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Sustainability Challenges of Rural Water Supply Schemes: The

Case Study of Four Tabias in Enderta Woreda, Tigray Region, Ethiopia

**A Thesis Submitted to the Department of Management in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Development Studies**

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**LIST OF ACRONYMS**

ADF African Development Fund

ADB Asian Development Bank

BOFED Bureau of Finance and Economic Development

CSA Central statistics Authority

DFID Department for International Development,

DWD Directorateof Water Development

EWRMP Ethiopia Water Resource Management policy

EWHO Enderta Woreda Health Office

EoWME Enderta office of Water, Mining & Energy

EoARD Enderta Office of Agriculture and Rural Development

mm millimeter

IRC International Water and Sanitation Centre

MDG Millennium Development Goal

MoWR Ministry of Water Resources

NGO Non-governmental Organization

OECD Organization for Economic Cooperation and Development

RWSPs Rural Water Supply Projects

RiPPLE Research-inspired Policy and Practice Learning in Ethiopia and the Nile Region

SPSS Statistical Package for Social Science

UAP Universal Access Plan

UK United Kingdom

UN United Nations

UNICEF United Nations Children’s Fund

USAID United States Agency for International Development

WSSCC Water Supply and Sanitation Collaborative Council

WHO World Health Organization

WSSTP Water Supply and Sanitation Technology Platform

WWC World Water Council

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***ABSTRACT***

*Water-supply programs consist of three essential components: technology, people, and institutions. The interface of these facets determines whether a particular scheme is sustainable or not.*

*Both the government of Ethiopia and donors are striving to increase the water supply coverage of Enderta Woreda. However, a high rate of non-functionality of the water supply schemes developed has been observed both at the regional and Woreda levels, implying a negative impact on the country’s water supply coverage. The non-functionality rate of schemes in the Woreda (14%) is well above the regional average (12%). This has forced communities to rely on unsafe sources of water for basic consumption.*

*In majority of cases, tariff setting involved the community and took place with prior consultation. According to the data obtained from the water users (72.5%) tariffs set are affordable. The presence of fee charges for water service for most water committees could be considered an important step towards subsequent scheme sustainability.*

*Regarding community participation in technology selection, some expert officers said that they tried to discuss with and convince the community regarding the schemes to be installed in the project site, but do not consult on scheme type selection. Nonetheless, the absence of community participation in technology selection leads to a lack of community acceptance of schemes and underutilization which also impacts significantly on the sustainability of schemes.*

*The fact that the majority of respondents contributed labor and cash during the implementation of the water schemes implies that these individuals are responsible for their development. This is also a big potential for community development. Nevertheless, it is also difficult to extrapolate whether or not participation of communities during the initiation or implementation phase of the project will result in long term sustainability.*

*The absence of participation of all segments of the community, water committee currently managing schemes rarely represent the community that they are serving. The low number of women in the water committees and their marginalized positions indicate that they are still not invited to be fully involved in the decision making process.*

***…………………………………………………………………………………………….***

***Key words:*** *Sustainability, institutional, financial, technical, Community participation, community management, water committee .*

**CHAPTER ONE**

**INTRODUCTION**

***1.1. Background of The study***

Water is the basis of life. We were all taught this in school and we all take water and sanitation for granted, but few people realize how tremendously important advanced water supply and sanitation services really are, with respect to both, economic development and safeguarding health and survival.

To maintain or to develop a prosperous economy, clean water supplies and safe disposal of sewage are essential. People need water for their physical well-being, not only to drink or do their washing, but also as a resource for agriculture and industry. Production of food, materials, clothes and other necessities is impossible without water. Millions of people are displaced; many perish for lack of water or endure regional conflicts over water resources. (WSSP, 2005)

Sufficient potable water supply is one of the basic rural services, which highly affect the economic progress of rural areas and the health of their people. However, many rural areas around the world are facing serious problem of water supply. The problem in most of third world countries, including Ethiopia, is particularly worst and multidimensional.

The provision of adequate supply of potable water in rural areas in both developed and developing countries is essential for life. In relation to this, Alebel (2004) and Churchill (1987) mentioned that in developing countries the provision of adequate potable water in addition to drinking, cleaning etc. improves health by reducing incidence of water related illnesses such as diarrhea, cholera, and the like. This also helps to reduce both the mortality and morbidity rates and the number of working days lost and increases the gross domestic product. Reducing the incidence of illness will help to slash demand for improved medicine and eases balance of payment problem facing least developing countries. As such, available evidence suggests that there is a very tenuous link between improvements in health and investments in water supply and sanitation services.

Water-supply programs consist of three essential components: technology, people, and institutions. The interface of these facets determines whether a particular scheme is sustainable (Betman & Miriam, 2007). The goal of the water supply and sanitation sector is to improve the social well being of the populace, enhance the performance of the national economy and ensure equitable provision of adequate quantity and quality of water services to all competing user groups on a sustainable basis.

In many countries, water shortages stem from inefficient use, degradation of the available water by pollution and the unsustainable use of the resource (Dessalegn, 1999). Supplying water projects alone would not contribute for reduce the problem of sustainability of schemes. Rather the issue of functionality, utilization by intended beneficiaries and continuity of water projects to serve for longer period are very important to be considered. Hence, integration between beneficiaries and project suppliers in all phases needs to be addressed to come up with sustainable utilization of the resource. The main objective of this study is to examine the above mentioned challenges of sustainability of rural water supply in Enderta woreda.

***1.2. Statement of the Problem***

In the majority of cases, it is rural poor communities that are socially and economically affected by water inadequacy and subsequent poverty. The quality of potable water and the threat of waterborne diseases, such as cholera and typhoid, are critical public health issues in many developing countries (ADB, 2002). Moreover, worldwide, poor sanitation practices and a lack of safe and clean water for drinking, cooking and washing are responsible for over 12 million deaths each year (USAID, 1990).

It is an alarming fact that, in most developing countries, an estimated 30% to 60% of existing rural water supply schemes are inoperative at any given time (Brikké and Bredero, 2003), with serious impacts on the health and welfare of the people. African Development Fund (2005) report shows that, 33% of the rural water services in Ethiopia are non-functional (those not delivering service) due to lack of funds for operation and maintenance, inadequate community mobilization and commitment, as well as lack of spare parts. Similarly 12% and 14% in Tigray region and Enderta Woreda respectively are not functional (EoWME, 2009).Thus, the issue of sustainability is critical when resource scarcity and equity matters are raised.

Under the national and regional development framework Of Ethiopia, large amount of fund from national and regional governments as well as local and international Non Governmental Organizations (NGOs) is flowing to rural areas of the region to reduce the inaccessibility of the rural community to potable water. Due to this, every year 10-15 potable water supply projects have been undertaken in rural Enderta Woreda especially after the Woreda level decentralization has been experienced (EoWME, 2009). Construction of potable water projects in rural area would definitely increase the access of the rural community to potable water and to the health of citizen. However, this action alone could not bring the intended objectives accomplished.

Sustainable use of water resources needs greater attention, such as better planning and follow ups, better operation, maintenance, and management. As the level of investment in rural water supply by the international and national organizations increases, more specific information is needed about the sector. In addition, it is necessary to examine challenges that undermine long term sustainability of rural water supply projects both at the planning and implementation phases. To date, there will have no doubt that the need for such study in Tigray Region, focusing to assessing challenges of sustainable rural potable water use at both pre and post-project implementation phases. This will be useful to have sufficient information before launching large investments in rural water supply works.

Although women can play a greater role in sustainability of rural water supply schemes, they have less impact in decision making. This is as a result of the greater burden is put on them. Hence this research gives emphasis to the role of women’s participation in sustainability of rural water supply.

Bearing in mind the above issues, this study tries to asses the impact of typical factors such as institutional, technical and financial factors against sustainable use of rural water supply. More over, it investigates whether user communities will continue to use a new scheme after the project implementer has phased out? And whether they are willing and capable to face any challenges?

**1.3 The Research Questions**

The study tried to produce answers to the following research questions:

1. What are the functionality and service level of existing water supply schemes in the Woreda?

2. To what extent the institutional, technological and financial factors have impact on sustainability of water schemes in the woreda?

3. What specific community characteristics significantly determine the success or failure of community water supply management?

4. What are the roles of stakeholders in general and women’s participation in particular in sustainability of water supply schemes?

**1.4. Objectives of the Study**

**The General Objective**

The general objective of this study is to assess the sustainability challenges of water supply schemes in Enderta Woreda.

**The Specific Objectives**

The specific objectives of the research are as follows:

* To assess the functionality and service level of existing water supply schemes in the Woreda;
* To examine the institutional, technological and financial factors impacting on sustainability of schemes in the woreda;
* To investigate management systems of rural water supply services under community-based management
* To assess the role of stake holders in general and women’s participation in particular in sustainability of water supply schemes;
* To forward recommendations for sustainability of rural water supply in Enderta Woreda in particular and Tigray region in general.

**1.5 Significance of The study**

This research will contribute to the better understanding of problems and factors related to sustainable water supply system. The output of this research may be used as an input while developing strategies and management system to improve the performance and sustainability of rural water supply systems in Tigray region in general and Enderta Woreda in particular. Besides, as the findings of this research are expected to come up with assessment of overall factors related sustainability of rural water supply systems, it may initiate interested researchers to undertake a more comprehensive investigation to a greater understanding of the issues related to system sustainability in the rural water supply scene.

**1.6 The Scope and Limitations of the Study**

The scope of the study is limited to assessment of sustainability challenges of rural water supply and does not include urban, industrial and other consumption of water supply. Due to time and budget constraints, this study is limited only to particular area of Enderta woreda and is difficult to make generalization. Sustainability pertains to multiple aspects of a rural water supply, with institutional, social, technical, legal, environmental and financial dimensions. However, the study is limited to the investigation and analysis of factors pertaining to sustainable rural water supply systems only in terms of technical, institutional and financial factors. Here in the type of technology spring is not included. Moreover, the sample size is also limited to 160 of the total households in four tabias.

**1.7. Organization of the Study**

This thesis is made up of five chapters. The first chapter covers the introduction part which includes the background of the study, statement of the problem, research questions, objective, significance, the scope and limitation of the study. Chapter two deals with the related literature review, survey of both theoretical and empirical literature on challenges of sustainability of rural water supply is summarized and presented. Then, chapter three deals with the description of the study area and methodology of the study. The chapter describes the location of the study areas and the status of water schemes. Research design and data analysis is also part of chapter three. In chapter four results and discussions of the major findings are presented. Finally, chapter five presents summery, conclusions and recommendations.

**CHAPTER TWO**

**REVIEW OF RELATED LITERATURE**

**2.1 Conceptual (Theoretical) Frame Work**

**2.1.1 What is Sustainability?**

Sustainability is a concept that has arisen from the debate on sustainable development, which became important from the 1970’s onwards. However, for many organizations in the development sector, the United Nations document written in 1987, entitled “Our Common Future”, is probably the most widely quoted definition. This definition marks an important shift away from the idea of sustainability as primarily concern of ecology to one that emphasizes the economic and social processes of development (IISD, 2003).

