the road sides. As noted by IWUC committee members, the existences of institutions in the sites provide farmers to obtain social services and agricultural information. This situation, in turn, has contributed for localities to sustain their livelihood. The two sites have all-weather roads which were constructed following the irrigation intervention. This accessibility has created linkages with nearby urban centers.

Employment linkage

The creation of employment opportunity linkages is mainly derived from the labour-intensive nature of irrigation activities. According to FGD participants, key informants and IWUCs committee members view, irrigated agriculture enables rural unemployed to have access to employment opportunities by renting land from poor farmers such as female-headed households. On the other hand, few plot holders who have irrigable land for example, are able to rent their land to landless youth for 1500 Birr a year round crop in Wonjella Kebele. This helps few landless farmers to generate farm incomes and food cereals to stabilize their households and inhibit them from out migration.

As noted by key informants, poor female headed households, young girls and boys who came from a poor family and have reached marriage age also work for rich farmers in weeding, land cleaning, *kutequato*, and harvesting activities earning 6.00-8.00 Birr per day. This helps them to improve and stabilize wages and in particular, to enable the landless to negotiate about their terms of payment with their employers. Women are more effective in agricultural activities. As my guide told me "*women are more serious and committed to their duties than men.*"

As the researcher heard from key informants, farmers who have rainfed holdings and landless couples living in the adjacent Kebeles come and work as sharecroppers in both irrigation sites on the agreement to share the harvest equally. Inhabitants called these farmers as *Degegnoch (*highlanders*)*. These farmers come with their seeds and labour. Plot holder provides land, water and labour.

The researcher observed local landless farmers working in loading and unloading activities In Wonjella Kebeles. They earn about 10-20 Birr per day on these non-farm activities. These daily laborers are busy during peak seasons. They have association and opened offices to carry out these duties. The association helped them to negotiate with property owners.

As reported by IWUCs committee members, the Kebeles have wireless telephones. This telephone system provides communication services for localities. The two sites obtained their priorities on telephone services due to the presence of irrigation schemes. The installation of wireless telephone opened employment opportunities for six youths. The money they obtain for the services help them to lead their lives.

In the case of backward linkage, landless farmers who plough land by renting and sharecropping have established linkages by purchasing little technological goods such as chemical fertilizers, selected seeds and pesticides. Sharecroppers buy agricultural inputs on equal bases for their agricultural activities. Hence, the existence of irrigation schemes created small degree of backward linkages with other small-scale economic sectors. This, in turn, positively affected smallholders to sustain their households.

Irrigation, poverty and health

According to Carney (1998:185), the existence of adequate water in quantity and quality are fundamental human needs. As noted by key informants and FGD participants due to poor quality of water, diseases, such as bilharzias diarrhea, and intestinal parasites are severely affect the health of poor farmers in the areas under study. The two rivers are polluted while they come across Kosober and Tilili towns. Inhabitant use this contaminated water for drinking, cooking, washing clothe and hygiene purposes. These situations adversely affect the farmers' health and then working abilities. This often resulted in low productivities and led households to devote their time and resources in taking care of sick members. The problem is more aggravated during wet season because floods can add up much dirty things into rivers. This in turn increases households' medical expenses.

According to the health extension experts in the study area, malaria is not as such a serious disease for inhabitants. However, farmers who migrated to Humera, Pawe, Wollega, Shendi/Wonberma, Birrsheleko, in search of temporary jobs comeback to their homes caught by malaria. This situation sometimes inhibits family members from agricultural activities. The problem often led the migrant to death. My informants also explained that, today due to climatic changes malaria symptoms examining in water logging areas, which did not exist before. These health problems led farmers to low productivities. This health problem, in turn, inhibited individual farmers to curb the poverty issues in their respective areas.

Water Logging and Salinity

According to Yilma (2001:85), Water logging results primarily from poor drainage systems, over irrigation and canal seepage .The concentration of salts on farming plots adversely affects the growth of crops. In line with these, the researcher requested FGD participants to elaborate it and they reported that, households' crops are often negatively affect by seepage, water logging, and flood. For example, in Wonjella Kebele 60 seepage and floods frequently affect households every year.

Sometimes households' crops damaged through water logging before they reach to harvesting. This often led to hunger and starvation of these specific households. It also affects the quality of houses. This poor house, in turn, adversely affects the health situation

and livelihood of households. These constraints frequently drain households' time and energy in cleaning and repairing of house. This, in turn, increases the workload of women and children and this prevented them from other farm and income generating activities.

Many farmers in Deninatqushta are adversely affected by irrigation dumping off or farmland salinity. Consequently, farmers are unable to produce onion in their holdings. This situation forces farmers to limit themselves into other agricultural crops that may not generate high farm incomes.

Households' labour incompatibility

As noted by FGD participants and personal observation of the researcher, the majority of the households have rainfed land in the areas under study. The plot sizes are relatively better than the size of irrigable land. However, substantial numbers of farmers do not pay attention to safeguard and rehabilitate the rain fed land comparing from irrigable land. This is because farmers exert much of their limited labour, time and energy in taking care of their irrigable plots. As a result, the rain fed lands situated around the bottom of the mountain and hillside exposed to high soil erosion. Consequently, the lands remain relatively unfertile and unproductive.

CHAPTER SIX

6. Conclusion and Recommendations

6.1. Conclusion

Farmers living in moisture sufficient regions produce relatively more than those in moisture stress areas in Amhara region. However, the uncertainty on the part of the farmers and variability of rainfall amount in the region sometimes negatively affect the households to produce small quantities of agricultural produces.

As noted in the study findings, the contribution of irrigated agriculture in reducing households' poverty differs from one scheme to another. For example, findings in both irrigation schemes revealed that in Deninatquashta Kebele 58% of the sample households lives in traditional houses, and 42% of the respondents resides in corrugated iron sheet houses whereas in Wonjella 90% of the sample households lives in corrugated iron sheet houses. The remaining 10% lives in traditional houses. In the same sample, 42% and 83.3% of the households respectively reported that the existence of irrigation schemes contribute to households to improve agricultural productions in Deninatquashta and Wonjella Kebele. This is because of access to households of irrigation water, their use of agricultural inputs; obtain training and information from extension workers, educational level of farmers and land renting on equal benefit with poor farmers. Moreover, sharecropping with poor farmers in agreement for equal benefits contributes to improve their livelihood.

