ASSESSMENT OF CHALLENGES OF SUSTAINABLE RURAL WATER
SUPPLY: QUARIT WOREDA, AMHARA REGION

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by
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Sustainability of water supplies is a key challenge, both in terms of water resources and service delivery. The United Nations International Children’s Fund (UNICEF) estimates that one third of rural water supplies in sub-Saharan Africa are non-operational at any given time. Consequently, the objective of this study is to identify the main challenges to sustainable rural water supply systems by evaluating and comparing functional and non-functional systems. The study was carried out in Quarit Woreda located in West Gojjam, Amhara Region, Ethiopia. A total of 217 water supply points (169 hand-dug wells and 50 natural protected springs) were constructed in the years 2005 to 2009. Of these water points, 184 were functional and 33 were non-functional. Twelve water supply systems (six functional and six non-functional) among these systems were selected. A household survey concerning the demand responsiveness of projects, water use practices, construction quality, financial management and their level of satisfaction was conducted at 180 households. All surveyed water projects were initiated by the community and the almost all of the potential users contributed money and labor towards the construction of the water supply point. One of the main differences between the functional and non-functional system was the involvement of the local leaders. In the functional systems nearly half of the local leaders were involved in the initiation of the project and selection of the location of the water point while this was less that 15% for the currently non-functioning systems. Since, there was an inverse relationship between the involvement of local leaders and the quality of workmanship of the water point, and since Woreda offices are greatly understaffed, local leaders form the focal point of the community to interact and supervise the work with the contractor and organize the community.
Another interesting finding was that more than three quarters of the users in the non-functional systems did not have the means to pay for the water services while payments was a problem for less than one third for the users in the functional systems indicating that ability how to pay for the maintenance should be an important consideration for the donors. In addition participation of women was less in the non-functional systems in the study area.

Thus a general held belief that the community involvement during initiation and construction of the water supply system is most crucial factor in the success of a water supply system does not seem to be important factor in the Quarit Woreda, but instead the organization of the community by having an effective local leader to interact with the contractor and Quarit personnel is important factor as well having the means to afford the payments for maintenance for a water supply system.
BIOGRAPHICAL SKETCH

Zemenu Awoke was born in Debremarkos, Ethiopia to my father, Awoke Alemayehu, and my mother, Etatu Zerihun, on November 12, 1984. I started my education at Rebu Gebeya Elementary School and completed for 8 years. I was spent four years in Debremarkos High School. I then completed my high school education and joined a three year degree program in 2004 at Haramaya University.

In 2006, I received a BSc degree in Agricultural Economics majoring Agribusiness Management. Two months after my graduation, I was employed as Junior Researcher at Ethiopian Institute of Agricultural research. Two years and Eight months later, I Joined at ADRA-Ethiopia (International NGO) as Monitoring and Evaluation Officer in Somali region, Gode Zone and served the organization for 9 months. Seeing the announcement for the Cornell University Master’s program, I applied and was admitted and then continued my Master of Professional Science (MPS study program International Agriculture and Rural Development (IARD)) offered by Cornell University. I have got deep knowledge, skill and experience on environmental concerns and challenges to human beings. As a result, I have been directed and helped my research interest to be on factors that determine sustainable water supply systems.

I am eager to continue my education and earn a doctorate program so that I can aid my country, Ethiopia in particular and Africa in general with the help of God.
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ABBREVIATIONS

ADF- African Development Fund
HH- Household
FWSPs- Functional Water Supply Points
NFWSPs- Non-functional Water Supply Points
O&M- Operation and Maintenance
PRWSPs- Potable Rural Water Supply Projects
RWS- Rural Water Staffs
RWSSHP- Rural Water Supply, Sanitation and Hygiene Program
RWSPs- Rural Water Supply Projects
SPSS- Statistical Package for Social Science
TPL- Traditional Pit Latrines
WAE- Water Aid Ethiopia
WASH- Water Supply Hygiene and Sanitation
WC- Water committee
WDP- Waste Disposal Pits
WHO- World Health Organization
WRMO- Water Resource Management Office
WSP- Water and Sanitation program
WSPs- Water Supply Projects
WSSP- Water Supply and Sanitation Policy
WRMO- Water Resource Management Office
CHAPTER ONE
INTRODUCTION

1.1. Background

“Water is fundamental for life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a pre-requisite to the realization of all other human rights.” (http://www.who.int/mediacentre/news/releases/pr91/en/).

Worldwide 1.2 billion people are without access to safe water (Klawitter and Qazzaz, 2005). Consequently, water and sanitation related diseases are widespread (Patrick, et al 2004). When human beings do not have access to potable water; they not only suffer physically and emotionally but also socio-economically. This can be the cause of environmental degradation (UNDP 2006). The main health problems, especially in developing countries like Ethiopia, are results of poor access to potable water, poor hygiene, and sanitation practices (Minten et al., 2002: Collick, 2008). In these cases, supplying safe drinking water is of critical importance. Ethiopia has the lowest safe water coverage in sub-Saharan Africa estimated at only 42% with a meager 31% rural coverage reported in 2008 (WSSCC, 2008).

Realizing the critical importance of supplying potable water, national and regional governments, local and international NGOs invest millions of capital every year in developing countries to tackle the problem through implementation of water supply projects (Prokopy, 2005).

However, constructing water supply systems alone would not eliminate all problems, especially in rural areas. Functionality, utilization by intended beneficiaries, and resilience of water projects are important characteristics to be considered and integrated in order to achieve maximum benefits (Harvey and Reed, 2007). Hence,
integration between beneficiaries and project suppliers in decisions and contributions as well as management in all phases need to be addressed.

1.2. Statement of the Problem

A report from Water Partner International (2006) indicates the number of people who lack access to improved water supply could increase to 2.3 billion by 2025. Global Water Supply and Sanitation Assessment 2000 Report also indicates that the majority of the world’s population without access to improved water supply or sanitation services live in Africa and Asia (WHO & UNICEF, 2000). A study by Hans Van Damme (2001) reported that, nearly 250 million water and sanitation related diseases are reported every year, with more than 3 million deaths annually. Each day this amounts to about 10,000 deaths. Moreover, diarrhea diseases affect children most severely, killing more than 2 million young children each year in the developing world. Many more are left underweight, stunted mentally and physically, and vulnerable to other deadly diseases.

Water supply and sanitation conditions in Ethiopia are not different from the general situation of developing countries as a whole. As of 2004, national water service coverage in Ethiopia was estimated at only 37% (24% rural coverage and 76% urban coverage) (ADF, 2005). The rural areas share was only 6,698,000 people. Thus, 87% of the rural population has no access to potable water in Ethiopia (WHO, 2000). Two reports, one by Water Supply Hygiene and Sanitation (WASH) (2005) and the other by Begashaw (2002), show the consequences of poor water supply coverage in the country is severe. Lack of access to improved water causes higher infant mortality rates, low economic productivity, and low female enrollment in school. These consequences are more serious in the rural populations that have virtually no
sanitation facilities, though only eight percent of the total population has access to sanitation (DESSALEGN, 1999).

Construction of potable water projects in rural areas is the first step to increase community access and contribute to the health of its members. However, this alone would not achieve all the intended objectives. An African Development Fund (ADF) (2005) report shows that 33% of rural water services in Ethiopia are non-functional due to lack of funds for operation and maintenance, inadequate community mobilization and commitment, as well as lack of spare parts.

Thus, the issue of sustainability\(^1\) is critical when resource scarcity and equity matters are raised. The sustainability of rural water supply (RWS) projects and the benefits they deliver are some of the overriding concerns of the sector. In recent years, there has been an increased focus on, and understanding of, the design and implementation phases of RWS projects as part of the efforts to make projects more successful and work more efficiently (Sara et al., 1997).

Aspects of water supply systems that promote sustainability but need improvement include better planning and follow ups, better operation, maintenance, and management.

As the level of investment in RWS by the international and national organizations increases, more specific information is needed on water supply systems. In addition, it

\(^1\) “Sustainability”, within the context of this study, is defined as the length of the useful life of water supply infrastructures. More specifically, it is the capacity of the improved water supply sources in providing continued beneficial services over time.
is necessary to examine challenges that undermine long term sustainability of rural water supply projects both at the planning and implementation phases. An assessment of the challenges of sustainable rural potable water use at both pre- and post-construction phases is critical for Ethiopia and particularly for the Quarit Woreda. It will be useful to have sufficient information before launching large investments in rural water supply works.

1.3. Objectives

The objective of this study is, therefore, to assess the sustainability of selected rural water supply structures, describe communities’ attitudes towards water safety, and define the benefits of local safe water supply in Quarit where water supply projects have been recently implemented. In particular, the study has the following specific objectives.

- To determine the nature and level of community participation in the development of rural water supply system.
- To examine whether the provision of water service satisfies the needs of the target group.
- To assess the nature of institutional support given for local communities after water projects are completed.
- To identify problems related to potable water supply and management systems in the study area.