The term sustainability is one that is used loosely to cover a whole range of topics. It is frequently used to refer to project sustainability— the capacity of a project to continue to deliver its intended benefits over the long term (Bamberger and Cheema, 1990). As this study focuses on water systems (not on projects), sustainability in rural water supply system refers to the maintenance and management of the water supply system as well as the provision of an acceptable level of services throughout the design life of the water supply system.

A number of simple definitions for sustainable development have been developed by different organizations.

***Brundlant Report*** *“Our Common Future” (1987) defines, as “Sustainable development is development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs.”*

***International Institute for Sustainable Development****, USA (2003); describes as “To be sustainable, development must improve economic efficiency, protect and restore ecological systems and enhance the well-being of all peoples.”*

***UK Government*** *“A better Quality of Life” (1999) defines as, “Sustainable development is a very simple idea. It is about ensuring a better quality of life for everyone, now and for generations to come.”*

***World Business Council for Sustainable Development*** *(2003), “Sustainable development involves the simultaneous pursuit of economic prosperity, environmental quality and social equity. Companies aiming for sustainability need to perform not against a single, financial bottom line but against the triple bottom line.”*

Three aspects are found to be common elements in the definition of sustainability. Such elements are: - the scarcity of available resources,the interdependence of human activities of both the present and future generations, andissues of equity in distribution of a benefit.

The issue of sustainability first arose within the environmental movement and attempts to protect natural resources and ecological systems from over-extraction and shocks or stresses. However, it has also been extended to incorporate other dimensions like economic, social and institutional. For example, the idea of economic sustainability which is achieved only when a given level of expenditure can be maintained over time or related to the resilience to risk of net benefit flows over time by World Bank (OECD;2003).

The concept also incorporates institutional or management questions, in that sustainability is achieved when prevailing structures and processes have the capacity to continue their functions over the long term (DFID; 2000).

Recently, the issue of sustainability has found some space in the corporate sector, whereby businesses are considering impacts of their activities, not only in economic terms, but also with respect to environmental quality and social equity (see definition of the World Business Council). For many organizations, from both the public and private sectors, the practical application of “sustainability” translates into broader governance issues about how different institutions and actors can work to maintain economic, environmental and social benefits over time.

**2.1.2. Theories of Sustainable Development**

Despite the apparent simplicity of the Brundtland Commission's definition of sustainable development, the concept itself is rather complex. David Brown (1991), President of the Institute for Development Research at Boston University, for example, distinguishes between four dimensions of sustainable development: 1) ecological sustainability implies that non-renewable and other natural resources are not depleted for short-term improvements; 2) economic sustainability implies that improvements do not depend on continuing infusions of resources that cannot be maintained; 3) political sustainability requires that changes are consistent with present or emerging distributions of power in the society; and 4) cultural sustainability suggests that changes must be consistent with core values, expectations, and mores of the society.

According to Brown, effective approaches to sustainable development must: a) optimize the use of resources that are available locally; b) minimize dependence on resources that must be brought in from the outside; c) not seek improvements for which continuous infusions of existing or new resources are needed; and d) conserve those resources that are needed for improvements over the long-term.

In the extensive discussion and use of the concept since then, there has generally been recognition of three aspects of sustainable development (Holmberg, 1992):

**• Economic:** An economically sustainable system must be able to produce goods and services on a continuing basis, to maintain manageable levels of government and external debt, and to avoid extreme sectoral imbalances which damage agricultural or industrial production.

**• Environmental:** An environmentally sustainable system must maintain a stable resource base, avoiding over-exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes. This includes maintenance of biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources.

• **Social:** A socially sustainable system must achieve distributional equity, adequate provision of social services including health and education, gender equity, and political accountability and participation.

Clearly, these three elements of sustainability introduce many potential complications to the original simple definition. The goals expressed or implied are multidimensional, raising the issue of how to balance objectives and how to judge success or failure. For example, what if provision of adequate food and water supplies appears to require changes in land use which will decrease biodiversity? What if non-polluting energy sources are more expensive, thus increasing the burden on the poor, for whom they represent a larger proportion of daily expenditure? Which goal will take precedence?

In the real world, we can rarely avoid trade-offs, and as Richard Norgaard (1993) points out, we can “maximize” only one objective at a time. Norgaard concludes that “it is impossible to define sustainable development in an operational manner in the detail and with the level of control presumed in the logic of modernity.” The strongly normative nature of the sustainable development concept makes it difficult to pin down analytically.

Nonetheless, the three principles outlined above do have importance at a common sense level. They satisfy the criterion set forth earlier for a powerful, easily grasped concept which can have wide applicability. Surely if we could move closer to achieving this tripartite goal, the world would be a better place – and equally surely we frequently fall short in all three respects. It may be easier to identify un-sustainability than sustainability and the identification of un- sustainability can motivate us to take necessary policy action.

It is instructive to examine the problem from different disciplinary perspectives. Certainly the goals set forth require the insights of multiple disciplines. Economists, one might assume, would tend to give greater weight to the economic objectives, ecologists to the environmental dimension, and social theorists to the social issues. But before we can attempt to balance these different perspectives, we need to understand them and explore their internal logics.

Each of the three areas is commonly referred to as a *system*: economic systems, environmental systems, and social systems each have their own logic. It is an impossible task to analyze all these systems at once. Therefore we must start by considering each separately, as suggested by the Bossell’s report on sustainability indicators**:**

*The total system of which human society is a part, and on which*

*it depends for support, is made up of a large number of component*

*systems. The whole cannot function properly and is not viable and*

*sustainable if individual component systems cannot function properly.*

*Sustainable development is possible only if component systems as well*

*as the total system are viable. Despite the uncertainty of the direction of*

*sustainable development, it is necessary to identify the essential component*

*systems and to define indicators that can provide essential and reliable*

*information about the viability of each and of the total system.* *(Bossell, 1999)*

This implies that we can use different indicators to measure different dimensions of sustainability. Indicators imply measurement; measurement implies the theoretical definition of concepts to measure.

**2.1.3. The Rationale of Sustainable Rural Water Supply**

In the 1980s, too many of the projects in the Rural Water Supply Sector had proven to be unsustainable (Harvey, 2003). Thus, the Water and Sanitation Decade of the 1980’s has shown that achieving lasting benefits from water supply interventions involves much more than building facilities. According to many commentators, the failure of many rural water supply projects in the past is largely attributed to the top-down, supply-side approaches practiced by different development actors in the past decades that failed to insure the genuine participation of communities. In this regard, Gourisanker (2003), WSSCC executive director, commenting on the WSSD'S target (set to be achieved by 2015) says: "The agreement on time bound targets should not be taken to imply a more of the same; a continuation of the 'top-down', 'supply down' approaches that have failed in the past " . For Gourisanker, " the most important lesson is that official agencies are most effective when they seek to stimulate and support community based initiatives, rather than doing the job themselves " (Ibid.).In general, in the early 1980s, it became clear that in the water supply sector, the customary supply driven approaches were not sufficient and should be replaced by the new bottom-up, demand-driven approach.

This new approach to rural water supply focuses on the importance of involving the community in all aspects of service delivery, the use of appropriate technologies, and the role of governments as service promoter rather than provider. It also demonstrated the limitations of top-down and supply driven approaches to delivering services. Today, the development endeavor of government and Non-Government Development Organizations in countries of Africa, especially those south of the Sahara, is found to be futile if the development activity does not have a participatory nature. Meanwhile, the justification to the new, bottom-up, demand-driven approach is largely attributed to what is known as sustainable development in general and sustainable rural water supply in particular. In connection to this, therefore, it is worthwhile dealing with the concepts of sustainability in rural water supply.

**2.1.4. Factors of Sustainability in Rural Water Supply**

Sustainability pertains to multiple aspects of a rural water supply, with institutional, social, technical, environmental and financial dimensions (WELL, 1998). This accounts for the fact that understanding and measuring sustainability is so difficult, and why solutions are highly context specific.

Other factors such as the on-going use of traditional sources of water, poor legal system, poor systems of cost recovery and the distaste for the water from the improved source also contribute to undermining sustainability (Parry-Jones et al, 2001).Some of the major determinant factors are described below.

***Technical Aspects***

The use of appropriate technologies which are low cost, easy to maintain, simple to use and readily available is one response to the challenge of sustainability. Appropriate technologies are integral to the concept of village level operation and maintenance which emerged in the Water Decade (1981 – 1990). Many of its basic principles are still guiding the water sector today, though a tension persists between the ease of maintaining a system and its durability (Reynolds, 1992). The village level operation and maintenance conceptualization of the community as an island also neglects to recognize the role of external support agencies, such as the government, in achieving sustainability (Webster et al, 1999).

Technical issues relating to the design and construction of rural water systems are the most obvious determinants of water system sustainability (Ripple, 2008). Poor construction quality or the use of low grade materials may lead to the failure of the water system before the end of its design life. Similarly, design flaws including shallow wells or boreholes, and overestimates of the water sources may cause a system to fail from the outset (Ibid).

***Institutional Aspects***

Rural water supply institutions at all levels have key roles to play in optimizing the delivery of sustainable services. Key challenges in the decentralization process are the lack of capacity and the political economy of institutional reform (Reed, 2004).  
  
Political commitment is needed both inside and outside the water supply sector to enable organizational change. Many local governments lack the human resources or expertise needed to carry out expanded responsibilities, while central agencies often find it difficult to change their role in sustainable water supply from implementer to facilitator(WWC,2003).  
  
Successfully decentralizing service delivery usually calls for technical assistance to address capacity constraints, alongside broad institutional reforms. An essential element in achieving better-managed rural water systems is the promotion of local private sector participation in management, provision of equipment, and maintenance. (WSSTP, 2005)

Experience has shown that even a well-constructed water system needs proper institutional arrangements to keep it functioning over time. Most systems require some sort of preventive maintenance (Ripple, 2008). Hand-pumps may require grease for moving parts. Gravity systems may require sediment be removed from storage tanks or repairs for leaky taps and cracked pipes. In addition, work is required to keep the water source free from contamination (Ibid). This implies that since most rural water systems are shared by a number of families, providing these inputs and accomplishing all these tasks requires some sort of community management structure, such as a water committee, to oversee operation and management and collect money to cover the costs of these services.

***Financial Aspects***

The widespread failures in water supplies have been attributed to a number a flaws in the project; the intervention was not desired by the community, the capital and/or recurrent costs are too high for the community, lack of ownership results in neglect of maintenance and repairs, the promised benefits don’t materialize, education programs are too short and trained members of the community move away or lose interest (Carter et al, 1999).

To sustain water supply schemes, it is vital to have the involvement of all segments of the community, in the form of full participation and control over the scheme’s operation and maintenance, overall management, strategic decision making, ownership and cost sharing for operation and maintenance and construction activities (Lockwood, 2004).

The sustainability of a rural water system depends on the willingness of users to provide the necessary time, money and labor to keep the system functioning. This willingness may be affected by socio-economic factors such as income level, ethnic homogeneity, or the willingness of villagers to work together (Palamagamba, 2005). More commonly, however, the willingness will depend on consumer satisfaction with the service, usually compared to the previous water source in a community. When communities perceive a significant improvement in water services, they are usually more willing to pay for operation and maintenance. Willingness-to-pay is also affected by community perceptions of ownership or sense of entitlement to free services from the government.

