ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
REGIONAL AND LOCAL DEVELOPMENT STUDIES

IRRIGATION MANAGEMENT AND INSTITUTIONAL ARRANGEMENTS: THE CASE OF TWO SMALLHOLDER IRRIGATION SCHEMES IN MIDDLE AWASH, NORTH EASTERN ETHIOPIA

A Thesis Submitted to the School of Graduate Studies of Addis Ababa Universiy in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Regional and Local Development Studies (RLDS)

By: Alemayehu Eshete

December, 2006
Addis Ababa

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

REGIONAL AND LOCAL DEVELOPMENT STUDIES

IRRIGATION MANAGEMENT AND INSTITUTIONAL ARRANGEMENTS: THE CASE OF TWO SMALLHOLDER IRRIGATION SCHEMES IN MIDDLE AWASH, NORTH EASTERN ETHIOPIA

A Thesis Submitted to the School of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Regional and Local Development Studies (RLDS)

By: Alemayehu Eshete

Approved by Board of Examiners	**signature**
1) _____	_____
Chair Person, Graduate committee	
2) Woldeab T.	_____
Advisor	
3) Akalu Amsalu	_____
Internal Examiner	
4) _____	_____
External Examiner	

December, 2006,

Addis Ababa

Acknowledgment

First, I must thank the almighty God who helped me to bring this work to the end.

My special words of thanks are due to Ethiopian Agricultural research Institute sponsoring me for the entire study period. Equally, my particular gratitude goes to International water management institute (IWMI) for their financial support to undertake the field work including cost of living during the research period. Thanks are also due to Werer Agricultural Research Center's Management, Finance and Transport sections for their generous cooperation and facilitations during my fieldwork.

I feel great pleasure to express my heart-felt gratitude to my principal advisor Dr. Woldeab Teshome for his invaluable guidance and insightful comments, which have shaped my thinking on the subject and helped me a lot during this research. I also would like to express my deepest gratitude and appreciation to my co-supervisor Dr.Michiko Ebato (IWMI), who generously shared her knowledge and time. I have benefited much from her valuable comments and suggestions.

Very special thanks are also due to my friend, Abraham Getachew, for the exceptional work he has performed on the successive revisions and editions of this thesis and supports in various ways. Without his generous support, the thesis would not be what it is.

Many persons have helped me in the editing process and sharing of ideas. For all their stimulating support, I would like to thank Tsion Yilma, Ferid Shewarga, Antenalu Desta, Tsegaye Abebe, Walelign Mekonene, Essayas Tena and Walelign Girma. Thanks are also due to Ashebir Kifle for his assistance in data collection and facilitation, and Abera Dinku & Ato Gizaw Beze from Awash fentale and Gewane Districts Agricultural office for facilitating communication with the respondents.

LIST OF ACRONYMS

IWMI	International water Management Institute
AESE	A agricultural Economics Society of Ethiopia
EFSS	Ethiopian Food security Strategy
PRSP	Poverty Reduction strategy and programme
FAO	Food and Agriculture Organization of the United Nations
EPRDF	Ethiopian peoples Democratic Revolution of the United Nations
WUAs	Water users Association (s)
SSI	Small -Scale Irrigation
SSIS	Small-scale Irrigation system
DAs	Development Agent(s)
SSA	Sub-Sahara Africa
PA(s)	Peasant Associations(s)
FDRE	Federal Democratic Republic of Ethiopia
ADLI	Agricultural Development led industrialization
MNRDEP	Ministry of Natural Resources Development and Environmental Protection
MOA	Ministry of Agriculture
MOWR	ministry of water Resources
HH(s)	Household (s)
WUTs	Water users Team (s)
HHH	Household Head
ABWRAO	Awash Basin Water Resources Administration Organization
HA	Hectare
IFAD	International Food and Agricultural Development

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

Abstract

Key words: socio-economic transformation, smallholder irrigation, irrigation management, Institutional arrangements

Smallholder irrigation development at Middle Awash areas including the case study areas is the result and part of an ongoing politico and socio-economic transformation undertakings. Until 1980s, livestock production has been the backbone of the Afar economy when they used to pursue the pastoral way of life. Their livestock wealth was considerable and they were almost entirely dependent on it for subsistence. However, this production system had been undergoing pressure over the last four decades and highly aggravated since the end of 1980s as a result its vulnerability to environmental stresses has increased.

Therefore, because of these ecological and environmental crises and others external factors together with their changing perceptions on the value of their land, the communities residing near the two sides of Awash river banks have started crop-livestock mixed production system. Sabure and Geleela Dora smallholder irrigation schemes are traditional irrigations systems initiated by the Agro-pastorals themselves since 1990s.

With this study, great effort has been made to clarify the state of irrigation management practices and the major institutional arrangements in the two study schemes. To meet the objective, a household survey was conducted during April 2006. Two traditional smallholder irrigation schemes from two different livelihood zones have been selected as a case study. These are Sabure irrigation scheme from Awash Fentale district and Geleela Dora schemes, from Gewane district. Stratified proportionate sampling method was used to select sample households based on the irrigation organization of the irrigation systems. In addition, key informant and expert interview, focus group discussion and direct observations were made to collect data and information from relevant sources. For data analysis, both qualitative assessment and descriptive quantitative analysis techniques were used in combination.

The survey result revealed that the organization in charge of irrigation management at the two case study areas is the basic Afar traditional resource management institution following with their principle of rationality ideology for water allocation and distribution at local level. However, the survey findings show that lack of formally established WUAs at the two schemes has negatively affected the negotiating power of the stallholders' informal organizations with other water users and external institutions in relation to their water rights. Another major finding by this study is that lack of better institutional arrangement (for water and land uses) at Middle Awash including at the two case study areas, is the major challenge for the productivity of the smallholder irrigation sub-sector. The legal and institutional problems in the water sector has resulted in artificial water scarcity for the smallholder irrigators and has negatively affecting the productivity and cropping pattern of the sub-sector. Finally, a number of conclusions and recommendations have been drawn about requirements for better performance and sustainability of the smallholder irrigation sub-sector at Middle Awash as a whole including at the two case study areas.

CHAPTER ONE

1. INTRODUCTION

1.1 BACKGROUND

The Afar are one of the largest pastoral groups in Ethiopia. The Afars inhabit most of the Middle and Lower Awash Valleys. Until 1960s, the Awash Valley was mainly used by semi-nomadic Afar for extensive livestock production. The traditional Afar pastoral production system based on the keeping of multiple species livestock on and an extensive grazing land was a sustainable one (Gamaladin, 1993,Seid 1994,). These opportunistic and low cost management systems of the pastoralists were well adjusted to the semi arid and fragile ecosystem of the area (Seid, 1992). Various strategies were used for copping with the environmental stress that periodically occurs in the region at different times. These strategies include seasonal herd mobility, changing herd composition, tradition institutions of mutual help and other mechanisms formerly maintained the sustainability of the system both ecologically and economically (Seid, 1994, Gebre, 2001, Asegid, 2001 Kassa, 2001). This system used to provide sustained livelihood for the Afar despite environmental fluctuation.

However, Seid (1994) & Kassa (2001) noted this system has been under going pressure over the last four decades and as a result, its vulnerability to environmental stress has increased. Getachew (2004) quoting EVDSA (1989) pointed out the changing land use, politico-economic, demographic and institutional conditions have contributed to the crises of Afar pastoral economy.

Besides the potential for livestock production, the Afar region occupies a strategic location for irrigation development because of its vast area drained by Awash River. During the early 1950s, the then government of Ethiopia considered irrigated farming as a strategy to bringing development in the Awash Valleys, EVDSA, 1989, (cited in Getachew, 2004). According to Kassa (2001), this change regarding low land areas development resulted from the mainstream view that many African governments had at the time. To realize the implementation of the strategy, the Awash Valley authority was

established in 1962 mainly to identify resources and attract foreign investors (Getachew, 2004 quoting EVDSA, 1989).

Following this, from a total of 155,000 hectare of irrigable land, 69,000 ha has been placed under irrigation from dry season grazing land from Middle and Lower Awash Valleys and 23, 000 ha from the 69,000 ha is from Middle Awash (Seid, 1994, Kassa, 2001).

The process, which started at the turn of this century, has led to the final stages of economic and political encapsulation in to the wider economic and political system. The pastoral economy has been transformed in response to the drastic reduction of dry season pastures, watering sites and problems of access to wet season ones due to recurrent droughts and land conflicts in the area. Former pastoral land use has been replaced by individual ownership, making access to communal clan lands and resources difficult. The individualization of plots of communal land by clan members had been to the advantage of only to a few wealthy members and powerful clan heads and new political elites with capital to invest in the growing of cash crops (Seid, 1994, Kassa, 2001, Asegid, 2001).

Therefore, it is apparent that the introduction of irrigation agriculture, the alienation of prime grazing land and the expansion of trade and wage employment have all led to large-scale socio-economic transformation of the pastoral sector. According to Kassa (2001), a number of evolving practices demonstrate this. "The involvement in cultivation and increasing dependence on market, trade and wage employment have led to sedentarization".

At Middle Awash including Awash Fentale and Gemane district since the introduction of irrigated farming agriculture is increasingly becoming an important subsidiary economic activity and source of food and cash crops and an area of capital development among many households (Gamaladin, 1989, Gebre, 2001). According to the report of Afar regional government, over, 30,000 ha of land has been under crop cultivation by about 29,000 small holder local farmers in the region through both by rain fed and irrigation cultivation (Afar Region bureau of pastoral and agro-pastoral report, 2005)

1.2 STATEMENT OF THE PROBLEM

Afars of Middle Awash, despite the potential natural resource, especially, irrigable land they have, face vast development challenges including sever poverty and food insecurity (Gebre, 2001, Asegid, 2001, Ali, 1994). However, since 1992, the Transitional government of Ethiopia returned some 10,300 ha of ex-state irrigated land to the Afar community in Middle Awash as compensation for the land they had lost (Middle Awash Agricultural Development Enterprise, Annual Report of 1993). Since then both large and smallholders irrigation development has been increasing on an alarming rate. The number of local smallholder irrigators increased from year to year since the last over 10 years especially at Amibera, Gewane and Awash Fentale districts (Afar Region Agricultural Bureau report of 2000-2005).

However, though the increasing participation of the local community in small-scale irrigation is encouraging, they face many challenges in the sector. Land and water disputes are a common phenomenon among the different irrigators (state farms, large private farmers and smallholder farmers and between the smallholder farmers themselves). Therefore, understanding and documenting the management aspects, the institutional and organizational arrangements for equitable distribution of irrigation benefits and burdens in the irrigation systems along with its sustainability are crucial, and the major interest of this study. The conditions of support services, the contribution of smallholders irrigation practice to household food supply and income is another source of information gap and will be addressed by this study.

1.3. OBJECTIVE

The research has the following objectives:

1) Identify the different irrigation management practices in the area
2) Explore formal and informal rules and norms governing irrigation management
3) Assess the existing support services for the development of small holder irrigation in middle Awash
4) Assess the implication of expanding smallholder-irrigated agriculture on the livelihood of the agro pastoralists.

1.4. RESEARCH QUESTIONS

The central research questions are:

1) How irrigation is managed?
2) What are the different institutional arrangements in irrigation management?

Specific research questions of the study are the following:

1) What are the different irrigation management activities in the area?
2) What are the formal and informal rules and norms governing irrigation management?
3) What are the existing supports services for the development of smallholder irrigation in Middle Awash?
4) What are the implications of the expanding smallholder irrigated agriculture on the livelihood of the agro pastoral community?

1.5 SIGNIFICANCE OF THE STUDY

Teshome (2003) (quoting Burke 2003; FAO 2001; and FAO ,2000) state, that the role of irrigation in addressing food insecurity problem and in achieving agricultural growth is well established. Smallholders' irrigation, as long as local priorities and technological feasibilities are kept well in mind and if supported by appropriate institutional development and managed properly, could make significant contribution to famine prevention and food security. Beside the increasing interest and participation Afar agro-pastoralists on sedentary irrigation agriculture, one of the major strategy of the government of Ethiopia for pastoral areas in general is gradual sedentarisation and settlement by expanding small-scale irrigation agriculture. To this end, Middle Awash has been selected as a pilot zone to implement the program (Ministry of Federal Affairs, 2002). In this regard, this study will generate micro- level and recent information on the dynamic and complex nature of land use system (especially irrigable farm land) and irrigation management aspects focusing on analysis of major institutional arrangements and so, therefore believed to have valuable contribution to successful implementation and sustainability of sedentarisation and settlement program of government and for other bodies who have interest to intervene in the sector's development.

1.6. ORGANIZATION OF THE THESIS

This thesis has five chapters. Following this introductory chapter, the second chapter provides research methodology. The third chapter presents theoretical background and empirical literature review. The fourth chapter presents result and discussion. Finally, the last chapter presents summary of major findings and conclusion.

CHAPTER TWO

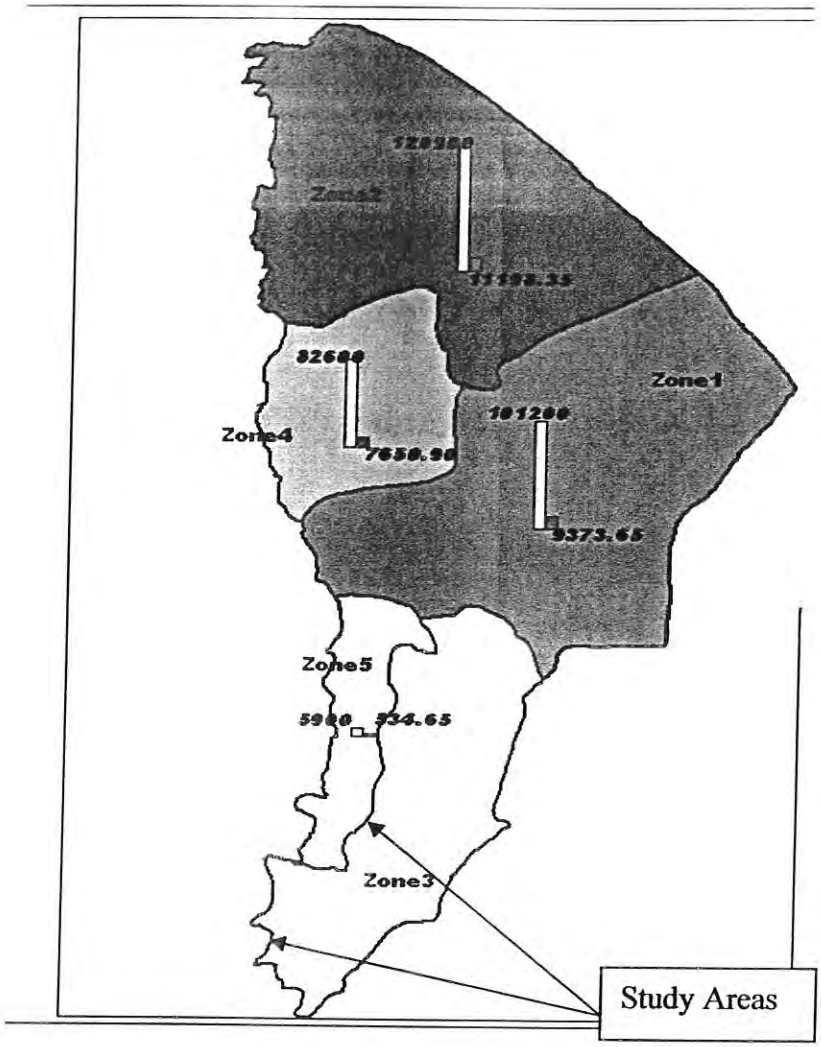
2.1 RESEARCH METHODOLOGY

2.1.1 Description of the Study area

This study was carried out in Middle Awash of Afar Regional State, which lies in the Northern part of the Rift valley, which is a part of the East African Rift valley. From the three Awash valleys, Middle Awash Valley lies along the Awash river basin, between the upper and lower valleys of Awash, where mechanized irrigated sugarcane and cotton plantation have been established by the central government of Ethiopia since 1960s. It is 250 km far from Addis Ababa. The area is characterized by high temperature ranging from 25°C to 37 °C and with mean temperature from 27-28 °C. Usually the mean annual precipitation is less than 600 mm. May and June is the direst season while July-September is the main rainy season(Werer Agricultural .Research Center Meteorological data report,2005).

Awash River is the longest in Ethiopia creating a valley approximately 10% of the counters land area. About 70,000 sq.km (58.3% of the valley area) is effectively drained by the river. More than 23,000 ha of land has been put under irrigation in the Middle Awash valley (Halcorow, 1990). Beside Awash River, Bulga and Kebena Rivers also drain the Middle Awash Valley. The soil in middle Awash is varying in nature and consists of alluvial black clays and alluvial brown soils in the irrigated schemes (MAS, 1991 in Seid, 1994).

Fig 4-1 map of the study areas



Source:www.dppc.giov.et

Sabure and Geleela Dora smallholder irrigation schemes are found in Middle Awash, Zone 3 of Afar Region. Sabure smallholder irrigation scheme is located at Sabure sub district of Awash Fentale district, which is found 240 km from the National Capital, Addis Ababa; and 40 km away from the main Addis Ababa - Djibouti asphalt road and the Awash Sebat Kilo town. It has an average altitude of 850 m.a.s.l and mean temperature of 26 °C with minimum 21 °C and maximum 38 °C. The total population of the sub-district is 5029 (CSA, 1996).

Geleela Dora smallholder irrigation scheme is located in Gewane district, Zone 3, Afar Region. It is 370 km from Addis Ababa and 18 km from the main Addis Ababa -Djibouti asphalt road and Gewane town. It has an average altitude of 600 m.a.s.l and mean temperature 35 °C , and with 42 °C and 15 °C maximum and minimum temperature. It has also low annual precipitation with mean rainfall of 450 mm. Geleela Dora sub-district has a total population of 2800 (CSA, 1996).

2.1.2 Selection of the irrigations Schemes

Two traditional smallholder irrigation systems in Middle Awash were purposively selected for a case study based on the level of participation by the local community and level of formation of organization. Accordingly, Sabure and Geleela Dora smallholder irrigation schemes from Awash fentale and Gewane districts respectively were selected and studied.

Stratified sampling technique has been applied to group smallholder irrigation systems in middle Awash in to similar livelihood zones. To this end, basic criteria set by FAO and IFAD (2002) for livelihood zoning was applied. Therefore, based on major crop types cultivated, source of irrigation water, method of water application and product marketing conditions, smallholder irrigation systems in Middle Awash have been divided in to two main livelihood zones. Accordingly one sample irrigation system from each of the two livelihood zones was selected purposively based on the criteria stated above. Taking two irrigation systems as a case study from two different livelihood zones was because, it has an implication on difference in nature of management, and problems faced by irrigators at

the two sample irrigation systems and so to make comparative assessment between the two irrigation systems.

2.1.3 Methods of Data Collection

Both secondary and primary data were used for the research. With regard to secondary data, theoretical and practical findings about smallholder irrigation systems, land rights institutions on dynamic resource use, institution of water rights, the role and significance of institutions for irrigation development were reviewed. Primary data was also collected using semi-structured interview, group discussion, key informant interview and other PRA techniques. Structured questioner was the major tool used for household level data collection.

2.1.3.1. Secondary Data Collection

The study has started with brief review of theoretical and empirical literature on irrigation management, land right institutions related to efficiency of land use as well as the equity of people's welfare on communal property regimes and institutional arrangements on the water sector from both Ethiopian and other countries experience. Review of the regional and national irrigation policies, strategies and formal laws (irrigation law, water law, water rights, land tenure policy (both the national and pastoral area land tenure policy) governing individuals and communal access and use rights of resources, especially resources of cultivable land and irrigation water. The main source of data has been published and unpublished produced by different institutions, scholars, and individuals, Internet..

2.1.3.2. Primary Data Collection

Local irrigators, large commercial farmers, Development agents, landless pastoralists, government irrigation agency, state farms and direct observation had been the source of primary data. The methods used for primary data collection were key informant interview, focus group discussion, semi-structured interview, expert interview, direct observation and structured questioner for household level.

1. Key informant interview have been made to generate general understanding of the dynamism in the pastoral production systems, to assess the availability of and

arrangements of institutions, organizations and rules of resource and irrigation management, conflict management aspects, the attitude and perception of the community towards irrigation agriculture, attitudes on the present tenure arrangements on communal irrigable lands, accountability issues on communal irrigation systems, equitable water distribution conditions both at basin and schemes levels.

Key informants were elderly, clan leaders, female representatives, young representatives, Agro-pastoral representatives, large commercial farmers, members of water committees, Authorities of Awash Valley water resource Administration, Developmnent Agents (DA) , government administrative officials, and other experts, government state farm officials.

2. Semi- structured interview has been made with concerned officials and experts of district and village levels, head of Awash valley water authority, share croppers and large commercials farmers and experienced and successful small holder irrigators so as to generate data for analyzing the operation of irrigation system including access and use rights and distribution of water at different level, efficiency of water distribution and other related management aspects of the irrigation system. Data on expansion and trend of private large-scale irrigation farming, small-scale irrigation and infrastructure development, resource conflict management aspects and other related data and information have been collected.

3. Focus group discussions were conducted with irrigators at different levels (sub-scheme levels) from the sample Schemes and other non-sample areas selected in Middle Awash. 52 purposively selected irrigators, being divided in to five groups at the sample schemed (three in sabure and two in Geleela Dora) and one focus group at Amibera district. In addition, each group with 7-10 members was involved in group's discussion. This may help broaden the understandings of phenomenon by looking from different angles of the issues raised in the preceding steps.

4. Structured questionnaire were employed for collecting of quantitative and qualitative primary data from sample households.

2.1.4 Sample Size and Sampling Technique

Complete list of member irrigators obtained from the respective chairpersons of the two-sample irrigation schemes were used as a sampling frames to select sample households. A total of 74 sample households were selected from 177 households (sample frame) using the following procedure.

Stratified proportionate sampling method was used because of the nature of irrigation organization of the irrigation systems. At the two sample irrigation schemes irrigation is organized at clan level (whole irrigation scheme) and sub-clan levels (sub-schemes or irrigation teams). At Sabure there are three irrigation teams organized under three sub-clans and at Geleela Dora, there are two irrigation teams organized under two sub-clans. This stratification has been done so that the end result of the study reflect the views and situations of irrigators proportionately in the sub-scheme locations. Then a proportionate percentage of sample size from the total sample size in the respective irrigation systems were given for each sub-scheme so that each sub-scheme will have equal chance of selection. Then simple random sampling technique was employed at each sub-scheme level to select a total of 41 sample households out of 86 total irrigators (48%) from Sabure scheme and 33 sample households out of 91 (36%) from Geleela Dora scheme and participated as respondents in the household interview

2.1.5 Methods of Data Analysis

For data analysis, both qualitative assessment and descriptive quantitative analysis techniques were used. The data that was obtained from key informant interviews group discussions and direct observational were analyzed using qualitative assessment methods. Data of the household survey was analyzed using the computer software known as Statistical Package for Social Science (SPSS). The descriptive statistical methods such as tabulation, cross tabulation, frequencies, percentages, means, and standard deviations were used.