This study is carried out in the rural Quarit Woreda, remote mountainous terrain; poor infrastructure, poor water supply construction, relatively uneducated community members, and lack of environmental conservation practices characterize this woreda as well as other woreda in the region. Quarit is a woreda located in the Amhara region of northwest Ethiopia. Over the past several years, it has been the target of multiple water development projects. Ministry of Water Resources (MOWR) (2007) showed
that potable water supply coverage in the region is low at only 30%. Similarly, in a 2003-2004 report, rural water coverage of Quarit was no more than 7.5%. At both the national and regional scale, the issue of rural water supply is recognized as critical and is reflected in national rural development policy and poverty reduction strategies. Hence, priority is given to development strategies that expand potable water supply coverage in the country, but especially to strategies for rural areas that will accelerate agricultural development.

Under this development framework, significant funding from national and regional governments as well as local and international NGOs is flowing into rural areas of Ethiopia to improve rural community accessibility to potable water. As a result of this and decentralization of potable water supply projects, Quarit has implemented a number of water supply projects.

1.4. Research questions

- What were the roles of local communities in the development processes of rural potable water supply systems?
- Do the communities perceive that the water supply system as satisfactory?
- What are the responsibilities of the community faced in the rural potable water supply systems to affect proper functioning and uses of the service?
- What kind of external supports are available for the rural communities with what extent?

1.5. Organization of the Thesis

The first chapter of this particular paper describes the background of rural water supply, in which the general view of the core issues of the paper is discussed. It is followed by a statement of the problem, general and specific objectives, research questions, a hypothesis and scope of the study. Chapter two presents a description of
the study area, data collection methods, research design and sampling procedures, sampling frame of the study, sample population and method of data analysis. The third chapter reviews literature pertinent to rural drinking water development, sustainability, and community management of schemes. In chapter four, the main findings and discussions are presented. Chapter five draws conclusions on the findings and makes recommendations. The last part, chapter six, contains references used in this study and appendices.

1.6. Scope of the Study

The focus of this study is on water supply projects constructed in the rural part of QuaritWoreda\(^2\). It has a primary focus on community-managed projects where water systems once erected are owned and administered collectively.

\(^2\) Woreda refers to an administrative level below a zone and includes more than one tabias (i.e. it is a collection of tabias).
CHAPTER TWO

LITERATURE REVIEW

2.1. The Concept of Sustainability

The issue of sustainability first arose within the environmental movement and attempts to protect natural resources and ecological systems from over-extraction, shocks or stresses. However, it has also been extended to incorporate other dimensions like economic, social and institutional once. For example, the idea of economic sustainability is achieved only when a given level of expenditure can be maintained over time or is related to the resilience to risk of net benefit flows over time by the World Bank (OED, 2003). The concept also incorporates institutional or managerial questions in that sustainability is achieved when prevailing structures and processes have the capacity to continue their functions over the long term (DFID, 2000). In every recent development endeavor, the issue of sustainability is given serious consideration. As a result, sustainable development has been given several definitions by different institutions and researchers. World Commission and Environment Development have the most commonly quoted definition of sustainable development that reads as: “Sustainable development is that which meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987).

In recent years, the sustainable livelihoods approach has become an important part of the global challenge of eliminating poverty. This approach considers the resilience of livelihoods to shocks and stresses over the long-term and the ability to manage available assets (including natural, physical, social, human and financial assets) both in the present and in the future, without undermining the natural resource base.
2.2. Defining sustainability in Rural Water Supply System (RWSS)

There is a broad range of definitions of sustainability in RWSS used in different studies. The majority of these definitions are similar in nature but have slight differences in emphasis. There also exist a number of definitions that are significantly different. How we define sustainability is important for selecting parameters, which are then important for measuring and understanding the determinant factors that affect prospects of sustainability. As Hodgkin (1994) notes, there arises a problem for objective quantification of sustainability because the adjective “sustainable” has strong normative connotations. That is to say that different group of people, users of water, donors, national governments, local private sector companies, research institutions, etc. have different perceptions of sustainability based on the relative value attached to its achievements.

As Black (1998) pointed out, sustainability in water supply and sanitation sector was primarily associated with financial aspects of service delivery and the need to make projects self-sufficient, highlighting the need for users to contribute to cost sharing. However, the above definition is problematic when considering the ultimate goals of providing RWS services. Improvements in health and the later positive impact on the broader wellbeing of rural populations can be the perceived benefits of water projects for many national and international agencies. Therefore, the logical definition of sustainability from the perspective of these institutions may be one that includes sustained health impacts. Whereas, for many rural communities, the perceived benefit of a project may simply be continued access of water nearby; which is closer to the definition that simply describes sustainability as whether or not water continues to flow over time.
Most of the examples cited above include definitions of sustainability, which describe a benefit resulting from the implementation of a project or establishment of a service. The most common of these benefits include water delivery itself, health benefits through reduced exposure to pathogens and others such as time saved, convenience and contribution to livelihoods.

Mukherjee et al (2003) describes sustainability based on the publication of WSP&IRC (2003) as the satisfactory functioning and effective use of services, and equity as everyone (men and women, rich and poor) … having equal access to benefits from projects. Another publication by IRC (Schouten et al., 2003) includes, as part of its definition of sustainability, a statement that a system that reliably and sustainably meets the needs of 80% of the population while leaving the poorest 20% un-served cannot be counted a success. The incorporation of a measure of social equity in the definition of sustainability reflects, in part, a political or ideological position in terms of viewing access to basic services as a fundamental human right.

Given this view it is fair to say that perhaps many of the definitions of sustainability may not yet have caught up with current thinking and that, at least for the community-management model, definitions should be reconsidered and modified to account for this potential contradiction. Therefore, classifying a community-managed RWS system as sustainable should not necessarily preclude the community from having access to continuous, external back-up support of some kind.

2.3. Determinants of sustainability

A number of studies have identified various determinants of sustainability of rural water supply systems. However, some of the most common determinant factors are: technical factors including design, performance and maintenance issues, Community
and social factors including willingness to support projects, Institutional factors,
including policy and external follow-up support, Environmental factors, including the
sustainability of the water source, Financial factors, including the ability to cover
recurrent costs, and health factors, including the need to continue the provision of
hygiene, Education to affect long-term behavior changes.

2.3.1. Pre Project Factors

Before a project is going to be decided for implementation, there are some steps to be
completed by the planners and project coordinators. The pre-implementation factors
are related to project rules that are essential elements of project design. They are
essential because they provide incentives for communities to express and act on their
demand for the services provided. Some of the main elements of pre-implementation
factors are described as follows.

2.3.1.1. Demand responsive approach

Demand responsive approach\(^3\) focuses to a great extent on demand and sustainability.
The approach underlines the fact that there must be a balance between the economic
value of water to users, the cost of providing services and the prices changed for these
services; and WSSs should be managed by the community themselves for
sustainability. In identifying safe drinking water supply projects, user groups should
feel the need for safe drinking water supply. The logic here is, that if there is real
demand for water supply from the community then that indicates that water, to users,
has an economic value; or if water is a felt need of the community, then this is an
indication of willingness to share and recover costs of a system to be developed. The

\(^3\) The principles of demand-responsiveness of RWSSs state that water is an economic,
as well as a social good and should be managed accordingly, and water should be
managed at the lowest appropriate level with users themselves involved in the
planning and implementation of projects. DFID (Department for International
Development).
fact that there is a real demand for supply of water will facilitate the management of
the water supply schemes by the users themselves, which in turn enhances
sustainability. (IRC, 1988; and Department for International Development (DFID),
1997). Sara et al (1997) reported that a project is more or less demand-responsive to
the degree that users make choices and commit resources in support of their choices.
In other words, it requires community members make informed choices whether to
participate in the project, technology and service level options based on willingness to
pay, when and how their services are delivered, how funds would be managed and
accounted for, and how their services are operated and maintained.

2.3.1.2. Community and women participation

In its broadest sense, participation represents a fundamental link between project
beneficiaries and project suppliers (Campbell et al., 1993). In the planning stage,
therefore, participation of communities in all and women especially is very necessary
(Aschalew, 2009). More attention is put on women because they take the central role
in the collection, management and use of water, as well as general sanitation of the
household (Fong et al, 2003). Furthermore, there is ample evidence to indicate that
more active involvement of women can optimize the results and impacts of RWSS
projects (Mukherjee et al., 2003; DFID, 1997).

participation has three main advantages: it gives planners a more thorough
understanding of local values, knowledge and experience, it wins support for project
objectives and fosters community assistance in local implementation, and it helps
resolve conflict over resource use. Gow et al. (1994) assure community participation
also enhances accountability and equity and sustainability of benefits. Hence, water
supply projects should give the participation of women high priority since they are the
ones who bear the brunt of lack of safe water supply. It is meaningless for water projects not to reduce the hardship, among others, of women and children.

2.3.1.3. Types of Technology

In order for rural water supply to be sustainable, appropriate technology must be used. Where the technology deployed is remote from the users’ capacity to maintain, operate or pay for it, prospects of sustainability of services are equally remote. Therefore, it is experience with a number of projects that can ultimately lead to a better choice of technology (Harold et al.).

According to the World Bank, Village Level Operation and Maintenance (VLOM) type pumps can be repaired and maintained easily by village level caretakers requiring minimal skills and few tools. Spare parts are easily available in markets and are cost effective. Skinner in Harold et al. (2003) indicated that technology type, operating and maintenance, capacity and acceptance of rural people and spare part accessibility issues are of importance for sustainability of the services given.