In the same samples size, 58% and 16.6% of the respondents respectively from Deninatquashta and Wonjella Kebeles underestimate the contribution of irrigation in reducing households' socio-economic poverty. The respondents argued that because of lack of capacity, poor allocation and distribution of water, gender biased allocation and distribution of water, lack of draft power to plough the land, and small size of land affect the improvement of agricultural productivity. In addition, distance of canals from the system to farm level (water volume decreases through evaporation and percolation reaches to farm level), inaccessibility of credit (non-members do not have access to credit from IWUCs), lack of adaptation to extension services, participation in organizational activities, selected seed and occurrence of diseases

attribute to low productivity. These problems more affect female-headed households, tail end water users and farmers living at the edge such as old age and the disabled.

Farmers also practice animal husbandry along with farming to sustain their households. Cattle (37.3%) and sheep (36.8%) ranked first and second in their order of importance for irrigators. These animals provide households with draft power, transport, manure and fuel. Among the animals, horses are used both for ploughing and transportation purposes. Farmers also benefit from varieties of consumable and sellable items such as butter and milk from their animals. These animals are also useful for households to accumulate wealth for difficult times and for some social obligations such as wedding, funeral ceremonies and *Mahebers*. However, these days the contribution of these livestock to the farmers is very limited mainly due to inadequate grazing lands. Indeed, a substantial number of farmers grow grass in their homesteads for their animals using irrigation. Few farmers generate some income selling crop residuals and grass. Findings of the study therefore, witness that the availability of improved irrigation schemes in both Kebeles have positively contributed to the households to have feeding for animals during dry seasons. In addition, irrigation has enabled some farmers to generate small income from selling grass. Grass and crop residuals are also used for making roofs.

Findings of the study show that both irrigation schemes are not well developed to establish strong socio-economic linkages within and outside. However, some linkages have been created between irrigation beneficiaries and various sectors. These linkages could be explained in terms of production, consumption, investment, and employment opportunities. In addition, the linkages persist in the form of forward (supply side) and backward (demand side) or one of the two.
In the case of forward (supply side) the study demonstrate that irrigation has enabled farmers to produce cereal and root crops such as barley, wheat, potato and onion. The majority of farmers consume barley and potatoes as staple food to sustain their households and they sell very small amount to the market in some towns. In relation to this, few farmers produce vegetables such as carrot, head cabbage and tomato. Producers thus, make sure the availability of home consumption and generate income to the households. This in turn has encouraged few farmers to enter into crop diversifications in Wonjella.

As backward linkages, irrigators purchase very small industrial goods like edible oil, fuel, salt, soap, sugar, umbrella, thread, clothes, plastic and farm implements.

The study revealed that irrigation did not contribute to investment opportunities because it is not yet matured to generate income for irrigators and people residing in adjacent areas could not engage in other economic sectors. In Wonjella Kebele, irrigation has played a role relatively in running few shops, opening local drinking houses and grain mills that did not exist before. Formal institutions such as health post, schooling, farmers' training center, wireless telephone, and all-weather road have also emerged because of the presence of irrigation schemes. The concentration of services and people along with irrigation schemes laid the basis for the emergence of semi-urban centers. These helped few women to involve in non-farm activities to sustain their livelihood. The existence of these institutions has positively affected the lives of the inhabitants in the study areas.

The study shows that the intensive nature of irrigation works has created forward effects for employment opportunities for substantial number of landless farmers, poor women and young daily laborers. Few landless youth have secured their livelihood through sharecropping and land renting from marginalized farmers. These opportunities enabled landless farmers to stay at their residential areas. If the government had not developed such modern irrigation schemes in both sites, several rural unemployed farmers would have migrated to distant areas to look for jobs. The existence of irrigation has also created job opportunities for immigrants who came from Highland areas. These Highlanders work as sharecroppers with the residents. As a result, both the farmers and the Highlanders obtained agricultural produces to sustain their households.

In Wonjella few farmers engaged in loading and unloading of agricultural outputs and inputs on trucks. These activities help them to gain income to sustain their family members. They have an association and an office to operate the activities. The association helped farmers to develop some negotiation skills with their property owners.

The presence of irrigation schemes facilitated the establishment of wireless telephone service. This service has created opportunities for local farmers to communicate with others and it in turn, has opened job opportunities for few rural unemployed.

The applications of agricultural inputs enable relatively rich farmers to increase their crop productions fairly. This in turn, has created positive demand to purchase agricultural inputs and farm tools beyond households' consumption. Households' demand for edible oil, fuel, salt, cloths, sugar, and corrugated iron sheet illustrate the backward effects of irrigation schemes.

Findings of the study also indicated that Zingni and Fetame rivers are used for irrigation and domestic consumptions. However, these polluted rivers while flowing across few semi-urban centers could be used by the inhabitants for drinking, washing, cooking, and bathing purposes. Consequently, irrigators' health is adversely affected by waterborne diseases such as diarrhea, bilharzias and intestinal parasites. This situation sometimes led poor farmers to additional medical expenses. Farmers, especially women also spend their time in taking care of sick individuals. This in turn, increased the workloads of women and children. The problem often prevents poor women from spending time and labour on income-generating and productive activities resulting in poor households unable to minimize socio-economic poverty issues.

As cited in the study, malaria is not as such a serious health risk in the study areas. However, few farmers who migrated to the lowland areas such as Humera, Pawe, Birrshelko, Wallaga etc to look for temporary jobs would comeback to their homes infected with malaria. These problems sometimes affect few households in producing agricultural crops.

It is also shown in findings of the study that seepages and flood are serious problems of few households. These problems adversely affect crop production and housing quality. It also drains household members' time and energy in clearing and maintaining household activities. This prevents family members from engaging in other productive and income-generating activities. A substantial number of farmers in Deninatquashta Kebele are also compelled to withdraw from onion production due to irrigation dumping off and root rots. This problem restricted farmers to fix into potato, barely and wheat crop production. The problem in fact emanated partially due to the failure of physical structures of the irrigation schemes and poor catchments management works around the reservoirs, soil erosion and accumulation of sedimentations in the reservoirs. These problems are exacerbated more by high run off during wet seasons.

In the two irrigation sites, women and girls are solely responsible for domestic activities. These domestic works take a major share of their daily works. Women work in irrigated agricultural activities. However, majority of women farmers especially female-headed households do not benefit well from irrigation schemes. First, the great majorities of sharecroppers do not plough their land on time and sow it. Second, they do not give a chance for female-headed households to discuss on irrigated agricultural issues. Third, these groups of women also lack access to leadership, decision-making, information and extension services resulting in female- headed households unable to minimize their Socio- economic and institutional problems.