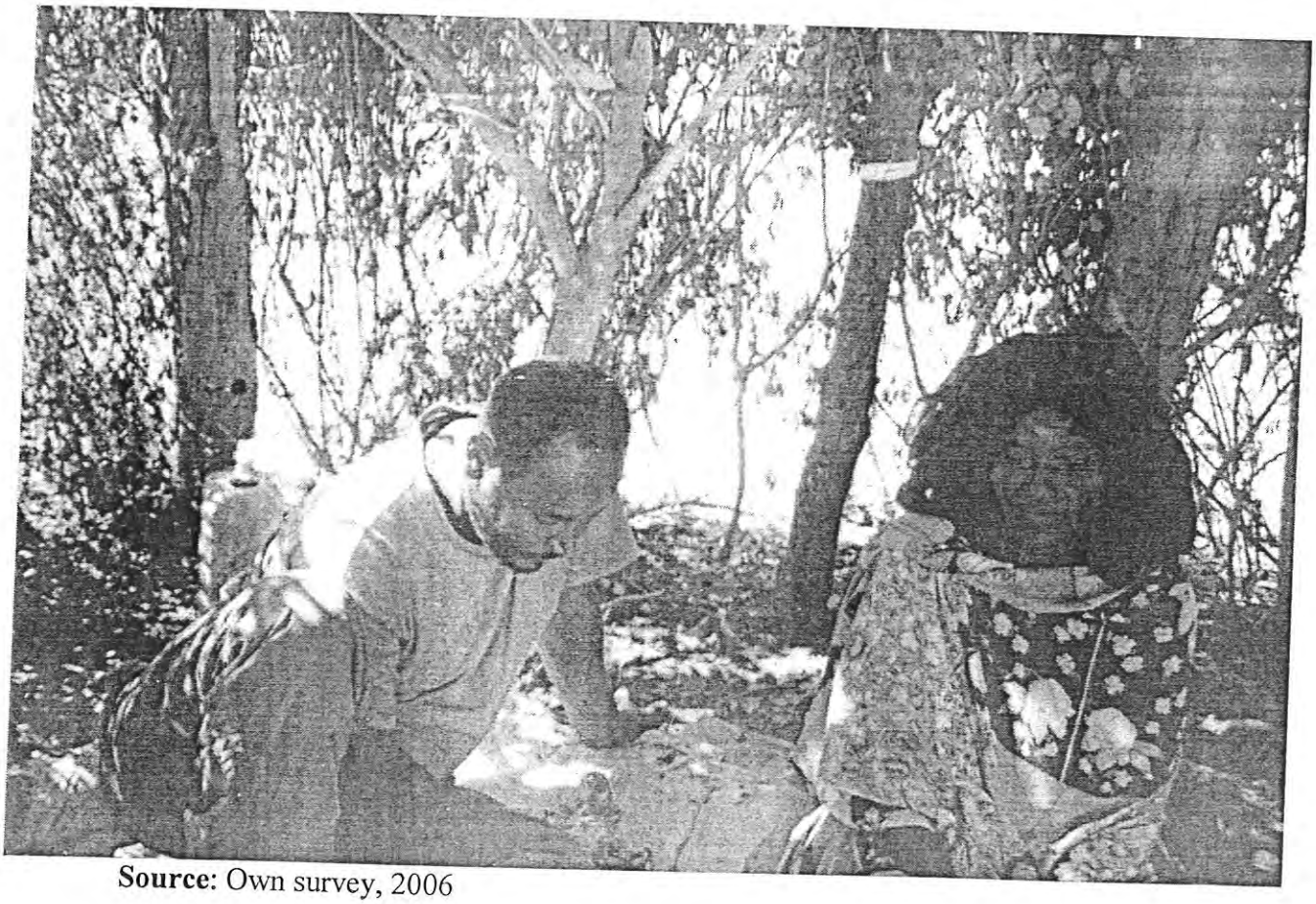
2.1.6 Scope and Limitations of the study

In order to address the concerns raised in problem statement part, Sabure and Geleela Dora traditional smallholder irrigations systems at Awash Fentale and Gewane districts respectively in Middle Awash were considered as a case study for the fact that the research is relatively detailed. In addition, I would like to remind the readers that all the views and voices of the community discussed in this paper represent only of those of the smallholder irrigators in the study areas and so do not represent of those pastoralists who do not participated in the irrigated crop cultivation during the time of this study.

This study paper has two important limitations which otherwise would have improved the quality of the paper. The first is that adequate information has not been gathered on important institutional linkages between the main stakeholders in the water sector, especially linkages between the smallholder farmers and the private large-scale commercial farmers. However, the problem was because of the fact that as this study has been conducted during the period when it was off-season for cotton cultivation by the large–scale farmers, I could not find the farm managers and farm owners in the area to discuss and get information.Therefore,the institutional linkages between the two water users- relationships in terms of credit, employment, input supply(chemicals, farm machinery, seed etc) ,experience sharing, land lease and other relation ships which are believed to have great impact (both negative and positive) on the sustainability and productivity of the smallholder sub-sector have not been well addressed.

The second major limitation is lack of triangulation in a few of information discussed in the paper. The problem was because some institutions, especially the State farms were not cooperative and not willing to give information. However, great effort and care was made so as to justify the accuracy of the information from neutral informants and so tried to decrease the problems that might have been created because of one-sided information.

Photo 2.1. Sample photo during interview with female farmer at Sabure irrigation scheme



Source: Own survey, 2006

CHAPTER THREE

3. LITERATURE REVIEW

3.1. INTRODUCTION

This chapter consists of two sections. The second section presents a theoretical background. This section briefly discusses theoretical literatures on institutions of water and land right and irrigation management (especially discussing irrigation management) especially discussing irrigation system as a socio-technical system). Section three reviews empirical literature on smallholder irrigation and some management aspects from international and Ethiopian experiences.

3.2 THEORETICAL FRAMEWORK

3.2.1 Irrigation Management

In irrigated crop production a number of interrelated activities ranging form designing and constructing of the irrigation infrastructure to water acquisition and watering crops are carried out. According to Boelens (1998) management of irrigation systems involves multiple activities including both management of the factor 'water' (identification, acquisition, allocation, distribution, applying and drainage) and management of the factor 'infrastructure' (identification, design, construction, operation, maintenance and modification). The users' organization regulates, co-ordinates, and monitors these activities, generally together with other institutional actors with whom it interacts, resulting in collective and individual actions to operate and sustain the irrigation system. Based on the irrigation system's operational requirements, the organization establishes the roles and functions, and determines users' rights and obligations.

This is a continuous, iterative process which grow of, matures, and adapts through out the 'life of the system' according to irrigators' experiences and institutional, biophysical and conjuncture changes, both internal and external. The organization is responsible for making decisions coordinating the mobilization of required resources (labor, money, materials etc) In process of on going negotiation and communication, it must also see to adequate management of conflicts among users, communities, institutions or with other systems. The difficult art of irrigation management requires well-consolidated forms of

organization that will negotiate, inform and plan; co-ordinate, oversees and monitor; regulate, authorize and enforce. These irrigation management tasks and activities are what Uphoof 1986 (cited in Teshome, 2003) identified and categorized in to three. namely water use activities, control structure activities and organizational activities.

In irrigation management, water control is crucial. It refers to the managerial control of water distribution and organizational processes in the irrigation system (Hunt, 1990 in Mollinga, 2003). Irrigation management or water control is thus the regulation and control of human behavior; implying social relation of power and competition (Mollinga, 2003).

Effective water control in irrigation management is a function of several factors including physical, technical, socio-economic, organizational, political, cultural and complex institutional factors (Lawder milk, 1990 in Moliinga, 2003). These components of irrigation systems interact in irrigation management.

Boelens (1998) has supportive explanations also in that irrigation water management is positioned with in and forms and part of the logic of farmers' social environment and agricultural production systems. Irrigation management takes shape according to the production system's specific needs, conditions and power structures (Boelens, 1998).

In diverging interests in irrigation, even when it is a collective activity shared by irrigators, mean that one can not assume that " the user them selves always seek the most equitable management and distributions regarding irrigation water". The long-standing systems often feature injustices based on class, ethnic, gender or other distinctions. In case of new irrigation systems, where water is introduced in a local setting, a new production factor -a powerful conflict ridden one- is inserted in to existing social relations.

This means that even those social relationships that were characterized by a relatively equitable and reciprocal balance may have become conflictive or oppressive after the introduction of water. Accordingly, many actors take part in the planning,

implementation, operating and maintenance of irrigation systems: together they create, beyond the technical and production related demand for water, a social demand (Boelens, 1998).

In the study area, development of irrigation agriculture by both large private farmers and local community smallholders is a recent phenomenon, which is one part of the ongoing dynamic socio economic transformation of the local economy. The local community, forced by natural and man made factors in the one hand, and encouraged by the opportunities they got in access to irrigation agriculture after the government has returned some of the ex-state farms to them in the other hand, have been motivated to participate on irrigated crop cultivation which is to mean involving on a new production farming system other than the one they used to be (pastoral farming system). However, one important thing to note is the government has handed over the irrigation schemes to the community with out any institutional arrangement and provision of supportive mechanisms so that the communities can use and benefit from irrigation in a sustainable way (Gamaladin, 1993). Previously the irrigation systems were all under one single-system management under one state farm.

Now the irrigation systems are under many actors and water users with diverse interests, a different social relations and power structure and opportunities. There fore the past irrigation technology norms and organization should be adapted to the new local socio-cultural environment with appropriate institutional and organizational arrangements.

As Stern (in FAO, 2000) noted, where issues of organization and management of irrigation are not well considered problems may arise in such areas as:

1. Existence of indefinite regulations about the share of responsibilities
2. Lack of coordination between different actors and work group
3. Absence of common meeting point for discussion and setting difference

3.2.2 Irrigation Systems as a socio-technical systems

Irrigation system at Middle Awash is formally jointly managed system. This means, that the Awash valley water resources administration organization has exclusive authority in

the management of the head work and the main canal, and also have the authority to control all accesses and use of the hydrologic resources, and that the state farm and farmers manage the local irrigation units below the main canal (secondary and tertiary canals) on their respective farms.

However, as Mollinga (2003) states "Water distribution in jointly- managed, large scale canal irrigation is notoriously inequitable". Accountability relation ships among water users, between water users and government managers, are crucial factor in the management performance of irrigation systems.

Mollinga (2003) criticizes past management and economics literature on irrigation and current approaches to irrigation studies for having three conceptual problems: lack of appreciation of the social dimension of technology, simplified concept of the human agency and little interest in social relation of power and the institutional forms through which purposes of irrigation are achieved.

Therefore, Mollinga (2003) regards irrigation systems as socio-technical systems; they embrace both technical and social system components. Social development, technological development and learning are intrinsically related (Engel, 1997). "Irrigation technologies shape and shaped by social relations" (Mollinga, 2003).

The social shaping perspective of irrigation technologies has three dimensions: social requirement for use, social construction and social effects (Mollinga, 2003).

Social Construction

Boelens (1998) explains that the heart of communal irrigation system is not so much the hydraulic infrastructure itself, but the ongoing interaction between this infrastructure system and the or organizational and normative system (social relations). Irrigation technology is an expression or materialization of irrigation norms (canal networks, rules and regulations, and method of water distributions, etc). In addition, when norms change, the infrastructure must be adapted, because other wise it will breakdown, be abandoned,

or even work against the interests of (groups of) users. Irrigation technology is a social construct. Mollinga (2003) also noted, "irrigation technologies are socially constructed".

In addition, according to Boelens (1998) social and normative relationships among human actors shape the irrigation works and its organization. At the same time contributions to construction, rehabilitation and maintenance of this infrastructure shape the specific feature of the social relationships and the normative systems of these actors. "Rules, rights and obligations shape and are shaped by collective action and social organization, around collective ownership of the irrigation infrastructure" (Boelens, 1998). There fore, irrigation technology and techniques contain social contents making up the key parts for operation and for distribution mechanisms.

Social requirement for use

Irrigation technologies require particular social conditions to work effectively (Mollinga, 2003). In relation to social requirement for use, it is important that there are management structures that suit the different irrigation technologies in use (Horst, 1998). The type of canal system in use determines the type of organization needed in an irrigation system (Teshome, 2003).

Water distribution and the type and nature of the physical irrigation infrastructure (technology) impose specific demand on the management structure of the irrigation systems to work effectively. It requires personnel, pre-pacified and agreed upon decision rules and organization.

Continuous operation and maintenance of the physical irrigation infrastructure and canal maintenance activities also require certain institutional arrangement. Continuity of management activity requires strong and well-established institution. Operation and maintenance activities require certain skills. Therefore, capacity building activities are crucial so that users undertake operation and maintenance activities them selves.

Social effects

Irrigation technologies have social effects as well (Molinga, 2003). Irrigation affects people's livelihoods through its effect on crop production and other things. Irrigation allows more diversified and intensive cropping. This leads to higher agricultural production, which may, in turn, generate economic growth and employment. (FAO, 1986 and Teshome, 2003) also argue that irrigators will be committed to irrigated agriculture if the financial returns gained from irrigation practice are attractive. Acceptable commitment of irrigators is obtained where good commercial opportunities exist, provide strong incentives and above all, where scheme management has been capable, consistent, and firm (FAO, 1986; Laban, 1995).

3.2.3. Institutions of Land Tenure, Water Rights and Irrigation Agriculture

Institutions are defined as the rule of the game in a society or, are the humanly devised constraints that shape human interaction (North ,1990). Institutions include the formal (statute law, economic rules, common law, regulations) and informal rules (conventions, norms of behavior, and self-imposed codes of conduct) and the enforcement characteristics of both. The creation of formal legal system to solve disputes that are more complex entails formal rules. Formal rules can complement and enhance effectiveness of informal constraints (Millgrom and Weingast ,1990). In this regard, Pankhrust (2001) observed, in his study in South Wello, that indigenous institutions (customary laws/informal rules) play a role in conflict resolution in smallholder irrigation system management. However, he observed that, issues that are more serious were addressed by the formal rules. Economic rules broadly define property rights that are the bundle of rights to alienate an asset or a resource (North, 1990).

Comprehensive understating of irrigation systems requires analyzing both technical and social (including institutions) components (Mollinga, 2003). Specifically, according to Blank, H. et al (2002), the institutional arrangements which facilitate collective action in irrigation systems and that deserve consideration in irrigation studies include among

others institutions of land tenure (land tenure arrangements) and institutions of water rights.

As a common pool property irrigation water use needs proper management for efficiency and equity based use with established norms, rules and known laws that ensure the interest of all beneficiaries are required. Governance and legitimacy are of crucial in irrigable land allocation and irrigation water distribution and management. This component of irrigation water management is ensured through establishing legal framework of known laws.

Formal laws, which specify appropriate management practices, the rights of WUAs, and individual users both in quantitative and qualitative terms, and operational regulations and clearly spelled out sanctions are required (WB, 2000). Lack of these regulations at the level of individual and associations leads to conflicts (WBI, 2000).

The most important institutional structure through which communities traditionally ensured proper management of land resources was land Tenure (Laban, 1995). Otsuka (2004) also stated that efficiently of resource use is governed by land right institutions; ranging from communal owner ship of land to private ownership, state ownership and common property. Therefore, in order to improve livelihood, it is essential to improve the land use efficiency in accordance with the comparative advantage of land use system (Otsuka, 2004). Incidence of poverty can be reduced by enhancing the efficiency of land use (Ibid).

Therefore, in this regard also land tenure system has a profound impact on irrigation development and management through its effect on ownership and access to irrigable land and the associated resources such as irrigation water (FAO, Website). Otsuka (1995) also noted, as "even though crop cultivation has a potential advantage over pastoral land use, it is difficult to disseminate sedentary irrigation agriculture under traditional communal land ownership".

3.3. EMPIRICAL LITERATURE REVIEW ON STALLHOLDER IRRIGATION DEVELOPMENT& MANAGEMENT AND LAND TENURE

This section reviews a selection of the existing empirical literature on smallholder irrigation. An attempt is made to cover not only literature specific to Ethiopia but also some literature on other African and Asian countries.

Irrigation is a very old practice in the world and its history dates back to the early civilization of mankind (H.Estern, 1979; Teshome, 2003). Irrigation development historically started as a response to bad agro-climatic in low rainfall areas and season (Nigussie, 2002 in Shimelis, 2006).

There are three broad categories of irrigation schemes. These are small, medium and large scale depending on the area irrigated, scale of operation and management. However, the criterions for these classifications may vary from country to country. For example 300 ha of irrigation scheme is categorized as large-scale in Ghana, while 10,000 ha is under small-scale category in India (Smith, 1998).

In Ethiopia, according to the classification of ministry of water Resource (2002), irrigation schemes are categorized and organized in to four based on the size and management types. These are:

- Traditional small-scale schemes up to 100 ha built and operated by farmers in local communities.
- Modern communal schemes with the discharge that can irrigate up to 200 ha, built by government agencies with farmer participation.
- Modern private schemes of up to 2000 ha; and
- Public schemes of over 3000 ha, owned and operated by public enterprises such as state farms.

According to Rahmto (1991), based on the level of operation and land size, irrigation schemes were classified in to three scales in Ethiopia during Derge regime. Accordingly,

irrigation schemes over 3000 ha were classified as large-scale schemes from 200-3000ha as medium and those up to 200 ha were classified as small-scale.

Teshome(2003) (quoting from Wyss, 1991) has noted that the practice of small-scale irrigation on schemes operated by traditional methods have been passed down from antiquity. However, the importance of small-scale irrigation development has been considered since the Second World War (Teshome, 2003, quoting from Vincent, 1994).

Smallholder irrigation development has shown through out the developing world that it can be used as a key drought mitigation measure and as a vehicle for the long-term agricultural and macro-economic development of a country. Successful smallholder irrigation schemes result in increasing productivity, improved in comes and nutrition, employment creation, food security and drought relief savings for the government (FAO Website, 2000).

In this regard, however, literature on smallholder irrigation in sub-saran Africa gives conflicting conclusions on the viability and sustainability of smallholder schemes. According to FAO, (1986); Webb, P. 1991 and Teshome (2003), the success of irrigation in Africa has been an issue of debate because of its disappointing performance in many cases.

As regards positive impacts of irrigation schemes (SSI), it is argued that about 75% of all SSSA countries irrigation schemes achieved or exceeded economic return through they are not operating at full capacity (Shawki and Maigne (1990). FAO (1987& 2000) pointed out that many SSA countries have realized the critical role of irrigation in food production. Irrigated maize yields three times as much as rain-fed during drought years in Zimbabwe (Meinzen Webb, P.et al, 1994). India and China, where famine was a threat, have a chivied agricultural growth through investments, among others, on the promotion of SSIS (UNDP, 2000).

FAO (2000) found out that irrigation helped to increase agricultural productivity of a given land through increased intensification in Africa such as Zimbabwe. Findings of

FAO (2000) proved that choices of crop types could be facilitated by irrigation and increase food variety and availability. Furthermore, FAO (2000) reported that 72% of farmers could secure better food production with irrigated land in Zimbabwe. Moreover, study by Webb (1991) of an irrigation scheme in Gambia showed that irrigation provided the chance for increasing income that was translated into increased expenditure, investment in productive and household assets, saving and trade.

Contrary to the above, there are arguments against the positive impacts of irrigation in Africa. Teshome (2003) has noted that African countries challenged by drought and famine have been considering irrigation as a drought mitigation strategy; with little attention to sustainability issues through it is one of the qualifications of SSI for achieving the food security goal. Rahmeto(1999) examined that many drought prone countries of Africa,. whose population cannot be adequately supported by rain-fed agriculture alone, expanded irrigation schemes to promote food security. However, many of these water projects were performing poorly and unable to meet their objective.

There are a number of constraints that have been responsible for a relatively slow rate of development and under performance of irrigation. Field research has highlighted substantial shortcomings in management (operation and maintenance), equity, cost recovery and agricultural productivity (ODI, 1995). A review of project experience by FAO (1986) ;Teshome (2003)and Shawki and Maigne(1990) make clear that institutional, social, policy and economic problems tended to be more common constraints to the exploitation of small-scale irrigation

Studies of irrigation systems in sub-Saharan Africa (FAO ,1986; World Bank; 1990), have shown that poor design and management practices have contributed to their unsatisfactory state, whether they have been managed by farmers or public bodies. In farmer-managed systems, the efficiency rate has nowhere risen above 30%.

Further, FAO (1986) stated that both technical and social factors constrain small-scale irrigation development in SSA and among them Institutional and management problems tend to be constraints that are more important. In addition, Mupawose (984)in

(FAO,2000) questioned economic viability of smallholder irrigation schemes in Zimbabwe. The author pointed out that certain small holder schemes have failed and are under-utilized. He attributed this to poor management, lack of inputs and irrigation experience by farmers.

In the rural societies of Tanzania, water is fully acknowledge as a strategic resource, and often regarded as more important than land livestock (Kagubila 1996 in CTA ,1999). Farmers thus usually manage on-farm irrigation work themselves.

However, CTA (1999) water management problem in Tanzania is major bottleneck for the productivity of the smallholder irrigation sector. The study by CTA pointed out that traditionally; on-farm water management involved using furrows or small basins, which are poorly drained and prone to water logging and Stalinization. Other problems are that small holders are unable to control their abstraction of water from rivers and, because there is no charge for water use, it can be wasted. In rehabilitation plans, according to CTA (1999) issues concerning water managements in Tanzania that need to be considered therefore include:

- Low efficiency in both water conveyance and its application;
- Poor drainage systems;
- Flood control measures to prevent rivers overtopping their banks;
- Rainwater harvesting through the construction of paddy basins;
- Improvement of water use efficiency to at least 30% (from 15-20%);
- Land-leveling to ensure even distribution of standing water;
- Empowering of Water Users' Association (WUA) or of Irrigators' Cooperative Societies (ICSs) through training.

Irrigation Development in Ethiopia

Traditional irrigation is very old in Ethiopia. The traditional small-scale schemes are, in general, simple river diversions. The diversion structures are rudimentary and subject to frequent damage by flood (IFAD, 1996).

'Modern' irrigation was started at the bigning of the 1960s by private investors in the Middle Awash valley where big sugar estates, fruit and cotton farms are found. With the 1975 rural land proclamation, the large irrigated farms were placed under the responsibility of the Ministry of State Farms. Almost all small-scale irrigation schemes built after 1975 were made into producers' Cooperatives. Now the status of the cooperatives is being redefined, and this will have consequences for irrigation development and management.

WUAs committees have long existed to manage traditional SSI schemes of up to 100 ha (IFAD, 1996)). They are generally well organized and effectively operated by farmers. The associations handle construction, water allocation, operation and maintenance functions with government technical and material sup0port (MOWR, 2002).

However, those smallholder farmers who practiced traditional irrigation were denied proper support from government in order to upgrade irrigations systems (Dessalegn, 1999). The modern irrigation development policies and initiatives during the Imperial regime (second half of the 1950s) and the experience during the military regime (since 1975) were also not in favor of small-scale irrigators (Rahmeto, 1999). Almost all SSIS built after 1975 were made into producers' cooperatives (FAO, 1995). The attempts of SSIS development were also failed because the irrigation systems were denied operational autonomy and guided by undemocratic guidelines (Rahmeto, 1999 and Teshome, 2003), which were top-down in approach. Under the centralized governmental management, operations and maintenance activities were also usually inadequate performed (MOWR, 2002).

The government in power(EPRDF) also appears to be committed to the promotion of irrigations. Government policy in the irrigation consists, among others, channeling direct support to farmers since the 1991 government reform (FAO, 1995). The status of producers cooperative has been redefined with a consequence for irrigation management (FAO,1995). The farmers/community are now forming their own irrigation schemes with support from the government and NGOs (FAO ,1995;MOWR,2002).

Still, they (SSIS) suffer by multifaceted problem, including management and organizational problems, lack of access to credit and in put and marketing facility (Rahmato, 1999). In this regard, (Aredo and Yilma, 20001) argue that inefficient and under utilization of available capacity of schemes in Ethiopia arises from giving more emphasis to technical aspects and less emphasis to the managerial and institutional aspects.

An Overview of Land Tenure System in Ethiopia

Land tenure system in Ethiopia cannot be isolated from the political and economic systems of the three regimes (Imperial, Dergue and the EPRDF governments). The land use issue was one of the leading questions of socio-economic and political developments of the three regimes. During the Imperial regime, Ethiopia survived semi-feudal land tenure systems for decades in which land lord-tenant relations pre-dominated. In 1975, a new land policy has proclaimed following a government change in 1974 (Dergue regime). According to article 3.1 of the Land Reform Proclamation (No, 31 of 1975), "all rural lands shall be the collective property of the Ethiopian people". This proclamation gave the peasants only possessory or usefructuary rights on the lands.