2.3.1.4 Institutional Support

Another very important factor highlighted by literatures was the provision of follow-up support to rural communities in the long term. This is increasingly recognized as a critical factor in sustainability, as evidenced by the importance it is accorded in many recent World Bank project proposals and in several recent publications by sector organizations such as the EHP (Lockwood, 2002) and the IRC (Schouten and Moriarty, 2003). In both of these documents, it is argued that the majority of rural communities cannot be expected to manage on their own indefinitely. In order to guarantee the sustainability of RWSS projects and the associated benefits, it is necessary to provide support and guidance that addresses a range of issues. As Lockwood pointed out, there are four main functions provided by such support
mechanisms above and beyond technical support for the O&M of physical infrastructure. These are technical assistance, coordination and facilitation, monitoring and information collection and training.

2.3.1.5. Water resource and baseline survey

According to the External Support Agency, conducting a baseline water resource survey is of paramount importance. Inputs of experienced personnel in hydrogeology, geophysics, engineering, development planning and sociology are vital in the course of water resource potential assessment, well site selection, and depth to groundwater establishment and choice of the right hand pump option. If assessments such as groundwater resource potential and depth to groundwater are not well identified, the result would most likely be dry wells and, therefore, unsustainable schemes (Sebsibe Alemneh 2002, 18).

2.3.1.6. Raising Awareness and Training to Community and Management Bodies

Raising awareness and providing training to water management bodies (water committee) could be important to equip users with the right knowledge in managing their scheme and responding to system failure. Moreover, by creating awareness and training the potential benefits of clean water could be promoted to the community. The community will then be willing to take responsibility for handling operation and maintenance issues which will create a sustainable system. Therefore, education about the linkages between unsafe water, inadequate excreta disposal, and disease should be integrated to water supply schemes of rural communities (Gebre Emmanuel Teka, 1977).

2.3.2. Post Project Factors

Post implementation factors are those factors that affect the functionality of RWSS after the system is developed. In this regard, we can identify two broad sets of issues, which can lead to problems for community-managed after projects have been
implemented. The first set of issues are within the community including community
dynamics, political or social conflict, lack of cohesion, lack of capacity (technical,
managerial, etc.) and lack of financial resources. The second set are those constraints
that are external to the community like lack of spare parts supply, lack of supportive
policies and legislation, and lack of long-term support to help communities through
major repairs. Of course, in some instances there is a direct relationship between
factors that are within the control of the community and those that are external. Some
of the critical factors that affect RWSS identified by different literatures were
presented below.

2.3.2.1. Cost Sharing and Cost Recovery

The issues of cost sharing and cost recovery are crucial in the process of enabling the
community to manage their systems after completion. It must, however, be clear that
does not imply total financial responsibility of the community. It does mean that some
contribution from users is needed to establish commitment, which through time should
increase to reach the intended level of making the developed systems sustainable
(Evans, 1992: Sebsibe Alemneh, 2002).

The provision of an improved water supply is neither cost free nor sustainable unless
the costs are recovered. These costs comprise operation costs, repair and maintenance
costs and replacement and/or rehabilitation costs (Briscoe and de Ferranti, 1988).
World Bank evaluation report states that sustainability can only be ensured if tariffs
generate enough resources to operate the system, finance the expansion of the service
to new customers and ultimately replace the infrastructure after its useful life
(Paraguay ICR, 1999).
The success of cost recovery efforts, as a key post-project determinant of sustainability, will be influenced by the extent to which individuals and committees are supported, re-trained, and guided in relation to tariff structures and broader financial management. If such (external) guidance is absent, then it is likely that the success of cost recovery efforts will slowly diminish over time (Misgina, 2006).

2.3.2.2. Users Satisfaction and Willingness to Sustain the System

Demand-responsiveness at the household level is a determinant of overall sustainability primarily due to its role in increasing consumer satisfaction and willingness to sustain the system. Consumers are more likely to be satisfied with results such as quantity of water, color and test of water, distance and waiting time to fetch water when they initiate the project, are involved in decision-making, and are informed about their responsibilities in terms of costs and O&M. It is expected that under such circumstances, users express a higher sense of ownership, greater confidence in their ability to maintain the water system, a better understanding of how the tariff is used, and a willingness to pay for improvements.

The central role that women pay in the collection, management and use of water, as well as with the general sanitation of the household is well documented (Fong et al, 2003). Furthermore, there is ample evidence to indicate that a more active involvement of women can optimize the results and impacts of RWSS projects (Mukherjee and van Wijk, 2003; DFID, 1998). Therefore, it is not surprising that the continued involvement of women, after project implementation has been completed, is identified as one important determinant of sustainability.

Similarly, an adequate degree of social cohesion within a community is now considered as a fundamental factor in sustainability. The collective willingness to
maintain a water supply system, is a reflection of social cohesion, and is dependent on the concept of community identity (Cater et al, 1999).

2.3.2.3. External Support

Another very important factor identified by different literatures was concerning the provision of follow-up support by water supply owners and other private sectors to rural communities in the long-term. Lockwood (2002) and Schouten et al. (2003) both identified external support as a key determinant factor for sustainability of RWSS. They pointed out that external support should focus on technical assistance, training, monitoring and information collection, coordination, and facilitation.

2.3.2.4 Availability of Spare Parts

The availability of spare parts is a critical factor to keep the system infrastructure working properly. An adequate supply of spare parts and maintenance tools is obviously of primary importance to long-term sustainability. Supply chains are now recognized as one of the key determinants of sustainability (Davis and Liyer, 2002), especially where the technology provided is imported, which has often been the case with large-scale hand pump programs in Africa, for example. The majority of recent World Bank proposal documents focus attention on the creation and support of spare part outlet chains, normally based on private sector providers, precisely to fill this perceived weakness. Linked to the issue of spare parts, is the question of sector standardization, which is part of the broader policy environment.

In general, understanding and measuring sustainability is difficult. However, different researchers have tried to develop a conceptual framework to capture the inter linkage of different factors that affect sustainability of RWSS. One specific conceptual framework developed by Carter et al. (1999) and modified based on research in this paper is shown below in Figure 2.
A weakness in anyone of these can lead to failure of the scheme and could affect the long-term sustainability of water supply systems.

2.4. Theoretical Frameworks Applied to Assess Sustainability in RWSS

If we look across recent studies and consider the main findings, it is possible to gain some insight into the relationships between sustainability and project-related variables and the factors influencing sustainability. The study by WSP/IRC (2003) largely considers assessment of sustainability in relation to project rules and implementation (i.e. what happened before and during a project). On the other hand, the Water Aid examples tend to focus more centrally on post-project issues relating to sustainability.

In this study, the researcher will combine both views for a comprehensive picture of factors for sustainability. Combining a few studies in addition to the above example studies, this study offers some broad insights about factors that commonly influence sustainability in rural water supply development and identifies the following broad conceptual framework about the critical issues affecting sustainability (Hodgkin and WASH Project Staff 1994, Sara and Katz 1997, Sugden 2003).
Figure 2: Conceptual framework of sustainable RWSS and the determinant factors
CHAPTER THREE
MATERIALS AND METHODOLOGY OF THE STUDY

3.1. Description of the Study Area

The Democratic Republic of Ethiopia is a land-locked nation located in the Horn of Africa covering an area of 1.1 million km². It is one of the poorest countries in the world with a population of 83 million in 2008 making it the second most populous in Africa. The nation’s economy is mainly dependent on rain-fed agriculture, which accounts for half the GDP, 60% of exports and 80% of employment (WAE, 2008). It has nine National Regional States and two Special City Administrations: Addis Ababa and Dire Dawa.

Quarit is one of the 105 woredas in the Amhara Region. It is 560 km to the north of the capital city, Addis Ababa. The woreda is divided into 30 kebeles (2 urban kebeles and 28 rural kebeles). It is part of the West Gojam Zone which is bordered on the southwest by the Jabi Tehnan, on the west by Sekela, on the north by Adet, on the east by the Misraq Gojjam Zone on the north-east by Gonch Kolela and on the Southeast by Dega Damot. The major town of Kuarit Woreda is Gebeze Mariam. Quarit woreda is the source of Birr River that contributes to the Blue Nile River. According to the Ethiopian Central Statistical Agency (2008), Quarit Worda has an estimated total population of 166,848 of whom 83,512 were males and 83,333 were females. About 4,520 of its population are urban dwellers. It has an estimated area of 613.6 km². Quarit has an estimated population density of 272 people per square kilometer. Teff, maize, bean, peas, potato, and wheat are the main crops types cultivated in the woreda. The administrative map of Quarit Woreda showing the elevation boundary of the area and the distribution of WSPs (both FWSP and NFWSP) are shown in the map (Figure 1).
Figure 3: Quarit Woreda map and distribution of water supply points in the Study area

3.2 Data collection

This study used a combination of both quantitative and qualitative research methods. A descriptive community-based cross sectional study design complemented by focused group discussion and field observation in the rural setting of Quarit Woreda was conducted.