***Environmental Aspects***

Another external factor for post-project sustainability is sustainability of the water source itself. Obviously, deterioration of source water quantity will be of major concern in areas of low rainfall, or poor groundwater re-charge, where there is greater sensitivity to over-extraction. Nevertheless, even in relatively water abundant regions of the world, the source can fail to satisfy demand, either due to population expansion or due to abuse of supply for non-domestic purposes (Lockwood, 2004). Water quality may also suffer from contamination from agricultural by-products or chemicals. In either case, care must be taken in the design of projects to determine the likely of sustainability of the source over a long period. In fact, several recent project designs have incorporated water conservation components to address this specific issue. For example, the proposal made by World Bank for Maharashtra state in India includes water saving designs and the construction of recharge mechanisms, such as check dams and infiltration structures, in the watershed area of the projects, which are to be maintained for up to five years following project completion. (World Bank, 2010)

**Social Aspect**

Community participation in management of water projects could be the appropriate tool for achieving sustainability of water projects and can be used as a pedagogic tool for scaling up service provision in rural areas due to its flexibility and suitability. Due to the fact that rural communities are poor and living in a diverse and rapidly changing physical and social environment, it is impossible to device a single blue-print that meets the needs of all. Only by supporting locally determined and tailor-made solutions can the right match between costs and benefits, resources and needs be made .(Schonten and Morriarty, 2004)

Participation is viewed as a tool for improving the efficiency of a project, assuming that where people are involved they are more likely to accept the new project and partake in its ongoing operation. It is also seen as a fundamental right; that beneficiaries should have a say about interventions that affect their lives (Pretty, 1995).

Kumar (2002) asserts that participation is a key instrument in creating self-reliant and empowered communities, stimulating village-level mechanisms for collective action and decision-making. It is also believed to be instrumental in addressing marginalization and inequity, through elucidating the desires, priorities and perspectives of different groups within a project area.

The central role played by women in the provision, management and husbandry of water, primarily in the domestic and household context, has gained widespread recognition in recent years; especially sine the UN Decade (1980-1990) for Women (UN, 1997). One of the main reasons for this is that it is usually women who are the main collectors and user of water.

The way to find out women and decision-making in water related matters might be to simply ask how, by custom, women do contribute to community matters. Even though the division of labor between men and women shows both cross-cultural (or cross-country) as well as cross- regional variations (within a country), it is a widely accepted fact that women, in most cultures, take the responsibility of collecting water from various sources and managing it at home. In fact, there exists a wealthy of evidences that show the existence of a tight and close relationship between women and water. Nane Annan, wife of UN Secretary General, Kofi Annan, powerfully spelled out the importance of water to women and girls in Johannesburg, at the world summit on sustainable development, 2002. In a speech she argues that women bear the brunt of the burden of lack of safe water, and their involvement is key to achieving the aims of the Water, Sanitation and Hygiene (WASH) for all campaign.

The results of a gender desegregated data, collected during most pre-feasibility studies of development projects, also revealed that women, mostly, select water as their first development priority need, than men usually do. One of the outcomes of a one year participatory assessment study on the linkages between participation, gender, and demand responsiveness done in east Africa in 1998 showed that women in Malawi and Kenya generally contribute more than men to water programmers. (WWC, 2003)

Similarly, extension staff members in Wollo, Ethiopia, who spent at each of 12 water sources observing the gender and age of water collectors, found out that, in their project area, on overage, women undertook 90 percent of all water collection trips; children 18 percent and men only 2 percent (Desalegn,1999). Thus, in view of women's greater interest and influences on family decision regarding water, projects should evidently treat women as ' valued customers’. In spite of this, in most African countries, absence of women from decision-making in water resource management and service delivery is both inequitable, and severally hinders the possibility of realizing sustainability. When involvement of women in all components of a given project is realized, it makes projects and their endeavors so close to their goals of bearing fruit and there by benefit the community sustainability.

**2.2. Empirical Studies**

**2.2.1 An Over View of Sustainable Global Water Supply**

At the Millennium Summit in September 2000 the Member States of the United Nations (UN) reaffirmed their commitment to working towards a world in which sustaining development and eliminating poverty would have the highest priority (World Bank, 2010). From the agreements and resolutions of this Millennium Summit and other world conferences organized by the UN in the past decade, the so called ‘Millennium Development Goals’ (MDGs) evolved. Water plays a prominent role in all of these goals. The amount of deaths attributed to unsafe drinking water is over 3 million per year, greater than the number of deaths caused by AIDS (Ibid). Clean water is a prerequisite for the treatment of diseases; in developing countries 80% of diseases and 30% of deaths are water related. More than 1 billion people around the world lack safe water and 2.4 billion have no access to sanitation (WSSTP, 2005).

Among the eight goals, the seventh **(ensure** environmental sustainability**)** involves specifically the sector of Water and Sanitation. This goal is connected to three targets (9, 10 and 11) that deal directly with water supply and sanitation sector. Each Target has a set of indicators to monitor the progress towards the expected results. **(UNICEF, 2008)**

Target nine aims to integrate the "principles of sustainable development" into country policies and programs and reverse the loss of environmental resources. It promotes the concept of reducing unsustainable exploitation of water resources by developing water management strategies at regional, national and local levels. Target ten aims to reduce by 50 % the proportion of people in the year 2015 that have no sustainable access to safe drinking water and sanitation. Under target eleven, the UN summit pledged to have achieved by 2020, a significant improvement in the lives of at least 100 million of slum dwellers, specifically including their access to improved water and sanitation facilities.

**There is a growing concern that the Water and Sanitation Millennium goals are to ambitious and will never be achieved (UNICEF, 2008).** More and moreGovernments and the international donor community start to realize that especially for the t rural water supply the Millennium Goals will never be possible by the way that water projects have been organized in the past.

The donated hand pumps are cheap but not sustainable. All studies show that the main reason that hand pumps are abandoned within a few years after installation, is that they break down whereas there are no spare parts and technical expertise available for repairs. Although many projects train users in the maintenance of the hand pumps and tried to create a spare part distribution chain, these measure s did not provide the desired results for various reasons. **(UNICEF, 2008)**  
  
**Therefore the actual situation is still alarming:** most donor hand pumps are still abandoned within 3 to 5 years after installation when left to the care of communities alone. The communities have no other choice but to wait for a new donor project to rehabilitate the borehole with a new hand pump, but they know already that this will not solve their water problems in the future. However, when a new, but similar, standard hand pump is installed, the spare part and repair problems will soon force the community to go back again to their traditional water sources that are often un-protected and many kilometers from their homes. **(UNICEF, 2008)**

**Initially most donors and NGOs were reluctant to speak about this problem**, because they felt accused of not doing their work properly in spite of all good intentions. It is understandable that a NGO prefer to proudly show in a report how many hand pumps are installed with the funding, but is often doubt full if those hand pumps will be sustainable and will still function after some years. On the other hand, it is also clear that this cycle of installing new hand pumps over and over again in the same borehole is very costly and does not provide a sustainable solution for the community. **(UNICEF, 2008)**

The problem is clear, but so far no real solutions were available, quality hand pumps like the Volanta for instance were considered as too expensive and selection of which hand pump to use is often a matter of price. The new and cheap Afri pump, a “spare parts free” hand pump, is considered by international experts as a break through in hand pump design that can achieve sustainability of rural water supply at low-cost. **(UNICEF, 2008)**

**2.2.2. Experiences of Developing Countries in Sustainability of Rural Water Supply**

The Millennium Development Goal of halving by 2015 the proportion of people without sustainable access to adequate and affordable safe drinking water will be hard to achieve in rural Africa due to low levels of existing coverage, but this will become almost impossible if sustainability levels cannot be improved (Reed, 2004).

It is estimated that 35% of all rural water supplies in sub-Saharan Africa are not functioning (Baumann, 2005), and despite the frequency with which it appears in development discourse, the reality of sustainability remains elusive.

Recent field studies in Ghana, Kenya, Uganda and Zambia have indicated that the actions of many stakeholders in the rural water supply sector undermine the provision of truly sustainable services (Reed, 2004). Much talk of sustainability is simply rhetoric, since it is often in the self-interest of NGOs, bilateral and multilateral agencies, governments and the private sector to limit the sustainability of rural water supplies. Hence, a history of top-down service delivery by governments and NGOs frequently leaves a legacy of dependency in the villages on external assistance. Consequently, in the event of a failure in the water supply the villagers do not make any attempt at repairs as it is not perceived to be their responsibility.

An innovative approach to achieve sustainable rural water supply, based on a reward scheme for communities and local governments, is on the cards in India. The reward scheme is expected to address some of the most critical challenges facing rural water supply in India. A recent Planning Commission report showed that by the end of the 10th Plan, while high access to public infrastructure in rural water supply (95%) had been achieved, in reality some 280,000 out of 1,422,000 habitations provided for, soon "slipped back" due to poor operation, maintenance and failure of water sources, while a further 277,000 habitations face severe problems of water quality.  These observations are confirmed by the results of sector assessments studies led by World Sanitation Program and UNICEF across 16 states in India during 2004-2007. (World Bank, 2010)

To address this situation, the Department of Drinking Water Supply (DDWS), Government of India, proposed the launch of the Sajal Gram Puraskar in July 2007, to reward communities and local governments that achieve "sustainable" rural water supply. In presenting the new scheme, Mr. A. Bhattacharyya, Joint Secretary and Mission Director, DDWS, emphasized that, "there is a need for action plans to ensure sustainability, as well as protection of drinking water sources and systems.” DDWS has sought inputs from state governments and various donors on the structure and modalities of the proposed awards scheme. Water and Sanitation Program - South Asia (WSP-SA) is providing inputs to the department on indicators of sustainability and the eligibility criteria for the awards. (World Bank, 2010)

The provision of water legislation is also very crucial in ensuring that the concerns and interests of rural dwellers are genuinely addressed. Fortunately the legislative process in Tanzania has made public hearings mandatory at the level of standing parliamentary committees and they are open to every body that wants to participate (Palamagamba, 2005). The experience in the process of enacting the Land Act, 1999 and the Village Land Act, 1999 in Tanzania has shown that where people are organized and consistent in pushing their arguments leads the Parliament enact a law that takes into account interests of the people. In the case of the land laws it was the women civil society organizations which took the lead in pushing for reforms (Ibid). Equally in the case of water laws if the women civil society will appreciate that water is as critical as land to women interest in Tanzania and champion the cause it will help in shaping the laws to the interest not only of women but the entire rural population and the indigent urban population (Ibid).

Report by Harvey (2003), linking poverty levels to water resource use and conflicts in rural Tanzania, said that to ensure sustainability of water services there is a need to emphasize demand driven and community participation approaches. He commended one of the successful project known as Uroki-bomang`ombe Water Scheme (UBWS) in Tanzania where the community willingness and their participation in activities were high. Communities participated in all stages from planning to implementation. However, it is emphasized that there must be common features for the success of the water supply and sanitation services under a community management approach.

Management skills on how to handle group dynamics, institutional arrangements and monitoring and evaluation of the systems are the important element for success and sustainability of community managed water supply and sanitation services (Schonten and Morriarty, 2004). It is however noted that successful community management of water supply services needs on-going support and guidance even if communities are well trained and organized to operate the system (Harvey, 2003). Local governments, NGOs and private sectors are the important organs to ensure institutional support for the sustainability of water supply service under community management approach.