The present EPRDF government retained state /public ownership of land and gave peasants only usufruct rights. As stated by the 1994 constitution:

The right to ownership of rural and urban land as well as all natural resources, is exclusively nested in the state and in the people of Ethiopia. Land is a common property of the nations, nationalities and peoples of Ethiopia and shall not be subject to sale or other means of transfer (Article 40.3)

CHAPTER FOUR

4. RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter presents the result and discussions of the study. It has five sections. The second section of the chapter describes the socio-economics characteristics of the irrigators. The third section discusses the irrigation management practices at the study area. Institutional arrangement conditions (water rights; land rights and tenure arrangements) have been presented in the fourth section. section five discusses about support services conduction finally section six presents the imprecation of smallholder irrigation development on the likelihood and household food security of irrigators in the study area.

4.2. SOCIO-ECONOMICS CHARACTERISTICS OF THE IRRIGATORS

4.2.1. Economic Activities and Livelihood Strategy Diversification

Previously, livestock production has been the backbone of the Afar economy when they used to pursue the pastoral way of life (Seid, 1994 as quoting from Lewis, 1969, Ayele, 1986, Cossins, 1972 ,G/Egziabher, 1991). Their livestock wealth was considerable and they were almost entirely dependent on it for subsistence both in whole Afar region and in the study areas. However, this production system had been under pressure over the last four decades, and as a result, its vulnerability to environmental stress has increased. The ever-changing land use, politico-economic, demographic and institutional conditions have contributed to the crises of Afar pastoralism (Seid, 1994, Gebre, 2002).

As shown in Table4.1 below, it was found that the average number of livestock asset owned by interviewed households has dropped by some 83% from what they owned before 15 years ago. As the majority of the interviewed households reported, the main cause for the reduction of livestock number has been primarily the effect of repeated drought that occurred since 1990s, especially the severe droughts in 1985,1998, 2000 and 2002. Prevalent livestock diseases, lose of prime grazing land by large irrigation schemes

and encroachment of the pastureland by alien weed species (Prosopis Juliflora) have also reported as the major contributing factor for diminishing herd size. Therefore, owing to these various factors, but mainly to effect of recurrent drought followed by expansion of large commercial agriculture on their prime grazing land, many families in the study area have fallen below subsistence threshold. According to Seid (1994), a household in the area (Middle Awash) needed on the average, 27 camels, 41 cattle and 80 sheep and goats to remain viable i.e. to support the households need for food and cash and to be able to rebuild the herd after drought and unexpected disaster. However, the average livestock holdings of the interviewed households in the two study areas was around 4 camels, 16 cattle and 25 sheep and goats. This is much lower than the subsistence threshold in the area. It was also observed that all the 74 households interviewed have a herd size below the viability threshold.

Table 4.1. Average livestock holding per household in the study areas by Type

	2006			Before 15 years
Livestock type	Number Sabure (N=41)	Number Geleela Dora (N=33)	Number All (N=74)	Number All (N=74)
Cattle	16	16.8	16.4	90
sheep and goat	25.5	24.8	25.2	120
camel	5.0	3	4	30
Total	**46.5**	**41.9**	**44.6**	**240**

Source: own Survey, 2006

Therefore, with this too small and unviable livestock holdings by a household, the Afar in the study area now seem to understand that their traditional pastoral system is failing to sustain them. As a result, according to Kassa (2001); Gebre (2002) and Seid(1994) also

noted, they are now to employ themselves in activities other than pastoralism to earn off-pastoral income to meet their subsistence needs.

In this regard, one part of an ongoing socioeconomic transformation is diversification of livelihood strategies. Gebre (2002) noted that it came as a matter of natural response for the once full time pastoral herds men to seek out supplementary activities. The diversification by the community in the study area manifested itself in the form of crop cultivation, wage labor employment and others.

4.2.2. Development of Smallholder Irrigation in the Study Areas

Development of traditional smallholder[1] irrigation in Middle Awash is relatively a recent phenomenon. However, the history of smallholder irrigation in Middle Awash in general including the study areas dates back with the establishment of government community settlement program as a compensation program for lost land during the development of large government irrigation schemes in 1970s. Since 1990s, the involvement of agro-pastoralists in smallholder irrigation activity has been increasing at alarming rate mainly after the return of some over 13,000 ha ex-state farmland to the Afar community at middle Awash in 1992. Kassa (2001) also noted that the introduction of the large irrigation Schemes in the area precipitated changes in Afar pastoral society of middle Awash. Besides large-scale cash crop farming, small-scale cultivation using irrigation has been expanding and many local Afars have taken to this activity and become sedentary agro-pastorals. These developments and measures taken by previous Ethiopian governments led not only to the expansion of irrigated agriculture, but also to a boom of many smallholder irrigated farm based settlements and small towns in former pastoral areas (Kassa, 2001).

An informant at Geleela Dora Irrigation Scheme, who is both a farmer and clan leader, tells how irrigated crop cultivation was started in the area:

> *Now days, we are very desperate on our pastoral production system or livestock production for survival. We*

[1] an irrigation system without modern irrigation infrastructure and management

became vulnerable to drought effects since the past twenty years. We lost much of our livestock assets by the recurrent drought effects and have no means to restock again. Therefore, we lost our confidence on livestock production for survival, especially after droughts occurred since 1990s. Therefore, realizing the unreliability of our livestock production in the one hand and, our awareness about the value of our land other than we used it before on the other hand, we forced to seek alternative means of livelihood using our ample water and irrigable land resources for crop cultivation.

According to the clan leader's explanation, the main reasons for their envelopment in irrigated crop cultivation are due to increased vulnerability to repeated drought effect and change on the perception of the value of their land. Most of the key informants reported that the root cause for their vulnerability to drought effect was past Ethiopian governments' interventions through large mechanized irrigation in the area. By this development program of the government, they suffered directly and indirectly. Directly, they lost vast area of their prime grazing pasturelands and so pushed out to unproductive marginal areas and disturbed their traditional rangeland use and management system like seasonal mobility system, which forced them to be confined in one wet season less productive grazing land .As a result, over stocking and over grazing led to severe rangeland degradation through palatable pasture depilation and encroachment by new unpalatable bush species. Through time, they became unable to cope up with resulting drought effects of live stock and human deaths and disease. Whereas indirectly, the introduction and invasion of alien weed species (prosopis Juliflora) in to their range land especially to the potential dry season grazing land since the past 15 years. The informants told that this invasive alien weed species came to the area together with the introduction of the large-scale irrigation schemes.

According to informants in the area, this alien weed species, which do not allow any under growth of other plant species and fast expanding character, came in to the area by the then Awash valley Development Authority office in middle Awash to control desertification and the high dust wind in the area during 1960s. However, it has brought

unintended side effect on the life of the pastoral community by invading their rangelands in uncontrollable manner.

Though the Government of Ethiopia has returned some of the ex-state farms to the local community, they could not use it for livestock grazing. This is because the whole retuned land in the study area has been invaded by the alien weed species (prosopis) , which is unpalatable and do not allow undergrowth of any grass and plant species. Therefore, according to the community interviewed, the only alternative mechanism to control the weed is to use the land for crop cultivation. In this regard, interviewed households and clan leaders at Geleela Dora bitterly told me as to the problem of the weed:

> *Previously, we have one historical enemy. It is the Issa tribe neighboring us who used to take our land and pushed us back and we fight them to return back. But now we encounter the second big enemy, prosopis weed, which took the whole of our best land but which we cannot fight it like the Issa*[2].

Therefore ,because of these ecological and environmental crises and other factors together with their changing perception on the value of their land, the ex pure pastoral Afar community have shifted to crop-livestock mixed production system.

Geleela Dora smallholder irrigation scheme, the then *Irroli*[3] smallholders' water users Association, established in 1989 as one part of the government of Ethiopia's settlement programme at Gewane district by 60 member farmers on 120 ha land. The informants told me that the settlement program was made on two clan lands (Madima and Yanberadi clans' land) but members were drawn from 12 clans in the district by taking 5 individuals from each clan. According to the information obtained, the irrigation scheme was modern small-scale scheme managed by the farmers themselves with full support from the government and an NGO. They were provided with basic service like irrigation infrastructure construction and provision including provision of marketing service. They

[2] A Somali tribe neighbouring Middle Awash, Southern part of Afar Region at the eastern border.
[3] Name of an irrigators association

used both gravity and pump irrigation methods from Awash River. The major crops produced during that time were tomato, onion, maize, groundnut, papaya and pepper. Informants from members in the previous *Irroli* Waters Users Association (WUAs) told me, "We had a strong water committee and good managements system during that time and were successful in our irrigation practice and got good income".

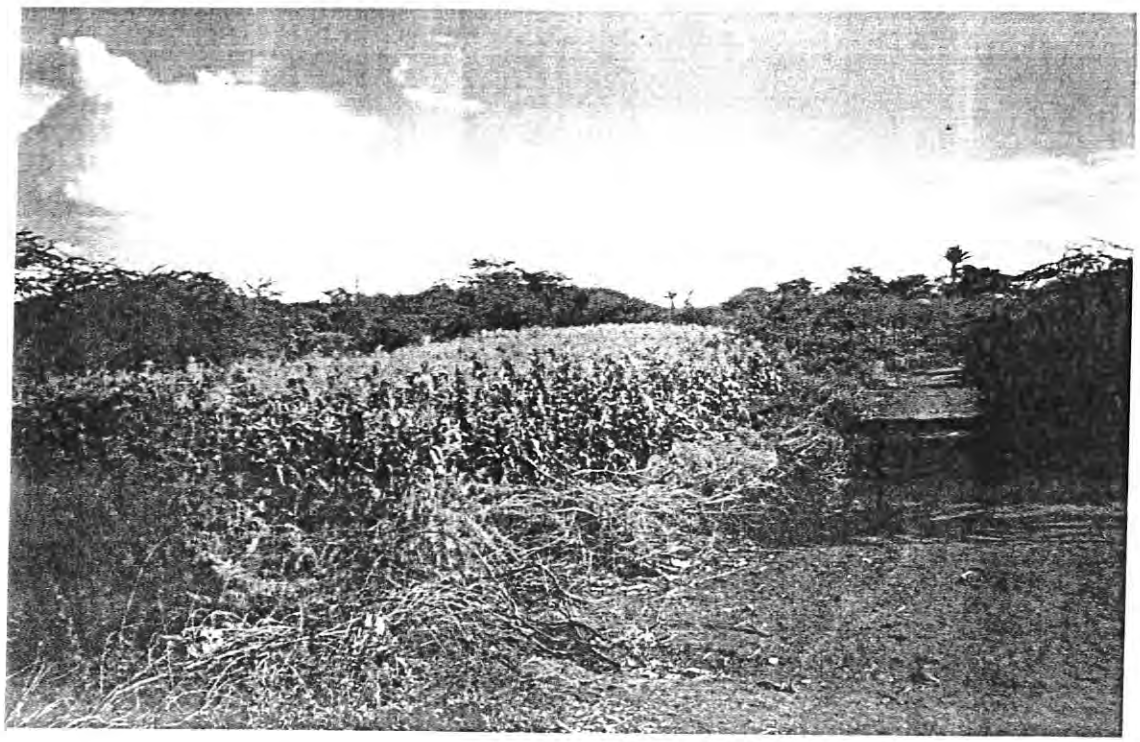
They used hoe and camel for plowing and got good training on camel plowing and other irrigation infrastructure operation. However, their irrigation scheme could not last long. It became collapsed and abandoned after four years of operation in 1991, when new government changed. It can be understood that the main reason for the collapse of the past irrigation scheme was absence of clear land tenure institution on communal clan based tenure system in the areas. After the change of the government, non-members of the irrigation scheme but who are customary owners of the land where the irrigation scheme was established, reclaimed their clan land and chased the irrigation scheme members and also abandoned all the irrigation infrastructures of the scheme.

The present Geleela Dora smallholder irrigation scheme has been started since 1998 by *Madima -Beguleeti* clan members on their own clan land. There are 91 member household farmers having more than 150 ha irrigable land on the command irrigation. The 33 sample households in the command area have a total of 83 ha land with average plot holding of 2.6 ha. Awash River is used as a source of water and both pump and gravity irrigation systems are used alternatively at different seasons. Maize is the main crop cultivated followed by tomato and onion.

The Sabure smallholder irrigation development started by few agro-pastorals since 1991. The number of Agro-pastorals involving in irrigated crop cultivation has been increasing, especially since the last 10 years. In 2000, the smallholder farmers established formal association and legalized by the Afar Region Cooperative Bureau. At the beginning, the association had 40 member households and by now, there are 86 member households having a total of 688 family members. The 41 sample households have an average land holding of 3.7 ha with minimum one ha and maximum of ten ha. This irrigation scheme

is mainly cash crop (tomato and onion) producing scheme mainly because of good access to market for the products.

Photo 4.1. Irregated maize crop farm by clearing prosopis bush from ex- grazing land at Geleela Dora area

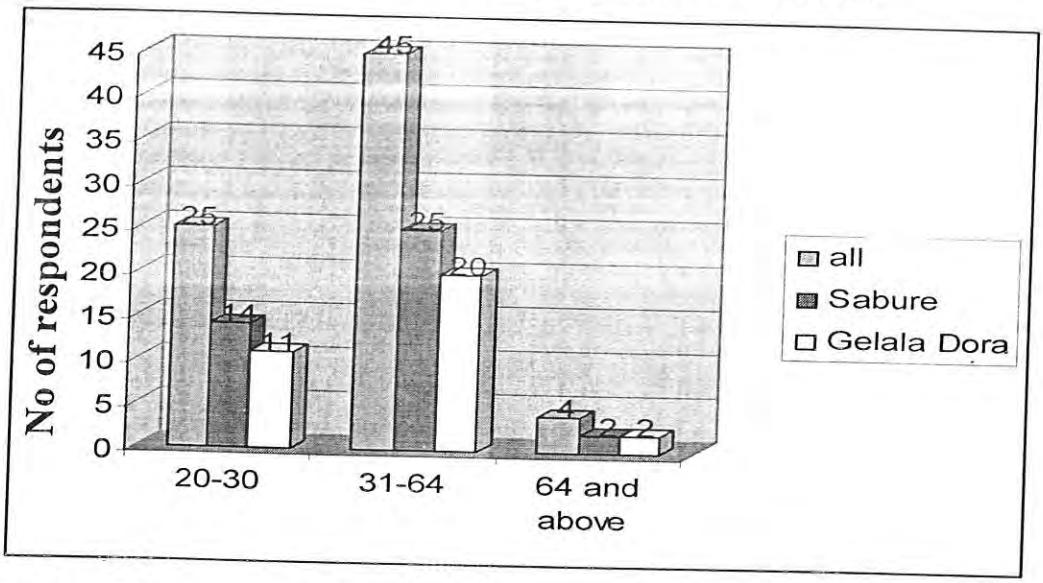


Source: Own survey, 2006

4.2.3 Household Demographic Characteristics

Figures 4.2 and 4.3 Show a summary of the demographic characteristics of sample households in Sabure and Geleela Dora smallholder traditional irrigation schemes. Of the 74 households in the two irrigation schemes interviewed, 73 are male headed while 1 is female headed. This is mainly because of the way all households acquired land in the area. The majority of the households got their plots through clearing of their clan land and so needs labor to do that. Therefore, the female-headed households were unable to clear forest for irrigation. With regards to age of household heads, 97.5% in Sabure and 93.9% in Geleela Dora are in the range of 20-64 years.

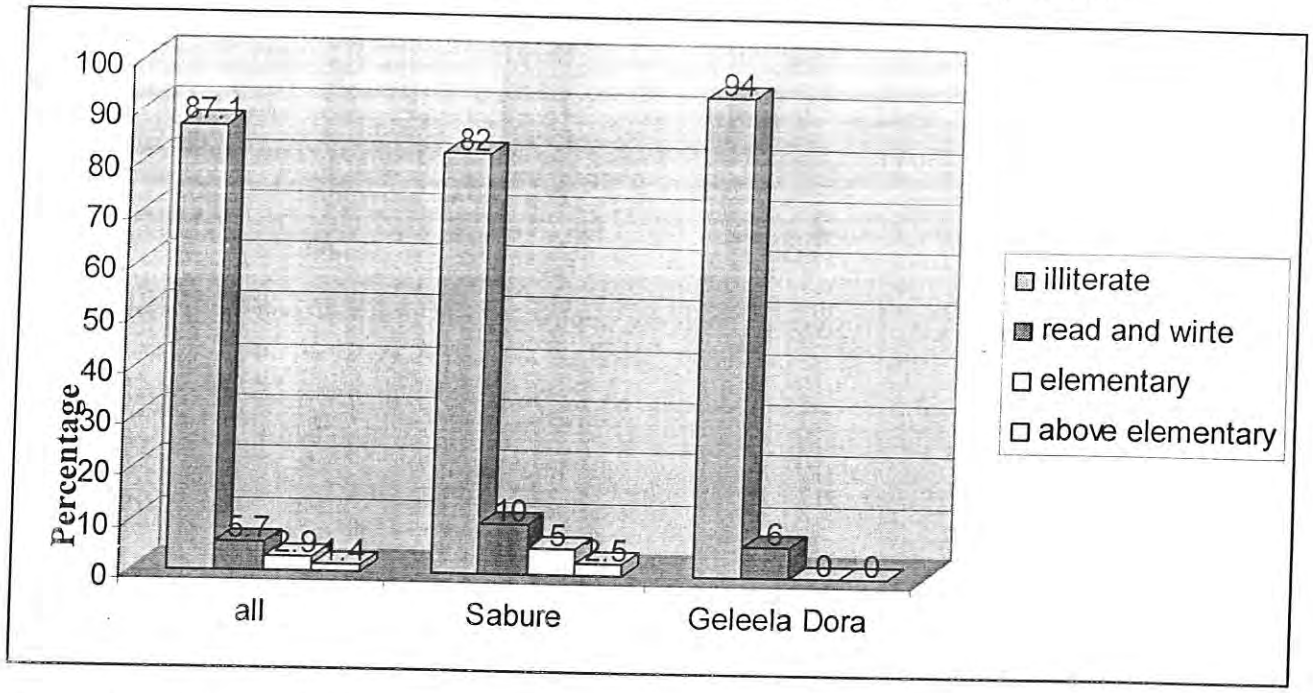
Figure 4.2 Age structure of Sample Household heads



Source: Own Survey, 2006

Regarding level of education of household heads, the majority of household heads, 82% in Sabure and 94 % in Geleela Dora were illiterate. However, the majority of interviewed households, (84% in Sabure and 72% in Geleela Dora) are educating or sending their children to formal schools (both male and female children).

Figure 4.3 Education levels of Household Heads in the study areas



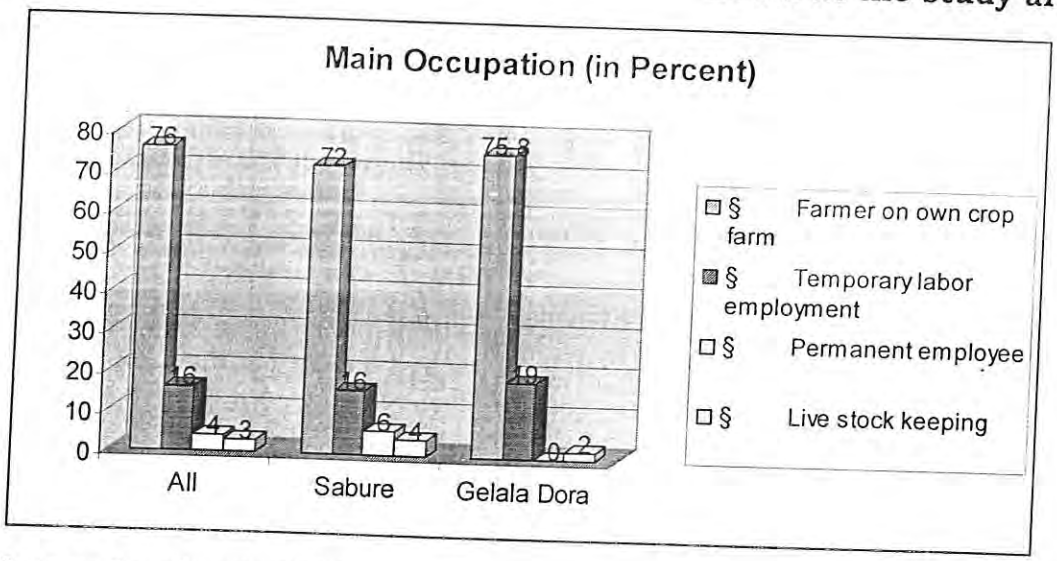
Source: Own Survey, 2006

Population growth rate is high in the study areas. The total family size is 341 from the 41 sample households in Sabure and 266 from 33 sample households in Geleela Dora. Average family size is 8.3 in Sabure while it is 8.1 in Geleela Dora. However, the figure for average family size in the study area according to population census of central stastical authority before 10 years, in 1996 was 6.0.

4.2.4 Source of Livelihood and Major Occupation of household heads

Figure 4.4. Shows major occupation of the sample household heads in the two study areas. 72% in Sabure and 80% in Geleela Dora of the interviewed household heads' major occupation is farming on own crop farm. whereas 16% in Sabure and 19% in Geleela Dora reported that temporary labor employment in state farm and private large farms is their main occupation Those responded livestock keeping as their main occupation in the sample area are too few which is 4% in Sabure and it is 2% in Geleela Dora. So the figures clearly show that how the ex-pure pastoral community have been gradually shifted to mixed crop- livestock mixed production system.

Figure4.4 Main occupation Of Household heads at the study areas



Source: Own Survey, 2006

With regard to livelihood source for the sample households, for 65% in Sabure and 78.5% in Geleela Dora of respondents, crop production and activities related to irrigated agriculture is their primary livelihood source, while 32.5% in Sabure and 18% in Geleela Dora said, livestock production is their primary livelihood source (Table4.2). Therefore, the situations clearly depict that how livestock production as a primary household livelihood source and its general contribution to household economy in the study area has decreased, unlike its past history.

Table 4.2. Major livelihood sources of sample households in the study areas

Primary source of livelihoods	Sabure (N=41)		Geleela Dora (N=33)	
	No	%	No	%
:				
▪ Crop production	20	50	18	54.5
▪ Livestock production	14	32.5	7	21
▪ wage employment	2	5	4	12
▪ Permanent and contract employment	4	10	3	9

Source: Own Survey, 2006

As far as farming system is concerned in the study area, especially at Sabure smallholder irrigation scheme, there are two types of farming systems and farm management. These are own farming & management and joint management with sharecroppers. The share cropping system in the study area is somewhat a different one with the common sharecropping system found in other areas of the country. It is not simply landowner lease out and share cropper lease in land with full management by sharecropper arrangement relation; but it is a joint management by dividing responsibilities of farming activities between the landowner and sharecropper.

This arrangement and management system, according to interviewed households, is because of lack of working capital and oxen for plowing. However, lack of irrigation experience was mentioned too. In the sharecropping arrangement, they divide the various management activities. The landowner is responsible to manage the irrigation infrastructure and the water together with the association and is also responsible to fence and guard the farm. The money contributor only manages all farm expenses, and search market for the final product while the laborer (the 3rd partner) operates all the farm operations beside his contribution of oxen for plowing. Finally, the final net income is divided equally in to three.

As shown in Table 4.3 below, 17.6 % in Sabure and 84.5% in Geleela Dora used family labor and own farm management Whereas,41% of respondents in Sabure and 15.5% in Geleela Dora reported that they practice own management but with hired labor for farm operation ,while 41% respondents in Sabure practiced sharecropping arrangement with joint -management system as discussed above. However, there is no sharecropping practice in Geleela Dora. The source and use of labor in the two irrigation schemes is different with high family labor in Geleela Dora . Use of hired labor and sharecropping arrangement in Sabure is much higher. This happens mainly because of difference in cropping type in the two Schemes.