A pre-tested, structured questionnaire was used together quantitative data after it had been translated in to the local language (Amharic). The questionnaire had covered information on the socioeconomic characteristics of the respondents, demand responsiveness and sustainability factors of the services, type of participation of beneficiaries and women, issues of cost sharing and recovery, community training and
awareness creation, level of consumer satisfaction for the service provided, physical condition of the water supply points under study, willingness of the beneficiaries to sustain the system, and repair and maintenance issues for the water supply services. A field observation using a structured checklist was done in 12 water points focusing on physical condition of the scheme, level of protection, construction quality and protection mechanisms. A focus group discussion was conducted with water committee members, woreda water staff, community leaders and cultural association leaders to collect qualitative data using a semi-structured questionnaire guide and note taking. The research design, sampling procedures, method of data collection and their source are discussed below.

3.3. Research design and sampling procedures
This research used a cross sectional research design so that data was collected for multiple cases at a single point in time. Different methods of data collection like structured questionnaires, interviews, discussions and personal observations were employed to produce primary data. Moreover, secondary data have been collected from existing documents, books, journals, reports, and others sources from sectorial offices and concerned bureaus inside and outside the woreda.

3.4. Sampling frame of the study
From all existing water schemes in the woreda, those constructed with in the last five years were selected purposively. In this study, water schemes built between 2005 and 2009 were considered for three reasons. Large numbers of water projects were installed in the woreda after the woreda-level decentralization was implemented. The

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4 Cultural association in this case refers to groups of peoples organized based on their culture and norm in order to help each other such as edir and equb.
5 Decentralization refers to the current political structure of the country in which the development responsibility has been given to the respective woredas as per their interest and development opportunities.
second is to observe if changes are occurring in the overall potable water development process. The last is to ensure the study is consistent and at a manageable size. These water schemes are arranged according to their corresponding tabias\(^6\). Four tabias were selected for this study based on accessibility and feasibility factors\(^7\). Three water points from the above selected tabias were chosen based on simple random sampling method. In all, 12 water points incorporating functional (those delivering service) and non-functional were identified as unit of analysis for this research.

### 3.5. Sample population

As beneficiaries are the main primary data sources in this study, fifteen households were selected from each sample water point resulting in a total of 45 households from each of four tabias. Therefore, a total of 180 households (HH) were included in the sample population. Respondents were picked systematically to accurately represent the population and save time since a water-scheme is believed to serve for 500 people (or 100 HHs), equal shares of households were taken from the sample water points. Method of triangulation was incorporated in this study in order to fill the gaps of employed research methods. In order to assess the safety of water sources with regard to drinking quality, 12 water samples were collected from study sites and stored in a box in a cool environment, as per the instruction given by the laboratory technician, and transported to Bahir Dar University where laboratory testing was carried out on 12 drinking water quality parameters.

\(^6\) Tabia refers to an administrative area that is a collection of kebeles. It typically contains two to four kebeles.

\(^7\) Accessibility and feasibility factors describe the degree of rugged topography and mountainous terrain. Accessibility can be very difficult not only by vehicle but also on foot.
3.6. Method of data analysis

Descriptive statistics based on percentages and ratios were used to analyze findings. Qualitative data collected from beneficiaries, technical staff members, and water committees using structured questionnaire interviews and discussions was entered and analyzed in Statistical Package for Social Science (SPSS) to determine descriptive statistics for the study.
CHAPTER FOUR
RESULTS AND DISCUSSIONS

In this chapter the survey, interview, focus group discussions and field observations are presented from four ketenes out of the existing ketenes in the Quarit Woreda. A total of 180 interviews were conducted for 12 different water supply systems.

4.1. Overview of water supply points in Quarit Woreda

A total of 217 water supply points (169 hand dug wells and 50 natural protected springs) were constructed in the years of 2005-2009. Of these water points, 184 were functional and 33 were non-functional. Most of the water points were constructed by the Finnish International Development Agency (FINNIDA) and the rest were developed by the Food Security Program and Red Cross Social Service Organization. The number of functional water points increased over the study period as well as the number of non-functional\(^8\) water points (Figure 4). However the number of non-functional water points decreased during 2006 and 2009 as organizations and individuals gave due attention for sustainability of water points and start to make participation of community and make projects demand responsive.

4.2. Socio-Economic Characteristics of the Respondents

The study was carried out in rural Quarit Woreda. Consequently, 95% of the respondents were farmers involved in crop cultivation (both irrigation and rainfed) and cattle, sheep, goat and poultry production. Ninety four percent and ninety one percent interviewees from functional and non-functional WSPs, respectively, were between 20-60 years old (Table 2), the age group that make decisions about WSPs. The average age was 30 years.

\(^8\) Non-functional in this paper means that those water supply points stop providing service due to some disrepair problem. However, functional refers to those water supply points providing service to water users without disrepair.
Figure 4: Distributions of Potable Water Projects (PWPs) constructed with in 2005 - 2009 by their status

Table 1: Technology Type and Status of Water Points Studied

<table>
<thead>
<tr>
<th>Kebele</th>
<th>Name of WP</th>
<th>Type of technology</th>
<th>Status</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chefakit</td>
<td>Worni</td>
<td>Spring</td>
<td>Non-functional</td>
<td>-</td>
</tr>
<tr>
<td>Dinja Tson</td>
<td>Shola</td>
<td>Spring</td>
<td>Non-functional</td>
<td>-</td>
</tr>
<tr>
<td>Enangiya</td>
<td>Keyemago</td>
<td>Handwell</td>
<td>Non-functional</td>
<td>20m</td>
</tr>
<tr>
<td>Weyebeyegn</td>
<td>Chaku</td>
<td>Handwell</td>
<td>Functional</td>
<td>12m</td>
</tr>
<tr>
<td>Gebeze Mariam</td>
<td>Geta</td>
<td>Handwell</td>
<td>Non-functional</td>
<td>18m</td>
</tr>
<tr>
<td>Genet Abo</td>
<td>Mehal Borebore</td>
<td>Handwell</td>
<td>Functional</td>
<td>12m</td>
</tr>
<tr>
<td>Quarit Enchilala</td>
<td>Buha Dingaye</td>
<td>Handwell</td>
<td>Functional</td>
<td>20m</td>
</tr>
<tr>
<td>Fengata Chegodie</td>
<td>Gudign Mesk</td>
<td>Handwell</td>
<td>Non-functional</td>
<td>11m</td>
</tr>
<tr>
<td>Dewaro</td>
<td>Bahir</td>
<td>Spring</td>
<td>Functional</td>
<td>-</td>
</tr>
<tr>
<td>Zambit</td>
<td>Bita</td>
<td>Spring</td>
<td>Non-functional</td>
<td>-</td>
</tr>
<tr>
<td>Girarma</td>
<td>Baydegim</td>
<td>Handwell</td>
<td>Functional</td>
<td>10m</td>
</tr>
<tr>
<td>Boinku</td>
<td>Enzegidim No.2</td>
<td>Handwell</td>
<td>Functional</td>
<td>16m</td>
</tr>
</tbody>
</table>

Almost three-fourths of the respondents in both functional non-functional systems were female (Table 2). This was done on purpose (and with support of the woreda) because women are responsible for providing the family with water. Almost all respondents in both systems were married. Only 4% were separated, widowed or not married. Nearly three fourths of the household (69% functional and 78%
nonfunctional) were male headed (Table 2) as is common in Amhara. In the remaining households, women were in charge for a variety of reasons but mainly because the husband was working in a different area. Average family size was 5 people. Most respondents were not educated because farmers need their children to help with farming, livestock grazing and household activities. Only a few (average 3%) who have support from educated relatives living in urban area were able to finish high school and join a university.

4.3. Water Source and Use Activities by the Respondents in Study

Information obtained from both interviews and focus group discussions with households and community leaders, respectively, indicate that students, children and women travel to the water sources on average two times a day to collect water. African Development Fund (ADF) (2005) indicated that women in rural areas often travel long distances to collect water, accounting for two to six hours per day. Insras\(^9\) and jerican\(s\) are used to fetch water. Sixty one percent of the households in both functional and nonfunctional systems use Insras while, the remaining 40% use jerican\(s\) (Table 3).

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\(^9\) **Insras** refers to locally made clay water containers with an average holding capacity of 15-20 liters that is used by the households in the woreda under study. However, now a day it is being replaced by jerican due to an intensive awareness crated by health extension agents in the woreda with the intention of reducing the occurrence of water contamination from point-of-collection to storage and household-use.
Table 2: Respondents Demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Category</th>
<th>No of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FWSPs</td>
<td>NFWSPs</td>
</tr>
<tr>
<td>Age</td>
<td>Under 19</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>20-40</td>
<td>44</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>41-60</td>
<td>41</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Above 60</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Marital status</td>
<td>Married</td>
<td>89</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>Separated</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Unmarried</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Widow</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Head</td>
<td>Husband</td>
<td>62</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Wife</td>
<td>28</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Size</td>
<td>1-4</td>
<td>30</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>5-8</td>
<td>58</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>9 and above</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Education</td>
<td>Not educated</td>
<td>55</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Mesert Timhirt(^{10})</td>
<td>21</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Grade 1 to Grade 12</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Religious</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

*Functional Water Supply points, **Non-functional Water supply points

\(^{10}\) Meseret Timhirt refers to the education program provided for those individuals who are older and did not attain a formal education when they were young. This program was provided during the Durge (Mengistu Hilemariam) government period.
Table 3: Distribution of type of containers used and water use capacity of respondents

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Container Type</th>
<th>Daily water use capacity (in liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insra</td>
<td>Jerican</td>
</tr>
<tr>
<td>Frequency</td>
<td>110</td>
<td>70</td>
</tr>
<tr>
<td>Percentage</td>
<td>61</td>
<td>39</td>
</tr>
</tbody>
</table>

Current WSPs are available for service at two periods: the first period is from 7 am to 10 am, while the second period is from 4 pm to 6 pm. Timing of water service varied between WSPs based on the quantity of water available at the schemes.