It also revealed that relatively rich farmers obtain water either by exercising the legal rights or illegally exerting their social influence on local institutions. This practice widens the gap between relatively rich and poor farmers (female headed, old age and disabled farmers). This in turn may increase social differences between farmers in the future. This problem resulted from poor irrigation management activities and inefficiencies of local institutions.

Both irrigators use natural gravity to obstruct water from the source. However, smallholders are unable to shift and raise food productions adequately. These problems are mainly caused by three interactive elements such as water use, physical structures and organizational activities.

For example, technical experts were not aware of the importance of farmers' involvement right from the inception to completion of the irrigation project. Consequently, farmers are insufficiently committed to the success and sustainability of the project. They do not regard the schemes as their own resources that led to poor operation and maintenance and conflict among/between irrigators. These problems inhibited local farmers to produce beyond home consumptions. As a result, majority of farmers stayed behind to enter into crop diversification and intensifications. This made smallholders not to escape from socio-economic poverty. These findings witnessed that engineers were not aware of incorporating the social dimensions in irrigation management activities. This shortsighted irrigation planning negatively affected the proper functioning of irrigation schemes.

IWUCs lack skills and experiences to operate the system according to the needs of irrigators. These situations gave a space for extension workers and Kebele cabinet members to interfere in the management and institutional affairs of the cooperatives. In fact, the legal entitlement of

cooperatives did provide special privileges to disperse very small amount of credit to its members to increase crop yields. Their legal status also offered an entitlement to collect maintenance fees from its members and non- members. Indeed, some members have complained that the management is not transparent on the collected fees.

Cooperatives have several problems such as lack of market to sell their agricultural produces with reasonable prices, scarcity of water to irrigate their plots, lack of capacities and limited memberships in one household. Other problems are seepages, absence of sluice, non-matching of alignments and cracking of canals. Shortages of building materials especially cement and steel also restricted the cooperatives to maintain irrigation canals. These problems mainly originated from poor structural designs and lack of institutional capacities and these affect the productivity of localities.

Local dealers around semi- urban centers also create problems by fixing the market prices before agricultural yield period. So, farmers are obliged to sell their produces with very low prices in these semi-urban towns. The problem is so serious for producers because they are unable to gain what they have expected from the sale of their produces. This situation deterred the performance of the irrigators from producing more.

A great majority of irrigators do not want to be members of the cooperatives. This is because water users thought that they would lose their agricultural produce and the cooperatives would make their plots communal just like that of the practice during the Derg regime. This effect has not erased in the minds of farmers. Consequently, IWUCs has faced difficulties to mange irrigation schemes. Thus, cooperatives are unable to mange irrigation schemes properly in accordance with the needs of the farmers.

In sum, irrigation is really a window of opportunity to minimize households' socio-economic poverty by improving social benefits directly or indirectly. But, its contribution in reducing households' socio-economic poverty varies from one irrigation scheme to another and across the irrigation system depending on the amount of water, management efficiency and availability of adequate infrastructures such as education, health, road, market and other inputs. However, it is not safe to conclude that irrigation can reduce households' socio-economic poverty with the presence of poor irrigation management activities, gender

inequalities with less access to resources and benefits, weak farmers' participation, institutional inefficiencies and other related problems such as lack of market, credit, transportation, storage, and packaging facilities.

Therefore, the socio-technical systems approach could be applied in the context of this study because improving the technical and managerial performance of the irrigation system through better stakeholders' involvement would help to improve irrigation efficiencies and this assists households to minimize households' socio-economic and institutional poverty.

6.2. Recommendations

On the basis of the findings, the following are recommended:

- Farmers who do not involve in irrigation planning right from the inception of the project to the end are unable to create sense of success and commitment for sustainability of the irrigation project. Therefore, they should obtain an opportunity to involve in planning, implementation and evaluation of the project. Development workers and planners also give due recognition for the skills and the experiences farmers and use their skills and wealth of knowledge as the benchmark to derive new skills and inputs.

- Cooperatives lack skills to management irrigation schemes. Therefore, a study tour/visit should be organized for farmers, committee members, water fathers and front line workers to acquire skill and knowledge from others. Extend training and re-training to stakeholders in water management, marketing, productivity, and gender issues

- Intuitional inefficiencies are serious constraints for both cooperatives. Hence, technical assistance and capacity building support should extend to cooperatives till they acquire adequate irrigation management skill.

- The water allocation and distribution schedule did not consider the distance from the source to the field resulted crop failure. Hence, the schedule must take into account distance to overcome water problems.

- Local government interference has been observed in the affairs of cooperatives. This local bureaucratic interference affected cooperatives negatively. Hence, avoid such interference in their internal affairs and substitute with genuine supports.

- Poor water management and scarcity of water have created conflict among and between irrigators in the project sites and around the entire catchments. Hence, the

establishment of catchments management council coming from different *gotts* at Kebele level seems plausible to minimize these and other land and forest related problems. The council should consist of both male and female farmers living in the catchments. This council will develop working modalities to administer the water distribution on equal bases and catchments conservation on the bases of water flow paths (head, middle and tail water users). The working modality has to develop through the involvement of all stakeholders.

- Relatively rich farmers use water legally or illegally to improve production and farm income but they negatively affected the poor. Therefore, cooperatives should put in place an efficient system of fee recovery based on the volume of water a farmer uses.

- Irrigation affects men and women differently. Hence, efforts should extend to empower women and to ease their workloads. Local governments should develop pro-poor strategies that consistently address gender issues such as avoiding one member per household rule to be membership for cooperative, provide all the necessary assistance including technical training to enable them to involve in irrigation management activities, train male couples on gender issues continuously to allow them to designate their wives as members in IWUC, give responsibility for women to participate in decision- making role in the cooperative.

- Female headed households encountered several difficulties in irrigating their own holdings. Majority of these households are not represented in irrigation management activities. Hence, mechanisms should be designed to enable them to play an active role in the existing irrigation management activities and thus to meet their practical and strategic needs.

- Lack of Market to sell their produce is a serious problem of farmers in both irrigation sites. Hence, government should give due attention to find market out lets and networks to promote farmers' agricultural productivity and production.

- Crops diseases, especially for onion, are so serious in the areas under study. Therefore, the responsible government bodies must take corrective measures before the disease expands to other root crops. These measures should back up by research activities. Livestock diseases are also rampant in the research sites. The corrective measures should also consider these problems too.

- An integrated development approaches are essential for rural development. Hence, stakeholders should put their efforts in packages to enhance the efficiencies of irrigation schemes.