Table 4.3. Farm management condition of Sample households

Management condition	Sabure (N=41)		Geleela Dora (N=33)	
	No	%	No	%
Own management with family labor	7	17.6	28	84.5
Own management with hired labor	17	41	5	15.5
Joint management with sharecroppers	17	41	0	0

Source: Own Survey, 2000

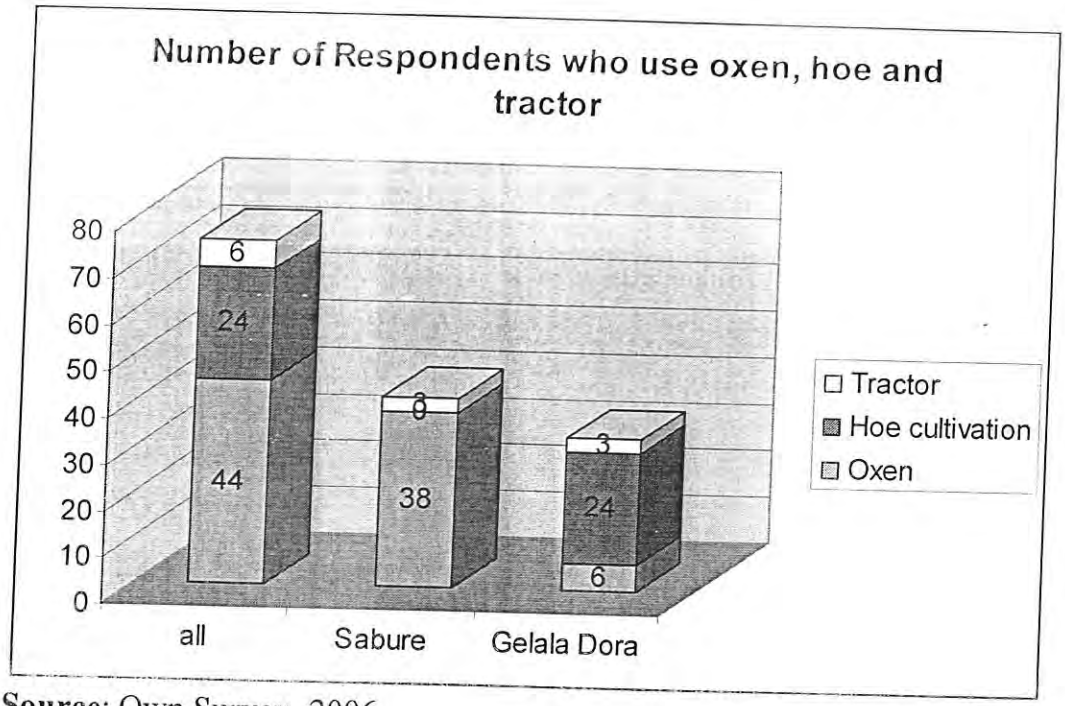
In Geleela Dora farmers, much of consumption crop i.e. maize is cultivated while much of the Sabure farmers cultivate cash crops as major (tomato and onion). As the cash crop cultivation is capital and labor intensive than maize cultivation, the Sabure farmers used to practice sharecropping arrangements.

In this regard, as to why the Geleela Dora irrigators forced to cultivate unprofitable crops and unable to increase the land productivity has been discussed in detail in section 4.3. The problem is mainly related to inaccessibility to water and market for their product.

Oxen is the main means of cultivation in Sabure whereas hoe is used more in Geleela Dora. As shown in Figure 4.5, 92% of respondents in Sabure and 72.6% in Geleela Dora used oxen and Hoe cultivation respectively. Tractor cultivation is also used by some 8% of farmers in Sabure. At both schemes, access to tractor is problematic because of both inadequate availability and unaffordable tractor rent[4] in the study areas.

[4] Tractor rent ranges from 250-300 Birr per ha for first plough and from 120-130 Birr for second plough, which was so expensive for the majority of interviewed households.

Figure4.5 Means of cultivation for sample farmers



Source: Own Survey, 2006

Oxen through rent is the main source in the study area. 90% of interviewed households in Sabure get oxen by renting[5] (Table 4.4).

Table 4.4 Source of oxen for farmers at the study areas

Source of Oxen	Sabure (N=41)		Geleela Dora (N=33)	
	No.	%	No.	%
▪ Own oxen	3	7.3	3	9.1
▪ Rent	37	90.2	1	1
▪ Share	1	2.5	0	0
▪ Communal	0	0	41	10

Source: Own Survey, 2006

[5] Oxen rent ranges from 30-40 Birr per person-day. A hector of land required 4 person-days for first plow and over 8 person- days of total until the last plough for sowing.

And many of the interviewed households in Sabure strongly complained with the high oxen rent in the area.

Photo 4.2. An Afar farmer in his Maize farm at Geleela Dora irrigation scheme

Source: Own survey, 2006

4.3 IRRIGATION MANAGEMENT

4.3.1 Irrigation organization

Establishing strong irrigation organization is one of the major aspects of irrigation management for successful and sustainable irrigation system irrespective of its level and scale (Boelens, 1998).

At the study areas of Sabure and Geleela Dora smallholders' traditional irrigation systems, irrigation has been organized around clans and sub-clans at scheme and sub-schemes level. The organization in charge of irrigation is the basic Afar customary social organization based on clan and sub-clan social structures. As discussed earlier, the

traditional resource management systems and institutions of Afar are used for the management of irrigation too. At Sabure irrigation schemes, though they have established formal association called *Lemilefen Farmers' Agricultural cooperative* initiated by themselves and got legal entity from the regional government of Afar since 2002, it is not that much functional to carry out its organizational responsibilities ,especially in negotiating with external institutions and defending the interests and rights of members particularly related to their water rights. According to the interviewed leaders of the association, the main reason for the weakness of their association was lack of support from external institutions. As has been observed at Geleela Dora, there was no formal association rather there was only informal organization established to he association.

Both the formal association in Sabure and the informal one in Geleela Dora have established their organizational structure to accomplish the various irrigation activities. As Mollinga (2003) and Teshome (2003) noted, "One of the social requirement for successful irrigation is organization and management structure that suit the irrigation infrastructure". In this regard, the irrigations at both schemes have created irrigation management committees and water users' teams.

The irrigation committee, which they called "Leech Committee" meaning 'water committee" has the following tasks;

- Mobilize resources for operation and maintenance of irrigation infrastructure
- Allocate water and control water distribution.
- Resolve disputes related to land, water and maintenance based on their internal laws and some others.

The executive committee consisting of five members in each irrigation system, is responsible for operation and maintenance of the irrigation system through resource mobilization. The formal and the informal irrigation organizations in the study areas play an important role in mobilize resources-for operation, maintenance and for periodic

rehabilitation . At Sabure scheme, in addition to executive committee there were control and monitoring committee and team leaders.

All the three committee types have different responsibilities in the association. Members of the executive committee are the chairperson, the vice chairperson, the secretary, the treasurer and the casher. All were elected by the general assembly and they have working period of two years.

The Executive Committee is responsible for the operation and maintenance of the irrigation systems. The control and monitoring committee has three members and are responsible for controlling and monitoring the performance of the executive committee That is they control whether the executive committee is performing well and is fully accomplishing its responsibilities. The committee is also accountable to the general assembly.

The team leaders, who are accountable to the executive committee, are responsible to follow up and implement all the irrigation operations and activities as per the plan outlined by the exclusive committee. These team leaders have three members and are better referred as sub-committees under the sub schemes. At the sabure scheme there are three-water users` teams organized under their respective sub-clans or lineage.

Scholars like(Boelens,1998) suggest that sustainable management of farmers-managed irrigation systems requires well established rules that ensure the interest of all irrigators. At Sabure and Geleela Dora schemes too irrigators have established their own internal laws which governs the rights and obligations of members. They have also set criterion for membership and fines and sanctions for rule defaulters. The sabure farmers associations which is organized formally has well defined and written rules while the Geleela Dora farmers run by informal rules governing their irrigations system. In general, some of the basic rules at both schemes have been outlined as follows:

- Having own private irrigable plot around the irrigation command area is demanding to have water right and to be member of the communal irrigators at both the schemes.
- At Sabure, only own cultivation and sharecropping farming systems is allowed for the landowner member in the irrigation scheme. Renting one's land for an outsider is prohibited and if any member irrigator rents his land, he will lose his water right. But this is not the case at Geleela Dora
- At Geleela Dora, members are not allowed to have greater than five ha plot per individual in the irrigation scheme. So water use is not permitted for an individual for plots he has in excess of five ha with in the irrigation system. However, no limit of land holding by individuals at Sabure scheme.
- Both men and women above 14 ages can be members of irrigators' associations.
- Full participation and contribution for all operation and maintenance of irrigation system is the basic requirement for members to have the right on water use at both schemes.
- Any user who is found guilty of breaking canals and diverting water out of his turnout will be fined from 35-200 Birr depending on the extent and frequency of the illegal action at both schemes.
- If any user fails to come and participate on canal cleaning and maintenance, he will be fined from 100 Birr up to the extent of passing his turn of water depending on frequency at both schemes.

4.3.2 Irrigation Infrastructure Management

The method of irrigation water application at Sabure small holders' scheme is through gravity from Bulga River, which is found about 2 km away from the irrigation command area. Basically, the smallholder farmers get water from the main government managed (Aura Melka State Farm) canal. The water that comes via the main earthen canal is by diverting the Bulga River with modern weir structure. Both the headwork and the main canal have been constructed by the government water resources authority of Awash valleys. The management and control of the weir and main canal is fully under the state

farm. The smallholder irrigators of Sabure were not entitled legally by the government water recourse Authority of Awash valleys to access and use water from the constructed irrigation infrastructure. The farmers were able to get water after negotiating and agreeing with the state farm. They are allowed to cultivate if they met the preconditions such as, the types of crops the states farm wants them to have, the time specification as to the cultivation, and so on. The farmers do this only during night time. (see the detail in section 4.4).

The water committee (*Leeh committee*) organizes members for canal cleaning and maintenance through resource mobilization i.e. finance and labors. The money contribution is people- based. Each member contributes 50.00 Birr per year for system maintenance irrespective of plots size holding. Interviewed sample farmers with smaller plot size told that this type of people -based contribution system is too unfair. According to them, though they complained repeatedly about such unfair contributions, the water committee could not respond to them. However, interviewed water committee leaders said that though contribution is people -based irrespective of plot size holding, water allocation is also people -based. This means all members have equal right in the allocation and distribution of water whether they have large or small plot size. However, the reason given by the committee leaders was not acceptable by this researcher in the area as far as there is no well-developed water institutions (absence of water market) in which an individual water right holder could benefit from the excess water he has after finishing irrigating his plot.

Two types of canal cleaning and maintenance are undertaken. Cleaning and maintenance for the 500 m length main government canal from where the smallholders receive water, is done commonly by all members of the scheme twice a year. However, the maintenance is undertaken by hired labor. The 50 Birr contribution done by all members is used for operation and labor hiring purpose. The second type is the on farm channel cleaning and maintenance. And this is done through members' labor participation with no fixed time of operation. That is cleaning and maintenance undertaken any time when need arise. This is because of frequent siltation problem and canal break off because of poor infield canal construction.

The infield (on farm) canal construction has been done by the farmers themselves on a new developed land with out any support from the outside. Absence of well-established division box at the point of main water distribution is one major problem and source of conflict between the three irrigation groups at the sub-schemes i.e. head end, middle and tail -end irrigation groups. Otherwise, the on farm operation and maintenance of the irrigation system is organized and undertaken at sub-schemes level led by team leaders.

The irrigation water application methods at Geleela Dora traditional smallholders' irrigation scheme are diesel motor pump and natural gravity from Awash river alternatively at different seasons. The motor water pump is donated to the farmers by FARM AFRICA; an international NGO working in Gewane district, Afar region .The pump has a limited capacity to irrigate more than 30 hectares of land.

The second method of water application is by diverting Awash River using natural gravity. The farmers use stones and sand filled sacks to divert the river. These stones and sand filled sacks are also used at the main distribution point to control the volume of water distributed for the different irrigator groups and for shutting of the water gates. Like the sabure irrigators, the Geleela Dora traditional irrigators also use traditional canal systems and infield channels designed and constructed by themselves. Accordingly, they face so many problems because of poor on farm channel network and poor water delivering capacity. Among these problems, flooding and high siltage problems are the most serious ones for this scheme than Sabure scheme irrigators.

Irrigators use the two water application systems alternatively at different seasons and for different crops type. Pump irrigation is used when the volume of Awash River lowers below where diversion using natural gravity is difficult. There are three main reasons. The first is during dry season (December-March) when there is no rain at the high land upper catchments area and also when its feeder tributaries dry out. The second major reason, as the interviewed households told me is the unfair and over extraction of water using huge motor pumps by large commercial private farmers found at the up stream mainly during main cotton cultivation season i.e. from March-June. There are ten huge

and high capacity motor pumps used by ten large commercial farmers at the up stream extracting with out control and limit, which potentially decrease the volume of water reaching the down stream smallholder irrigators. Therefore, this free access and improper utilization of water by large commercial farmers has created artificial water scarcity for the smallholder irrigators in the area.

Change in the flow direction or route of Awash River since 1997 at *Debel* locality in *Burimudaytu* district of Middle Awash has been one reason for the decrease of water volume from the main route of Awash River and this makes natural gravity water abstraction difficult for the smallholder irrigators.

Operation and maintenance of both types of irrigation infrastructures has been coordinated by their informal water committees mainly by the chairperson of the irrigators. One important observation I noted at Geleela Dora smallholder's irrigation scheme was that unlike modern irrigation schemes principle of irrigation management, both the management of water and infrastructure i.e. operation and maintenance of infrastructure, allocation and distribution of water follows rationality principle, which has been the basic old age customary resource management system.

Therefore, operations and maintenance of their irrigation systems have been undertaken by common understanding of members following their customary rules and norms where rationality[6] is the basic ideology. Accordingly, operation costs of motor pump i.e. fuel and oil is fully covered by each individual used every time during his/her turnouts. He has to come up with his own fuel and motor oil with the amount he believed enough to irrigate his plots. Expenses for the fixed costs of pump operation were covered through contribution by only those who cultivate cash crops and who use the pump frequently. Otherwise they have no constant annual contribution of money unlike the Sabure irrigators. In addition, labor is mobilized by the informal water committee for construction and maintenance of headwork and main canals for the gravity water delivering structure for both scheme and sub-scheme levels when needed. But have no

[6]Following Principle of adaptation and flexibility in resource management according to local circumstances of social, economic and environmental changes.

fixed schedule for cleaning and maintenance. According to informants, there is no problem on the operation and maintenance of their irrigation system other than the poor and too traditional irrigation canals water diversion and conveyance system, and poor on farm channel network with poor water delivering capacity. As a result most of the interviewed irrigators told flooding is the major cause for frequent damage of canals every after two farmers irrigate because of high silt deposition.

4.3.3. Irrigation Water Management

The water source for Sabure traditional irrigation system is from Aura Melka state farm controlled main canal, which conveys water from diversion weir at Bulga river by gravity method. The farmers are allowed to use only during night time from 6:00 pm-6:000 am. The reason as to why was discussed in detail on section 4.4 under water right.

The farmers do not have their own water guard (*Leeh Fekie*) assigned at the main gate for water distribution .Water is distributed by the water guards of the state farm and so it is one major challenge the farmers come across in the water distribution .untimely release of water and unreasonably decreasing the volume of the released water from the main gate are the major ones among others.

From the 41 interviewed households at Sabure scheme, 80% of respondents reported that the water guards of the state farm do not distribute water fairly and timely. The next problem is that the water guards at the main gate have to be told daily by the representative of the farmers. Unless they have to be told by the representative, they do not release water by any means even if told by other water committee members other than the one that has been once assigned by the farmers. In this regard, the chairperson of the water committee has been in charge for this duty and they call it "*Leech Kurakure*" meaning, "water distributor". The bad scenario for irrigators happens when this man (water distributor who is in charge to tell the water guards daily for water release) is not around by any case, water will not be released by the water guards until the man formally assigned will return back. Therefore, this is an other unresolved problem and sources of water shortage. Beside lack of free access and control of the source of water

and the accompanying distributional problem creating artificial scarcity[7] of water, the smallholder farmers at Sabure have their own rules for water allocation and distribution at scheme, water user teams, groups and farm unit level. "Distribution system by scheduled turns" is the main water allocation and distribution system used by the irrigators.

According to Gerbrandly (1998) and Mollinga (2003), there are two major water distributions systems: vis-a-vis free irrigations system and distribution system by scheduled turns. The choice between these two depends on the availability of water sufficiently for irrigation. Free irrigation system is used when water is sufficient for all irrigators while the later is used when there is scarcity of water. Moreover, broadly, there are two types of distribution system by scheduled retunes: land-based and people- based allocation. According to Gerbrandly, these systems reflect the ways people think about water right with in their communities. "Everybody has rights to use water, but all plots also have this right'. These systems are applied singly or in combination.

The Sabure traditional irrigators use distribution system by scheduled returns method as a result of water scarcity as explained earlier. However, both types i.e. land-based and people-based water allocation systems are used in combination. Individual irrigators with all plots of land around the command area have the right to get water and the plots to be irrigated equally. But this is not true in the case at Geleela Dora irrigators because only people have the right to get water (people-based allocation) .In this case irrigators with plots of land in excess of 5 ha are not allowed to get water in accordance with their internal laws.

As has been discussed earlier, the Sabure scheme is divided in to three sector or sub-schemes of user teams. Water distribution to the main canal and to the three sectors or user teams is continuous while it is rotational in user groups. Here, irrigators in each sector or user teams are again sub-divided in to 4-5 user groups having 1-4 ha of plots. The water coming from the main canal is divided in to the three secondary canals equally. Therefore, each sector or user team receives equal volume of water daily. The division of

[7] Man made water scarcity because of poor water management

water is made by guess; they have no other means of measurement. And it has been one source of conflict between user teams on volume of water flowing to each secondary canal. As has been discussed before, the problem is the absence of moderndivision box at the distribution point and as a result irrigators from all the user teams illegally dig down their respective secondary canals at the triangular distribution point with the intention of lowering the gravity level of their canal so that more volume of water will be flowing to their direction. Because of this problem irrigators of a particular irrigation day from all groups assign one farmer from each of the three sectors at the main distribution point to control illegal action by other parties.

Likewise, the principle of rotation at group level is that each group can irrigate for 12 hours, starting from 6:00 pm-6:00 am, and within the group, each irrigates until finishing. In this way, each group will receive water again after a week of rotation.

Irrigation Organization at Gleela Dora smallholder irrigators is relatively weaker than that of sabure irrigators. That is, both the use and management of water is different and very traditional. As explained in the previous section, the source of water for Geleela Dora scheme is Awash River by direct extracting water from the river using diesel motor pump and diversion by natural gravity.

As to the use of the two water application methods i.e. pump and gravity, they use pump when the flow volume of Awash river decreases because of reasons out lined earlier and use gravity when the river is full. However, pump irrigation is used mostly by those farmers who cultivate cash crops (tomato and onion). This is because of two main reasons. The first reason is as the capacity of the pump they have is low that is it fails to irrigate more than 30 ha.Thus, to avoid competition and conflict; they set rules for using the pump. These are ; the expenses for fuel and motor oil should be covered by individual irrigator always during his turn out and other fixed costs of the pump i.e. maintenance cost is to be covered through contribution by user whenever need arise. Therefore, as the majority of irrigators could not afford the running cost of the pump, they are forced to get out of the competition on their will without any conflict. Therefore, an irrigator ,as long as he covered the cost of fuel and motor oil for his own, can use any time he wants. In

this regard, 75% of interviewed from 33 sample households produce non-cash crop i.e. maize. The second reason as interviewed informants reported is that using pump irrigation, which has high operating cost, is not profitable for non-cash crops production. This is what Mollinga (2003) explained, "irrigation technology needs social requirements to use". To this end, access to market for cash crop products is their major problem not to produce cash crops followed by water scarcity (see section 4.4).

With this brief discussion of means of water acquisition at Geleela Dora scheme, water allocation and distribution principle at this scheme follows the basic rationality ideology of their traditional resource management system. Two types of water distributions systems are used based on water availability. When water is available i.e. when the Awash River is full, all irrigators in the scheme use free gravity irrigation, but during dry season, when the volume of water is decreasing, gravity irrigation is not allowed for those who can access pump.

For the pump irrigation method, distribution system by scheduled return system of water distribution is used .Therefore; rotational distribution on time based for acre of land is applied. But here, with this rotational water return, in the principle of allocation for an individual irrigator with the boundary of 5ha land holding, the frequency of receiving water turn and length of allocated hours to irrigate depends on three criteria. These are the size of plot, soil type and crop water requirement. Therefore, an individual irrigator can irrigate until he finishes his all plot(s) and with frequency of the water requirement nature of his crop. Other wise, normally, an irrigator with 1 ha plot has the right to irrigate for 12 hours and if they are in-group, for 24 hours.

4.4 INSTITUTIONAL ARRANGEMENTS AND MAJOR CHALLENGES

4.4.1. Institutions of water rights

The history of River basin water resource management in Awash valleys including middle Awash goes back to 1960 s, when large scale mechanized irrigated agriculture was introduced by the then Ethiopian empirical government (Awash Valleys Authority, 1968). The government institution in charge of management of all types of water use and

allocation was the "Awash Valleys Authority" during the implementation of the scheme and now it is organized as "The Awash Basins water resources Administration organization". In this Agency-managed irrigation system's institutional framework, the agency had been responsible to mange the head works and main canals in that it fully control these infrastructures including cleaning and maintenance and give technical assistance fully for large-scale commercial investors until 1974 and only for states farms since 1974 to end of 1980s. The management of the infield canals including secondary and tertiary canals above the main canals is the responsibility of users.

Therefore, under the jointly- managed large scale irrigations system, there are/were only two major actors; the agency and the large commercial investors until 1974 and the state farms since 1974 until the end of 1980. However, conditions have changed since 1990s. The number of actors in the irrigations system with the change of government in 1991 with new political and economic system (Market economy). Besides the state farms, large scale private commercial farmers and small holder farmers have been introduced in the irrigation systems in the area.

During the implementation of the irrigation systems in Middle Awash, the government's Agency had never established clear criteria (legal and institutional framework) about the rights and obligations of future users. Only rigid agency criteria for allocation and distribution of water were/are binding (water use and supply according to fees paid).

According to informants from Awash Basin water Resources Administration Organization (ABWRAO), water use- right is granted for the state farms and large-scale commercial agricultural investors and in turn, the organization collects fees. Indigenous smallholder farmers were informally permitted free access and use water for irrigation. Interviewed sample households from the two study areas have confirmed this too. However, in this water use arrangement there are two types of fee-paying systems designed by the State water Agency: service fees and water concession fees. From these two fee types the indigenous small holder farmers have been made free from the water use fee, other wise if any small holder farmer able to access and use Agency's controlled

canals and got service of cleaning and maintenance, he/she has to pay service fee according to the law of fee payments set by the Agency.

As indicated above, the organization (State water Agency at Middle Awash) has been applying differentiated fees depending on service provision and water concession together and water concession alone. For service provision and concession fees together the agency computes with a basic service fee[8] to recover the investment expenditure with agency and a volumetric water fee to finance operation and maintenance expenditures. The second type of fee is only for water concession[9]. This is for those large-scale private investors who use their own hydraulic infrastructure, mainly who use pump irrigation method. In this regard, the computation of fee payment is based on size of irrigated land area irrespective of crop types cultivated.

However, this law of water use and allocation system for competing water users with different power structure and relation has resulted inequitable water allocation and distribution and has caused artificial scarcity of water for the indigenous smallholder irrigators in both quantity and time of use. Because of this legal and institutional problem with the state agency, there has been frequent conflict between the indigenous smallholder new irrigators with the large investors and with the state farms. Water theft, canal breaking, illegal water extraction from government diversion sites through informal negotiations with water guards during night time, were some of the illegal actions done by the small holder farmers. The artificial water scarcity in the area is what Mollinga (2003) noted as "scarcity is a socially constructed" Hunt and Hunt (1976) also noted "water scarcity may be created by new power structure that destroy balances"

Interviewed sample households and other indigenous smallholder irrigators at Awash Fentale, Gewane and Amibera districts of Middle Awash bitterly told :

[8] During the time of this study, the cost of fee for the mentioned fee type is 0.006 Eth Birr per one cubic meter of water used.

[9] The fee is 50 Eth Birr per one hectare of irrigated land.