The majority (86%) of the respondents consume less than 100 liters of water per day per household. Only 11% of the respondents consume more than 100 liters of water per day per household and 3% of the respondents do not know exactly how many liters of water was consumed per day (Table 3). Average water-consumption-ability of households from the developed potable water projects was calculated to be 49.1 liters and 33 liters in a day from functional and non-functional systems respectively.

Table 4: Daily water collection and per capita water consumption by users

<table>
<thead>
<tr>
<th>Measurement Units</th>
<th>FWSPs</th>
<th>NFWSPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water collection frequency per day</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Once</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Twice</td>
<td>60</td>
<td>67</td>
</tr>
<tr>
<td>Three times</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>&gt;Three times</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>Per capita water consumption (liters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; Than 20</td>
<td>70</td>
<td>78</td>
</tr>
<tr>
<td>&gt;Than 20</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

The frequency of water collection trip by the households, on average, was two times a day in both functional and non-functional systems (Table 4). Nevertheless, it increases
during cropping time, dry season and holidays in both systems. Average per capita water consumption is 10 liters a day, which was very low comparing with the amount recommended by WHO which is 20 liters per day. Nearly three fourths of the people consume less than 20 liters of water in a day (Table 4).

4.4. Demand Responsiveness of the Water Projects in the Woreda

4.4.1. Project Initiation and Baseline Survey

The current method for organizing water projects in the woreda is done mostly in the regional office of water resources. Community leaders (who are agents simply to pass the community messages to the office) will request the woreda level water resource management office to implement a WSP. An expert from the office will visit and install a system regardless of its feasibility, accessibility of water, or community preference.

There is a high demand for improved water supply systems by the community in both systems. The survey results show that 54% and 80% of the respondents initiated the idea of improved water development in FWSP and NFWSP, respectively. This is an important precondition for the project owners\(^{11}\) to create responsibility of the community for taking the project as their asset. Site selection was made by local leaders in 49% of FWSPs and 60% of NFWSPs. 80% and 60% of type of technology selection were made by the project owners in FWSPs and NFWSPs, respectively (Figure 5). This indicates that the community had a relatively small part in selecting the service site based on their suitable area (especially in NFWSPs) and the type of technology installed. Full participation of the local leaders\(^ {12}\) during project initiation is

\(^{11}\) Project owners in this case refer to the implementers who have developed the water supply points in Quarit Woreda.

\(^{12}\) Local leaders are those persons who have been selected by the community and represented to act on behalf of the community.
important in order to consider the demands of the beneficiaries rather than implementing supply side approach. The more local leaders involve in decision-making in site selection and type of technology, the greater the potential for sustainability. On the other hand, doing a baseline survey by the project owners through active local leader participation is an important step to identify the primary problems of the community. When a project implemented that does not fit the needs and is not a priority of the community, it will not be accepted by the local leaders and making it sustainable.

![Figure 5: Community share for project initiation, site selection and technology type](image)

Almost all respondents (94%) explained that improved water development is their priority issue in both water supply points (Figure 6). The remaining respondents stated that gully formation, expansion and landslides are their priority problems in the study area. Hence, the community has a concern water development in the study area that indicates there is a water supply problem there.
Three fourths of beneficiaries perceived that the distance to new improved water points was greater than where they fetched water before (Table 5). On the other hand, 65% of respondents said that the new water points reduced their total time for collection as compared to the previous unsafe water sources. Nearly half of the respondents stated that their time to fetch water from the developed water sources was not reduced despite the water point being closer than to the previous source. This is because users must climb a large mountain to fetch water from developed water points but not to reach the unsafe one. Hence, the total collection time should be considered during water development with equal weight given to distance. In this case, beneficiaries preferred shorter collection time and payment free water from unsafe sources.

Table 5: Respondents perception of distance to previous water source and improved ones

<table>
<thead>
<tr>
<th>Respondents perception of distance to previous water sources compared with improved water sources</th>
<th>Have the new water sources reduced fetching time compared to previous unsafe sources?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farther</td>
<td>Nearer</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
</tr>
<tr>
<td>%</td>
<td>3</td>
</tr>
</tbody>
</table>
4.5. Physical Condition, Type of Technology and Construction Quality of Water Supply Systems in the Study Area

4.5.1. Physical Condition of Water Supply Points

The physical condition of water supply points is an indicator for sustainability. Appropriate fencing with the right kind of fencing material (wood or metal wires) could prevent animals and humans from freely entering water supply points.

Table 6: Distributions of respondents to whether their nearer potable water point has been fenced and whether animals enter to WPs

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Is WSP fenced?</th>
<th>Do animals enter to WSP?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FWSPs</td>
<td>NFWSPs</td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>36</td>
</tr>
<tr>
<td>Percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>

The field survey shows that 60% of functional WSPs were initially fenced. In non-functional systems only 23% were fenced. Respondents confirmed that 77% of water points were never fenced (Table 6) and eventually became non-functional. At these water points, the probability of animals entering the area is very high causing contamination of the service. Accordingly, 58% of the respondents said that animals enter the water points (Table 6).

Discussions with elder water users has revealed that when irresponsible visitors pass, in Zambit water point for example, they will take the service key and leave the water point vulnerable to damage. As a result, sustainability could be affected despite the presence of water supply guards. Irresponsible visitors even took the wood fence for
their own household fire use (Right side of Figure 7). Other WSPs do not fenced at all (Left side of Figure 7). Sustainability of water supply points is higher in those water points that are fenced properly with adequate door and key. Hence, considerable attention should be given by project owners to consider fencing of the scheme. This should be the main project rule applied and accepted by the community in order for them to take responsibility for the service.

![Figure 7: Fencing status of NFWSps water supply points in the study area](image)

4.5.2. Type of Technology Used and Construction Quality of Water Points

Water users generally preferred hand dug wells over protected springs because measures to protect springs were usually difficult to maintain after installation. Despite this, several protected springs were installed (Table 1) by woreda personnel because of the inaccessible and rugged nature of the terrain and the expense of transporting the equipment for hand dug wells. Hence, project owners should make more effort to inform the community of available technology that is appropriate for use and so that an informed choice could be made.

Sustainability of water supply systems is partly affected by construction quality. There was a similar style of construction used throughout the woreda. Most of the water supply points were poorly constructed due to shortage of time, poor supervision, and
late budget release and availability. This was evidenced by the discussions with water committee members stating that the woreda water resource management office seldom visited the water supply points. Local leaders only made contact with woreda personnel if the system needed repair.

![Bar chart](chart.png)

Figure 8: Opinion of respondents on the construction quality of water projects

Of the functional systems, 50% of respondents found construction quality of the systems good while 25% found them bad (Figure 8). For non-functional systems, 31% deemed them well constructed while 24% were considered bad, or poorly constructed. Due to the fact that a larger percentage of respondents considered functional systems had good construction quality, as compared to non-functional, a poorly constructed scheme is more likely to become unsustainable.

Examples of poor construction quality can be seen in Figure 9. The picture to the left shows the foundation of the scheme (such as Geta, Shola and Bita) was cracked and the stones removed so that beneficiaries were not using this scheme anymore (Figure 9). The right hand picture shows that non-functional water point that was built too close to a private house. As a result, the owner of the house did not permit the people to fetch water because he is afraid his property will be damaged.
4.6. Community Participation and Contribution in Water Supply

Active participation of the community in all aspects before, during and after project implementation is a strong indication of sustainability of water supply systems. From the study it has been found that the communities have shown active participation during the project initiation stage (Figure 5) though not much participation was observed in site selection and type of technology. There is high community participation during the project development process. They know that their participation has a big role in the success of the project in both systems as well as what the source of the project budget is. More than 80% of the respondents have participated in the development endeavor in one way or another (Figure 10).

Beneficiaries of FWSPs contributed 28%, 43%, 2% and 6% of money, labor, ideas or all of these, respectively during water project development (Table 7). On the other hand 42%, 21% and 9% of the respondents contributed money, labor and local material, respectively, in NFWSPs. The remaining 5% did not participate and as a result, were not allowed to use water from these schemes. Hence, level of participation of the community is a firm basis for the sustainability of the schemes developed.
Figure 10: Respondents perception on source cost, importance and level of participation

Table 7: Percentage Distribution of Respondents Based on Type of Contribution

<table>
<thead>
<tr>
<th>Mode of contribution</th>
<th>FWSPs</th>
<th>NFWSP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percentage</td>
</tr>
<tr>
<td>Money</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Labor</td>
<td>39</td>
<td>43</td>
</tr>
<tr>
<td>Local Materials</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ideas</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>All</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Not participated</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

Women’s participation in the water development process is an important factor for sustainability. As a result of this realization, women’s participation is being given due consideration in any rural water development endeavor in Ethiopia and Africa. Moreover, the consideration evolves from the fact that women are those who are most affected by a lack of safe water supply in the household. Evidence and experience obtained from field observation and discussion with women water committee
members revealed that women and children (especially girls) are responsible to fetch water from distant and unsafe water points. Currently, they are also the ones who fetch water from improved water supply systems. Currently, they are also the ones who fetch water from improved water supply systems.