- Membership seems one of the criteria to get access to loans to improve crop production and farm income in both irrigation sites. Thus, responsible bodies should design some mechanisms for non-members to have access to loan to increase their crop yields and incomes. Besides, reasonable interest rates and payback periods seem plausible to households to boost up their agricultural productions.

Above all, policy-makers and planners should avoid mono-displineary approaches to design and implement irrigation schemes. Hence, they must give due emphasis for technical, socio-cultural and institutional elements to operate and maintain irrigation management activities to break the poverty circle.

Annex Meanings of Saint Days

Date of Month	Name of Martyr, Saint or Angle	Meaning
3	Baata	Entrance of St Mary to the Temple
5	Abbo	St. Gebre-menfes-kidus
7	Sillasie	Trinity(The three Godhead)
8	Kiros	Kiros, The Martyr
12	Michael	Michael the Angle
13	Egziabher Ab	God the Father
14	Gebre Kiristos Aregawi	Aregawi, the Servant of Christ
16	Kidane Mihret	Covenant or Mercy (Mary)
18	Yostantinos	St. Yostantinos
19	Gabriel	Gabriel the Angel
21	Baale Mariam	Assumption of the Holy Virgin
23	St. George (Giorgis)	St. George
24	Tekle Haimanot	Tekle Haimanot, the Martyr
27	Medhanialem	Saviour of the world
29	Baale-Egziabher	Festival of God

Source: Adopted from Darout Gum'A (2004) and Waldeab (2003)

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Photographs

Photo 1: Focus Group Discussions on Irrigation Management and Poverty issues in the Research areas.

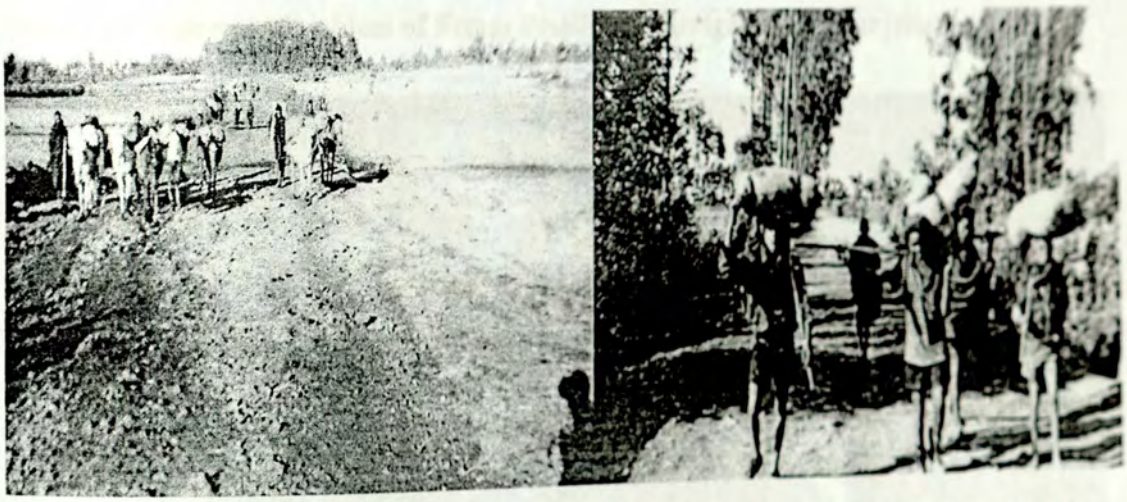

Photo 2: Farmers of Wonjella Kebele going to Market to sell their Produce at Tilili town