**2.2.3. Sustainability of Water Supply in Ethiopia**

The water supply and sanitation sector in Ethiopia is one of the least developed and is mostly characterized by service deficiency of physical infrastructure as well as by inadequate management capacity to handle policy and regulatory issue and to plan, operate, and maintain the service (Desalegn, 1999).

The national safe water supply coverage has reached 42.2% (MoWR, 2007). The Ethiopian government (subsequently the regional governments) adopted the National Water Resources Management Policy in 1999 (MoWR, 1999) so as to increase and sustain water supply services in both rural and urban areas. The overall goal of the policy is to enhance and promote ‘efficient, equitable and optimum utilization of water resources’ for sustainable socioeconomic development. The policy follows the principle that the water supply sector has to ensure that every Ethiopian citizen has access to water of acceptable quality to satisfy their basic human needs.

The government later adopted the Universal Access Program (UAP) to scale up the water supply and sanitation coverage of the country and achieve 100% water supply coverage in most of the rural regions by 2012 (MoWR,2006). UAP includes the Tigray region. To attain this target, the UAP assumes that, to make water supply schemes sustainable, hand pumps have to be made locally and repaired by local technicians and, generally, pumps and generators have to be standardized in relation to village-level operation and maintenance for sustainable service (ibid). It has been estimated that 33% of rural water supply schemes in Ethiopia are non-functional at anytime, owing to lack of funds for operation and maintenance, inadequate community mobilization and commitment and a lack of spare parts (MoWR, 2007). With regard to this issue, the UAP aims to rehabilitate and maintain existing water supply schemes in the first two years of its seven-year plan, so as to develop a maintenance culture and increase the sustainability of both the newly constructed and the existing water supply schemes (MoWR, 2006).

Like any other sector, water supply needs institutions (organizations) which are responsible for the provision of water supply and sanitation: Planning, financing, monitoring, and maintenance of water supply and sanitation activities. In this case water sector is characterized by complex institutional arrangements, and a variety of channels and sources of funds are used to finance the sector (OECD, 2003).

Based on the decentralization principle, the government of Ethiopia established the Ministry of Water Resource (MoWR) in 1995 at the federal level. The Water Supply and Sanitation Authority (WSSA) reduced to a modest department level within the Ministry’s functional structure6. The management of water resources at the national level is carried out by the Ministry of Water Resources. Ministry of water resources is responsible for formulating policies for the water sectors at national level, for long term planning strategies, the setting of generic standards and for the coordination of projects and their funding together with foreign donor agencies (MoWR, 2006). It is also responsible for legislation with regard to utilization and protection of water resources as well as the allocation of water between regional governments. It also provides technical assistance and advice upon request to the regional governments of the country. The table bellow identifies the new respective institutional role responsibility.

**Table.2.1:-The Water Supply Institutions Roles and Responsibilities in Ethiopia**

|  |  |  |
| --- | --- | --- |
| **No.** | **Institution** | **Responsibility** |
| **1** | **Federal** | * Policy setting: preparation & enforcement of policies, standards, and regulations * Technical assistance to regional bureau for big projects * National database development * Coordination and resource mobilization for the Water Fund |
| **2** | **Regional water bureaus** | * Preparation of regional policies, and regulations * Study, design, supervision and regulation of water supply projects * Construction of schemes: spring developments, small & large gravity schemes, motorized schemes, boreholes and shallow wells * Contract out to the private sector * Build the capacity of zonal and woreda water offices * Set water tariffs |
| **3** | **Zonal water offices** | * Capacity building and technical support to the woreda * Implementation and monitoring assignments from regional bureau * Operation and maintenance in complex cases |
|  | **Woreda water desks** | * Construction and maintenance of hand-dug wells and spring developments * Monitoring construction done by regional bureau or private contactors contracted by the bureau * Simple operation & maintenance |
| **4** | **Peasant associations/**  **Tabias** | * Community mobilization and contributions of labor and/ or cash * Site selection |

**Source :( MoWR, 2006)**

Each of the 9 regions and the Dire Dawa Administrative area has a Regional Water Bureau (RWB). RWBs roles include project implementation and scheme operation, but this has changed to one of program planning, management, coordination and capacity building in the region. RWBs are now responsible for approving the Woreda programs as well as consolidating monitoring and evaluation reports of the Woredas for transmittal to MOWR. The planning and management of town water supply and sewerage services are the responsibility of Town Water Boards who are expected to contract out operation and maintenance services to Town Water Utility Operators under performance or service contracts. Addis Ababa Water Supply and Sewerage Authority (AAWSA) has the responsibility for management of water and sewerage services in Addis Ababa.

The next lower institution after regional bureau is the Woreda Water Desk (WWD) which is responsible for planning and managing its own programs; financial and procurement management; monitoring and evaluation; and for contracting and supervising Local Service Providers at the Woreda and community levels. The WWD is responsible for the promotion, planning and implementation of water supply activities within the Woreda, as well as the coordination of NGO activities in the Woreda to; carry out simple feasibility studies and appraisals of simple projects; approve projects financed from the Woreda development budget; and ensure that schemes financed by others are properly appraised and implemented to the required standards. WWDs has a role in initiating, facilitating and providing motivation for community management of rural water services, the application of cost recovery principles, and the monitoring and evaluation.

**CHAPTER THREE**

**DESCRIPTION OF THE STUDY AREA AND RESEARCH METHODOLOGY**

**3.1 Description of the Study Area**

**3.1.1 Physical Characteristics**

Tigray region is the northern most of the nine [ethnic regions](http://en.wikipedia.org/wiki/Regions_of_Ethiopia) of [Ethiopia](http://en.wikipedia.org/wiki/Ethiopia) containing the homeland of the [Tigray people](http://en.wikipedia.org/wiki/Tigray-Tigrinya_people). Geographically, it is located between 12º15’ -14 º 49’ North latitude and 36 º 27’- 40 º 00’ East longitude (Peter etal, 2000). Its capital is [Mekelle](http://en.wikipedia.org/wiki/Mek%27ele). Tigray is bordered by [Eritrea](http://en.wikipedia.org/wiki/Eritrea) to the north (independent from Ethiopia since 1993), [Sudan](http://en.wikipedia.org/wiki/Sudan) to the west, the [Afar Region](http://en.wikipedia.org/wiki/Afar_Region) to the east and the [Amhara Region](http://en.wikipedia.org/wiki/Amhara_Region) to the south. Excluding Mekelle town, the regional capital, there are six administrative zones: Western, central, Eastern, North Western, South Eastern and Southern; comprising a total of 46 Woreda (districts) and 620 tabias (sub-districts). Besides Mekelle, other major towns and cities in Tigray include [Abiy Addi](http://en.wikipedia.org/wiki/Abiy_Addi), [Adigrat](http://en.wikipedia.org/wiki/Adigrat), [Adwa](http://en.wikipedia.org/wiki/Adwa), [Aksum](http://en.wikipedia.org/wiki/Aksum), [Humera](http://en.wikipedia.org/wiki/Humera), [Inda Selassie](http://en.wikipedia.org/wiki/Inda_Selassie), [Korem](http://en.wikipedia.org/wiki/Korem), [Alamata](http://en.wikipedia.org/wiki/Alamata), [Maychew](http://en.wikipedia.org/wiki/Maychew), [Wukro](http://en.wikipedia.org/wiki/Wukro), [Qwiha](http://en.wikipedia.org/wiki/Qwiha), and [Zalambessa](http://en.wikipedia.org/wiki/Zalambessa), as well as the historically significant village of [Yeha](http://en.wikipedia.org/wiki/Yeha) (BoFED,2009).

Enderta Woreda is located in the [Tigray Region](http://en.wikipedia.org/wiki/Oromia_Region)al state of [Ethiopia](http://en.wikipedia.org/wiki/Ethiopia); Part of the South Eastern zone. Enderta is bordered on the south by [Hintalo Wajirat](http://en.wikipedia.org/wiki/Hintalo_Wajirat), on the west by [Samre](http://en.wikipedia.org/wiki/Samre_(woreda)), on the northwest and north by the [Misraqawi (Eastern) Zone](http://en.wikipedia.org/wiki/Misraqawi_Zone), and on the east by the [Afar Region](http://en.wikipedia.org/wiki/Afar_Region). The altitude of this woreda ranges from 1500 to 2400 meters above sea level (WoARD,2009).It lies in the *woina dega* (midland) agro ecology, characterized by dry climatic conditions and erratic annual rainfall of 450-600mm (Enderta Woreda Agriculture and Rural Development Office,2009). The terrain is mostly plains and hills, with bush scrub vegetation. The land is rocky with limestone and marble resources that are currently being extracted by private investors. A good main road runs through Mekelle, connecting it to Asmara, the Eritrean capital, and to other parts of Ethiopia.

**3.1.2 Demographic Characteristics**

Based on the 2007 Census conducted by the [Central Statistical Agency](http://en.wikipedia.org/wiki/Central_Statistical_Agency_(Ethiopia)) of Ethiopia (CSA), the Tigray Region has an estimated total population of 4,314,456, of whom 2,124,853 are men and 2,189,603 women; urban inhabitants number 842,723 or 19.53% of the population. With an estimated area of 50,078.64 square kilometers, this region has an estimated density of 86.15 people per square kilometer. For the entire region 985,654 households were counted, which results in an average for the Region of 4.4 persons to a household, with urban households having on average 3.4 and rural households 4.6 people.

Based on figures published by the [Central Statistical Agency](http://en.wikipedia.org/wiki/Central_Statistical_Agency_(Ethiopia)) in 2007, Enderta Woreda has an estimated total population of 144,784, of whom 73,887 are men and 70,897 are women; 21,527 households. With an estimated area of 1,339.93 square kilometers, Enderta has an estimated population density of 108.1 people per square kilometer, which is less than the Zone average of 133.18(CSA, 2007). Enderta Woreda has been divided in to 17 Peasant associations (locally known as *tabias*) and 64 Sub Peasant associations (also known as *Kushets*) for administrative purposes (Enderta Woreda Administration, 2009).

**3.1.3 Socio-economic Characteristics**

In the study region, Tigray water for human consumption is collected from deep wells; shallow hand dug wells, springs and minor rivers. Overall water supply coverage of the region in 2009 was at 64% (56% rural and 72% urban) (BoWME, 2009). There were 4064 hand dug wells, 2815 shallow wells, 203 deep wells, 1021 spring developments , total of 7853 water supply schemes constructed by the regional government and NGOs in recent years (ibid). However, it has been noted that a large number (12%) of the water supply schemes are non-functional at any given time (ibid), implying negative impacts on coverage and on the attainment of the UAP. To this end, the Tigray BoWME aimed to increase the sustainability of water supply schemes.

According to the data obtained from Water, Mine and Energy office of Enderta Woreda (2009), there are 100 hand dug wells,121 shallow wells, 15 spring development and 3 motorized pumps total of 138 water supply schemes.The proportion of population having clean water in the Woreda is 73%. The maximum distance from any house hold to the nearest water point put by the Unicef is 500 meters (HCMSDR ,2004).But in Enderta Woreda average distance of water schemes from the house hold are located in areas 1.5 kms (EoWME,2009) far from settlements. In this case, the schemes lack closer eye contact from beneficiaries resulting in exposure to danger.