According to the assessment of respondent’s perception of the participation of women in water development process and water committee more than three fourths of the respondents in both functional and non-functional systems are not members of the water committee. Of FWSP users, 38% believe that the current level of women’s representation (2 women of 5 members) was not enough while 20% NFWSP users hold the same view. Conversely, 54% and 31% of the respondents in FWSPs and NFWSPs, respectively, stated that more representation of women is not good for society. No special encouragement for women to be water committee members was the response for 79% of users of both systems. For those who responded ‘Don’t know’, 23% believe that more representation (3 women out of 5 members rather than 2) of women would be beneficial to the improvement and sustainable water supply (Figure 11). There were respondents who replied ‘Don’t know’ on the importance of women’s participation for the improvement of the water supply points. The level of participation of women in WCs is very low despite the fact that all beneficiaries believe that the implementing organization has made every effort to facilitate more participation of women and the existing effort is satisfactory. Women’s participation on providing food and drink (local tella) for the well diggers was appreciated in the area.
The concept of cost sharing and cost recovery are key aspects of sustainability of water supply systems. When a water development project is designed, the project owners transfer the budget through the woreda’s finance and planning office. The community is expected to cover 15% of the project cost. Moreover, the community is expected to provide a place from its land that will be used for the service site. The beneficiaries should also contribute local construction materials, such as eucalyptus logs, for fencing of the scheme. All these are considered as cost sharing by beneficiaries.

The water committee is responsible to mobilize resources for construction, operation, and management of hand dug wells and pumps, and collecting and managing water fees. No structure was used to determine service fees but the common understanding of the community is that those individuals who want to use water should pay. In general, there was a very poor cost sharing, cost recovery, and financial management in both FWSPs and NFWSPs in Quarit Woreda.
The field survey result (Table 8) shows that 80% and 72% of the respondents support the idea of water fee payment in FWSPs and NFWSPs, respectively. The rest of the respondents do not support water payment for the service provided because they believe that water is a free good. In this case, respondents should be made aware of the benefits of improved water supply in the area. We can see that the percentage of beneficiaries supporting water fees, paying water fees and who pay water fees on time decreases in both systems. These shows there are people who fully support the idea of paying service charge but are unable to pay.

Table 8: Responses of communities in percentages to water fee perception and payments

<table>
<thead>
<tr>
<th>Do you support water fees?</th>
<th>Do you pay water fees?</th>
<th>Do you pay water fees on time?</th>
<th>Amount of water fee paid/month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FWSP</td>
<td>NFWSP</td>
<td>FWSP</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>Yes</td>
<td>80</td>
<td>72</td>
<td>46</td>
</tr>
<tr>
<td>No</td>
<td>20</td>
<td>28</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

From the focus group discussion, it is understood that households are not paying the monthly water fee due to one of the following reasons: sickness and old age (low income), landless people without income (no water provided), payment collection has not begun, and the belief that water is gift from God and should not be paid for. Respondent’s perception regarding the source of operation and maintenance cost was assessed and their views were summarized in Figure 12.
Figure 12: Distribution of respondents on source of money for O&M of water services.

Nearly four fifths (FWSPs) and two fifths (NFWSPs) of the respondents said that operation and maintenance costs should come from tariff and additional contribution. A significant percentage of the community from NFWSPs, 43% of respondents, revealed that woreda level water management (government) should finance O&M costs while 19% said project owners should (Figure 12). This indicates that beneficiaries lost ownership of the asset and don’t want to contribute money for O&M especially in NFWSPs. This is one reason why water supply points become unsustainable.

4.8. Training to Water Committees and Households in the Study Area
Mobilizing and administering appropriate training to water committees and households that focus on operation and maintenance (O&M) and personal hygiene education is important to improve sustainability of water supply systems. Training on O&M informs people of what expectations they should have for their water system and how to identify and address minor problems in the system before they become major. It also educates community members that the responsibility for maintaining the system rests with them, not with project owners or the government. Similarly, hygiene
education plays a crucial role in increasing people’s willingness to sustain the system by creating a link between the disease and its cause. It also educates people on the value of health benefits obtained by protecting the water source and increases their personal satisfaction.

![Figure 13: Training given to water committees and households](image)

Nearly 66% and 62% of the households in FWSPs participated in training educations and have received benefits from training respectively and the rest (34%) do not received training. However, more than half (51% and 53%) of the households in NFWSPs do not receive training and do not get benefit. All respondents who have attended the education session have indicated that they have in one way or another benefited from the provided training.

The households did not attain the training sessions due to old age, sickness, religious responsibilities, and too many household and farming responsibilities, lack of time to attend the meeting, lack of information or did not want to participate in political issues. Most notably, there was a gap in household training related to O&M, personal hygiene and environmental sanitation and conservation. As a result, due attention should be given in this regard as it affects sustainability.
For many projects the creation and existence of a water committee is a prerequisite for receiving project assistance and developing a water supply point. Accordingly, all supply points have a water committee with five members: three males and two females. Although the establishment of a water committee is a prerequisite, the members are not selected based on their willingness, especially with regard to females who were selected for formality.

The purpose of a water committee is to manage and oversee the system’s operation. This may include conducting preventive maintenance, collecting tariffs or payments for repairs, keeping records of financial transactions, manuals and blueprints, and sanctioning people for non-payment. Communities that do not have water committees often rely on traditional leaders to manage the water system. This study found the traditional system of management often was ineffective. In many cases, leaders purposefully sited the system on their property and excluded some residents from using the service. Trained water committee staff turnover is the main problem observed in most of the water supply points under study. Due to the traditional thinking of the community, female members of the water committee are not effective decision-makers. Hence, it is necessary to capacitate females in order to harness their decision-making ability. Strengthening their interest to solve water related problems would also be beneficial to the community.

4.9. Beneficiaries Level of Satisfaction and their Willingness to Pay

4.9.1. Beneficiaries Satisfaction

When beneficiaries show active participation in the development of their WSP, it is an important indicator for community project acceptance. Moreover, the level of consumer satisfaction as an indicator of sustainability of water supply schemes is also
reflected by the continuous support and participation of the community in water supply related issues.

The field result shows that almost 72%-74% of the respondents said that they were satisfied with the test, color and amount of water in both systems (Table 9). Eighty eight percent of respondents were satisfied with water pressure in functional WSPs but only 23% are satisfied in non-functional WSPs. Similarly, about 25% of the respondents stated that they were somewhat satisfied with the test, color, amount and pressure of water provided in functional and nonfunctional systems (Table 9). Respondents from functional water supply points explained that there is no water supply system with poor test, color, quantity and pressure of water. Respondents were not satisfied with the water service provided in non-functional water systems as evidenced by the percentage of ‘Poor’ responses (Table 9). Those dissatisfied beneficiaries explained that water points located beside rivers were affected by floods and resulted in polluted, non-functional schemes. This was the case for a protected spring in Chefakit Kebele. Another problem in some water points, such as Fengeta, both animals and people were using the service causing the color and test of the water to be affected. Furthermore, seasonal variation of the quantity in water supply points under study, especially in Gebezemariam and Enangiya, causes consumer dissatisfaction.
Table 9: Respondents satisfaction of water supply characteristics

<table>
<thead>
<tr>
<th>Satisfaction level</th>
<th>Test</th>
<th>Color</th>
<th>Amount</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FWSP</td>
<td>NFWSP</td>
<td>FWSP</td>
<td>NFWSP</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Good</td>
<td>73</td>
<td>74</td>
<td>72</td>
<td>74</td>
</tr>
<tr>
<td>Somewhat</td>
<td>27</td>
<td>20</td>
<td>28</td>
<td>23</td>
</tr>
<tr>
<td>Poor</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

About 89% of FWSP respondents and 44% of NFWSP respondents were very satisfied with the time given for the service to be used for collecting water (Table 10). Of the ones who were not satisfied, they mentioned that the water point, especially in the dry season, does not have sufficient water forcing the time given for water collection to be shortened. Those elder women and students were highly affected with service time. Students were unable to get water because water service time was during school hours. Satisfaction with current service of WSPs was reported in 86% of FWSPs and 43% of NFWSPs. Most interestingly, there was very low satisfaction in NFWSPs than satisfaction in FWSPs (Table 10).

Table 10: Respondent’s satisfaction with allotted for service and overall service

<table>
<thead>
<tr>
<th>Satisfaction level</th>
<th>Are you satisfied with the number of hours available?</th>
<th>What is your overall satisfaction with the service?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FWSPs</td>
<td>NFWSPs</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Very much</td>
<td>80</td>
<td>88.9</td>
</tr>
<tr>
<td>Somewhat</td>
<td>10</td>
<td>11.1</td>
</tr>
<tr>
<td>Not much</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>
In the study area, the topography of the land is mountainous and settlements are spread out. In this case, water users were traveling long distance and even climbing the mountain to get water. In combination with the survey and interviews with beneficiaries, results show that about 69% of the households revealed that they were standing for a long time at the water point to collect their water. They explained that they were wasting their time standing because the available water point was not properly matched to the population size. Hence, 68% of the respondents would like to see additional modern water supply points constructed to reduce the problem of excessive standing time (Figure 14).