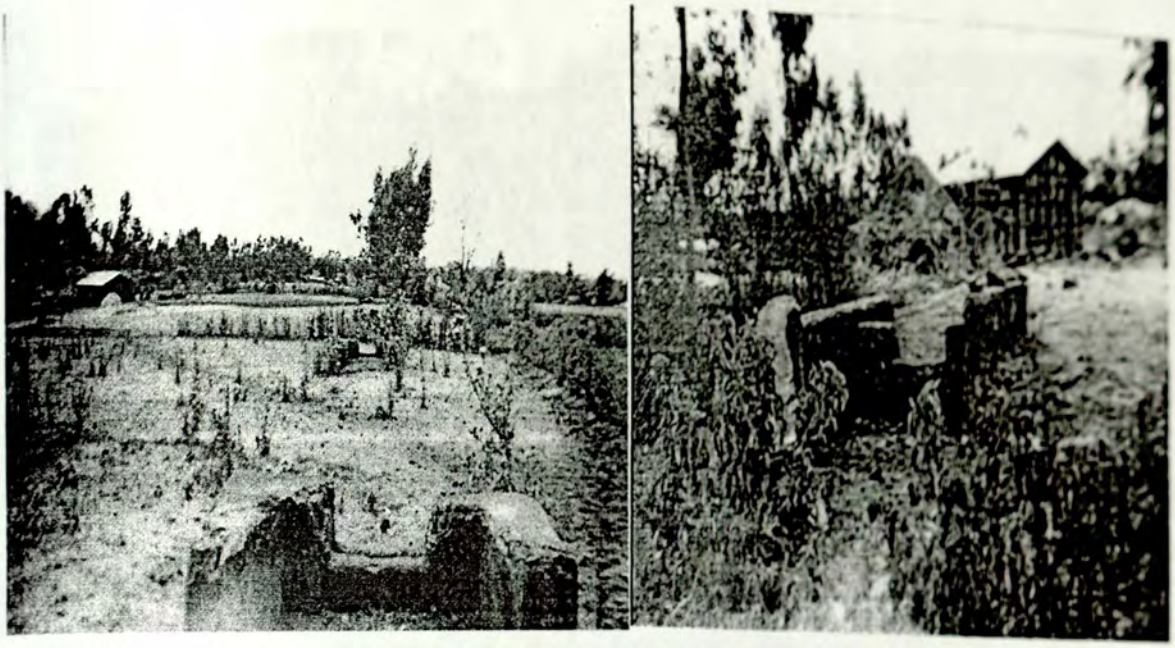

Photo 3: Alignment Problem of Fetam Small-Scale Irrigation at Wonjella

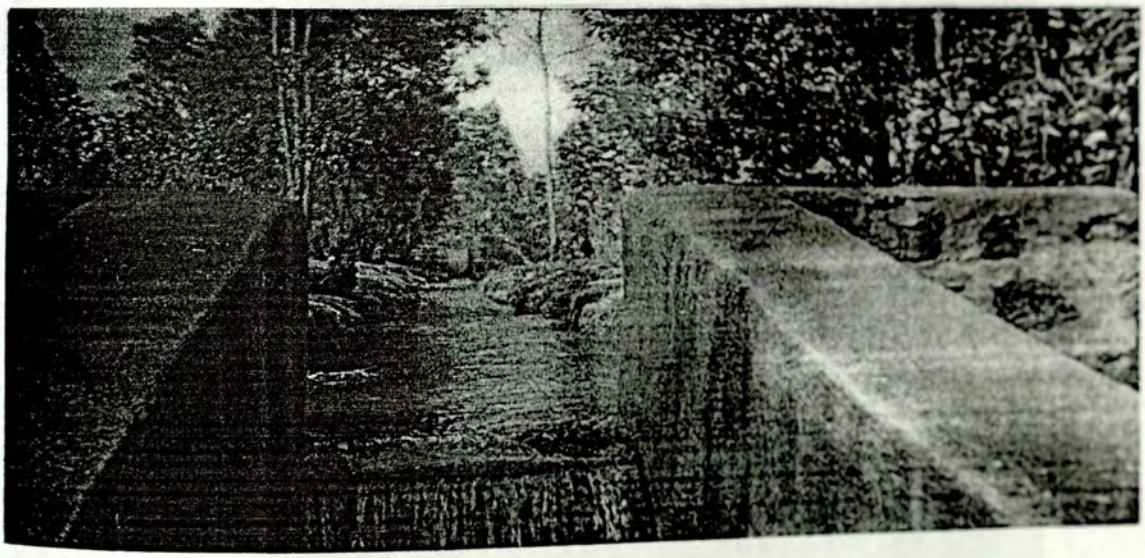

Photo 4: Main Canal of Zingni Small-Scale Irrigation Scheme at Deninatquashta Kebele

Photo 5: Farmers with their family members ploughing their plot and Sowing Potato on line at Deninatquashta Kebele

Photo 6: A Farmer directing the water to his plot at Deninatquashta Kebele

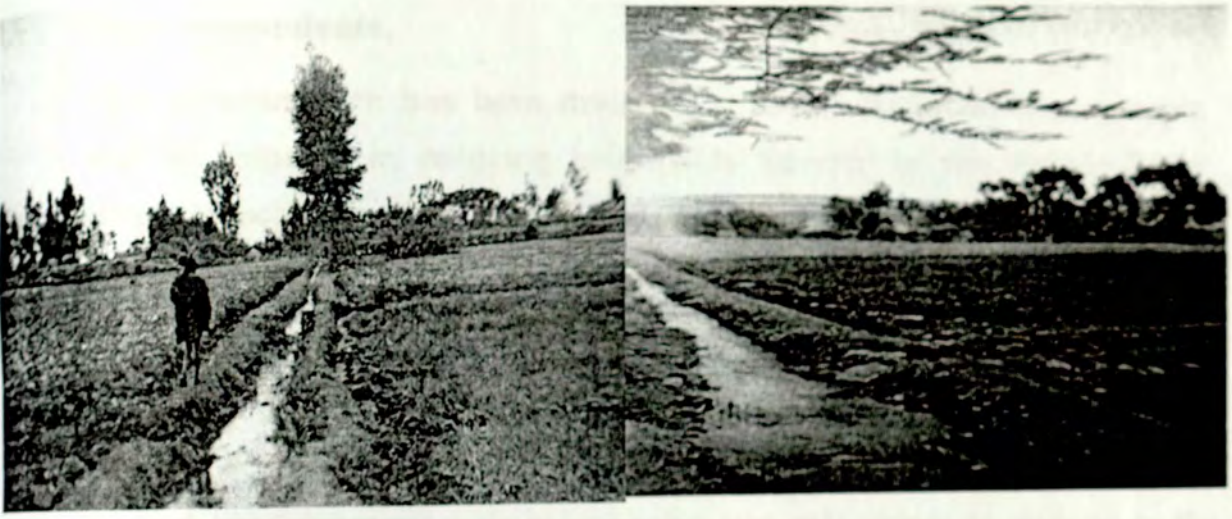

Photo 7: Potato and Onion Production in the field at Wonjella and Deninatquashta Kebeles

Photo 8: A Female-Headed Household cultivating her land Around the Homestead with her elderly Daughter and her Grand Children

Dear Respondents,

This questionnaire has been designed to assess irrigation Management and its impacts in reducing households' poverty in two Small- Scale irrigation schemes of the Blue Nile Basin in Awi Nationality Zone of ANRS. The study mainly focuses on the management activities of irrigation and its impact in reducing poverty.

The ultimate objective of the study is to propose appropriate irrigation management systems in order to scale -up the benefits of irrigators.

Thus, I kindly request your co-operation and willingness to respond to the items on the questionnaire honestly. Be sure that any information you delivered will be kept confidential and be used purely for the purpose of the study.

Thank you

Researcher

Background Information and Personal Data of Household Heads

Name of Enumerator _____

Sex: 1. Male 2. Female:

Educational Status: _____

1. Household identification number: _____
2. Interview: Date _____ 2006, Time taken _____
3. Name of Woreda: _____
4. Name of Keble: _____
5. Name of village /gott: _____
6. Name of irrigation scheme _____
7. Geographical location of the interviews

   1. Head end ☐ 2. Middle stream ☐ 3 Tail end ☐

8. Family head: Sex):1. Male ☐ 2. Female ☐ Age_____
9. Ethnicity): 1. Awi ☐ 2. Amhara ☐ 3.Other (specify) _____
10. Religion: 1. Orthodox ☐ 2. Islam ☐ 3.Other (specify) _____
11. Educational status 1. Illiterate ☐ 2. Read and write

    3. Grade 1-6 ☐ 4. Grade 7-8 ☐ 5. Grade 9 and above ☐

12. Occupational status:_____
13. Marital status: 1. Single ☐ 2. Married ☐ 3. Divorced ☐ 4. Widowed ☐

    5. Separated ☐ 6.Other (specify) _____

14. Household size:
    - Children: 1. Male _____ 2. Female _____ total _____
    - Relatives 1. Male _____ 2. Female _____ total _____
    - Non-relatives 1. Male _____ 2. Female _____ total _____
15. Why non-relatives, reside in the owner's house?_____
16. Head of household place of birth _____
17. Estimated duration of stay at current place of residence: _____