The community uses water as per the schedule of water committees. They also check and balance the activities of water committees with the help of the tabia Administration, to which the water committees are accountable. The tabia Administration supervises the overall activities of the water committees. The roles and responsibilities of the Wereda Water, Mine, and Energy Office constitute overseeing all the water supply schemes in the Woreda and providing backstopping support for water committees. These include: controlling and supervising water supply scheme design and construction; managing water supply schemes; providing maintenance support and relevant trainings for users and water committees; and controlling the quality of water supplied for domestic activities.

The office of Water, Mine and Energy of Endetrta woreda is the only responsible body for activities related to water supply development activities. Local and international NGOs help community of the woreda through the channel of this office.

Currently, rural water supply office of the woreda has only 13 staff members. The Head of rural water supply office explains that, the staff greatly suffers in covering all problems of the schemes found in the woreda. The office does not have enough budget and facility (such as vehicle, equipments, etc) as well as spare parts to solve failings at the right time. The office has only two motor cycles to serve the staff members in all areas of the woreda. This all have negative impact on the sustainability of the scheme.

The main crops cultivated are wheat and barley. Meager amounts of vetch, teff and lentils are produced to supplement income. The decision to grow short cycle crops is to some extent influenced by the oftentimes unreliable rainy season. Oxen are used to provide traction power for land preparation (WARD, 2009).

Other important economic activities in the woreda are labor migration, firewood sales and honey sales. Labor migration and firewood sales are important sources of income for poor households. Honey production requires initial capital for the purchase of beehives and management skills and is therefore practiced by the better-off households. Agriculture labor opportunities are available in the local areas, and casual wage labor is found in the urban areas. Firewood is mainly sold by both men and women in the very poor wealth groups.

**3.2. Research Methodology**

A combination of both quantitative and qualitative research methods were employed in this study. Data source and type, sampling procedures, data collection instruments and method of analysis are discussed below.

**3.2.1 *Data Source and Type***

Quantitative and qualitative data from both primary and secondary sources generated were used as input for the research findings. Primary data were obtained through questionnaire household surveys, in depth interviews and discussion with beneficiaries, water committee and technical staff members of the woreda, In addition, the researcher was tried to observe realities through field visit on the ground. The secondary data were obtained from official statistics and reports available in the project implementing agencies' offices of Enderta Woreda Water, Mine and Energy office, Enderta Woreda Administration, Enderta Woreda office of Agriculture and Rural Development, Tigray Region Bureau of Water, Mine and Energy, Tigray Region Bureau of Finance and Economic Development and other sources from sectoral offices in and out side the Woreda were the major sources of secondary data in this study.

***3.2.2. Research Design and Sampling Procedures***

The research used a cross sectional research design and data were collected on more than one case at a single point in time. The obvious advantage of this research design in this study would enable the researcher to control important factors that vary by community socio-economic settings, village geo-physical characteristics, scheme type, etc. that significantly affect many aspects of a rural water supply system. Thus, the case study had identified to represent some basic common factors that let comparison possible.

The central objective of the thesis is investigating the challenges in sustainability of water supply in Enderta Woreda. To conduct such kind of research, one obviously needs to collect primary data through census. However, due to finance and time constraints, the researcher made to focus on selected households. In the study both probability and non-probability sampling techniques were used. In Enderta Woreda there are 17 peasant associations locally called “Tabias”. From the 17 tabias four tabias were selected as a sample. The main criteria for selection were distance from the urban center (near and distant), topography (higher and lower elevation), and number of schemes having (larger and smaller schemes) were selected. Accordingly, May tsedo, Shbta, Mariam Dehan and Felege selam are selected (see table 3.1)

***Table 3.1:- Distributions of Potable Water Projects in Enderta woreda by type of Scheme and by (tabia)***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Names of**  **Tabias** | **Types of Scheme** | | | | **Total** |
| **Hand dug Well** | **Shallow Well** | **Spring** | **Deep Well** |
| 1 | Felege Selam | 4 | 8 | - | - | 12 |
| 2 | Mariam Dehan | 10 | 10 |  | - | 20 |
| 3 | Mahbere Genet | 3 | 8 |  |  | 12 |
| 4 | May Tsedo | 2 | 7 |  |  | 9 |
| 5 | Shibta | 9 | 10 | 1 |  | 20 |
| 6 | Messebo | 9 | 1 |  | 1 | 11 |
| 7 | Lemlem | 4 | 4 | 4 |  | 12 |
| 8 | Mahbere Genet | 4 | 12 | 1 |  | 17 |
| 9 | Chelekot | 10 | 7 |  |  | 17 |
| 10 | May Anbesa | 10 | 8 | 1 |  | 18 |
| 11 | Derge Ajen | 8 | 8 | 3 | 1 | 20 |
| 12 | Arato | 3 | 5 | 3 |  | 11 |
| 13 | Didba | 3 | 6 |  | 1 | 10 |
| 14 | Messeret | 8 | 8 |  |  | 16 |
| 15 | Felege Mayat | 4 | 1 |  |  | 5 |
| 16 | Debri | 2 | 7 |  |  | 11 |
| 17 | May Alem | 7 | 10 | 2 |  | 17 |
| Total |  | 100 | 120 | 15 | 3 | 238 |

**Source: Enderta Woreda Water, Mine and Energy Office (EoWME), 2009**

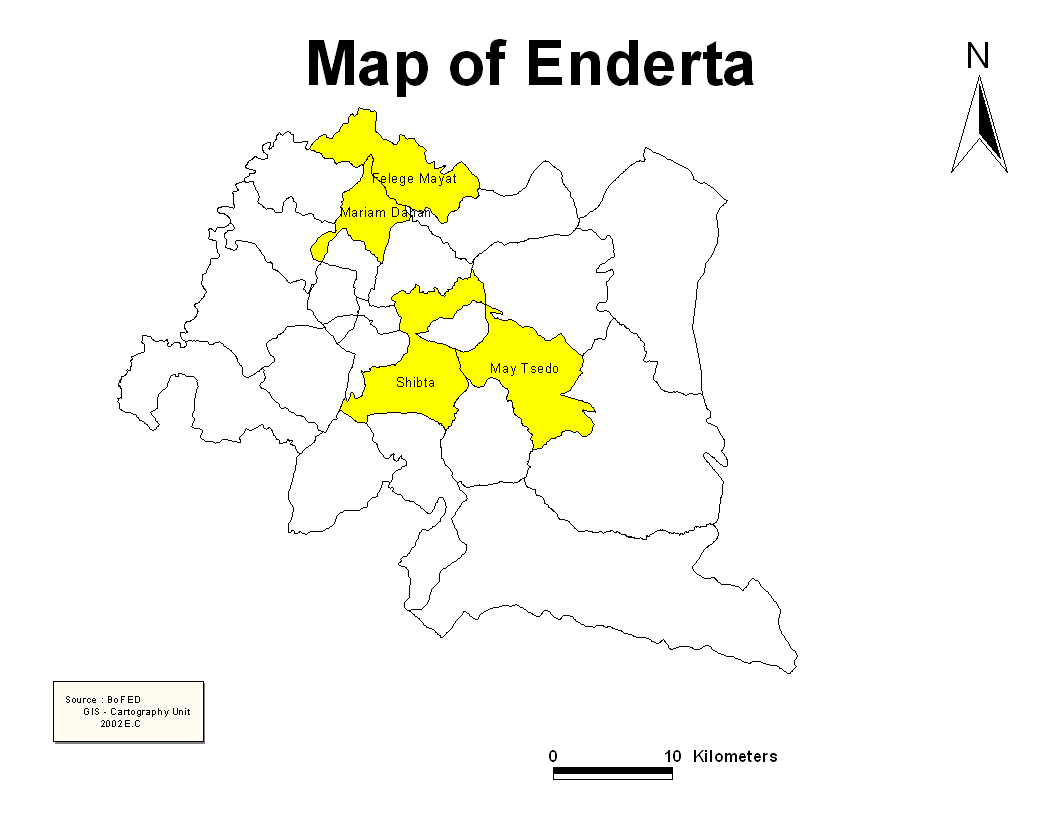
In general low sample sizes are taken for populations which are very similar in terms of content and subject matter while high sample sizes are needed for more diverse population. Having this in mind, from all existing 238 water schemes in the Woreda, three water points each from the above selected four tabias were chosen. The factors used for selection of the water points were technology type (shallow well and hand dug well) and status of schemes (functional and non functional). The sampling method used was simple random sampling method (lottery Method). On aggregate, 12 water points of different technology incorporating functional (those delivering service) and not-functional (those not delivering service) were identified as unit of analysis for this research.

**Table 3.2:- Functional and Non-Functional Schemes of Enderta Woreda**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Names of Tabias | Total Number  Of Schemes | Functional Schemes | Non-Functional Schemes |
|
| 1 | Felege Selam | 12 | 9 | 3 |
| 2 | Mariam Dehan | 20 | 16 | 4 |
| 3 | Mahbere Genet | 12 | 9 | 3 |
| 4 | May Tsedo | 9 | 8 | 1 |
| 5 | Shibta | 20 | 15 | 5 |
| 6 | Messebo | 11 | 10 | 1 |
| 7 | Lemlem | 12` | 11 | 1 |
| 8 | Mahbere Genet | 17 | 15 | 2 |
| 9 | Chelekot | 17 | 15 | 2 |
| 10 | May Anbesa | 18 | 16 | 2 |
| 11 | Derge Ajen | 20 | 17 | 3 |
| 12 | Arato | 11 | 9 | 2 |
| 13 | Didba | 10 | 9 | 1 |
| 14 | Messeret | 16 | 14 | 2 |
| 15 | Felege Mayat | 5 | 4 | 1 |
| 16 | Debri | 11 | 9 | 2 |
| 17 | May Alem | 17 | 15 | 2 |
| **Total** |  | **238** | **201** | **37** |

Source: Enderta Woreda EoWME (2009)

Table (3.2) shows functional and non-functional schemes in the woreda, The total number of schemes in the year 2009 were 238 out of this 201 were functional and 37 were non functional. From this we can understand that the number of non functional schemes are high. This needs an integrated work between the community, government and the NGOs.



**Figure 3.1 Map of Enderta Woreda and the Selected Study Area Tabias**

**Table 3.3:- The Number of Water Points in the selected Tabias**

|  |  |  |
| --- | --- | --- |
| **No** | **Name Of Tabia** | **Numbers of WPs** |
| 1 | Shbta | 20 |
| 2 | Mariam Dehan | 20 |
| 3 | May Tsedo | 9 |
| 4 | Felege Mayat | 5 |
|  | Total | 54 |

**Source: Enderta Woreda EoWME (2009)**

Household was the unit of data collection in the study and was contacted through semi-structured questionnaire response. It is desirable to have a sample which is representative of the total households of the Woreda as much as possible; thus 160 households were included as a sample population and are assumed as a representative for the population since it is homogenous. Thus, 13 households are selected from each sample water points to have a total of 40 households from each of four tabias.

Systematic random sampling technique was used to draw samples from the entire households in the four ‘Tabias’ of the Woreda. Through which the first element was chosen randomly in each tabia while the remainders were selected systematically. Then the population was classified in to groups and then the every ith household of the population was selected as a sample. This can be determined as:

|  |
| --- |
| **i th element=total population/required sample size** |

This technique was selected because the population was homogenous; it was easy to carry out and did not incur high cost.