Figure 14: Respondents perception of wait time and need for new water points

Looking at the general service satisfaction level of households in the study area, about 64% of the respondents (Table 10) were satisfied with the general service provided by developed water points as compared to previous ones. This is an encouragement for project owners to do more and establish an overall community in the study area.

4.9.2. Willingness of Consumers to Sustain the Schemes

Willingness of the community is an indicator of sustainability of water supply points as it provides evidence of community support. It is a general fact that when people
value something, they try to keep the service from damage. Willingness is important to measure the degree to which community members feel responsible for maintaining their water system.

In this particular study, about 72% of (FWSP) respondents fetch water for all uses. However, only 64% of the NFWSP respondents fetch water for all uses. 3%, 9%, 10% and 5% of the FWSP respondents use water for drinking and food preparation, for bathing, for cloth washing and for animal drink and vegetation respectively (Table 11). On the other hand, 33% of the NFWSP respondents use water for bathing and cloth washing respectively. This indicates that the water supply is important for day to day activities. Hence, people would expect the community to finance future maintenance, repair, and system replacement and also express willingness to pay for improvements.

Table 11: Water use of respondents in the study area

<table>
<thead>
<tr>
<th>Water use</th>
<th>FWSPs</th>
<th>NFWSPs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Drinking and food preparation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Bathing</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Clothes washing</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Animal drinking</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Garden vegetation</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>All uses</td>
<td>65</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

Discussions with the beneficiaries as well as with water committee members found that there were beneficiaries using water from other sources (rivers, unprotected springs, and rain water) in order to reduce the burden and damage of improved water supply points. Accordingly, beneficiaries’ perception of alternative water use and its
importance in sustainability were assessed. It was found that most of the respondents use alternative water sources continuously.

With regards to their sense of ownership of the service, communities’ perception of system ownership is essential to ensuring that the community will maintain the water system. Nearly 87% of FWSP and 70% of NFWS respondents perceive that water service belongs to the community. The rest of the respondents (10% from NFWSPs and 23% from NFWSPs) claimed that the water supply points belong to the local government. Moreover, a small but significant number of households did not know to whom the system belongs (Figure 15).

![Figure 15: Respondents perception of ownership of rural water services](image)

In the study area, project owners expected the community to pay for operation and maintenance and refund them if there is a problem with the service. The balance between economic ability of payers and water charges has to be considered as it could cause dissatisfaction and affect the service. In the study area, beneficiary’s level of perception on water fee was assessed and the result presented in Table 12. The field survey shows that 6% of the respondents said water fees were expensive while 35% and 50% of respondents said the water fee is fair and inexpensive, respectively. The rest of the respondents said there is no payment for water (Table 12). Those
individuals who did not pay water fees and those who perceive the water fee as expensive should be interviewed about their reason for not paying so that they could contribute as per their economic ability.

Table 12: Opinion of respondents to the existing water service fees

<table>
<thead>
<tr>
<th>What is your perception of water fees?</th>
<th>No</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expensive</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Fair</td>
<td>63</td>
<td>35</td>
</tr>
<tr>
<td>Inexpensive</td>
<td>89</td>
<td>50</td>
</tr>
<tr>
<td>No water fee</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>180</td>
<td>100</td>
</tr>
</tbody>
</table>

In the study area, 23% of FWSPs and 40% of NFWSPs households have problems paying the water fee and the remaining do not. Of FWSP respondents 82% believed they were able to replace the system from community funds and 72% believed they could sustain it. According to NFWSP respondents, 62% thought they could replace the scheme with only 33% perceiving that they could sustain it (Table 13). A significant percentage of NFWSP community respondents (82% and 72%) explained that they have financial problem to replace the service and unable to sustain the service respectively (Table 13). On the other hand, 62% and 33% of NFWSP respondents explained that they have financial problems to replace and sustain the scheme respectively. It is interesting to note that a significant number of respondents do not believe that the monthly tariff would cover a major breakdown. This means that nearly half of the individuals who believe their tariff will cover the cost of repair are misinformed, and may not be prepared to cover the cost of a system failure. Close similarity was observed between FWSPs and NFWSPs regarding the water payment problem, and the community replacement fund.
Table 13: Opinion of respondents on water fee payment problems, capacity of funds to sustain and replace the service

<table>
<thead>
<tr>
<th>Opinion of respondents</th>
<th>Water fee problem (ability to pay)</th>
<th>Community replacement fund</th>
<th>Financial capacity to sustain the service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FWSP</td>
<td>NFWSP</td>
<td>FWSP</td>
</tr>
<tr>
<td>Yes</td>
<td>23%</td>
<td>40%</td>
<td>82%</td>
</tr>
<tr>
<td>No</td>
<td>68%</td>
<td>56%</td>
<td>9%</td>
</tr>
<tr>
<td>No response</td>
<td>9%</td>
<td>4%</td>
<td>9%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

4.10. Institutional Support and Capacity of the Woreda Water Staffs

Quarit Woreda WRMO is responsible to provide all the required support to the rural community for the development of clean water supplies. This office is the contact point for all national and international organizations that assist in water supply projects. A group discussion was held with the WRMO staff and the education and qualification of the group is given in (Table 14).

Table 14: Quarit Woreda water staff based on their education and qualification

<table>
<thead>
<tr>
<th>No</th>
<th>Field of Study</th>
<th>Responsibility</th>
<th>Education level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chemistry</td>
<td>Water quality expert</td>
<td>Diploma 1</td>
</tr>
<tr>
<td>2</td>
<td>Rural water supply and sanitation</td>
<td>Rural supply water expert</td>
<td>BSc 1</td>
</tr>
<tr>
<td>3</td>
<td>General Mechanics</td>
<td>Pump Attendant</td>
<td>Diploma 1</td>
</tr>
<tr>
<td>4</td>
<td>Mechanical Engineering</td>
<td>Maintenance and operation expert</td>
<td>BSc 1</td>
</tr>
<tr>
<td>5</td>
<td>Management</td>
<td>Planning and documentation expert</td>
<td>Diploma 1</td>
</tr>
<tr>
<td>6</td>
<td>Agricultural Economics</td>
<td>Office head</td>
<td>Diploma 1</td>
</tr>
</tbody>
</table>

With the above staff members, the woreda water office was providing water development facilities and support to the community. Only 4 BSc degree professional staffs and 2 Diploma experts are there in the woreda. Discussion with Woreda water
office identified that the staffs are not enough to provide the necessary water development service.

The field survey indicates that 44.4% of the respondents said that a system break occurred in their water supply system (specifically in the case of Chefakit and Zambit protected springs). The rest of the respondents (55.6%) explained that there was no major system break (in particular, the case of Weybeign and Enanigia hand dug wells). On the other hand, 25%, 6.7%, 3.3% and 12.2% of the respondents confirmed that there was system failure once a year, twice a year, three times a year and more than three times a year, respectively (Table 15).

Table 15: Respondents perception of occurrence of system breakdown and frequency per year

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Breakdown Occurred</th>
<th>Breakdown frequency per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No.</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>%</td>
<td>44.4</td>
<td>55.6</td>
</tr>
</tbody>
</table>

As seen from the results, unless beneficiaries report system failures, the woreda will not know the status of the scheme. This indicates weak monitoring and supervision activity in the woreda.

4.11. Water Quality Analysis

A variety of microorganisms are found in water, including pathogenic and non-pathogenic species. Non-pathogenic microorganisms may cause taste and odor problems with water supplies, which can influence whether people use the water for
consumption. However, the principle concern for microbiological quality is contamination by pathogenic species. Pathogens found in drinking-water include species of bacteria, viruses, protozoa and helminthes.

Lab results show that important criteria for chemical and biological quality of water from all the sample sources are under the World Health Organization (WHO) guideline values (see Table 16). During field observation it was noted that all water points under study were free from contamination. There was no nearby latrine site. However, at Gudign Mesk water point (a hand dug well), which was non-functional during this study, the total coli forms were 2 total coli form colonies per 100 milliliters which is greater than the WHO guideline value. The sample was taken from an unprotected spring used by the community. They were using this source because their developed water source was non-functional due to lack of water. Both beneficiaries and animals were using the source.
### Table 16: Source water quality results for selected WHO drinking quality parameters time given for service use

<table>
<thead>
<tr>
<th>Water sources</th>
<th>pH</th>
<th>Turbidity (NTU)</th>
<th>Conductivity (μs/cm)</th>
<th>Nitrate (mg/l)</th>
<th>Nitrite (mg/l)</th>
<th>Ammonia (mg/l)</th>
<th>Alkalinity (mg/l)</th>
<th>Fluoride (mg/l)</th>
<th>Total Hardness (mg/l)</th>
<th>Total Dissolved solids (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO standard value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.5-8.5</td>
<td>5</td>
<td>&lt; 4000</td>
<td>50 (as NO₃)</td>
<td>3 (as NO₂)</td>
<td>1.5</td>
<td>350</td>
<td>1.5</td>
<td>300 (as CaCO₃)</td>
<td>1000</td>
</tr>
<tr>
<td>Chaku</td>
<td>6.81</td>
<td>2.21</td>
<td>272.00</td>
<td>4.64</td>
<td>0.02</td>
<td>0.00</td>
<td>173.00</td>
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CHAPTER FIVE
CONCLUSION AND RECOMMENDATION

5.1. Conclusion

This study elicited the main reasons why water supply systems have become non-functional within a short time after installation in Quarit Woreda. Field survey, personal interviews, focused group discussion and field observations were done to collect the relevant information about twelve water supply schemes in the woreda. The majority of water supply systems installed were still functional five years after installation in Quarit Woreda, and only a relatively small amount (15.2%) became nonfunctional. Therefore, six of the selected schemes were still functional while the other six were not. Below we will explain the differences between the two systems.