18. If your place of birth is different from the present, why you came here?

_____

19. Type of house: 1.corrugated iron sheet ☐ 2.Grass/straw ☐ 3.other ☐

1. Irrigation Management Issues

1.2 Before Government Irrigation Intervention

1. Have you practiced traditional irrigation before the intervention of the new scheme?

1. Yes ☐ 2. No ☐

2. Where did you find water to irrigate your plot? 1. River ☐ 2.stream ☐

3. Pond ☐ 4. Well ☐ 5.a combination of all ☐

3. What was your contribution in the construction of traditional irrigation scheme? 1. Labour ☐ 2.Money ☐ 3.Materials ☐ 4.Other ☐

4. How was water allocation and distribution carried out before intervention? 1. Rotatio ☐ 2.contin ☐ 3.I don't kn ☐

5. Was water sufficient to practice traditional irrigation in the past? 1. Yes ☐ 2.no ☐

6. How was water allocation and distribute before intervention? 1. Through water father ☐ 2.Government bodies ☐ 3. A combination of all ☐

7. Was water conflict existed before intervention? 1. Yes ☐ 2.No ☐ 3. I don't know ☐

8. If yes, to Q#7 how was the magnitude? 1. Very small ☐ 2. Small ☐ 3.Non ☐ 4.I don't know ☐

9. How was conflict managed in the past? 1. by water father ☐ 2. By government offici ☐ 3.1and 2 ☐ 4.I don't know ☐

10. How do you evaluate production before intervention? 1. Very adequate ☐ 2.Adequate ☐ 3.Fair ☐ 4.I don't know ☐

If it was very adequate toQ#10, why? _____

If it was fair to Q#10 why?_____

1.2 After Government Irrigation Intervention

1. Who were the parties involved in the construction of the scheme?

1. Community only ☐ 2. Government only ☐

3. Non-government only ☐ 4. Any combination of the above actors ☐

2. How long you practiced Modern irrigation? 1. 1-5 years ☐

2.6-10 years ☐ 3.11-15 years ☐ 4.More than 15 years ☐

3. Does the scheme has been constructed with the consent and the participation of the farmers? 1. Yes ☐ 2.No ☐ 3.I don't know ☐

4. What was your contribution to the construction of the scheme? 1. Labor ☐ 2.Money ☐ 3.Material ☐ 4.other specify ☐

If no contribution, please reason out _____

5. How was water allocation and distribution carried out after intervention? 1. By Water father ☐ 2. By IWU ☐ 3.By government officials ☐ 4.1and 2 ☐ 5. 1 and 4 ☐ 6 2 and 3 ☐

6. How did you get water in your turn to your farm? 1. By rotation ☐ 2.By continuous supply ☐

7. Does the rotation schedule suit for your farm?

1. Yes ☐ 2. No ☐

If no, to Q#7 why? _____

8. What are criteria to access to water?1. Land holing size ☐ 2.crop type ☐ 3.1 and 2 4.I don't know ☐

9. How many households do have access to water at a time in your village/gott? 1. 1-5 HH ☐ 2. 6-10 HH ☐ 3. More than10 HH ☐

10. Is water adequate for your farming? 1. Yes ☐ 2.no ☐

If no, to Q#10 why?_____

11. Have you ever-participated in maintenance of the irrigation scheme? 1. Yes ☐ 2. No ☐

If yes, to Q#11 how many times per year? 1. One times a year ☐ 2.Two times a year ☐ 3.three times a year ☐

If yes to Q#11, 1.around my plot ☐ 2.on the whole canal ☐ 3.Acombination of all ☐

12.Do water control structures on canal allow a satisfactory water distribution? 1.Yes ☐ 2.No ☐ 3.I don't know ☐

If no to Q#12, why? (List in order) 1._____ 2._____ 3._____

13. Is water logging a problem in your plot? 1. Yes ☐ 2.No ☐

14. How do you remove excess water from your farm? _____

15. Does the scheme have problems? 1. Yes ☐ 2. No ☐

16. How often damage the structure? 1. In all wet seasons ☐ 2.In all dry seasons ☐ 3. 1and 2 ☐ 4.other specify_____

17. What are the main causes of the damage of the structure? (List in order.)
1._____ 2._____ 3._____ 4._____

18. Who Operate and control the irrigation system? 1IWUC 2☐ommunity as a whole ☐
3.government ☐ 4.1and2☐ 5.1and3☐6.2and3☐

19.Is there conflict on water allocation and distribution after intervention?1. Yes ☐
2. No☐ 3.I don't know ☐

20. What are the major causes of conflict in your village? 1. Waters allocation and distribution ☐ 2. Boundary ☐ 3.Other specify_____

21. Have you come across any defaulters of water distribution in the scheme? 1. Yes☐
2. No ☐

22. Does the community have a customary law to control water defaulters? 1. Yes ☐
2. No ☐ 3.I don't know ☐

Ifyes, toQ#22 what does the law says? _____

If yes to Q# 22, do you believe that the law is enforced in the way people formulated?
1. Yes ☐ 2. No ☐3.I don't know ☐

If no to Q#22 why? (list the causes in order)

1._____ 2._____ 3._____ 4._____

23. Who has the authority and responsibility to enforce this customary-law? 1. Idir as ☐
a whole 2.Mahiber as a whole ☐ 3.Elders ☐ 4.a combination all ☐

24. What happen if the defaulter is disobeying to the law? 1. Punshed by birr ☐
2.punshed by labour ☐ 3.he/she does not get water in their turn ☐ 4.he/she ostracized from idir, mahiber☐ 5.a combination of all ☐

25.Is there Water Users' Association in your area? 1.Yes ☐ 2. No ☐

If yes to Q#25, what is your perception towards Water Users Association? 1. Very good ☐
2.Good☐ 3. Fair ☐ 4.Bad ☐

26. How is WUA communicating with the irrigators? 1.By water team leaders ☐
2.through meetings☐ 3.In the religious place ☐ 4. a combination of all☐

27. Does IWUC has a written of by-law to control the allocation and distribution of water? 1.Y☐ 2. N☐ 3.I don't know☐

28. How is this by-law formulated? 1.By all irrigators ☐ 2. By members only ☐ 3.Idon't know☐

29. Does the by-law practiced in the way it formulated? 1.Yes ☐ 2.No ☐ 3. I don't know☐

If no to Q#29, whay?1_____2._____ 3._____ 4.____

30. Is IWUC capable enough to manage water resources properly? 1.Yes☐ 2.No ☐ 3.I don't kno☐

31. Does IWUC has a fixed schedule to allocate and distribute water to the users? 1. Yes☐ 2. No☐ 3.I don't know ☐

31. When do you get water to your plot? 1. At day time☐ 2. At Night time ☐ 3. 1 and 2 ☐

32. Do you have a reservoir in your homestead? 1. Yes ☐ 2.No ☐

33. What is your perception towards IWUC? 1.I like it☐ 2.I don't like it ☐ 3.I am Indifferer☐

34. Do you pay any water are fee? 1. Yes ☐ 2. No ☐

If yes, to Q#34, for what purpose? 1. Maintainance☐ 2.Salary for guard ☐ 3.water use charge ☐ 4.1&2 ☐ 5.1&3☐ 6.2&3☐