***3.2.3 Instrumentations***

***Questionnaire***

Semi-structured questionnaires were administered to key informants. On those issues which needed wider explanations, an open-ended questionnaire was employed.

***Observation***

During his stay in the field, the researcher tried to observe realities on the ground. Accordingly, he undertook transit-Walks and informal discussions with key informants of community members.

**Focus Group Discussion** **(FGD)**

The informants were selected from all the stakeholders, both from grass root and agency levels together. At the grass root level, the informants were drawn from among community members who had participated as initiator, leader, committee member, and main contributor during project development or implementation period. In addition, women and community members who had served as Water committee member at different points in time after the start of the service delivery were also selected as informants.

Similarly, at agency level, informants were drawn from among key officials (Enderta Water, mineral and energy office, Enderta Woreda Administration office, Enderta Health office) consultants from Relief society of Tigray of the projects' implementing agencies who participated in the planning, management and execution of the projects.

***3.2.3. Data Gathering and Method of Analysis***

Data about the water supply sustainability problems were collected using different methods of data collection; these were semi-structured questionnaire, interviews and discussions with beneficiaries, members of different water committees, technical staff members, and personal observations were employed to produce primary data.

As to the analysis and interpretation of the empirical quantitative and qualitative data collected on user households, technical staff members and water committees using semi-structured questionnaire(quantitative), interviews and discussions (qualitative): various methods of statistical analysis and interpretation were applied. Data collected through the questionnaire survey was analyzed using the Statistical Package for Social Science (SPSS) version 16 for Windows. The questionnaires were given numbers for identification purposes. Each question was identified by a variable name and within variables there were values and value labels for identification of responses from the respondents. After coding the information from the questionnaires, template for entering data in the computer program was created. The data was then entered in the SPSS computer program where frequencies, multiple responses, mean, standard deviations and cross tabulations were computed during the analysis.

**CHAPTER FOUR**

**RESULTS AND DISCUSSIONS**

In this part, the status, functionality level and the main challenges that affect sustainability of the water supply schemes of the woreda are discussed based on the findings obtained from the survey.

Data collected during the questionnaire survey was analyzed using the Statistical Package for Social Science (SPSS) version 16.0 for Windows. The data was entered in the SPSS computer program where frequencies, multiple responses, mean, standard deviations and cross tabulations were employed where appropriate during the analysis.

Information collected through focus group discussion from the water committees and technical staff members of Enderta Woreda Water, Mine and Energy Office were grouped together according to the checklist questions and category of respondents. Data were summarized according to the questions and respondents to make it easier for comparisons between different groups on specific issues. Data were then read carefully between lines where related topics were highlighted with markers of similar colors. The identified topics and key words were then summarized and interpreted. Different views from different groups were also taken into consideration during interpretations.

**4.1 Characteristics of Respondents**

**Table 4.1:- Age-group, Sex and Educational Status of Respondents**

| **Age- group** | **Sex** | | | **Educational status** | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Male** | **Female** | **Total** | **Illiterate** | **Grade**  **1-4** | **Grade**  **5-10** |
| 20-24 | 5 | 27 | 32 | 12 | 20 | 8 |
| 25-29 | 16 | 20 | 36 | 16 | 8 | 0 |
| 30-34 | 7 | 9 | 16 | 8 | 0 | 8 |
| 35-39 | 13 | 19 | 32 | 32 | 0 | 0 |
| 40-44 | 7 | 9 | 16 | 12 | 0 | 0 |
| 45-49 | 5 | 11 | 16 | 12 | 4 | 4 |
| 50-54 | 4 | 0 | 4 | 4 | 0 | 0 |
| >55 | 3 | 5 | 8 | 4 | 0 | 4 |
| **Total** | **60** | **100** | **160** | **104** | **32** | **24** |

***Source: Own survey results, 2010***

A total of 160 questionnaires were distributed to be responded by the household water users during the questionnaire survey in four tabias of Enderta Woreda .The Tabias and number of respondent water users were May Tsedo(40), Shibta(40), Mariam Dahan(40) and Felege Mayat(40) with zero non response. About 60 (37.5%) of respondents were male and 100 (62.5%) were female. The higher number of female respondents is attributed by culture and traditions of Ethiopia, especially in rural areas where women and girls are responsible for collecting and managing of water in the household. Hence, water supply scheme failures largely affect women. So, it is the women who know much about the problems they are facing concerning water accessibility and sustainability use.

The age of respondents ranged from 20 up to above 55 years with an average of 34 years. Thus the respondents were in the economical productive age .That means data was gathered from the productive age group and indeed people of this age are those expected to have greater awareness and understanding concerning sustainable rural water supply and are expected to take actions in the sustainable development processes of rural water supply.

As in table 4.1 indicates, the educational status of the respondents shows 104 of respondents (65%) were illiterate, 32 respondents (20%) were grades 1 up to 4 and the remaining 24 respondents (15%) were grades 5 up to 10.This implies that the majority of the respondents were illiterate un able to read and write. Illiterate people have less awareness about the health benefit of improved sustainable rural water supply service and they are more likely understood and support the sustainable water service.

**Table 4.2:- Occupation and Marital Status of Respondents**

| **Marital status** | **In addition to farming in what activities do you engaged?** | | | | | | | | | | **Total** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Farmer only** | | **Daily laborer** | | **Crafts men** | | **Trader** | | **Other** | |
| Never married | 8 | | 12 | | 0 | | 0 | | 0 | | 20 | |
| Married | 40 | | 44 | | 4 | | 4 | | 0 | | 92 | |
| Widowed | 8 | | 0 | | 0 | | 4 | | 0 | | 12 | |
| Divorced | 12 | | 4 | | 12 | | 4 | | 4 | | 36 | |
| **Total** | | **68** | | **60** | | **16** | | **12** | | **4** | | **160** | |

***Source: Own survey results, 2010***

Table 4.2 presents the occupation and the marital status of the respondents which shows majority of them are currently married (57.5%) and 22% of respondents are divorced. Others are not married and widowed. This indicates that above half of the respondents are responsible for their households to ensure availability of enough water to cater for household needs.

All of the water user respondents were farmers and in addition to farming some of them were engaged in daily laborer employees (37.5%) and others were involved in petty business like selling local hand crafts (10%) and operating small shops (7.5 %) and remaining were engaged in other different activities. Engaging in different activities in addition to farming increases the household income; and this increases the willingness to pay fee for water service which helps to maintain and operate the water schemes.

**Annual Income of Respondents (in Birr) in the Study Area**

When respondents were asked about the annual household income, most of them did not give exact answer due to lack of records and others feared to expose their real income. Most of them gave estimations of what they sold to get money for household needs.



***Figure 4.1:- Annual Income of Respondents (in Birr) in the Study Area***

***Source: Own survey results, 2010***

As figure 4.1 indicates majority of the respondents’ annual income is estimated below 3500 Birr. These shows as majority of the respondents are under poverty, which have a negative impact in paying of monthly fee of water service. Nevertheless, the figures need to be used with precautions because they don’t depict the reality in the field; they are based on estimations of crops sold and monthly income of few employees who responded during the data collection.

**4.2 Sustainability, Functionality and Service Level of Water Schemes**

The study reveals that groundwater is the main source of water supply; all of the respondents use groundwater as the main source of domestic water supply. According to the data obtained from Office of Water, Mine and energy of Enderta Woreda, there are 238 water supply schemes with three types of technology (Hand dug well, Motorized and Shallow well ).These were developed from the year of 1984 up to 2001 EC. These shows as the water supply schemes were constructed by the regional government and NGOs in recent years. The proportion of population having clean water in the Woreda is 73%.This indicates there is a gap between the demand and of provision of clean water in the woreda.

According to the data obtained from Water, Mining and Energy office of Enderta Woreda (2009), the proportion of population having clean water in the integrated tabias of Mariam Dahan, May tsedo , Shibta and Felege Mayat were 56.5%, 45.24%, 65% and 29.84% respectively. These shows as Felege Mayat have the lowest coverage. This is mainly due to its topographic factor i.e., located at higher elevation which results to low potential of ground water.

**Table 4.3: Level of Functionality of Water Supply Schemes by Type in the Integrated** **Tabias**

|  |  |  |  |
| --- | --- | --- | --- |
| **Scheme Type** | **Number of Functional** | **Number of Non-Functional.** | **Total** |
| Hand dug well | 18 | 8 | 26 |
| Shallow well | 23 | 5 | 28 |
| **Total** | **41** | **13** | **54** |

***Source: own survey results, 2010***

Regarding the distribution of schemes in the four tabias of study area, out of the 54 schemes a total of 41(75.9%) were found during the study to be functional where as 13 (24.1%) were non-functional.Out of the 13 non-functional schemes, 3 schemes have been completely abandoned because of water table drawdown, 10 schemes were non-functional owing to various technical problems of foot valve, bobbin, and cut of rod have stopped service.

To explore the causes of non-functionality of distribution points, a purposive survey was undertaken covering four tabias. A range of aspects were examined: technological, management, demand and socio-economic status. Results showed poor financial management was the primary correlate of non-functionality.

***Table 4.4:- Technology and Machine Types of Water Points Studied in Enderta Woreda.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No** | **Tabia**  **Name** | **Specific**  **Area** | **Year of**  **Construction (E.C)** | **Technology**  **Type** | **Machine brand** | **Status of service** |
| 1 | *Mariam Dahan* | Adikolakul | 1998 | *Hand Dug Well* | Afridev | *Functional* |
| 2 | *Mariam Dahan* | May Amrakut | 1988 | *Shallow well* | Afridev | *Functional* |
| 3 | *Mariam Dahan* | Gereb Ayder | 1997 | *Shallow well* | Afridev | *Not Functional* |
| 4 | *May Tsedo* | *May Senti* | *1985* | *Shallow well* | Afridev | *Functional* |
| 5 | *May Tsedo* | *May Abadi* | *1996* | *Hand Dug Well* | Afridev | *Not Functional* |
| 6 | *May Tsedo* | *May Ayni* | *1996* | *Hand Dug Well* | Afridev | *Functional* |
| 7 | *Shibta* | *Gergenbez* | *1994* | *Shallow well* | Afridev | *Functional* |
| 8 | *Shibta* | *Adi Seleste* | *1990* | *Shallow well* | Afridev | *Functional* |
| 9 | *Shibta* | *May Geza* | *1992* | *Hand Dug Well* | Afridev | *Not Functional* |
| 10 | *Felege Mayat* | *Motogo* | *1994* | *Hand Dug Well* | Afridev | *Functional* |
| 11 | *Felege Mayat* | *Tsahilo* | *1996* | *Hand Dug Well* | India Mark II | *Functional* |
| 12 | *Felege Mayat* | *May adre* | *1999* | *Shallow well* | Afridev | *Functional* |

***Source: Enderta Water, Mine and Energy Office (2009)***

Table 4.4 presents the technology, machine type, year of construction and the current status of water schemes in the selected four tabias of the woreda. Here, there we can observe the functionality and non-functionality of the schemes are not dependent in their year of construction rather they depend up on the availability and potential of their ground water. Therefore, there is no standard expected time of service delivery. For example Mayamrakut scheme in tabia Mariam Dahan was established in the year of 1988 E.C and it is still functional. However, May Abadi scheme in Maytsedo tabia was established in 1996E.C but it was non-functional.