Though we are allowed to use water freely with out payment, but it is just like the proverb "giving meat and hiding the knife". This is to mean we lack the means to use the water productively like financial and technological in the one hand and weak organizational power to negotiate and compete with influential large-scale irrigator groups on the other side-so because of the unjust and unfair water law of the government agency in the area for water allocation and distribution with the rules of granting water-use right according to fee paid has paves the way for exploitative type of irrigations systems. So the condition has made us totally to be marginalized and unable to exercise fully our legal customary right on our water resources.

Therefore, according to the community, the legal and institutional framework designed by the state agency during 1960s ,the time when they were fully pastoralists, not applicable to the present condition of water user groups. As Burchi (2005) quoted by Randolph, (2005) has a clear note in that "Neglect of customary rights in the formulation of water law and policies can cause serious opposition from those whose rights are ignored".

According to informants from the State's Water Agency at Middle Awash, the customary water right of the indigenous smallholder irrigators has not been clearly defined on its Institutional Framework. They are informally entitled customary territorial water right. But it is with out the means of legal and institutional support for equitable water distribution and benefit from the irrigation systems because of power imbalances among user groups. In this regard Bruns (2005) quoting Bromley (1992) points out that "rights have no meaning with out correlated duties... on aspiring users to refrain from use". That means, he continues, "Property rights are not a relationship between a person and a thing, but are social relationships between people with regard to some object (the property)". Property right are effective (legitimized) only if there are some kind of institutions to stand behind them and the rights are only as strong as those institutions" (Ostrom, 1992 and Boelens ,1998).

To summarize what has been discussed so far in this section, with the present legal and institutional arrangements at Middle Awash as a whole and the two study areas, the

players who win are those with the greater economic, political, (mainly clan leaders) or technological power, supported by the skewed water allocation and distribution nature of the water law in the area has been threatening the availability of water for the indigenous community with lesser power.

4.4.1.1. Implication of Artificial water scarcity on the Productivity of the Smallholder irrigation sub-sector

"***Water is life; a basic right to be shared by every one***" **(Boelens and Bavila, 1998)**

Artificial water scarcity at the two sample irrigation systems has been the major outcome of the existing institutional gap in the water sector. The method of water concession and distribution system in the area was too skewed towards the powerful large commercial irrigators including the state farm enterprises.

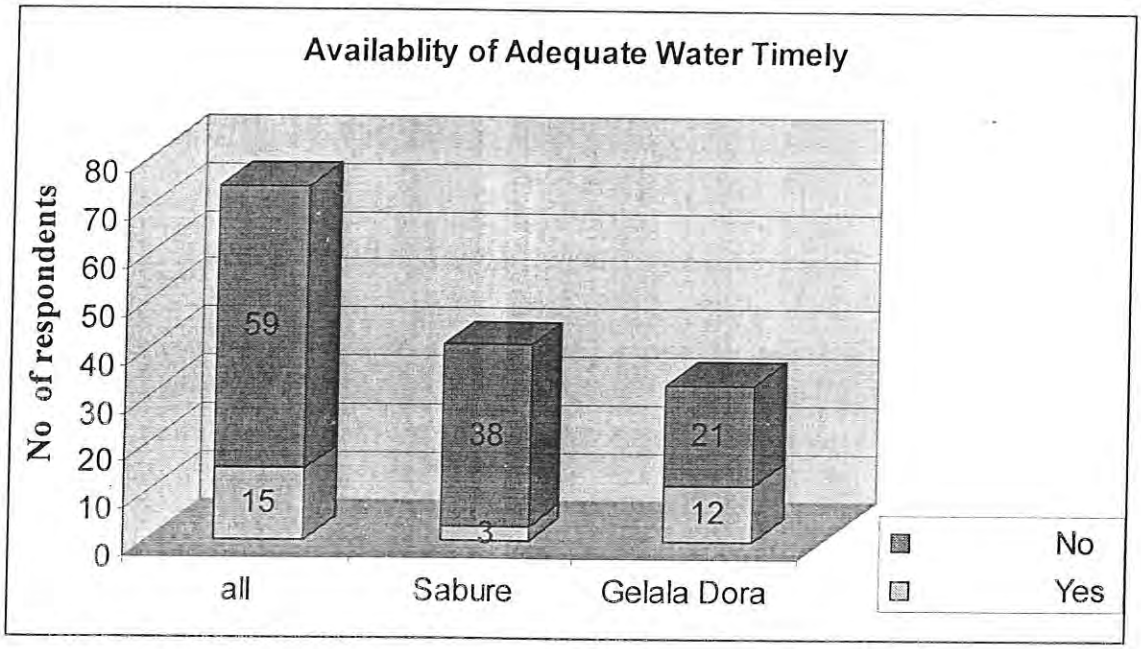
As Mollinga (2003) and Hunt and Hunt (1976) noted, "scarcity is a socially constructed". Multiple users' water management at the level of basins and water shades is a question concerning the societal distribution of water rights; water rights do not just refer to the rights to access and use water but includes the issues of control and authority (Ostrom, 1992, Boelens, 1998). These include rights to access and use water (quantity, quality, timing, duration and place of acquisition), rights to access; use and control infrastructure (hydraulic) and others.

Therefore, lack of clear and appropriate legal and institutional arrangements for the smallholder irrigation sector, has been seen to have a great negative implication on the productivity of the small holder irrigation in the study area and is discouraging the efforts of the new indigenous small holder irrigators towards their household level food security in particular and the sustainability of small holder irrigation development in general at middle Awash.

The following discussion shows how all the institutional problems discussed above have been reflected on availability of water (in time and quality) and productivity of the smallholder irrigation sector and on other irrigation variables and attributes in the sector.

As shown in Figure 4.6, from interviewed all sample households at Sabure and Geleela Dora schemes, 92% (Sabure)and 64% (Geleela Dora) of respondents have reported they didn't' get adequate water for irrigation.

Figure 4.6 Adequacy of irrigation water for their plots



Source: Own Survey, 2006

Therefore, these all clearly show how the smallholder irrigators at the study areas faced lack of access to water in time and adequate quantity.

Their reasons for not to get adequate water is different as has been outlined in table 4.5. 68% of respondents of Sabure said the major problem is access and control of their water source is the primary reason followed by weak distribution management at field level reported by 18% of respondents .While in the case of Geleela Dora sample irrigators 59% of respondents have reported that water shortage from the source is their primary reason for inadequacy of water followed by shortage of water pump for 36% of respondents as their primary reasons.

Table 4.5 Reason for not getting adequate water timely

Reason	*Sabure (N=41*		*Geleela Dora (N=33*	
	No.	%	No.	%
- Shortage from source	3	8	19	59
-Weak field distribution management	7	18	0	0
- Lack of Access to water	28	68	0	0
-Pump shortage	0	0	12	36
-Location of plot (tail-end)	2	5	2	5
-Poor canal network	1	3	0	0

Source: Own survey, 2006

According to informants from the two study areas, the problems for the inadequacy of water are almost artificial. That means it is the result of poor water management systems of the state agency for equitable access, use and distribution of water for all user groups, inability and even lack of interest to resolve dispute and conflicts between different user groups having different power structures.

At Sabure, 68% of respondents reported that they do not get adequate water primarily because of lack of access (Table 4.5 above). The problem is legalistic and artificial rather than actual water scarcity (because of difference in supply and demand), but it is so because of deliberate action by powerful irrigator (Aura Melka State Farm) in the area. The state farm is doing this also because of change in production relations in the irrigation system of the area. As Boelens, 1998, Mollinga (2003), Uphoff, (1978) have noted "with the introduction of new irrigator groups in an existing irrigation system, there will arise serious conflicts as a result of change in production relation, water scarcity, change in social power structure etc.".

As briefly discussed in earlier sections, the Sabure smallholder irrigators get water from government main canal under the control of *Aura Melka* state farm legally since 2000 after informal agreement has been made between the farmers and the state farm. In addition, as to the information obtained, the canal has the capacity to irrigate more than

1000 ha land. However, during the time of this study, the Aura Melka state farm has only 150 ha under irrigation and the smallholder irrigators have 90 ha under irrigation but have a total of 400 ha in the irrigation command area. Therefore, with this condition of infrastructure capacity to irrigate and actual area of land under irrigation, one can definitely asks what makes water scarce for the traditional irrigators in the area? However, the answer is mainly because of absence of better institutional arrangement for fair water distribution for all user groups in general and as a result the main hydraulic infrastructure has been monopolized by the state farm there and have full control over it.

In this regard, the sad scenario was when it was observed that the basic reason the state farm has for its denial to allow the small holder traditional irrigators to fully and formally access the government's hydraulic infrastructure and share the management. It is because, according to all the informants, the state farm is not totally interested in the new smallholder irrigators and the participation of ex-pastoral local communities on irrigated crop cultivation. This is not because the farmers are competing the state farm with water, but it is because they are competing it with labor and product market. To this end, though the researcher has tried to discuss the issue with Aura Melka state farm officials they were not cooperative and willing to give information. However, through informal discussions made with some workers of the state farm the same reasons given by the farmers were mentioned.

The indigenous smallholder irrigators at Sabure made much individual struggles to access water legally from the state farm's controlled canal for over ten years from 1990 to 2000. Since 2000 they got informal permit from the state farm to access water. This happened after they were organized as an association and struggle through it collectively.

According to the informants from sample irrigators at Sabure, though they are informally permitted to legally access water but it is with injustice and unfair preconditions set by the state farm. They are allowed to irrigate only during nighttime (6:00 pm-6:00am) and not to cultivate cash crops (Tomato, onion, cotton etc). Vice-chairperson of the association explained the situation as follows:

When we started irrigated crop cultivation in 1990 we used to cultivate maize on small plots of land, though the state farm was not interested this beginning. During that time the state farm was cultivating perennial crops (Orange, Mango), and cotton. However the problem and serious disputes started when we have started cultivating horticultural cash crops (onion and tomato) and at the same time the state farm also changed its cropping pattern and began producing horticultural crops the same to us. Therefore as we were becoming strong, we were able also to highly compete the wage labor supply in the area and the product market. As a result, in 2002, the state farm warned us as unless we totally stopped cultivating horticultural crops and continue to cultivate maize they will block the canal totally. But if we agree to cultivate maize, the state farm will support us in all aspects including plowing all our lands by their tractors and also can get water during day time". However, we disagreed with this precondition and the problem has not been resolved yet.

According to the vice-chairperson of the Sabure farmers' association, though they repeatedly appealed the problem to their district government Administration council and to Middle Awash water resource Administration organization, they could not get solution.

However, the Awash Fentale district government officials told, "as the state farm pays fees to the state Agency, it has the right to deny the farmers to access. They have no legal right to access and use the irrigation infrastructure; they can use through informal negotiation with the state farm." This is really a surprising scenario the researcher observed during this time, when the Government of Ethiopia in its food security strategy "expanding and supporting small holder irrigated crop cultivation at agro pastoral areas" as its one major strategic direction.

In case of Geleela Dora smallholder irrigators, as indicated in Figure 4.6, 59 % of the respondents do not get adequate water timely. Here the reason is different from Sabure irrigators. Water shortage from the source is the primary reason they reported. However, the shortage from the source is not because of natural phenomena. However, according to key informants, it is because of uncontrolled and unlimited water abstraction using huge

water pumps by few large-scale commercial investors at the head end. So the volume of the river dramatically decreases during main cropping season. According to them "The few large investors by extracting water for their large land size; we could not get water for less than a hectare of plots we have".

Generally, all the prevailing situation in the water sector at both the study areas depict that there is a great water management problem at the Awash valley as a whole for peaceful and sustainable irrigation development in the area

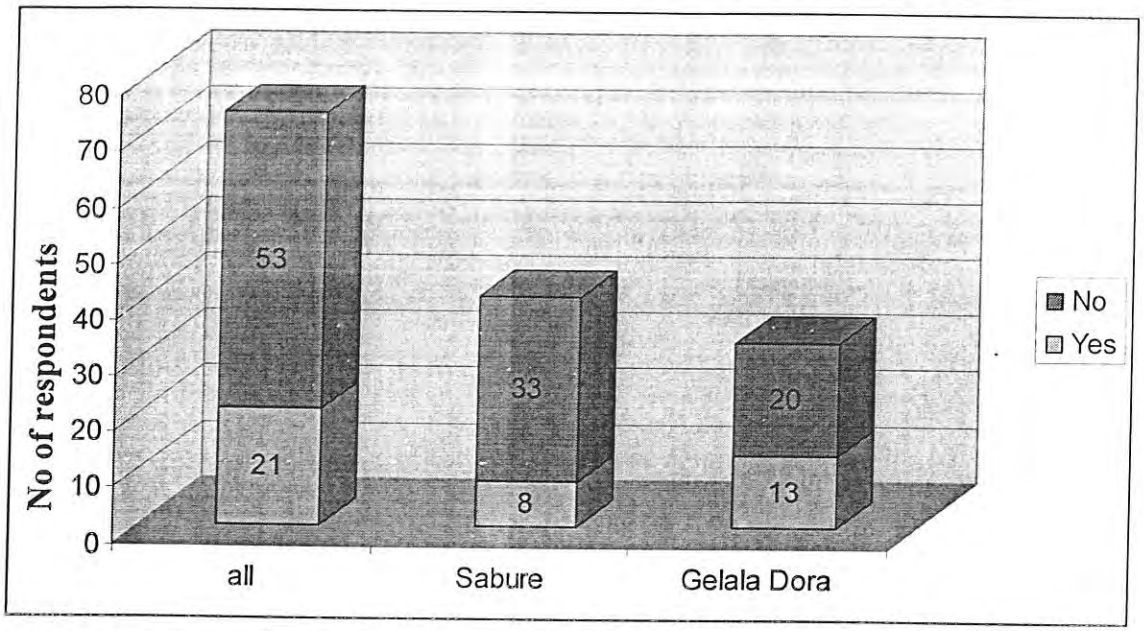
Table 4.6 Frequency of production in a year by sample irrigators

Frequency of production in a year:	Sabure (N=41)		Geleela (N=33)	
	N	%	N	%
Once in a year	41	100	17	52
Twice in a year	0	0	16	48

Source: Own Survey, 2006.

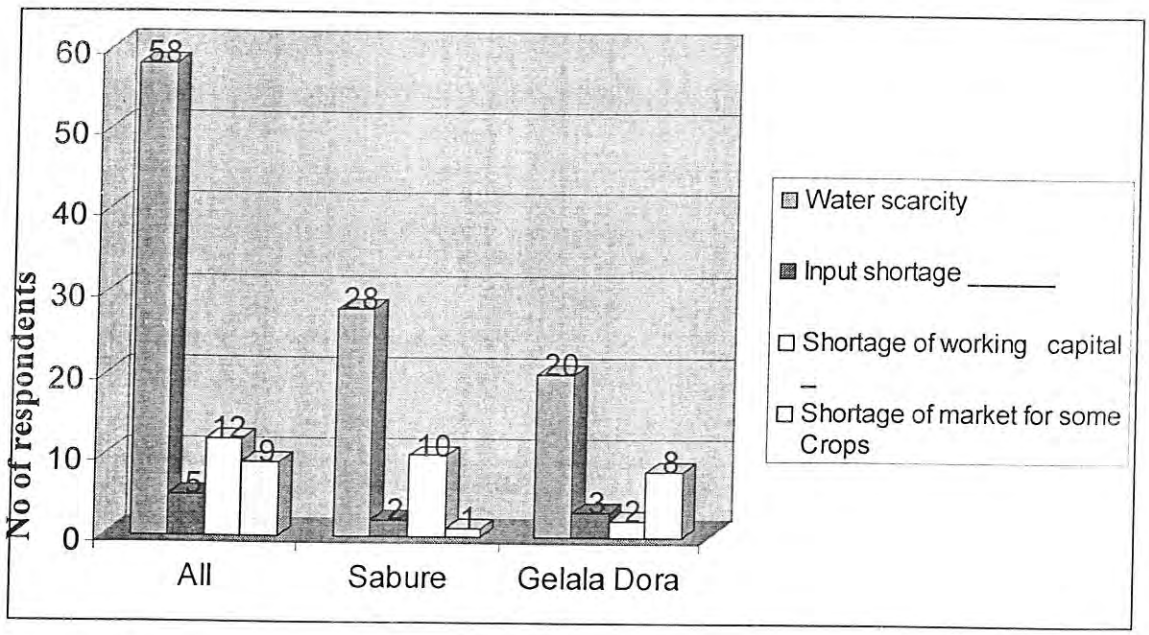
Among others, ability of double cropping and above, timely sowing and freedom to choose and cultivate one's own prioritized cropping pattern, are the most important attributes of an efficient and sustainable irrigation system (Mollinga, 2003, Ostrom 1976, Boelens, 1998). Table4.6 shows the opinions of sample irrigators at the two study areas about those attributes at their respective irrigation systems. Almost all in Sabure and 39% in Geleela Dora of respondents from all sample households have reported that they cultivate only once in a year, while 61% of respondents from Geleela Dora scheme able to produce twice per year (double cropping) .At the same time, 76% and 61% of respondents do not sow their crop timely at Sabure and Geleela Dora respectively(Table4.7).

Figure 4.7 Opinion of farmers on timely sowing of the crops



Source: Own Survey,2006

Figure4.8. Opinion of farmers on the problems they faced not to produce their prioritized crops at the two study areas



Source: Own Survey, 2006

Another important aspect in the artificial water scarcity at the study area is its likely impact on the pattern of crop production cropping pattern may depend on many factors among others availability of water (in time and quantity), working capital (finance, technology, labor), market availability, social factors, etc. To this end, interviewed households from the sample areas, 71% in Sabure and 50% in Geleela Dora reported that they have no freedom or are unable to cultivate their prioritized crops, which can grow in the area in one way or another (Table 4.7).

Table 4.7 Opinion of farmers on their rights to cultivate according to their priority

Did the farmer has right to cultivate own prioritized crops	Sabure (N=41)		Geleela (N=33)	
	N	%	N	%
Yes	12	29	15	47
No	29	71	18	53

Source: Own Survey, 2006

At Middle Awash as a whole including the case study areas, the smallholder farmers have well developed commercial mentality through production of horticultural crops, mainly tomato and onion. However, they faced problems to cultivate these crops. As shown in Figure 4.8 above, water scarcity and lack of working capital at Sabure respectively and in Geleela Dora, water scarcity, lack of working capital and lack of access to market are the major constraints for the farmers at the respective study areas not to cultivate their priority crop types at different levels. For example, at Geleela Dora Scheme from the 33 sample households interviewed, 76% are cultivating only maize, while 24% are cultivating onion and tomato on very small plots because of the reasons they have outlined above. According to them, these crops though profitable for them if cultivated, their production is capital intensive, they need more water than maize and their production season coincides with the main cotton production season of the large-scale commercial investors at the head end. Thus, as discussed earlier, during this period the volume of Awash River decreased below natural gravity level and therefore, it is unable to get water for the smallholder irrigators.

The same is true for Sabure irrigators too. The state farm does not allow the farmers to cultivate the same crops as it is cultivating. Otherwise, they have to cultivate the crops by jumping the main cropping season for these crops (onion and tomato). But, during the off-season for those crops, sowing them will result in very low productivity due to high pest and disease infestations.

In this regard, one important advantage of irrigation for crop cultivation is for increased crop productivity at normal condition (Mollinga, 2003). However, because of the aforementioned problems the farmers faced for adequate water, they could not fetch expected higher yield from their irrigated crop cultivation. Table 4.8 below shows the summary of crop productivity in unit per hectare of land for the various crops grown at the two sample schemes.

Table 4.8 Actual and expected productivity of crop types under irrigation in the two schemes

crop type	Present actual yield in Qn/ha		Expected normal yield in Qn/ha
	Sabure (Qn/ha)	Geleela Dora (Qn/ha)	
Onion	64	30	100-200
Tomato	62	33	150-300
Maize	18	25	100-150

Source: Own Survey, 2006

As the survey result shows in table3.8, it is possible to compare the actual productivity of the crops with the normal expected yield under irrigation. However, one might explain for the present low productivity at these sample schemes because of factors other than water, like soil fertility level, the researcher found from Werer Agricultural Research center's Soil section that this is not the case. Soils at Geleela Dora are rich in fertility naturally and do not need fertilizer. The crops productivity at Geleela Dora is seen to be lower than that of at Sabure. But this difference is nothing more than showing only the difference in the level of water scarcity at the two schemes.

Finally, to summarize the discussion on this section I would like to quote one important concluding remark made by (Bruns, 2005) stated as follows:

> *As competition for water grows among user group, water and water management organizations seek better institutional arrangement for coordinating use and resolving conflicts. Done right, water rights reform can secure access to water for existing users and offer equitable ways to meet additional water needs or demands establishing institutional arrangements to clarify rights and settling disputes.*

The researcher believes the above remark to be taken as a solution to fill the existing institutional gap in water sector at Middle Awash and get smooth functioning of the irrigation systems.

4.4.2 Institutions of Land Tenure

Regardless of the national policy of resources in which the right of ownership of all land is exclusively vested to the state and the people of Ethiopia, the land tenure system that is widely accepted and understood by the Afar pastoralists is communal ownership right. As Asegid (2002) clearly pointed out in his study on "managing common property resources in Gewane Woreda", there is a gap between the statutory (de-jure) and the customary (de-facto) property system in the Afar region. (see table 4.9).

Table 4.9. Gaps between statutory (de-jure) and existing in fact (de-facto) tenure systems in Afar.

Resources		Property Systems		
	Private	**National**	**Common**	**Open access**
Land(irrigable)		De-jure.	De-facto.	
Enclosure	De-facto		De-jure	
Well, pond and spring				
River water		De-jure.		De-facto.
Wet land		De-jure.	De-facto.	

Source: Adapted from Asegid, 2000

This survey result revealed that the communal ownership of land (especially irrigable land) at clan level was highly threatened by the increasing process of private enclosure of cultivable land by clan members. The land holdings per household varies from 1-10 ha and 0.5-28 ha at Sabure and Geleela Dora schemes respectively and with an average holding of 3.7 ha at Sabure and 2.6 ha at Geleela Dora. In this regard, 92% at Sabure and 79% at Geleela Dora got their irrigable land through free clearing of their clan land while the rest, 8% at Sabure and 21% at Geleela Dora got their land through allocation by their clan leaders.

4.4.2.1 The link between Land acquisition & land size with household production factors endowment

In this study, one important finding is that the introduction and there by the participation of the local communities in irrigated crop cultivation has resulted in gradual degradation and weakening of the past strong social institutions of mutual help, resources use and management and other rituals of the Afar community. It creates social differentiation in terms of access to irrigable land for the majority of the poor and particularly for the female-headed household clan members. Inequality both in wealth accumulation and access to and size of land holding by sample households is said to be one reflection of social differentiation.

At the two study areas, access to irrigable land and land size holding depends on two crucial factors. These are availability of family labor and financial capability of individual households. To this end, those households with large male family members above age of 15 and those who have the means to get money (these are indeed clan leaders, powerful elites, good livestock holders) have been able to access and get large size plots of irrigable land. This is all because land clearing requires sufficient labor in the area. Those who have sufficient family labor and those who have financial means are able to have from 4-10 ha of land. Therefore, access to farm land and size of plots holding by individuals is highly related to the number of male family labor and financial wealth. This has clearly been evidenced. That is from the 74 sample households at the two study areas, 73 were male-headed except one female- headed household at Sabure

scheme. All interviewed households having land size one ha and below when asked the reason for holding small plots, they all reported shortage of money to hire labor for land clearing or lack of additional male family members to help in land clearing. Therefore, according to the community informants. "any clan member as far as he/she has the capacity in one way or an other, he can clear and hold his private land unlimitedly from his clan land" . This was true upto the time of this study.

It was found that the present communal ownership of land tenure system at clan level failed to respond to the new and dynamic land use systems. This resulted in social differentiation in different aspects like inequality in access to irrigation, wealth accumulation and living conditions. It also proved to have clear negative impact on the sustainability of the smallholder irrigation development at the two study areas. In this regard, Ostuka (1995) noted, "even though crop cultivation has a potential advantage over pastoral land use, it is difficult to disseminate sedentary irrigation agriculture under traditional communal land ownership". This means that unless communal ownership of tenure system is changed to individualized tenure system (irrigable land) by securing private land rights, it will have greater impact on individual decisions to the various investments in irrigation activities.