35.Is water distribution reliable for all the command area? 1.Yes 2.No 3. I do☐ know ☐

36. Are there people who use water outside the command area? 1.Yes ☐ 2.No ☐ 3.I don't know ☐

37. Is the irrigation method well adapted to crops and soil? 1.Yes ☐2.No☐3.I don't know☐

If no to Q#37, Why? _____

38. What are the difference purposes of water in the area? 1. Drinking ☐2.livestock ☐ 3.washing ☐ 4.irrigation☐ 5.housing utility purpose ☐

6. Other specify_____

39. Where do you sell your product? 1.In open market ☐ 2. In cooperatives ☐ 3.Other specify_____

40. How far is the market on average? 1. about5-10 km ☐ 2.11-15km☐ 3. More than 15km ☐

41. What type of transport are you using to transport you product? 1.pack animal ☐ 2.human labou☐ 3.Vhicle ☐ 4.1&2☐ 5.1&3 ☐ 6.2&3 ☐ 7.A combination of all☐

42. Do you face problem in selling your product? 1. Yes ☐ 2. No☐

If yes to Q#41, how did you overcome it? _____

43. Is there micro-finance institution in your area? 1. Yes ☐ 2. No☐ 3.I don't know ☐

If yes toQ#42 what is it? 1.*ASCE☐ 2. Farmers' co-operative☐ 3.1&2 ☐

44. Have you been borrowed money from the institution? 1. Yes ☐ 2.No ☐

If yes to Q#44 ,how much is it?1.50-99birr ☐ 2.100-150birr☐ 3.More than151 birr ☐

If no, to Q#44 where did you get credit from? 1. Relatives☐ 2.Friend☐ 3.Money lenders ☐ 4.1&2☐ 5.1&3☐ 6.2&3☐ 7.Acombination of all ☐

45. What do you do the money? _____

46. Do you have experience of default on your repayment? 1. Yes ☐ 2.No ☐

If yes, how did you solve it?

1. By selling of livestock ☐
2. By Selling of house furniture 3. By renting out land ☐
4. By borrowing money from relatives☐ 5. Any combination of all ☐

47. Do you have Ikub? 1.Yes ☐ 2.No☐

48. When are you paying your money for your Ikub? 1.In weekly base☐ 2.In monthly base ☐ 3.1&2 ☐

49. Do you save money? 1. Yes☐ 2. No☐

If yes to Q#49, what do you do your savings? _____

If no to Q#49,why? _____

50. What is the main problem of getting credit from the institution? _____

2. Production and Income

2.1 Production

1. Do you have land for agriculture use? 1. Yes ☐ 2.No ☐

If yes to Q#1, how did you get access to it? 1.Through land redistribution☐ 2.Shered from relatives☐ 3.Inherited from parents☐ 4.share cropped in ☐ 5.purchased ☐ 6.Other (specify)_____

If yes, to Q#1 how many ha/qada of your cultivable farmland has access to irrigation water? 1. 1quada ☐ 2.2quada ☐ 3.3quada ☐ 4. 4quada ☐

5. More than 4 quada ☐

If yes, toQ#1 how many ha/qada of your cultivable plot has access to rain-fed? 1.1quada ☐ 2.2quada ☐ 3.3quada 4. 4quad ☐ 5.More than 4 quada ☐

2. What has happened to the size of your landholding over the last ten years? 1. Increased ☐ 2.Decreased ☐ 3.constant ☐ 4.I don't know ☐

If it has increased, why?_____

If it has decreased, why?_____

3. What are the major agricultural crops you produce applying irrigation? 1._____ 2._____ 3._____ 4._____

4. What are the major crops you produce using rain-fed farming? 1._____ 2._____ 3._____

5. How many times you produce annually using irrigation? 1. One times a year ☐ 2.Two times a year ☐ 3.Three times a yea ☐ 4.other specify_____ ☐

6. Do you use rain-fed agriculture for your agriculture? 1.Yes ☐ 2.No

If yes to Q#6, how much is it? 1.1 qada ☐ 2. 2qada ☐ 3. more than 2 qada ☐

7. What are the main bottlenecks of production?(list in order) 1._____2.-_____3._____ 4._____

8. Have you ever faced problem of crop failure when you using irrigation? 1. Yes ☐ 2.No ☐

If yes toQ#8 why it happened?_____

9. How many months of the year are engaged in irrigation activities?1. about six months of the year ☐ 2.about eight months of the year ☐ 3.Other specify_____

10. there land that use commonly with other people in your area?

1. Yes ☐ 2. No ☐

If yes to Q#10, what are the benefits that your household gets from it?

1. Pasture/grazing ☐
2. Fire wood for selling ☐
3. Fire wood for home consumption ☐
4. Water for various purpose ☐

5. Source of construction material ☐

6.Other _____

11. Do you rear livestock? 1. Yes ☐ 2.No ☐

If yes toQ#11, what animals are you rearing?

No	Type of animal	Number	Animal sold
1	Horses		
2	Sheep		
3	Oxen		
3	Cows		
4	Goats		
5	Mules		
6	Hen		
7	Donkey		
8	Calves		
9	Other		

12. What are the main problems of livestock rearing (list in order)? 1._____

2._____ 3._____ 4._____

13. Have you come across for shortages of food? 1. Yes☐ 2.No ☐

If yes to Q#13, When?_____

If yes to Q#13,Which months of the year you are experiencing shortage of food?_____

If yes, to Q#13, what was your copping strategy to overcome it?

1._____2._____ 3._____ 4_____

14. Do you perform as supplementary activities other than farming? 1.Yes ☐ 2.No ☐

IfyesQ#14.whatarethey?1._____2._____3._____ 4._____

15. How is the extent of poverty for the last five years? 1. Increased☐ 2.Decreased ☐

3.I don't know ☐

If it is increased to Q#15, why? 1.____2._____ 3.____ 4._____

5._____

If is decreased to Q#15, why? 1.____2._____ 3._____4. _____

16. Is there any area of irrigable land you have rented in 1. Yes ☐ 2. No ☐

If yes to Q#16, how much is it? _____

For how long? _____

Under what terms? _____

17. Have you sharecropped out your plot to other peasant?

1. Yes ☐ 2. No ☐

If yestoQ#17, why did you share crop out?