In the table above one-fourth of water points comprising two Hand dug well and one shallow wells under study are not functional. *Hand Dug Well* in *May Geza* was among the structurally good construction type but un-functional since a year and half ago. The failures are not specified indeed but believed to be beyond the capacity of the technical staff in the Woreda. As a result of it, people are fetching water on their back from previous traditional unsafe water sources.

The technicians of the office of Water Development, Mine and Energy confirm serious problem of spare parts did not happen to this time. The office has some reserves and if problems beyond the reserve occur, spare parts in most cases for Afridev types and to some amount to Indian Mark II, type is available in the regional capital, 12 km away from the Woreda office of Water, Mine and Energy. Although the office technicians have said this, the reality seems to be different. It makes no sense for water services to stop functioning for more than a year when some one is saying spare parts are available nearer to it. It seems that less attention is given to action.

**4.3. Sustainability Factors of Rural Water Supply Schemes**

4.3.1Institutional Factors

According to the proclamation number 122/1999 Water and Sanitation Committee of the Regional State of Tigray all members of the water committee are elected by user community for three years. The written bi-law governs the activities of the committee. The committee is responsible to the tabia administration and has recognition by the woreda administration. There exist a developed working guidelines, manuals and procedures. There are also developed norms that govern the behavior of water users. From the responsibilities of the water committee, close supervision of system operation and conflict resolution are expressed to be the major ones. Committee members have a regular meeting monthly for discussion of issues related to water sustainability and accessibility.

During focus group discussion it was reported that, conflicts arise between guards and the users that may arise in relation to water use in keeping time of opening and closing are usually resolved through discussion. Keeping time of opening and closing helps the ground water to be accumulated and the machine draws water properly and functions with out any difficulties.

The water committee members informed that currently the community covers both the operation and maintenance cost. So far, several trainings are provided to the water committee members. But, it was known that there is no incentive such as daily perdieum of any kind arranged to committee members in reward to their efforts during maintenance activities.

In most of the integrated tabias visited, water committees are dominated by men, although there is at least one woman per committee in almost all of them. In May Tsedo tabia, out of six members there are three women in the committee. Moreover, in all selected four tabias, all the chairperson and secretary positions are held by men. This shows that the participation of women in water committee leadership is still nonexistent.

**4.3.2. Financial Factor**

The monthly payment for water service per household differs from tabia to tabia and from one scheme to another scheme which ranges from one up to three Birr. This is mainly due to absence of common responsible organ in setting users water fee. Water fees are set by the water committees of each scheme through meeting with the water users. The major factors for setting water fee are the cost for maintenance and guard salary levels.

**Table.4.5:-Monthly Average Water Users Fee by Tabia**

| **Tabia Name** | **Users Fee in Birr By Frequency and Percent** | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **1Birr** | | **2Birr** | | **3Birr** | |
| **Frequency** | **%** | **Frequency** | **%** | **Frequency** | **%** |
| Mariam Dahan | 5 | 13 | 27 | 68 | 8 | 19 |
| Felege Mayat | 1 | 4 | 32 | 79 | 7 | 17 |
| May Tsedo | 4 | 11 | 28 | 69 | 8 | 20 |
| Shibta | 0 | 0 | 30 | 76 | 10 | 24 |
| **Total** | **10** | **7** | **117** | **73** | **33** | **20** |

***Source: Own survey results, 2010***

Survey result of the study for water payment shows (table 4.5), 117 of respondents (73%) affirmed that they pay two Birr per month, while 33 of the respondents (20%) pay three birr per month. This implies that the majority of the water users pay two Birr. Paying higher water fee helps to increase the financial capacity so as to operate and maintain the schemes with out delay during their breakdown.

**Table 4.6:- Perception of Respondents on Affordability of Water Service**

| **Tabia Name** | **How do you see the payment of water supply service?** | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Inexpensive** | | **Fair** | | **Expensive** | |
| **Frequency** | **%** | **Frequency** | **%** | **Frequency** | **%** |
| Mariam Dahan | 31 | 77.5 | 7 | 17.5 | 2 | 5.0 |
| Felege Mayat | 34 | 85.0 | 6 | 15.0 | 0 | 0.0 |
| May Tsedo | 28 | 70.0 | 8 | 20.0 | 4 | 10.0 |
| Shibta | 23 | 57.5 | 11 | 27.5 | 6 | 15.O |
| **Total** | **116** | **72.5** | **32** | **20** | **12** | **7.5** |

***Source: Own survey results, 2010***

According to Table 4.6 about 116 of the respondents (72.5%) replied that the fee was affordable to them and 32 of the respondents (20%) said the fee is fair to pay. From these we can understand the majority of respondents have an opinion that users fee is affordable in relation to their income. However, water users in tabia Maytsedo those who pay three birr per month claimed the fee was expensive to afford.

Water committees said that cost of maintenance was the main factor taken into consideration when setting water charges. For Maytsedo tabia water scheme the situation was different, the capacity of the people to afford the cost was reported as the main factor taken into consideration. It is not surprising to see this difference because MayTsedo is a new scheme with hardly one year in operation so it had not yet experienced many problems regarding operations and maintenance of the water scheme compared to other older schemes.

**Responsible Body in Setting Water Charges**

Water users’ awareness about who sets the price for water is not very developed and varies greatly between tabias. According to the water committee, in Shibta and Felege Mayat tabias community village meetings is considered to be as the responsible organ in setting water charges. On the other hand in May Tsedo and Mariam Dehan reported that water committee was the one responsible for setting water charges.

Some users have an opinion at the local administration and they said the charge should increase in order to meet the operational and maintenance cost. This might be a good idea for consideration by the policy makers for sustaining the water schemes.

The position of the researcher here is that water supply charge should be increased, but the way of charging customers should be based on their self selection of the service and volume of water consumption. This means the poor and other customers should select the service type in accordance with their income level and the price would be charged based on volume of their water consumption. This can enable efficient use and sustainability of water supply

**4.3.3 Technical Factors**

Findings obtained through focus group discussion from water committee indicated that maintenance activities were done by using their own local and Wereda technicians. Procurement of spare parts and other necessary materials was the responsibility of water committee using money accrued from water fees. It was said that local technicians are using their own experience in maintaining minor problems of water schemes because they have received trainings. Most of the local technicians were members of the management committee, so they done maintenance activities by voluntary. This helps to solve the problem on time and decrease the non functionality rate of the water schemes .It was said that in case of major breakdown water committee reported to the office of Water, mine and Energy whenever report reached the office also sent qualified technician to maintain the schemes.

**Technology choice**

Generally, the water committees said that they have never participated in technology selection activities. The Office of *Water, Mine and Energy Development of Enderta Woreda*  stuff members also complained that some NGOs come with grants approved for a given type of technology and install the scheme without getting community input or holding prior consultation with their office.

Water committee and tabia Administrations in scheme design it added that it was the *Rural Water, Mine and Energy Office* that gives them the technology standards before schemes are developed in specific project sites. Regarding community participation, some expert officers said that they tries to discuss with and convince the community regarding the schemes to be installed in the project site, but does not consult on scheme type selection. Nonetheless, the absence of community participation in technology selection leads to a lack of community acceptance of schemes and underutilization which also impacts significantly on the sustainability of schemes.

**Spare parts**

As data obtained through focus group discussion from the officials of water, mine and energy of Enderta Woreda, there is no provision of free spare parts in case of scheme failure. The water committee report to theWater, Mine and Energy Office of the woreda. Whenever report reached the staff, the technicians will reach the area and give support. If it is necessary the technicians specify the spare part to be procured. In many cases spare parts provision is from the regional Bureau ofWater, Mine and Energy. In the majority of cases, hand pump spare parts are not found as single units but rather as part of a set, hence they are very expensive.

**Table 4.7:-Responses of Respondents on Frequency of Service Failures Occurred.**

| **How many times the scheme does break in a year?** | **Frequency** | **Percent** |
| --- | --- | --- |
| Never broken | 18 | 11.2 |
| once in a year | 71 | 44.4 |
| Twice a year | 39 | 24.4 |
| Three times a year | 24 | 15.0 |
| >three times | 8 | 5.0 |
| **Total** | **160** | **100.0** |

***Source: Own survey results, 2010***

As in the table 4.7 indicated 44.4% of respondents reveal that their water services face failures once a year and 24.4% say occurrence of failures are twice a year in the service. These shows as the majority of existing water services face failures at least once in a year. Here continuous follow up of the local technicians using their own experience in maintaining minor problems of water schemes helps to reduce the occurrence of breakdown frequently.

**4.4. Rural Water Supply Services under Community-based Management**

**Community Participation**

Community participation in project activities is considered as very important because it builds a sense of ownership and commitment among the local people. Participation can take many forms, for example users may be involved in planning, management or even contributing money, labor and ideas.

**Table 4.8:- Frequency of Community participation in project planning**

| **How do you see your participation in the planning process?** | **Frequency** | **Percent** |
| --- | --- | --- |
| Low | 82 | 52.0 |
| Medium | 38 | 24.0 |
| High | 36 | 22.o |
| Very high | 4 | 2.0 |
| **Total** | **160** | **100.0** |

***Source: Own survey results, 2010***

The majority of respondents in villages did not participate in the planning for the establishment of water scheme, as in table 4.7 indicated 52% of respondents reported their participation is low. And 24% of respondents were medium, they attended the planning meeting, but their participation was not active because they did not contribute ideas. From this we can understand community participation in project planning was low. This is mainly due to lack of information from their leaders and the approaches used by the water providers when implementing water projects. Low level of participation in planning has adverse impact in monitoring and people lucks sense of ownership as a result sustainable use of water schemes is failed.

The technical officer from the office of Water, Mine and Energy of Enderta Woreda indicates that participatory approaches are used when implementing project activities. Village meetings were cited as the highest organ where water problems were discussed and agreed by the communities. Plans of activities were discussed in the village meetings where communities had opportunities to give their suggestions and comments on what should be done to improve the proposed plan. Communities also participated in identifying location of the water taps, reliable water sources and in electing the management body of the water scheme. Sustainability is higher when demand is expressed directly by household members, not through traditional leaders or community representatives. However, a majority of water providers affirmed that village local leaders and water committees were important in the planning process. Therefore, water providers should focus in village meeting with the community when they are preparing their plan.

***Type of participation***

**Table 4.9:-Type of Participation in Water Scheme Development**

| **What was your contribution during the scheme construction?** | Frequency | Percent |
| --- | --- | --- |
| Labor | 72 | 45.0 |
| Cash | 32 | 20.0 |
| Idea | 28 | 17.5 |
| local material | 12 | 7.5 |
| Other | 16 | 10.0 |
| Total | 160 | 100.0 |

***Source: Own survey results, 2010***

As in the table 4.9 presents the majority of respondents were participated in project activities in terms of labor, cash and idea provision that is 45%, 32% and 28% respectively. In addition, provision of local materials to the project activities was also contributed during the water supply scheme development. This indicates that when people are mobilized they can contribute their own contribution.