The survey result showed that the majority of the interviewed sample households believed that they are not secured in their present irrigation activity under the communal land tenure system. Accordingly, 68 % at Sabure and 77% at Geleela Dora scheme need formal individual land reallocation of all irrigable clan lands under their respective territory. To this end, when asked their opinion about by whom they prefer their clan land (irrigable land) shall to be reallocated and distributed, 79%(Sabure) and 91%(Geleela Dora) of respondents reported that, it is better, if done by their clan leaders and elders through their customary rules supported by local governments. While 21% from Sabure and 9% from Geleela Dora told that the land allocation and distribution at individual level is better if done by government as has been done at other high land Regions of the country.

4.5. SUPPORT SERVICES FOR SMALLHOLDER IRRIGATION DEVELOPMENT& MANAGEMENT

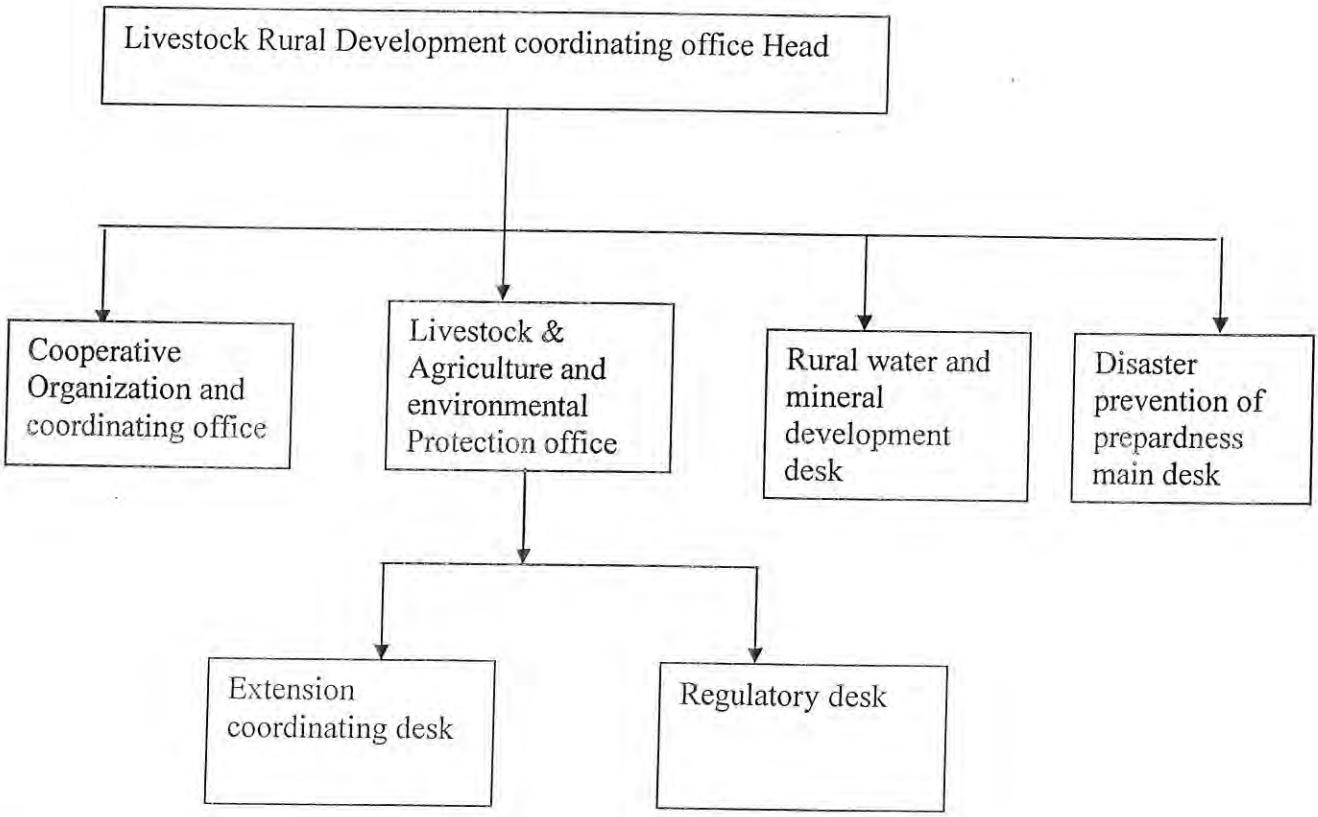
As it is well known, irrigation technology for crop cultivation is a complex practice, especially for those smallholder subsistence farmers (Mollinga, 2003, Boelens, 1998). Smallholder irrigators badly need adequate institutional support in many aspects including provision of infrastructure (hydraulic infrastructure), provision of agricultural inputs (improved seed, fertilizer, pesticides, and farm implements), extensions service and provision of credit services among others.

At the two study areas, the districts' pastoral and agropastoral offices provide supports and services for smallholder irrigators though it is not adequate. The offices provide improved seed(only maize) and extension services. Werer agricultural research center is also an important government institution in the area supporting the farmers through provision of improved seeds(onion, tomato, sesame, Groundnut, forage, sweet potato), training, technical assistances and others. In addition, FARM AFRICA, an international NGO working in Gewane district supports farmers in Gelela Dora scheme in various ways.

4.5.1. District Agriculture Offices

All the districts at middle Awash, southern Afar region have the following organizational structure.

Figure4.9 Organizational Structure of District Agricultural Office



Source: Awash Fentale Agriculture Office,2006

In Middle Awash including the two study districts, there is no a particular and responsible irrigation institution stood behind the indigenous smallholder irrigators. Unlike other Regional States of Ethiopia, such as Oromia, Amhara& Tigray, there is no irrigation desk in the structure of government administration, especially in the Rural and Agricultural offices at district and local levels (see figure4.9). Sample households have reported during the interview "as we have no capacity to invest for modern hydraulic infrastructure, we are using traditional diversion structures and poor canals which are vulnerable for frequent damage, siltage and poor water delivery".

Therefore, according to all interviewed sample households especially at Geleela Dora Scheme, they badly need irrigation infrastructure, mainly high capacity water pump more than any other types of supports.

Extension Service Provision

Although extension service has been provided for the farmers in the study areas, it is not adequate according to the irrigators. Development agents (DAs) have been assigned for them for technical assistance in their crop production. However, the DAs have no knowledge and skill in irrigation to assist the farmers. The other extension service provided by the district agricultural offices is improved seed and fertilizer supply. However, the improved seed provided by the agricultural office is only Maize. Ninety one percent of sample households got improved maize seed from their district agricultural office including farm implements like hoes, cutlasses and shovels. But at Sabure irrigation scheme, as 76% of them are cultivating cash crops (horticultural crops), they did not get seed supply from their respective government agriculture offices. Informants told as "the district agriculture office pressure us to cultivate maize rather than horticultural crops. The office said, horticultural crops are not included in the extension package of the program and so seed can not be provided". Therefore, 83% of respondents at Sabure told they got seed and chemicals from market while 9% of them have prepared their own seed by getting training for own onion and tomato seed preparation from *Werer Agricultural Research center* which is found in Middle Awash.

Credit Service Provisions

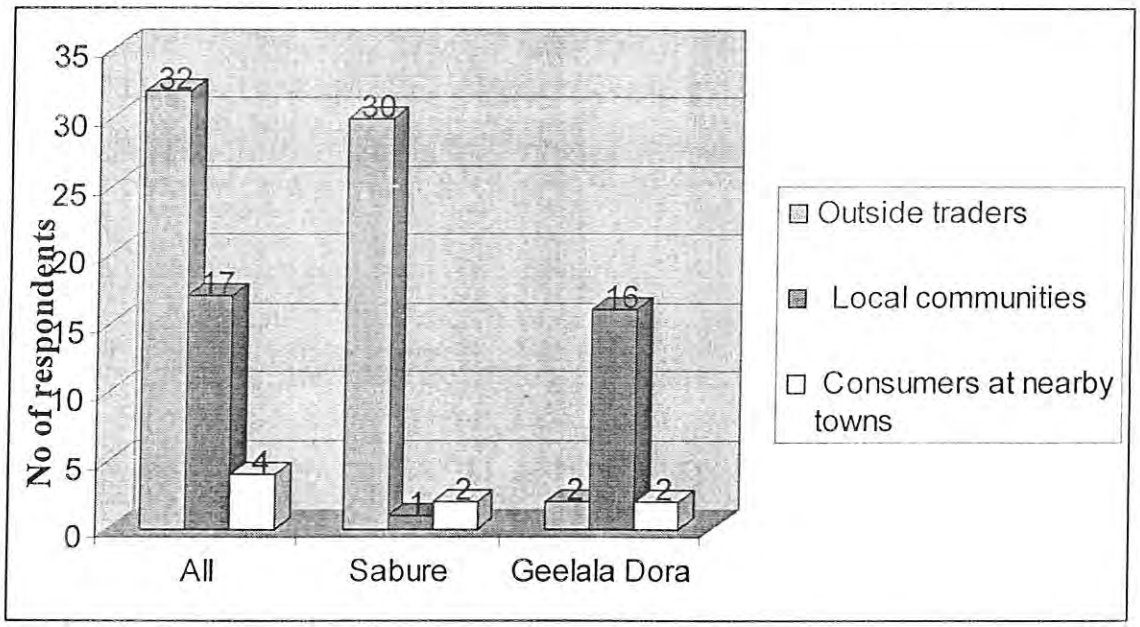
There is no credit providing institution in the study areas either from government or non-government organizations. Even there are no local traditional institutions providing credit for individuals. As a result, from interviewed all sample households, 95% at Sabure and 97% at Geleela Dora reported that they never have got credit for farm operation so far from any source including from individuals and relatives. When sample households asked: Do you need credit for your farm operation?, 100% from Sabure and 50% from Geleela Dora said "yes". Here the percentage of farmers who need credit at Geleela Dora is lower because of difference in the type of crops produced in the two areas. As the crops at Sabure are cash crops, they are capita intensive cultivation per hectare of production

and are greater in cost than maize cultivation. This is why as discussed earlier that sharecropping arrangements observed at Sabure schemes because of financial shortage.

Marketing

Related to the production of high value horticultural crops using irrigation is the issue of marketing (FAO, 2006). If high returns are to be realized from the marketing of perishable horticultural crops, then there is a need for easy access to markets and an organized marketing strategy and conducive physical and social environment. As to the marketing outlets, 95% at Sabure and 50% at Geleela Dora Schemes, their product market outlet is on farm sale, while 95% at Sabure scheme their buyers are traders coming from out side and at Geleela Dora Scheme, 90% of the sample households interviewed reported that their buyers are the local communities from their villages and neighboring localities (Figure4.10).

Figure 4.10 Marketing outlets at the study areas by number



Source: Own Survey, 2006

This difference in market outlets at the two schemes is because of difference in the nature of products at the two areas. In this regard, at Geleela Dora, the local communities as a whole are also benefiting from the irrigation scheme by getting grain to buy from where

they used to buy in the past by traveling long distances to high land markets out of their region.

Table 4.10 Product Marketing Conditions at the Two Sample Schemes

Marketing activities and farmers perception indicators	Sabure (N = 41)		Geleela Dora (N = 33)	
	No.	%	No.	%
1) Method of sale; - On farm sale - Take up to the buyer	 31 2	 96 4	 18 2	 90 10
2) With the help of brokers? Yes No	 30 0	 100 0	 4 16	 11 89

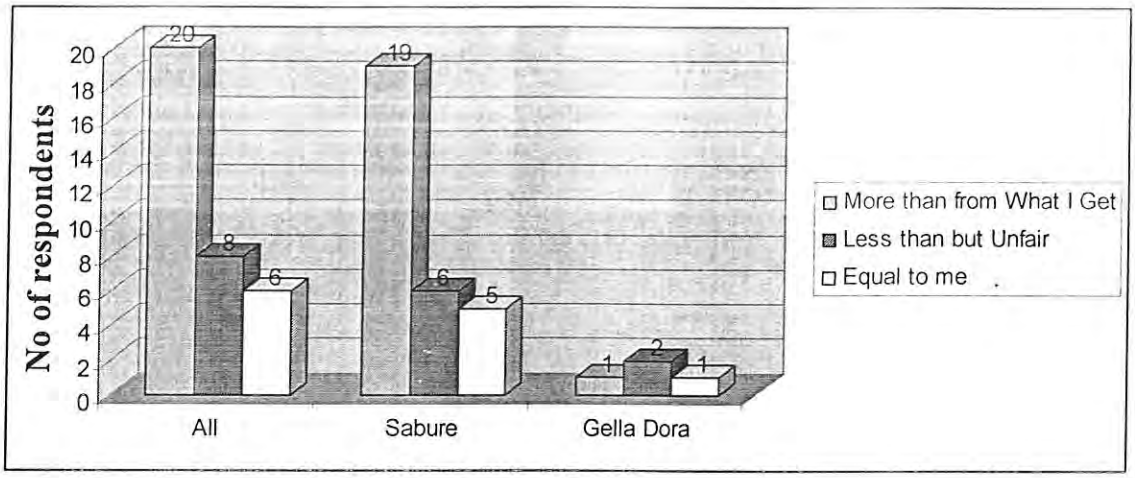
Source: Own Survey, 2006

The Sabure Scheme is very close to the main Addis Ababa-Djibouti asphalt road and to the Ethio-Djiboutti railway, which both are 45 km away from the scheme and linked with all weather good feeder roads. This makes access to potential markets to Nazareth and Addis Ababa cities and traders can easily came from those cities to their locality to buy and collect horticultural products from the Scheme.

However, this possibility of access to market by the farmers at the Sabure scheme is not by withstanding the major challenges they faced in the marketing process of their product. Absence of conducive social environment is their major challenge. The presence of unwanted market brokers (according to the farmers) and marketing complexities made by the local and district government administrators are the major problem creators and sources of greater marketing burdens on the farmers.

As shown in table 4.10 above, all interviewed sample households in Sabure have reported there are market brokers between them and the buyers. When asked their perception about the marginal profit taken by the brokers, 62% of respondents have said they believed that the brokers take more profit (Figure4.11).

Figure 4.11. Perception of farmers about the marginal profit taken by market brokers at the study areas

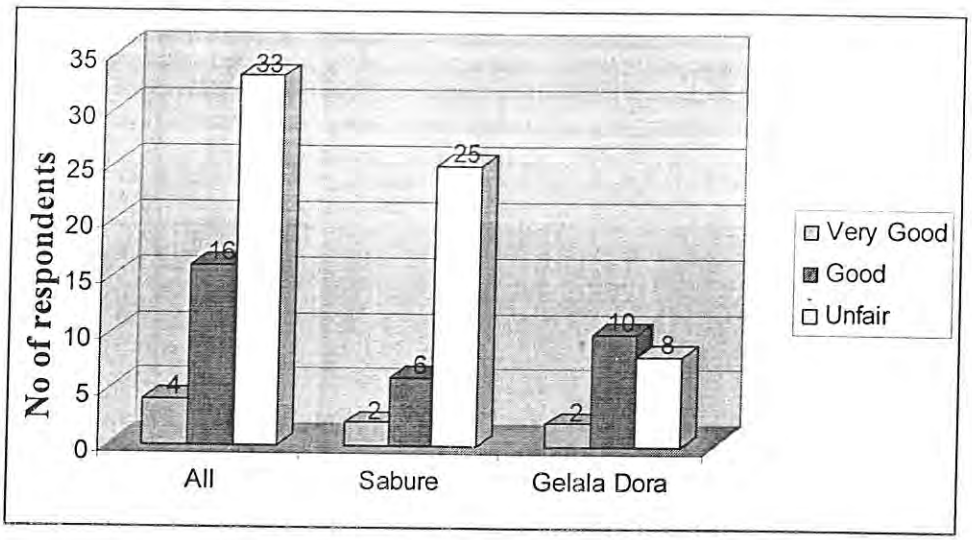


Source: Own Survey, 2006

According to My key informant, farmer and vice chairperson of the Sabure farmers' Association, has explained the situation very bitterly as:

> *We are very discouraged and seriously troubled by the unnecessary marketing complexities made by the local and district government officials, the local (kebele) administrative officials and their allies brokers (delalas). There is no justice at all. We are ill-treated by the officials. We do not need brokers because the traders coming from Addis Ababa know us. They know already the harvesting period of our crops. There is no problem of information. But the brokers being supported by the district government officials forced us to pay 200-300 Birr commission per one Isuzu car entered to our farm. The finance office asked us unfair and unreasonable sale tax, we have to pay for the police also but we do not know why? Even we cannot sell our product taking to Nazareth and Addis Ababa because the brokers spoil our market deliberately coming with us. The other major problem is, the price is totally determined by the brokers making agreement with the traders much below the market price.*

Figure4.12 Opinion by farmers on the price they get for their product at the study areas



Source: Own Survey, 2006

In the case of Geleela Dora scheme, lack of transport is their major problem for marketing. Though the scheme is very close to the main Addis Ababa-Djibouti asphalt road and Gewane town, which is only 18 km away, there is no feeder road to the Scheme. Therefore, they face problems to transport their perishable horticultural crops timely. This is another reason as to why they refrain from producing horticultural crops and forced to cultivate unprofitable Maize crop in addition to the water shortage.

4.5. SOME IMPLICATIONS OF SMALLHOLDER IRRIGATION DEVELOPMENT AT THE STUDY AREAS ON THE COMMUNITIES' LIVELIHOOD AND HOUSEHOLD LEVEL FOOD SUPPLY

This section discusses the last objective under this study paper. That is, it tries to elaborate what implications have the recent development of the smallholder traditional irrigation system on the general livelihood of the communities who were before 10-15 years used to follow a fully pastoral way of life; its impact on irrigators` household level food supply and welfare conditions and impact on household income generation. This aspect of irrigation development is what Mollinga (2003) explained it as "irrigation technologies have social effect".

4.5.1. Change on Communities Perception and attitude toward the Value of their natural resources (land and water) and toward life itself.

Through its social effect (as Mollinga,2003 noted), smallholder irrigation development by the local communities at the study areas since the past 10-15 years, has became as cause for a turning momentum on the life of the Afars both at community and individual levels in study areas.

According to the survey result, the community's perceptions and attitudes towards life in general has been changing in a visible way-changing perception on life from traditional to modern way of thinking. According to the people, in their traditional pastoral production system "life was simple". This was because the production system by itself requires simple production relations by its very nature. However, currently, situations are changing because of dynamism in land use and production system. A new production system has been introduced. That is mixed sedentary irrigated crop cultivation and livestock production. Therefore, as a result a different and new production relations have been introduced (as Mollinga, 2003 noted) other than the one used to be in the pastoral production system. My key informant from Geleela Dora scheme, explained the situation as follows:

> *Previously, when we used to follow and practice fully pastoral production system until mid of 1980s, life was simple for us, because our production system did not require complex relation of production. That means, the traditional livestock production system do not require skilled labor and extensive laboring and capital investment. Therefore, there was no need for us to have wider and extended social relation with external communities and institutions outside our territories. Accordingly, we used to be isolated our selves from the external world outside our territories and made confined in to narrow boundary. However, these days things are changing, we are entering into a new productions system with a new production relations. Unlike our*

past production system, the new production system requires technical skilled and intensive labor participation and capital investment and also demanding wider social interaction beyond our territories for all these requirement the new production system is demanding-input supply, market search for our product, labor requirement, need for external support and for others. Therefore, as a result of the all demanding process in the new production system, our perception and attitudes towards life has been changed together-change toward modern way of life.

Development of private thinking in resource management (irrigable land), gaining experience of saving money in bank which seems to be a recent phenomena in the rural Afar communities, house building in towns, loose of individuals responsibility at community level and more emphasis at household level, sending their children to formal schools are some of the reflections of modernity thinking in life observed at the study areas and middle Awash as a whole.

4.5.2. Contribution to Household income generation and Food Supply

Contribution to incomes:-

The development of the smallholder irrigation schemes have resulted in substantially good income for the smallholder local farmers. In Sabure Scheme, the incomes are as high as 10,000 Eth Birr per farmer per year, while the figure is 6000 in Geleela Dora scheme. But the figures seem to be smaller. This is because those farmers that are interviewed might have underestimated their incomes they got from irrigated crop cultivation for fear of the government tax or it may be related with government support for them. The information obtained from neutral key informants, farmers get income as high 15,000-30,000 Eth Birr per farmer per year in Sabure cash crop producing scheme. In this regard however, one important observation possible to see from this survey data is that there is a great variation in income farmers got. For example, in Sabure, the average annual income from irrigation activity is 5320 Birr with high standard deviation(2076)

from the average and it is 4256 Birr annual average income (with 1494 standard deviation) in Geleela Dora. The greater difference in income received by the farmers in both schemes is mainly attributed to difference in types of crops cultivated and the other is attributed to plot size difference irrigated by farmers.

Contribution to Household food supply:-

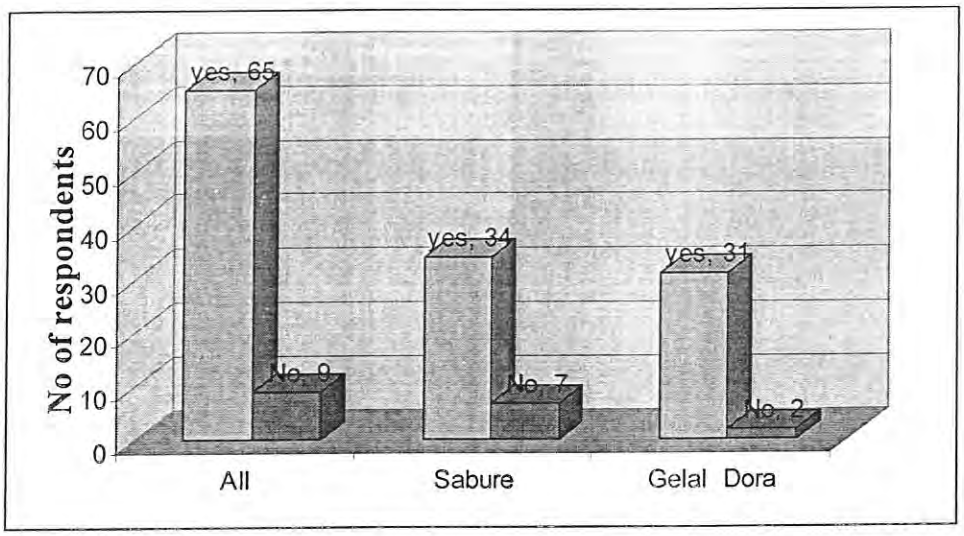
As has been shown earlier, in Table4.1, average livestock holding by sample households in the study areas is much below the average threshold for survival of households in the areas. According to the information obtained from the community and Gewane & Awash fentale district government officials, relief program through food Aid is the main source of food supply for the majority of the people in the district in the last 10-15 years. However, at the two study irrigation schemes, interviewed household irrigators reported that they are relatively better off than the non-irrigators in their localities and districts in terms of living conditions and household food supply.