1. Lack of draft power ☐
2. Lack of seed ☐
3. Unable to purchase technological input ☐
4. Elderly and unable to operate ☐
5. Illness ☐
6. Have extra land ☐
7. Gender (FHH) ☐
8. Other (specify) _____

18. Are there special consideration for crop type and stage of growth during water allocation? 1. Yes ☐ 2. No ☐

If no, what happen when somebody is convincingly in higher need of water? _____

19. Do you know water requirement rates for your crop in the field? 1. Yes ☐ 2. No ☐

If no toQ#19 who assists you (specify) _____

20. What negative impact brought irrigation in your area? _____

3. Gender and Irrigation

1. Do all socio-economic group men and women in the area have equal access to water? 1. ☐ 2. No ☐

If no toQ#1, which groups have most affected by lack of water of water? 1.FHH ☐ only 2.Women as a whole ☐ 3.Disabled and aged people ☐ 4.1&2 ☐ 5.1&3 ☐ 6.2&3 ☐ 7.all ☐

2. Why these groups of people have less access to irrigation? 1.____ 2.____3._____

3. Which groups of people get more water? 1. IWUC executives ☐ 2.Water team leaders ☐ 3.political leaders ☐ 4.1&2 ☐ 5.1&3 ☐

6.2&3 ☐ 7. a combination of all ☐

4. Does the rotation schedule suitable to female-headed households? 1. Yes ☐ 2.No ☐ 3.I don't know ☐

5. Do female-headed households assigned at night for water distribution? 1. Yes ☐ 2. No ☐ 3. I don't know ☐

If yes to Q#5 what are the problems they encountered during the night (list in order)

1._____ 2._____ 3._____ 4._____

6. Is attention being given equally to women in the selection of WUA executives? 1. Yes ☐ 2.No ☐

7. Do female-headed households get equal chance to participate in leadership and decision-making? 1. Yes ☐ 2.No ☐ 3.I don't know ☐

If yes toQ#7, what extent are women participating to the leadership and decision-making?_____

If no to Q#7, why?_____

8. What is the attitude of extension workers towards female irrigators? 1. Very good ☐ 2. Good ☐ 3.Fair ☐ 4.Bad ☐ 5. I don't know ☐

9. Do FHH have power to decide on their resources? 1. Yes ☐ 2.No ☐ 3. I don't know ☐

10. Is poverty reduced after the introduction of irrigation? 1. Yes ☐ 2.No ☐ 3.I don't know ☐

11. Did the labor hiring payment increased due to irrigation? 1. Yes ☐ 2. No ☐

If yes to Q#11 how much man/day? 1. before_____ 2.Aftere_____

4. Social Organization

1. Do you participate in different community organization? 1. Yes ☐ 2.No ☐

If yes to Q#1 what are they? 1.Idir ☐ 2.Ikube ☐ 3.Mahiber ☐ 4.other_____

If you participate in Idir, how much you pay per month?_____

If you participate in Ikub, how much you pay per month?_____

If no to Q#1 why?_____

2. Do you participate in various community labor organizations? 1.Yes ☐ 2. No ☐

If yes toQ#2 Why specify it?_____

If no to Q#2 why?_____

5. Others

1. What will be your suggestion to improve irrigation management activities?

1._____2._____3._____4._____

2. Anything remain_____

Checklists and Guidelines of Irrigation Management and Its Impacts in Reducing Poverty:

6. Group Discussion Guidelines

Number of participants_____

Sex Composition: Male_____ **Female**_____

1. What is the historical trend of the irrigation development in the area?
2. How do they Management irrigation water before and after intervention?
3. Who are the actors involved in the Management activities?
4. What were constraints for irrigation management tasks?
5. What are crops produce by the farmers using irrigation)?
6. Is irrigation intervention improved Households' livelihoods?
7. What are the problems of crops production in the area?
8. What is perception of farmers towards IWUC?
9. How do farmers Perceive poverty in the area?
10. What are the causes of poverty in the study area?
11. What are copping mechanisms to overcome difficulties?
12. What are off-farm activities in the area?

7. Institutional Guidelines

1. How do farmers management irrigation activities before and after intervention?
2. How conflicts manage in the area before and after irrigation intervention?
3. How institutions communicate with other organizations before and after irrigation intervention
4. What are positive and negative changes of irrigation in the life of the farmers?
5. Where are crops marketed? What are the Problems of marketing?
6. Do farmers have access to credit? And use of credit?
7. Where did find inputs and agricultural extension services?
8. Do female-headed households have access to water to irrigate their plots?
9. What is the participation of women in decision-making and leadership?
10. How do evaluate the volume of water before and after intervention?
11. Are there changes on the management of irrigation after the establishment of IWUC?

8. Key-Informants Discussions

1. How do Farmers manage irrigation activities in the past?
2. When was government irrigation intervention started?

3. When was the construction of the scheme finished?
4. How was conflict managed before irrigation intervention?
5. What was the cause of conflict? Process, outcome (punishment)
6. How did Farmers communicate with water fathers?
7. Did the farmers participate in the construction? By what item?
8. What was the perception of the farmers towards the construction of the scheme?
9. What was the role of institutions in managing irrigation activities?
10. What was the weakness and strength of these institutions before and after intervention?
11. Have you come across shortage of food?
12. What is your perception towards production before and after intervention?
13. Is farmers' livelihood change due to irrigation intervention?
14 How did you see land redistribution of 1996/1997?
15. What would be your suggestion to improve management of irrigation to minimize poverty?
16. Who took the first initiative for the construction of the scheme?

9. Interviews for Irrigation Experts

1. What are the main problems of the scheme?
2. What are the main problems of crop production and livestock in the area?
3. Is production increase or decrease in the area?
4. How do you evaluate production before and after intervention?
5. How did you evaluate relation between irrigators and non- irrigators?
6. What is you suggestion to improve irrigation management activities?

10. Discussions with Extension agent

1. What are the services deliver to the Farmers?
2. What are the perceptions of farmers towards technological inputs?
3. Do farmers exercise off-farm activities other than farming?
4. What are the main constraints of irrigation management in the area?
5. How do evaluate irrigation impacts in reducing poverty?
6. What do you suggest to improve irrigation management?

Declaration

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

Candidate:

Name Kerealem Salikh

Signature

Place A. A. U.

Date January 18/07