For all projects (both functional and nonfunctional) the community was similarly involved independent of whether the system failed afterwards or not. Nearly 80% of the households were involved in asking for a new water project. The amount of work contributed and other factors indicating community involvement in the water supply project did not show any significant difference. Beneficiaries are willing and happy to sustain their systems as far as the service is provided for drinking, bathing, watering their animals, clothes washing and garden irrigation because the communities (about 78% of the respondents) understand the system belong to them (Figure 14). They were also happy to refund the system in order to rehabilitate as much as possible. In addition, communities depend on rivers, lake, and unprotected natural springs for other water needs than drinking and food making to reduce pressure and frequent failures, which is resulted from concern and satisfaction. But their economic ability and other problems like sickness and low harvest makes them not to involve in water fee. A significant number of people could not pay for the water. It is well established
that payment is extremely important for the sustainability of a water supply system. Our results confirm that there was larger percentage of people from the non-functional systems (79%) compared to the functional systems (54%) who could not pay for the water fees due to one of the following reasons: sickness and old age (low income), landless people without income (no water provided), payment collection has not begun, and finally the belief that water is gift from God and should not be paid for (Table 8). It is usually assumed by donors that all people can pay and a framework of a sliding payment schedule based on income is established usually. However, there is no true tariff stricture to establish water fees. The community has been paying only at the beginning of the project development. Once they paid their share, they were free to get their service. They believe that the operation and maintenance cost should be covered by the local government and project owners because the salary of the guards and expenses for receipt take greater part of operational costs in the study area.

Consequently, the general held belief that community involvement is the most crucial factor in the failure rate of a water supply system (World Bank, 1992: Campbell et al., 1993: Mukherjee et al., 2003) does not seem to be an important factor in the Quarit Woreda because often community participation is not from their own motivation but enforced by the local government (Figure 13). However, there is substantial contribution from local communities during the project implementation phase. The provision of plot of land for well site, provision of food and drink for the workers and monetary contribution is encouraging. In this regard, contribution of labor by the community is dominant. The study found that the contributions required by projects often were perceived by household members as a tax, rather than a contribution to the type and level of service they would receive.
The study found that demand-responsiveness of projects could affect sustainability of water supply points. When household members, rather than community representatives like water committees, traditional leaders, and local governments are involved in the initiation and design phase of the projects, there is sustainability of water supply projects (Figure 5). It was found that community involvement in site selection and the type of technology was weak. This indicates that water supply projects were developed from the supply side and not based on any particular demand from the community. In such cases, community members often expressed dissatisfaction with the service, possessed a low sense of ownership, and had little willingness to pay for the maintenance and sustainability of the service. Hence, the demand-responsive approach is most effective when demand is expressed directly by household members, not through community leaders or community representatives.

The establishment of a water committee has a significant effect on sustainability of water supply schemes as a committee is important for producing plans for new water supply systems and maintenance of old ones. In addition, committees in both functional and nonfunctional were responsible for collecting tariffs, keeping financial records, encouraging the community to take part in the existing and new water development projects, demonstrating the benefit of sanitation, sanctioning people for non-payment, promoting additional drinking water developments, and maintaining existing water supply systems. For rural water projects, the creation of a water committee elected by beneficiaries is a prerequisite to receive project assistance. The study found that almost all water supply points established their water committees having five members with a three men and two women composition. However, women members were elected just for the sake of fulfilling the criteria of the project. Women’s participation as members of water committees is very low in the study area.
though there were two women members in the water committee in all water supply points. This is attributed to the cultural attitude of the area which discourages women to sit and discuss problems with their male counterparts in water committees and others.

One of the main differences between the functional and non-functional systems was the involvement of the local leaders (Figure 5). The importance of the local leaders can be understood in light of the findings of the Rural Water Supply and Environmental Program (RWSEP) (Personal Communication, Yohannes Meleku, 2010). As reported by RWSEP and in accordance with our findings, the Quarit woreda offices are greatly understaffed and unable to deal appropriately with the many water supply projects that are being installed. Therefore, the woreda personnel cannot provide sufficient supervision of the contractors who are installing the systems, and this lack of supervision can result in poor workmanship. The local leaders can provide this supervision to the local contractor, and these local leaders can make sure that the correct site for the water supply is selected. An inverse relationship between the involvement of (and the supervision provided by) the local leaders and poor workmanship was determined in this study.

Thus, the construction quality of the schemes had a major impact on sustainability. The results from field observations confirmed that there were construction quality problems for many of the studied water supply points, especially the nonfunctional ones. When construction quality was poor, systems had a lower chance of sustainability. Systems built by private contractors were not consistently better or worse than those built by community members. Instead, the evidence suggests that
poor construction quality was more likely to occur when contractors or project staff were accountable to a distant project manager rather than to the communities.

The study found that most of developed water points were not properly fenced (Figure 7 and Table 6). Moreover, there was no integrated approach to the conservation practices to be conducted by the community. Flood and gully formation are the problems affecting the functionality of water supply points. Thus, appropriate water point fencing and protection are important for sustaining water supply points. Moreover, the damage to water supply points by flood and gully formation within or near most water points are likely to cause the pollution at some of the water points. However, the laboratory analyses of water quality shows that the various parameters tested were well within WHO values.

The other conclusive finding of this study is that substantial numbers of respondents were satisfied with the test (74%), color (73%), quantity of water (56%) and the number of hours (75%) required for water collection at all water point except Girarima water point (Table 9). However, the study reveals that an extended time is required to fetch water for daily use. Without considering the time of travel, people stay for at least two hours waiting to fetch water at some water points. The landscape of the area, family size and the inadequacy of existing services are dominant factors indicated by beneficiaries to this extended time. Furthermore, seasonal shortages of water occur. Despite this, the degree of satisfaction with general services is higher (Table 10).

One of the most conclusive findings of this study is that both household and water committee training before and after the after project plays an important role in ensuring sustainability. Training provides knowledge of the operation of the water
system, the means to repair parts, various health benefits to protecting the water source and preventing major problems (Figure 13). However, the objective of the training is often politically oriented rather than oriented towards the benefits of the water point. However, this study shows there is poor background of training both at household and water committee levels. The training approach for water committees is inconsistent since some committees have received trainings multiple times while others have not received a single training.

Poor training approaches and inconsistencies in training are likely the result of the shortage of skilled manpower at Quarit Woreda water resource management office. Furthermore, there is a lack of manpower to conduct in advance an integrated baseline survey at the water supply project proposed site. Moreover, no effective monitoring and supervision during and after the project was completed despite their support to the community for making repairs.

5.2. Recommendations

A total of 217 water supply points (169 hand-dug wells and 50 natural protected springs) were constructed in the years 2005 to 2009. Of these water points, 184 were functional and 33 were non-functional. This indicates that a decent effort is being made to improve water supply access in the rural communities. It can be even better when more attention is paid to the following factors.

1. When the role of project initiation and selection of service level options, technology and siting are placed in the hands of well-informed local leaders rather than project owners or water committees, there is often a high level of sustainability of water supply points. Projects should take steps to ensure that
community representatives truly stand for all members of the community, including women and other traditionally excluded groups. Beneficiaries should be viewed as consumers with demands so that their needs are directly addressed in the design. Special attention should be paid to assuring that women leaders are part of the process and that their particular needs are included.

2. Construction quality, appropriate fencing, system area conservation practices and periodic monitoring, and effective supervision of rural potable water projects enhance sustainability of schemes. In the study area, there was a gap on these infrastructures mention above. Hence, the woreda water office in collaboration with the project owners should develop a standard rule for appropriate fencing, construction quality, monitoring and supervision activities.

3. Investing in household and water committee training strengthen the sustainability of water supply systems. In the study area, it was found that the training objective given by the woreda staff was politically oriented. Projects should include training as part of their project design and training should be related to the project objectives. Communities that receive household-level training in operation and maintenance and hygiene education are more satisfied with their systems, more willing to pay the costs of maintenance, keep the system in better physical condition and take better overall care of their systems.

4. It is recommended that appropriate cost sharing and recovery could improve sustainability of water supply systems. However, water payment of the users in the study area was very weak. More awareness creation efforts should be done related to the importance of tariff payment and it was paid for their service use and even
they are willing to increase the water tariff further. Hence, users should be encouraged to set a reasonable tariff that enables them to recover sufficient reserve fund for replacement and rehabilitation of schemes. Regulations or subsidies should be in place that cannot pay.
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