Table 4.11 Major Source of sample households` food supply

Major source of Household food supply	Sabure *41(		Geleela Dora (N =33)	
	N	%	N	%
1				
- Livestock production	7	16	6	7
-Irrigated crop production	32	78	22	78
- Food Aid	2	5	5	15

Source: Own Survey, 2006

Figure4.13 Opinion by farmers on the contribution of irrigated crop production to their household food supply and income

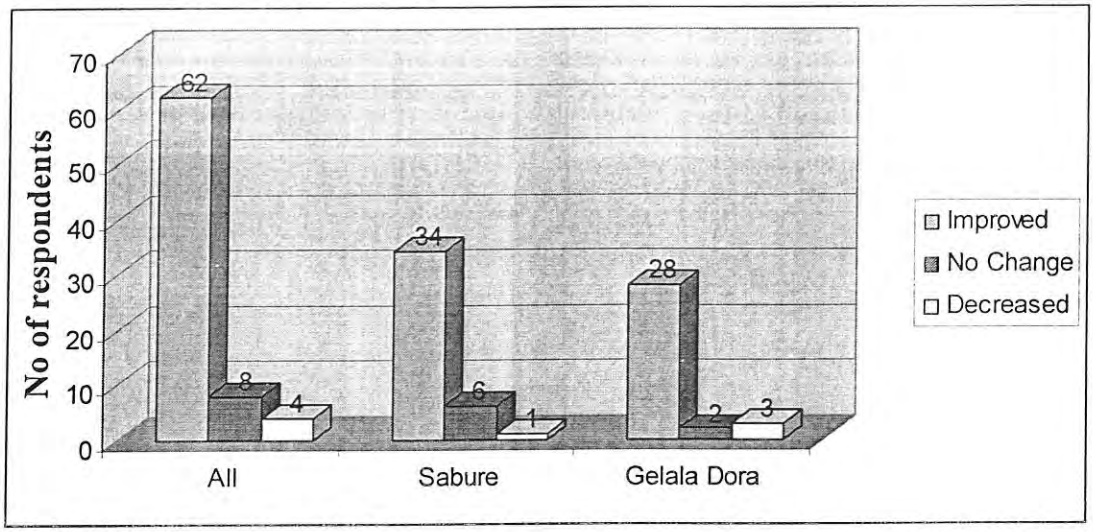


. Contribution of irrigated crop production (Yes, No)

Source: own Survey, 2006

As shown in Table 4.13 above, 78% of the interviewed households at both schemes of Sabure and Geleela Dora have reported irrigated crop production and activities related to irrigation (employment) is their main source of food supply for their households, while 16% at Sabure and 7% at Geleela Dora respondents have reported income from livestock production is their major sources for their household food supply followed by crop production. 85% in Sabure and 94% in Geleela Dora of interviewed sample household reported, irrigated crop cultivation has a great contribution for their household's food security either through production of consumable crops or through grain buying by the income they derived from sale of cash crops and wage employment in the schemes. In addition, 84% of respondents at both schemes when asked their over all opinion about their living conditions; reported that it has been improved after they started participating in irrigated crop cultivation. Where as 13.5% and 6.3% of respondents at Sabure and Geleela Dora schemes respectively, reported that no change has come at all in their living conditions from the time they were before the schemes. (Figure 4.14).

Figure4.14. Opinion by farmers on their living conditions after they have started irrigated crop cultivation



Source: Own Survey, 2006

CHAPTER FIVE

5. SUMMARY OF MAJOR FINDINGS AND CONCLUSION

5.1. SUMMARY OF MAJOR FINDINGS

Smallholder irrigation development at Middle Awash including the case study areas is the result and part of an ongoing politico and socio-economic transformation undertakings. Until 1980s, livestock production has been the backbone of the Afar economy when they used to pursue the pastoral way of life. Their lives stock wealth was considerable and they were almost entirely dependent on it for subsistence. However, this production system had been under going pressure over the last four decades and highly aggravated since the end of 1980s as a result its vulnerability to environmental stresses. In general the changing land use, politico-economic, demographic and institutional conditions and recurrent droughts since 1985 have contributed to the crises of pastoralism at Middle Awash (Gebre, 2002; Seid; 1994, Kassa, 2001).

Therefore, because of these ecological and environmental crises and others external factors together with their changing perceptions on the value of their land, the communities residing near the two sides of Awash river banks have started crop-livestock mixed production system. Sabure and Geleela Dora smallholder irrigation schemes are traditional irrigations systems initiated by the Agro-pastorals themselves since 1990s, by few local irrigators whose number has increased as the people got experience of irrigation and working capital. This study has made effort to clarify the state of irrigation management practices and the institutional arrangements in the two study schemes. The major findings of the study are summarized below, according to the research questions outlined to achieve intended objectives of the study.

5.1.1. Irrigation Management Practices in the Irrigation Systems

Establishment and presence of strong irrigation organization for both modern and traditional irrigation system, is very indispensable for efficient and sustainable irrigation activity. Smallholder irrigation is a recent phenomenal that came in to being in the two

study areas as an adaptation strategy to combat with the recurrent drought effect in the area. There is no formal water users Association established. But in Sabure irrigation scheme irrigators have established agricultural production association and got certificate from the Regional Cooperative Bureau since 2002, while in Geleela Dora they have informal irrigation organization.

At both schemes, the basic Afar traditional resource management principles and institutions were used for the management of irrigation. Lack of formally established WUAs at the two schemes had resulted in more impact for problems coming from outside than from inside the schemes.

The water committee (leech committee) organizes the members for canal cleaning and maintenance through resource mobilization. Members contribute money annually and labor as needed for these operations. However, as members contribute money and labor equally based on people rather than based on plot size by the internal rule set by the water committees, Irrigators having small plots at Sabure scheme have strong complaint.

Due to lack of experience in irrigation and financial capability by the irrigators at both schemes, the on farm channel design and network is too poor. These problems together with problem of land leveling are major problems in their traditional irrigations system through its effect in low water delivering capacities, frequent canal break off, flooding and frequent siltatiion problems. The problems are creating greater burden for irrigators on besides shortage in water received to their plots, faced with higher operation cost.

5.1.2. Institutional arrangements and Challenges

Lack of better institutional arrangements (for water and land) at Middle Awash as a whole including the case study areas is the major challenge for the productivity of the smallholder irrigations sub-sector during the time of this study.

The sole government institutions at Middle Awash (Awash Basin Water Resources Administration) in charge of all water management issues (control, allocation and distribution of water for users), has been seen to be unable to respond to the new additional water demand by the indigenous small holder irrigators, This is because the legal and institutional framework designed in the Agency's water law and policy since 1960s did not take in to account the present indigenous small holder irrigators and still not been adapted to the changing situations.

At basin level, water for irrigators is available only through State Agency's concession for large commercial farmers-concession of water through water-use right permit. Water is allocated for users according to water fees paid.

Though the indigenous smallholder farmers were informally entitled to use water freely, they are not secured to access water as they are made to compete water with those large commercial farms who were permitted to use water unlimitedly as far as they paid fees for the state agency. Therefore, these types of water-use institutional arrangements have led to a skewed and inequitable water distribution system, which only benefiting the large commercial farmers.

Therefore, the presence of institutional gap in the water sector has resulted in artificial water scarcity for the smallholder irrigators in the two case study areas.

Lack of access and control of their source of water for Sabure and seasonal scarcity of water for Geleela Dora schemes has affecting the productivity of the small holder's irrigation and also has influenced the types of crops they are producing. That is, though the farmers have developed commercial mentality, they are forced to cultivate unprofitable crops.

The present communal land tenure system in the area seems to be another obstacle for the sustainability of the smallholder irrigation systems. Irrigable land acquisition of farmers through free clearing the communal clan land became source of social differentiation.

Opposition from those who lack the means and capacity to clear land for irrigation and interest difference between groups of clan members on the land use system of their collective land is one area of conflict and so highly threatening the sustainability of the smallholder irrigation system. In this regard, according to interviewed sample households, the majority of them suggested formal land reallocation and distribution for individual clan members is indispensable.

5.1.3. Support Services provision

Lack of intuitional support and service provision from outside is another challenge the smallholder irrigators faced. The farmers badly need support in irrigation infrastructure construction, water pump and technical support provision. Lack of credit providing institution in the area is also major constraint to finance their irrigation activities especially for cash crop production. Extension service provision is not adequate also.

5.1.4. Contribution of Smallholder irrigation to Household food Supply and Income generation

Notwithstanding the many challenges faced by the irrigators, smallholder irrigation has contributed much for the farmers at the two study areas. Increased household income through production of high value horticultural crops and better access to house hold food supply through production, purchasing by income gained by crop sale and employment in the schemes, were the major contributions of the smallholders' irrigation to households in the schemes.

5.2. CONCLUSION

The study used the socio-technical approach to irrigation technologies as theoretical conceptual framework in examining management practices and institutional arrangements A number of concussions are drawn from findings of the study using the theoretical notions like social requirement for use, social effect and social construction.

Smallholders' irrigation management at the two study areas is poor. Besides lack of irrigation experience, poor water management at basin level in Middle Awash is another

problem. Because of inefficient River water management in the State's Water Agency at Middle Awash i.e. poor irrigation coordination, skewed water allocation and distribution for different users at different level of management capacity, and inability to resolve conflicts over water have resulted in artificial water scarcity for the smallholder irrigators at the sample study areas. This artificial water scarcity has seriously affected the farmers choice of crop and cropping pattern, time of sowing and also on the productivity of the small holder irrigation sector. It is possible to conclude that the problems related to irrigation management in the study areas is more of legalistic and institutional. The legal and institutional framework of the irrigation sector in Middle Awash, starting with the creation of Awash valleys Authority (AVA) in 1960s and the subsequent expeditions of water law and its regulations has been still on work with out adaptation and reforms. These past water laws and policies of the state Agency which are still working at present are in a new context of the country as a whole and Middle Awash in particular than the contexts in the past or those years.

Things have changed now with new social, political and economic contexts. Since 1991/92, the new EPRDF governments of Ethiopia has adopted free market economy, it has returned some of the ex-state farms to the local Afar community; As a result at middle Awash, medium and large scale private irrigators and smallholder irrigators have been introduced as a new actors in the irrigation sector in addition to the state farms. Therefore, a new-unbalanced social relation of power has been introduced. This has produced unequal water distribution as well as legal technical conflicts over the access and distribution of water.

Development of smallholder private irrigation activity on communal land Tenure system is highly threatening the individual investment decision and the sustainability of the sector. This is because decision on the future land use system of the communal clan land is vested on clan leaders and all clan members and so the present communal land use may be decided to a different land use and tenure arrangement against the interest of the present irrigators like leasing out the whole clan land for investors at any time by the clan leaders and other clan members decision..

Finally, the researcher suggests the following important notes for the sustainability, efficiency and productivity of the smallholder irrigation sub-sector in particular, and private irrigation sector in general in Middle Awash.

The institutions that influence access to water matter for many reasons. Improvement in households' food supply through increased irrigation productivity at the study areas greatly rely on availability of water timely and in adequate quantity. Therefore, access by indigenous smallholder irrigators to water must be insured, which implies granted collective access to irrigation.

Establishing better institutional arrangement to the water sector and irrigable land is highly required to clarify rights and settling disputes.

Therefore, the State Water Agency in Middle Awash has to adapt its institutional framework with the changing circumstances in the area in relation to water use. The agency has to react to the new additional irrigation water demand created by the smallholder irrigators. It has to design new policies and regulation systems for equitable water allocation and distribution system and for efficient irrigation management in general. The State water Agency, the Regional &Local government administrations and other relevant stake holders have to be coordinated and work in collaboration in all aspects including designing and planning of water use policies and regulations for the smooth functioning and efficiency of in irrigation systems in the area.

In addition, the Smallholder irrigators at the study areas and others in Middle Awash badly need institutional support and service provision mainly from Regional and local governments for their irrigation activities. This helps to ensue that the powerless and poor smallholder irrigators realize tangible benefits from using water. This is possible only if the traditional irrigators have the means-financial and technological to develop better irrigation infrastructure to use the water productively, provision of services to the farmers such as credit service, adequate extension services, technical assistance and training and provision of other incentives are the major intervention areas among others.

List of References

Abraham ,Getachew. (2004). Determinants and Constraints of off-farm labor participation among the people of Afar at Amibera district. Unpublished Masters Thesis, Addis Ababa University.

AESE. (1995). Food security, Nutrition and poverty alleviation in Ethiopia: problem and prospects. Proceeding of the Inaugural and First Annual conference of the Agricultural Economics Society of Ethiopia, 8-10June 1995, Addis Ababa, Ethiopia.

Ali ,Seid. (1994). "Pstoralism and State policies in Middle Awash Valley". African Arid lands, working paper series No31 1994

Alula ,Pankhurst.(2001). Institutionalization of Irrigation in South Wello. in Alula Pankhurst, (2001). (ed.). Institutions for Natural Resource Management: Thematic Briefings, FSS (Ethiopia) and University of Sussex (UK).

Awash Valley Authority. (1968). Annual Report, 1968, Addis Ababa

Ayalew, Gebre .(2001). Pastoralism under Pressure. OSEREA 2001, Addis Ababa

Blank, Herbert G, Clifford M. Mutero and Hammord Murray-Rust, (eds). (2002), The Changing Face of Irrigation in Kenya: Opportunities for Anticipating Change in Eastern and Southern Africa, Colombo, Sri Manka: International Water Management Institute.

Boelens, Rutgerd and Davila ,Gloria (eds) .(1998).Searching For equity: conceptions of justice and equity in peasant irrigation. van corcum, 1998

Bohle, H.G. (1993). "The Geography of vulnerable food system", in (eds) Bohle, H., J.E Downing, J.C Field, and F, N. Ibrahim, Coping with vulnerability and criticality. University Freiburg, Freiburg.

Bruce John W. et al. (eds).(1995). Searching for land tenure security in Africa.

Bruns, B. Randolph Ringer, Clavdia and Ruth Meinfen Dick (eds) .water Rights reform: Lessons for Institutional design. IFPRI, Washington D.C, 2005

CTA. (2001). Water Management: proceedings of a CTA Seminar. Cordoba, Spain, 20-25 September 1999. Aniane, France: Louma productions.

Debebe ,Habtewold. (1993). "Rural vulnerability in Ethiopia : the need for micro level assessment", in the proceeding of incorporating food and nutrition issues in to development plan, projects and programs, August 24-septem2, Nazaret.

Debebe ,Habtewold. (1995). "Food security: A Brief Review of Concepts and Indicators", in Mulat Demoke, wolday Amha, Simeon, Jesfaye Zegeye (eds). Food Security, Nutrition and poverty alleviation in Ethiopia, Agricultural Economics society of Ethiopia, First Proceeding 8-9 June 1995.

Debebe ,Habtewold. (19995). Food security, Nutrition and poverty alleviation in Ethiopia: problem and prospects . Proceeding of the Inaugural and First Annual Conference of the Agricultural Economics Society of Ethiopia, 8- 10 June 1995, Addis Ababa, Ethiopia

Degene, Aredo. (1994) ."Land Tenure and Resource conflict in Awash Valley" in Rahmato (ed), land tenure and land policy in Ethiopia after the Derg, 1994, Addis Ababa.

Degene, Aredo. (2000). "Institutions: A Conceptual Framework" in EEA and AAU (2000). Institutions, Resources and Development in Ethiopia. Proceedings of the Ninth Annual Conference on the Ethiopian Economy, Oct. 8-9, 1999, Addis Ababa, Ethiopia.

Desalenge ,Rahemeto. (1999). Water Resource Development in Ethiopia: Issues of sustainability and participation. FSS Discussion paper. Addis Ababa Ethiopia.

EEA and AAU. (2000). Institutions, Resources and Development in Ethiop: proceedings of the Ninth Annual Conference on the Ethiopian Economy. Oct .8-9, 1999, Addis Ababa, Ethiopia

Engel, P.G.H. (1997). The social Organization of Innovation: A focus on stakeholder Interaction .Amsterdam: Royal Tropical Institution (KIT).

Ethiopian, Interim Poverty Reduction Strategy paper 2000/01- 2002/03.(2000). Addis Ababa, Ethiopia (Reprinted from world Bank Document Report No 21469-ET, January, 30,200).

FAO. (1995). Irrigation in Africa in Figures. FAO: Rome

FAO. (1986). Irrigation in Africa South of the Sahara. FAO Investment Center Technical paper No. 5. FAO Rome.

FAO. (1997) . Farm Management for Asia: A systems Approach. Department of Agricultural and Resource Economics, University of New England Australia

FAO. (2000). Socioeconomic impacts of Smallholders Irrigation Development in Zimbabwe. Safr, Harare.

FDRE .(2002). Food Security Strategy (FSS). Addis Ababa, Ethiopia

FDRE. (2002). Food security strategy (FSS). Addis Ababa Ethiopia

Fiona, Hinchcliffe, John Thompson and Jules N. Prety. (1996). Sustainable Agriculture and Food Security in East and Southern Africa: An Empirical Analysis of Current Initiatives and Review of the Literature. Stockholm: Sweedesh International Development Cooperation Agency (SIDA).

Frank Place Michael, Roth Peter Hazell. (1993). "land Tenure security and African tural Performance in Africa" Over view of research methodology" in W. Bruce et al (eds). Searching for land tenure security in African. Kendal Hunt pub com, 1993.

Getachew ,Kassa. (2001). Among the pastoral Afars :Change and Continuity. OSEREA, 2004 ,Addis Ababa

International fund for Agric. Development (IFAD) .(1992). "The state of world rural poverty: IFAD evolving experience, a technical paper" .Rural Poverty Alleviation Nutrition. Staff working paper series, Rome

Laban.P. (1995). "Accountability in Integrated Village Land Management" in J.P.M.Vanden Bleemer et al (eds.) Local Resource Management in Africa. John Wiley and Sons Ltd, 1995.

Lyne, Coppock. (1983). The Borana plateau of Southern Ethiopia: Synthesis of Pastoral Research, Development and change 1980-91, Executive summary. ILCA. System study, no. 5 ILCA, Addis Ababa

Maxwell, S and Smith, S. (1992) "Household Food Security: a conceptual review: in Maxwell, S and T. R. Fran Kenberger (eds), Household Food Security: Concepts, Indicators, Measurement (A Technical Review), UNICEF and

IFAD, Rome.

McKinley ,Terry. (1994). Implementing Complementary Method of poverty Measurement

Merill-Sands, D. and D. Kaimowitz. (1990). The Technology Triangle: Linking Farmers, Technology Transfer Agents and Agricultural Researchers. The Hague: International Service for National development.

Middle Awash Agricultural Development Enterprise (MAADE). Annual reports of 1993-1994

Mollinga, Peter P. (2003). On the Water Front: Water Distribution, Technology and Agriculture Change in a South Indian Canal Irrigation System. Orient Longman Private Limited: New Delhhi.

MOWR .(2000). Ethiopian water Resources policy.MOWR,Addis Ababa.

MOWR. (2002). Ethiopian water sector Development program 2002-2016. Main Report.

Nigussie ,Taffesse . (2002). The Role of Irrigation Development in Enhancing Household Food Security: A case Study of three Small-Scale Irrigation Schemes in Southern Nations,. Nationalities and People's Region. Unpublished MA Thesis, Addis Ababa University.

North, C. Duglous. (2000). "The New Institutional Economies and Third World Development", in Harris, J., Janet Hunter and Coline Lewis (Eds), 2000. The New Institutional Economics, New York: Roteledge.

North, C.D .(1990). Institutions, Institutional Change and Ecnomic Performance. New York.

ODI. (1995). Recent Trends in Irrigation Managemnt: Changing Directions for the public Sector, Natural resource Perspective. London: UK.

Otsuka. K. (2004). Land Rights Institutions and the efficiency of natural resource management in marginal areas. Foundation for advanced study on international development Mansholt lecture at Wageningen University, January 20, 2004.

Poverty Reduction Strategy Paper of Ethiopia .(2002). Final Report, Addis Ababa

Richard,Chambers. (1992). Rural Appraisal: Rapid, relaxed and participatory. IDS Discussion paper; 311

Ruthenberg, Hans. (1995). Innovation poverty for small farmers in the tropics: the economics of technical innovations for agriculture. Oxford, England clarend on press

Sen, A. (1981). Poverty and Famines, Clarendon Press, Oxford

Sen, A.K .(1994). 'Poor, relatively speaking', in Resources values and Development, Oxford, Basil Black well, 1994

Shawki,B. and Guy Le Moigne. (1990). Irrigation in Sub-Saharan Africa: The Development of Public and private Systems. W.B Technical paper No. 123, Washington D.C

Sisay ,Asefa .(1995).Combating Rural Poverty and Hunger in Africa: Introduction. African Rural and Urban Studies, African Study Center and Michigan State University Press. East Lansing.

Sisay, Asefa .(1995). "perspectives on Agricultural Poverty, Rural Poverty and food insecurity in Ethiop". In Mulat Demoke, wolday Amha, Simeon, Tesfaye

Zegeye (eds).(1995). Food Security, Nutrition and poverty alleviation in Ethiopia. Agricultural Economics society of Ethiopia, First Proceeding 8-9 June 1995.

Sterin ,Peter. H. (1998). Operations and Maintenace of Small-Scale Irrigation Schemes. UK: International Technology Publications LTD.

Tegegn ,Gebre Egiabher. (2000). "Institutions and Local Development in Ethiopia: The Case of east shoa". In EEA and AAU .(2000). Institutions, Resources and Development in Ethiopia. Proceedings of the Ninth Annual conference on the Ethiopian Economy. Oct. 8-9, 1999, Addis Ababa, Ethiopia

UNDP.(1997). Human Development Report. Oxford University Press, New York, 1997.

Webb, Patrick and Joachim Von-Braun. (1994). Famine and Food Security In Ethiopia: Lessons for Africa. The International Food Policy Research Institute (IFPRI). John Wiley and Sons Ltd: England.

Webb, Patrick. (1991). When Projects Collapse: Irrigation Failure in the Gambian from a Household Perspective. Journal of International Development Vol. 3 No. 4, July 1991. Washington, DC, USA.

Woldeab ,Teshome. (2003). Irrigation Practices, State intervention and Farmers Life-worlds in Drought Prone Tigray, Ethiopia. Ph.D Dissertation, 2003. Addis AbabaUniversity.

World Bank .(1986). Poverty and hunger: Issues and Options for food Security in Developing Countries. WB Policy Study, Washington D.C

World Bank .(1986). The Challenge of Hunger in Africa: A Call to Action. WorldBank, Washington D.C

World Bank .(2000). Case Studies in Participatory Irrigation Management. WBI Learning resource Series. Washington, D.C: The World Bank.

Yeraswork, Admassie. (2000)."Indigenous common property Resources Management" in Alemu Mekonnen and Degene Aredo (eds).In Situations, Resources and Development in Ethiopia. Ethiopian Economic Association Proceedings of Ninth Annual Conference October 8-9, 1999.

Yirgalem ,Asegid. (2001). Common Resource Management on returned ex-stat farms in Afars, Middle Awash: Challenges and Opportunities. Farm Africa, 2001, Addis Ababa.

Annex-I household level Questioner

Addis Ababa University

Regional and Local Development Study

Irrigation Management and Institutional Arrangements: The Case of Two

Small Holder Irrigation Schemes in Middle Awash

Household level Questioner

Instruction/Interview Guide

I am conducting a survey to find out what irrigators and other stakeholders think about the institutional setting, management and challenges of Gleela Dora kebele of Gewane wereda and Sabure kebele of Awash Fentale woreda Small-Scale Irrigation System. A representative sample of beneficiary households in the irrigation system has been selected for interview in this study. This will give you the opportunity to 'have a say' and your taking part will make a great contribution to the study.

Tell the respondent that the result of the study, including his suggestions will help stakeholders in the irrigation sector and policy makers to take useful and appropriate measures to improve the institutionalization, management, productivity and sustainability of the irrigation systems. Inform him/her that everything he/she says will be treated confidentially. No names will be attached to any information he/she provides. Thereafter, request him/her kindly to provide us with genuine responses.

Specifically, Dear Enumerator:

1) Make a brief introduction to each farmer before starting any question
2) Introduce yourself by greeting a farmer in the local way, tell him your name, and make clear the purpose of the questionnaires
3) Weight until agreement is shown
4) Ask each question clearly and patiently until the farmer understands your point
5) Please probe the interviewee to give accurate responses when you think the question is sensitive and he/she is reluctant to respond
6) Please fill out the questioners according to the farmer's reply; don't put your opinion
7) Please circle multiple 'yes' responses for al questions having choices

Thank you Alemayehu Eshete

I. General information

1.1 Particular of Household Member Questionnaire no_____

1. wereda	2. kebele	3. clan /ethnicity
4. name (head of household)	5. family size	

6	7	8	9	10	11	12	13
No	House hold member	Sex	Age	For members aged 5 years and above	For members aged 10 years and above engaged in productive works	If no	If yes
	Family member r/n code	Male = 1 Female = 2		Education status code	Yes = 1 No = 2	Reason for not working	Major occupation
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							

Family relation
Head = 1
Spouse =2
Son/daughter =3
Brother/sister =4
Father /mother =5
Other relatives =6
Non relatives =7

Education
illiterate = 1
read/write =2
primary education =3
above primary =4
other =5

other reason =6

Reason for not working
unemployed=1
student =2
domestic service =3
old =4
disabled =5
laborer at State farm =6

Occupation
farmer on own land=1
livestock keepers= 2
trader =3
employer = 4
labourer at private farmer =5

1.2. Accesses to or use of services for the household

15	16	17	18
No	Service	Distance (km)	Does the household use/ the services Yes = 1 No = 2
1	Primary /elementary school		
2	Junior/ secondary school		
3	Senior /high school		
4	Health station /clinic		
5	Health center		
6	Hospital		
7	Drug store/ pharmacy		
8	Veterinary clinic/ service		
9	Flour mill)		
10	Market (primary		
11	Market (secondary)		
12	Potable water		
13	Transport /road network		
14	Postal service		
15	Telephone service		

19. Do you make a lively hood now from? (Circle multiple 'yes' responses if any)
    - 19.1 Animal husbandry
    - 19.2 crop husbandry
    - 19.3 share from leased clan land
    - 19.4 wage from labor employment in farms
    - 19.5 permanent employments in farms
    - 19.6 Trades
    - 19.7 other (specify) _____
20. Rank the relevant means of line hood in order of importance for the house hold from 1 to 3 (write the corresponding numbers as 2.1, 2.2, etc)
    - 20.1 1st _____
    - 20.2 2nd _____
    - 20.3 3rd _____

IIA. Irrigation practice

21. For how many years you have practiced cultivating irrigated crop? (Answer should be in number of years as 1, 2, 3, etc)
22. How many hectares do you cultivate now? _____ Hectare
23. Which crops you cultivate in 1997/98 cropping season?
    1. Cotton ____ ha
    2. Onion/ tomatoes _____ ha
    3. Sesame ____ ha
    4. Maize _____ ha
    5. Other (specify) ___ ha
24. How many times you cultivate crops in a year?

1. only one time
2. two times
3. through out the year

25. If only one time in question11, what is/are your reasons
26. Did you sow your crops on time (before passing the sowing date)
    1. Yes 2. No
27. If no for question no 26, why?
    1. Shortage or problem of timely access to water
    2. Shortage of tractor for early ploughing
    3. In ability to gate seed early
    4. Hired labor shortage
    5. Finance shortage for operation
    6. Other (specify) _____
28. What are the reasons for the problems you state in question 27
29. Do you cultivate or can you culminate any crop type in the area as per your own priorities and interest?
    1. Yes 2. No
30. If your answer is no for Qn 29, is there any body in the area who decide or select the types of crops you cultivate on your land?
    1. Yes 2. No
31. If your answer is yes in Qn 30, who decide or select the types of crops you cultivate? Give multiple responses of any)
    1. Irrigation committee of the association
    2. The state farm
    3. The investors
    4. Large land size irrigators
    5. The clan leaders
    6. The Woreda Agriculture office
    7. Other (specify) _____
32. If your answer is no for both Qn 29 and Qn 30, what affect you not to cultivate the types of crops you want or prioritise. (Give multiple responses of any)
    1. Water scarcity /seasonality of water availability
    2. Input shortage (seed, chemicals etc)
    3. Labor shortage /seasonality of labor a violability
    4. Some crops are capital intensives
    5. Market problem for some crops
    6. Other (specify) _____
33. Please Rank the first two major problems you indicated in an 32 according to their relevance.
    33 1st _____
    33 2nd _____

IIB. Irrigation management practice

34. Water Management

34.1 What is your source of water?

1. Direct pumping from river by own pump

2. Direct pumping from river by common pump
3. By Siphoning from others
4. other (specify)

34.2 Which of the following irrigation types you used

1. flood irrigation
2. furrow irrigation

34.3 If your answer for question 34-2 is flood irrigation why you used it?

1. No experience for furrow irrigation
2. Problem of land leveling for furrow irrigation
3. Other (specify)

34.4. Do you get enough water for irrigation?

1. Yes 2.No

34.5 If your answer is no for Qn 34-4 what do you think are the reasons? Please rank the following in order of importance for you (from 1= most important reason and the next 2nd, 3rd ...etc)

1. Water scarcity b/s of low volume from the source
2. Poor coordination of water distribution
3. Limited access to water-Water scarcity
4. See page loss
5. Water theft
6. I am tail-end irrigator, water does not reach
7. Shortage of infrastructure (Pump, channel)
8. Low pump capacity
9. Unsuitable canal not work for small holder irrigators
10. Other (specify) _____

34.6 I know or heard that limited access to water/water scaraty is your problem, which of the following are the major causes? Please rank them according to their importance for you (start or give 1= for most important caused 2nd ...3rd etc/

1. Prohibited/ denied by the state farm to access freely
2. Prohibited/denied by the investors in the area to get access freely
3. Unfair water allocation and distribution by the water committer.
4. Shortage of irrigation infrastructure (pump, channel construction)
5. Increasing number of water users for irrigation
6. In adequate coordination of water distribution
7. Other (specify) _____

34.7 What do you feel about performance of WUA Committees in the management of water distribution in the scheme?

1. Enough water is not received? 1. Yes 2. No
2. Water is not received when needed? 1. Yes 2.No
3. Water distribution is unfair? 1. Yes 2. No

34.8 If you answer for Qn 34.7. 3 is yes, which socio-economic groups consume or use more water? (Circle multiple responses if any)

1. Farmers with large irrigable land
2. Head end farmers

3. Farmers who cultivate cash crops
4. Farmers with large family size
5. Other (specify)_____

34.9 do you think the water guard distribute water fairly according to the schedule? 1. Yes 2. No

34.10 What are the major management problems related to water distribution in the irrigation system (if applicable) (Circle multiple responses if any)
1. Rules & regulations are not practically implemented
2. Sanctions not imposed against illegal water users
3. Rotations are not strictly implemented
4. Poor coordination of water distribution by WUAs Committee
5. Other (specify)_____

35. Infrastructure Management and participation

35.1 What is your opinion about the internal irrigation organization of the irrigation system so that the irrigation system performs efficiently (the internal canal net works, water delivering capacity etc) (circle only one choice)
1. Well organized
2. Poorly organized
3. Fairly organized

35.2 If your answer to the previous question is poorly organized (choice2) how and why? (Circle multiple yes responses if any)
1. Water delivering capacity of the canals are low/not adequate in general
2. The internal canal delivering capacity is not uniform for all plots of lands and so it is unfairly constructed
3. Enough water do not reach to my plot
4. Water does not reach to tail-end user's head-end-users use more water
5. There is high water seepage
6. The canal maintenance is poor
7. The design construction for the internal canal net work is not suitable for small holder individual irrigators
8. Other (specify)

35.3 If the maintenance of canals is poor (if applicable) what do you think and the causes? (Circle multiple yes responses)
1. Poor coordination of maintenance activities by WUA committee?
2. Poor imposition of sanctions on reluctant users?
3. Reluctance of some members for contribution?
4. Breaking of canals by illegal water users?
5. Cost of maintenance is high and not affordable by members
6. Other (specify) _____

35.4 Do you participate or contribute in the following?
1. Canal construction, maintenance, clearing
2. Pump operation (if applicable)
3. On member meetings
4. Other irrigation activities (specify) _____

35.5 How often you participate or contribute in the precious question's activities

1. Always as need arised
2. Some times

35.6 Over all, which of the following are the major problems you think in the irrigation system? Please rank them form 1-the most important, 2- 2nd important actc as relevant to you.

1. Access and use of the main and secondary government managed canals
2. Poor internal canal network/poor internal irrigation organization
3. Flooding problem
4. Timely access to water
5. High siltation problem
6. Poor drainage system and saltation
7. Shortage of high capacity water pump (if applicable)
8. Other (specify)

IIIA. Land tenure

36. How did you obtain land for irrigation (circle multiple 'Yes' response if any)
    1. Own share allocated by customary rule from clan land
    2. By clearing clan land
    3. Leasing in from others
    4. Inherited from family
    5. Share cropping with others
    6. Other (specify) _____
37. From the total land you have in part II Qn. 44 how much is? Specify the share
    1. Share from clan land sub division ___ ha
    2. free clearing _____ ha
    3. leasing from others in ___ ha
    4. share cropping ___ ha
    5. other (specify) ___ ha
38. Did you face problem of access to irrigation land 1. Yes 2. No
39. If yes for question46, why? Please list out the reasons
40. Do you support that leasing your clan land to investors
    1. Yes 2. No
41. If yes for the pervious question what is the reason for your answers? please list them down

    _____

    _____
42. Who decide to lease or when leasing your clan land for inventors?
    1. clan leaders only
    2. clan leaders after consultation with all clan members
    3. clan leaders and local administrators together
    4. other (specify)
43. Which of the following land tenure institutions in your opinion is better so that the whole clan members can be benefited from irrigable land?
    1. Individual tenure institution
    2. communal tenure institution

44. If your answer is choice 1 in question 43, who do you suggest the land sub division should be done?
    1. by our customary rule only
    2. by government reallocation as done for highlanders
    3. by our customary rule supported by local authorities
    4. other (specify) _____
45. Which of the following bundles of right do you have on the land you own (circle multiple 'yes' responses if any)
    1. Selling to others of non clan member
    2. Selling to other clan members
    3. Renting to others freely with out influence
    4. Inheriting to others non clan members
    5. Inheriting to other clan members
    6. Inheriting to children (males)
    7. Inheriting to children (females)
    8. Inheriting to wife
46. How do the fact that absence of clear land tenure policy on irrigable land affects small holder irrigator by your opinion?
    1. It discourages us to invest in irrigation infrastructure and activities
    2. It affects or influence us to get access to credit using our land as collateral
    3. It aggravates conflict and decrease land productivity
    4. other (specify) _____

III B Water rights

47. Can you access and use water from the government managed channels? (For those near the government channel systems)
    1. Yes 2. No
48. If yes for Qn. 47 what criteria or obligations you have to fulfill to access and use? (Circle multiple responses if any)
    1. Registration and fee paying by directly communicating with government water authority
    2. Negotiating with state farms or investors
    3. Informal using from the channels using siphones
49. If your answer for Qn 48 is choice 2 or 3 what is /are your reasons not to use formally or legally?
    1. Unable to get permission or denial for registration by the government water authority?
    2. Because of long beauro critic process for registration
    3. High water price and so unable to pay fee?
    4. As the water is our own property I have to use it freely?
    5. The state farms or investors prohibit me to use formally?
    6. Other (specify)_____
50. From the following bundles of rights which of them do you have on the water in your irrigation system?
    1. Access
    2. With drawal

3. Management
4. Exclusion
5. Transfer

51. If you have no rights in all or some of the rights in Qn. 50 what are the main reasons? (Circle multiple responses if any)
    1. I have no land right at all on the irrigable land as I am not member of the clan
    2. I have no my own land though I am the member of the clan
    3. The communal customary rules do not allowed me to do so though I am a member
    4. I do not know or tried to exercise the rights yet
    5. Though I know that I have the rights the state farm or the influential large area cultivators prohibit me to exercise the rights I have on the water
    6. Other (specify) _____
52. Do you feel the government water authority treat you equally with all users (state form, large area private producers etc)
    1. Yes 2. No

IIIC. Resource conflict and management

53. Have you ever faced conflicts in relation to your irrigation activities especially on land or water? 1. Yes 2. No
54. If your answer to Qn 53 is yes, what are the causes? (circle multiple responses if any)
    1. Conflict over access to irrigable land with own clan members
    2. Conflict over access to irrigable land with clan leaders
    3. Conflict over land with neighbor clans
    4. Conflict over land with large investors
    5. Conflict over land with state farm
    6. Water theft
    7. Water scarcity
    8. Competition due to increasing number of small holder water users
    9. Lack of proper control of water distribution by the water committee
    10. Water competition with the state farm or investors
    11. Other (specify) _____
55. In your opinion, have your internal by laws been enforced (in relation to water allocation) distribution conflict management 1. Yes 2. No
56. If your answer is no to the previous question what are the major reasons? Please rank the following from 1- most important to 3- least important
    1. WUA committee members are reactant
    2. Users do not respect the decisions of the WUA committee
    3. Lack of external support in water and conflict management
57. How did the conflict you have over irrigable land resolved? (circle multiple responses if any)
    1. Through the customary rules
    2. Through the local government intervention
    3. Through formal court
    4. Through own negotiation with the other parties
    5. Not resolved at all

58. If your answer for the previous question is not resolved at all (choice 5) what are the reasons you think? (Circle multiple responses if any)
    1. The customary conflict management institutions has been weekend than before?
    2. The local government did not willing to intervene to resolve the conflict
    3. The local government officials sided to large and influential farmers
    4. Other (specify) _____

IV. Input-output marketing and support services condition

59. From where you get seed? (circle multiple 'yes' responses if any)
    1. Gift from investors
    2. Buying from investors
    3. Buying from state form
    4. Buying from were research center
    5. From woreda agricu burea
    6. Own seed preparation
    7. Other sources (specify) _____

60. Do you use fertilizers? 1. Yes 2. No
61. Do you use improved seed? 1. Yes 2. No
62. From where you get fertilizers /pesticides (circle multiple 'yes' responses if any)
    1. Gift from investors
    2. Buying from investors
    3. From woreda agric-office (specify if buying or gift)
    4. Buying from state farm
    5. Buying from market
    6. Buying from individual merchants in the area
    7. Not used at all
    8. Other source (specify) _____
63. Who operate on your farm?
    1. own operation with family labor
    2. by employing labourer and own operation
    3. by hiring labour only
    4. other (specify)
64. If you hire labor in Qn. 63, from where you hire?
    1. from the local Afar laborers
    2. highlanders
    3. both
    4. other (specify)
65. How is hired labor availability in the area for your farm activity during peak period?
    1. adequate
    2. not adequate, shortage
66. Which of the following you use as main for ploughing?
    1. Tractor
    2. Oxen
    3. Camel
    4. Other (specify)

67. If your answer is by tractor in 5, from where you get?
    1. Support from investors
    2. Rent from investors
    3. Rent from individual tractor renters
    4. Rent from state farms
    5. Own tractor
    6. other (specify) _____

68. If you rent in tractor how is the availability of tractor to rent in in the area? Can you get at any time or timely when you need for ploughing at peak period?
    1. Yes it is adequate
    2. No it is not adequate

69. How expensive is the norm of tractor rent in the area in your opinion?
    1. cheap
    2. fair
    3. expensive

70. If your answer is by oxen in Qn. 66 from where you get oxen?
    1. own oxen
    2. support from other farmers
    3. renting from others
    4. sharing arrangement

71. Did you get support from the following? (circle multiple 'yes' responses if any)
    1. Federal government
    2. Regional government
    3. Local government
    4. NGOs
    5. Investors
    6. Water authority
    7. Research institute
    8. Other (specify) _____

72. If yes for questions 1-8, in the previous question what support did you get?

1. Federal government	1. Input supply
2. Regional government	2. Training
3. Local government	3. Machinery supply (Tractor, pump, sprayer
4. NGOs	4. Credit
5. Investors	5. Extension service
6. Water authority	6. Market search & information
7. Research institution	7. Canal construction and maintenance

(Answer should be give as 61.1 = 1, 2, 3... etc
62.2 = 1, 2, 3... etc)

73. If you got extension service list them down.

_____

74. Where or for whom did you sell your products mostly? (circle multiple 'yes' responses if any)
    1. For private ginneries
    2. For near by investors

3. For state farm
4. For textile factories
5. For merchants
6. Collective exporting with others
7. At near by market
8. Other (specify) _____

75. In which way you sold mostly?
    1. On farm gate sell
    2. Taking up to the buyer
76. If you sold for investors only, what is the main reason
    1. Forced because of credit or other support relation
    2. No other alternative
    3. Because of good price I get in other (specify) _____
77. Did you faced major problem in marketing of your products?
    1. Yes 2. No
78. If yes which of the following are your major problems? (circle multiple 'yes' responses
    1. inaccessible to potential market area because of low know how
    2. high marketing costs
    3. unreliable transportation facility or high transport cost
    4. lower price I fetch for my products
    5. higher profit taken by intermediaries
    6. lower prices set by investors or merchants
    7. shortage of market information
    8. other (specify) _____
79. which of the following are major problems of production for you
    1. Tractor for rent or shortage of tractor to rent
    2. Water pump
    3. Input supply
    4. Labor shortage to hire
    5. Access to credit
    6. Access to market for product
    7. Know how about irrigation
    8. Access to water
    9. Other (specify) _____
80. Rank the first 3 major problems in question no 79
    1. 1st _____
    2. 2nd _____
    3. 3rd _____
81. Have you ever got credit for your farm operation from any source (government, friend, relatives individuals, investors, or local lenders)
    1. Yes 2. No
82. If yes for question 81 from which source? (circle multiple 'yes' responses if any)
    1. Credit institutions (private or government)
    2. From local government
    3. From investors

4. From local lenders
5. From relatives
6. From NGOs
7. From bank
8. Other (specify) _____

83. Do you need credit for your farm operation
    1. Yes 2. No
84. If yes for question 83, from which source you speculate most?
    1. Bank
    2. From government institutions (micro credit institutions, regional and local government offices, etc)
    3. From NGOs
    4. Other (specify) _____

V. Household income, expenditure and division of labour

85. Which of the following livestock you own since the last one year (including animals sold and given to others)? please indicate the number owned
    1. Cattle _____
    2. Goat and sheep _____
    3. Camel _____
86. Have you bought animals for restocking in the past one year?
    1. Yes 2. No
87. If yes for question, no 2 which animals and how many? (Put 'o' for not bought)
    1. No of cattle _____
    2. No of goat and sheep _____
    3. No of camel _____

88. Have you sold home animals (own animals) in the past one year?
    1. Yes 2. No
89. If yes which animals and how many? (Put 'o' for not sold)
    89.1 No of cattle _____ Total price _____birr
    89.2 No of goat and sheep ____ Total price _____ birr
    89.3 No of camel _____ Total price _____ birr
90. Have you sold milk and butter since the last one year?
91. If yes in Qn. 90 How much milk and butter you sold in the past one year on average please estimate it _____ birr
92. What is the average milk yield in litter per day? ____ lit/ day
93. Please estimate the average income you received from the following (income includes those received by all family members)
    93.1 sale of own crop _____ birr
    93.2 income from share cropping _____ birr
    93.3 income from land leased out _____ birr
    93.4 share from clan land leased for investors
    93.5 income from labour employment _____ birr
    93.6 income from permanent or contract employment

93.7 income from charcoal and fire wood sale _____ birr
93.8 net income from trade ____ birr
93.9 income from other sources (specify) _____ birr
94. Please estimate your expenditure on the following items

No	Items	Amount in birr	Reference period (year, month, day)	Remark
94.1	Food (grain, flour, rice, pasta, oil, sugar, etc)			Food expenditure do no include food items obtained by aid
94.2	Clothing			
94.3	HH equipment and utilities			
94.4	Health			
94.5	Education			
94.6	Religious and culture			
94.8	Social obligation			
94.9	Chat			
94.10	Others (specify)			

95. From which income sources as major for your expenditure on food items on question 94?
    1. from livestock income
    2. Income from irrigated agriculture activities (sale of crops, employment, share from investors etc)
    3. Income from trade
    4. other (specify) _____
96. Do you think that the irrigated agriculture /crop cultivation you involved in has contributed to your family food security?
    1. Yes 2. No
97. If your answer is yes for question 12, how is the food security condition when compared to the livestock production?
    1. I am more secured in crop cultivation than livestock production
    2. I am less secured than livestock production
    3. I am indifference between the two production systems
    4. I can not compare the two
    5. other (indicate) _____
98. if your answer in question 13 is choice 2, what is your reason list them please _____
99. Are your family members participate on operations on your farm activities
    1. Yes 2. No
100. If your answer is yes on question 99, which members participate?
    1. Wife
    2. Male children
    3. Female children
    4. Other family members

101. If your answer in question 100 is no, why they do not participate?
   1.Labour shortage for other activities
   2.Do not have cropping experience
   3.Un willing to participate
   4.Other (specify)

102. From your family members, which of them participate on labour employment in other farms
   1. Wife
   2. Male children
   3. Female children
   4. Husband

VI. Others

103. What is your feeding habit as major?
   1. Mufe with milk
   2. Mufe with tea (ashera)
   3. Injera with wat
   4. Injera with wat and rice and pasta equally
   5. Mufe and injera with wat equally
   6. Mufe with wat

104 how do you explain your family's living standard relatively compared with that of before you start and participate on crop cultivation
   1. if has been improved
   2. no difference
   3. it has been declined

105. If the drought condition is improved or the rain fall condition is favoured as before, do you return back to rearing livestock as before or continuing crop farming as major?
   1. livestock rearing as major
   2. crop cultivation as major

106. What is your own general opinion on the expansion of and shift of the pastoralists to crop cultivation in the area?

_____

_____

107. Is there any changes and incidences on relation ships with in your family members in the following after you engaged on irrigation agriculture?
   1. Change in division of labour
   2. Conflicts increased
   3. Failure to fulfill family obligations
   4. others (specify) _____

Annex-II Sample checklist

1. Group Discussion Checklist

1. Irrigation practice and management condition
   a. Management of the infrastructure
   b. Management of the water factor
   c. Organization
2. Institutions, conflict management and support services
   -what are the formal and informal institutions there in relation to irrigation agriculture
   - formal
   - informal
   - Importance of the institutions and in what way?

   -How you evaluate the prevailing land tenure system in the area as to the sustainability and productivity of the irrigation agricultural practice of smallholder irrigators

   -What are the sources of conflict in relation to irrigation agriculture in the area? (Land, water, other?)
   -How could you manage these conflicts?
   -What are the various traditional conflict man agreement institutions you have? And how strong they are now after the introduction of irrigation agriculture when compared to the past?
   -What are the basis or criteria to individuals access to irrigation water
   -What support you got from different institutions? (training, credit, market, input supply, irrigation infrastructure, etc

2. For Key Informants

1. How do you manage your irrigation system?
   - infrastructure management) design, construction, maintenance, operation activities
   - water management (acquisition, allocation, distribution, drainage etc
   - organization
2. What are the major problems you faced (small holders as a whole) in irrigation activity?
   - legal problem
   - finance /credit for what
   - irrigation water shortage
   - irrigation infrastructure
   - land leveling
   - input shortage
   - market
   - in what way are these a problem

3. For Water Resource Authority

1. What is the base /rules or criteria for water allocation to individuals water users (i.e. is there formal specification of water right of all users for water allocation)
2. Wow do the organization resolve water disputes among users
3. What is the clear mandate of the organization?

3.1 What are its responsibilities?
3.2 What are the organization's rules and regulations in irrigation water allocations?
3.3 What are the management activities of the organization in the irrigation
- Infrastructure management
- Construct, design, operation, maintenance activities
- Water management
- Allocation, distribution, operation etc activities
- Cost sharing condition

4. What looks like your organization level of communications with the different parties (water users) in the area? (With investors, state farms, farmers, pastoralists, other user institutions)
5. What are the responsibilities and obligations of
   1. Your organization
   2. Different water users
   (Aspects of water fees, use rights)
7. What is the base or criteria for water allocation?
   1. Land size?
   Equity based on water right
   2. Is there equity consideration by the organization in access to and allocation of water?
   (i.e. do the organization treat all its clients equally? Are all water users equal in the face of the organization?
8. What is your organizational structure i.e. how is the institution organized
   (Department organization and structure with their responsibilities)
9. Do you think the organization is efficient enough to manage the irrigation system in the area? If not why?

4. Interview for local administrators agricultural and economic development offices

1. how do you perceive the trend of small holder irrigation development in your distinct in particular since the last 10 - 15 years

2. What is the cause for the pastoralists to shift to crop cultivation or to participate on irrigation crop cultivation?
3. What supports you provide for the small holder irrigators

DECLARATIONS

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

Name----------Signature----------Date----------

Addis Ababa University

This thesis has been submitted for examination with my approval as a university advisor