The community provided labor during procurement of construction materials like stone, sand, aggregates, and other construction materials. This contribution forms a part of the percentage which is supposed to be contributed by the village for project implementation. Water providers revealed that they emphasized more on community participation during the implementation of project activities compared to the planning process. This results people not to participate actively therefore, water providers should give emphasis on participation of community from the beginning.

***Reasons for participation***

As data obtained through questionnaire most of the respondents participated in project activities because they wanted to solve water problems they were facing in their location. The need for safe and clean water as remedial measures for water borne diseases and the need to reduce distance to the water sources were the main driving forces behind community participation to project activities. In rural areas women and children, especially girls, travel far searching for water for household use. To reduce this workload to women and girls, the community thought it was high time for them to participate in project activities.

During focus group discussion when participants put their reasons about not community participated in project activities are:

* Lack of cited activities to be done in project activities.
* They assume water committee was responsible for all activities related to water supply.
* lack of information and discouragement and
* Because they thought that the money paid for water was enough to cater for all activities related water supply.

**Management of Water Schemes**

**Table 4.10:- Management of Water Supply Schemes**

| **Who is the Manager of the water supply scheme?** | Frequency | Percent |
| --- | --- | --- |
| Water Committee | 83 | 52 |
| Tabia Administration | 62 | 39 |
| Woreda Administration | 8 | 5 |
| I don’t know | 7 | 4 |
| Total | 160 | 100.0 |

***Source: own survey results, 2010***

The role of local community in the management of water supply projects is crucial for sustainability of water schemes. Some donors also showed emphasis on community participation in management of projects. The findings from the respondents in table 4.10 indicate that most of the management activities of the water scheme were under the water committee (52%). And 39% of the respondents said management activities are under tabia Local Administration whereas 5% are admitted to the Woreda administration.

In the case of water supply scheme management, each water point has a water management committee of six people elected by the villagers. From management committees of each water point, three of them are women elected to be the member of the committee. They are responsible for day to day management of the water schemes. Guards of water schemes are responsible for opening and closing water points and collecting water charges, were appointed by the committee. The monthly salary of the guard is paid from the monthly collection fees. The management system tries to represent views of all communities with regard to water issues. Generally water committees are the main management body in the water schemes.

Misuse of funds intended for water issues and lack of trust in the water committees are some of the obstacles to the water committees to run the schemes. It was realized that village water committees were not independent and free bodies to run the schemes.

Sometimes tabia Administrators used the money intended for water projects for other activities and when breakdowns occur there were no funds for repair.

**4.5. The Participation of Stakeholders in Sustainability of Water Supply**

**Users**

Most of the respondents said that they did not participate in the scheme development projects, in terms of consultation in the pre-feasibility study, technology selection or construction. Besides, the women are not called to tabia meetings to discuss water-related issues or are not given the chance to express their views in the meetings. They said: *‘Mostly our husbands go for Tabia meetings to* *discuss water-related issues. But our husbands mostly do not tell us what the discussion was about.’*

Moreover, *‘The Water committee and the Tabia Administration do not give the chance to women to give* *their views on water issues.’* Users said that they participate in scheme management aspects by contributing labor for scheme cleanliness and by bringing stone for fencing and gravel to prevent water stagnation around the schemes and water points.

Users explain that hand pumps fail mostly because children and young females are not aware of how to use them properly. Others indicated that the main reason of failure of hand pumps is that technicians are not skilled enough to operate and manage the schemes.

The researcher also checked that some of water the points in the study do not have any fence to prevent failures.. Here, travelers usually break keys to drink water when they pass and resulted for additional cost. A water committee member of that water point has indicated that their largest operational cost next to guard’s salary is frequent replacement of keys. There were guards usually employed to take care of service, however, it was beyond their control for it is not their only work.

**4.5.1. Role of Women’s participation in sustainability of water supply schemes**

**Table 4.11:- Special Encouragements to Women and perception of Respondents**

| **Have you been given special encouragements to participate in the water committee?** | **Frequency** | **Percent** |
| --- | --- | --- |
| Yes | 25 | 25.0 |
| No | 75 | 75.0 |
| **Total** | **100** | **100.0** |

***Source: Own survey results, 2010***

Water supply scheme failures largely affect women, because they are most often collectors, users and managers of water in the household. In such cases, participation of women in both development and management activities is crucial for sustainability of the scheme.

In an assessment made to check whether or not women have been given special encouragements to participate in the water committee? Majority responses of women users in table 4.11 show a negative response.

Although there is a rule that encourages equal participation of both men and women in water committees, some people in the study area interpret this equal share in management seats negatively because, they thought that women can not carry equal responsibilities as men do. Therefore, enormous effort has to be done in awareness creation of the society to enhance their understanding towards participation of women in water committee which has a great role in keeping the service working for a longer period.

**CHAPTER FIVE**

**SUMMARY, CONCLUSION AND RECOMMENDATIONS**

**5.1 Summary**

Both the government of Ethiopia and donors are striving to increase the water supply coverage of the woreda. However, a high rate of non-functionality of the water supply schemes developed has been observed both at the regional and Woreda levels, implying a negative impact on the water supply coverage.

The non-functionality rate of schemes in the Woreda (14%) is well above the regional average (12%). This has forced communities to rely on unsafe sources of water for basic consumption. Regarding the distribution of schemes in the four tabias of study area, out of the 54 schemes a total of 41(75.9%) were found during the study to be functional where as 13 (24.1%) were non-functional. Out of the 13 non-functional schemes, 3 schemes have been completely abandoned because of water table drawdown, 10 schemes were non-functional owing to various technical problems of foot valve, bobbin, and cut of rod have stopped service.

Survey result of the study for water payment shows (table 4.5), 117 of respondents (73%) affirmed that they pay two Birr per month, while 33 of the respondents (20%) pay three birr per month. This implies that the majority of the water users pay two Birr. In majority of cases, tariff setting involved the community and took place with prior consultation. According to the data obtained from the water users (72.5%) tariffs set are affordable; it could be concluded that they represent the different socioeconomic groups of the community.

Regarding community participation in technology selection, some expert officers said that they tried to discuss with and convince the community regarding the schemes to be installed in the project site, but do not consult on scheme type selection. Nonetheless, the absence of community participation in technology selection leads to a lack of community acceptance of schemes and underutilization which also impacts significantly on the sustainability of schemes.

The technicians of the office of Water Development, Mine and Energy confirm serious problem of spare parts did not happen to this time. The office has some reserves and if problems beyond the reserve occur, spare parts in most cases for Afridev types and to some amount to Indian Mark II, type is available in the regional capital, 12 km away from the Woreda office of Water, Mine and Energy. Although the office technicians have said this, the reality seems to be different. It makes no sense for water services to stop functioning for more than a year when some one is saying spare parts are available nearer to it. It seems that less attention is given to action.

The majority of respondents in villages of did not participate in the planning for the establishment of water scheme, as in table 4.7 indicated 52% of respondents reported their participation is low. And 24% of respondents were medium, they attended the planning meeting, but their participation was not active because they did not contribute ideas.

The study found that the relationship between the demand-responsive approach and sustainability is strongest when household members, rather than community representatives (such as water committees, traditional leaders, or local governments) are involved in project initiation and in decisions that need to be made about the water system. The study found that large gaps often exist between the perceptions of households and the community leaders with which project staff or intermediaries work.

Although there is a rule that encourages equal participation of both men and women in water committees.In an assessment made to check whether or not women have been given special encouragements to participate in the water committee? Majority responses of women (75%) users in table 4.11 show a negative response.

**5.2. Conclusion**

Water-supply programs consist of three essential components: technology, people, and institutions. The interface of these facets determines whether a particular scheme is sustainable or not. Supplying water projects alone would not contribute for reducing the problem of sustainability of schemes.

For most of the schemes in the Woreda that have failed owing to abandonment, this is caused by long years of service without rehabilitation. On the other hand, weak water committees, operators and caretaker performance in scheme management, lack of community awareness on proper use of schemes, overpressure on schemes, and low backstopping support from the Water Resource, Mine and Energy Office are identified as the main factors accelerating the failure of schemes and stagnating maintenance.

The monthly payment for water service per household differs from tabia to tabia and from one scheme to another scheme which ranges from Birr one up to three. This is mainly due decentralization of power to set water fees. Water fees are set by the water committees of each scheme through meeting with the water users. The major factors for setting water fee are the cost for maintenance and guard salary levels.

Recurrent scheme breakdowns have also contributed greatly to increasing the amount of walking distance the communities have to do in search of water, thereby aggravate the missing of school to students. In addition to frequent breakdowns, slow maintenance speed, limited number of stand posts, failure of reservoirs, poor water committee management and low discharge of hand pumps all contribute to reducing the quantity of water and quality of service delivery to the user communities.

Community participation in project planning was low. This is mainly due to lack of information from their leaders and the approaches used by the water providers when implementing water projects. Low level of participation in planning has adverse impact in conserving the water schemes and people lack sense of ownership as a result sustainable use of water schemes would not be achieved.

The fact that the majority of respondents contributed labor and cash during the implementation of the water schemes implies that these individuals are responsible for their development. This is also a big potential for community development. Nevertheless, it is difficult to conclude the participation of communities during the initiation or implementation phase of the project will contribute; but it can not be a guarantee in long term sustainability.

Water committee currently managing schemes not fully represent the community that they are serving. Some people in the study area interpret the equal share of men and women in management seats negatively. This is due to their thought that women can not carry equal responsibilities as men do. The absence of equal participation of women in the water committees and their marginalized positions indicate that they are still not invited to be fully encouraged in the decision making process. Culture contributes to the low participation and involvement of women in water related meetings, water committee membership selection and committee representation.

**5.3. Recommendations**

Although, the challenges that significantly affect the sustainability of water supply schemes and better service delivery are diverse and intricate, the following recommendations are forwarded as footsteps towards meeting challenges of sustainable rural water supply schemes in the Woreda:

Rehabilitation and maintenance of non-functional schemes. Replacement of schemes that are beyond their design period and are not currently providing a service; construction of new schemes in areas where there is high demand for improved water and increasing the number of water points in schemes where there is high water demand but limited numbers of water points. Hence, the government and donors with incorporation the community should construct water points at a reasonable distance

(Less than 500m from residence houses) to serve the majority of the users. Moreover, integration between beneficiaries and project suppliers in the phases of planning, implementation and evaluation through meeting need to be addressed to come up with sustainable utilization of the resource

Investing in household and water committee training in maintenance and financial management pays off in terms of sustainability. Projects should include training to young water committee members as part of their project design. Communities that receive household-level training are more satisfied with their systems, more willing to pay the costs of maintenance, keep the system in better physical condition, and carry out better operations and maintenance. At the same time, training members of the water committee can lead to better operations and maintenance and financial management.

To sustain water supply schemes in the woreda, it is vital to have the involvement of all segments of the community in the form of full participation and control over the scheme’s operation and maintenance, overall management, strategic decision making, ownership and cost sharing for operation and management and construction activities. The role of water schemes project initiation and selection of service options, technology and site selection should be given to local communities rather than tabia administers and office technicians. Moreover, such community management has to be backed by external agents over a long period of time with regard to technical issues for operation and maintenance, training, monitoring, information collection, coordination and facilitation.

The water supply charge should be based on cost recovery for maintenance and operation, but the way of charging customers should be based on their self selection of the service and volume of water consumption. This means the poor and other customers should select the service level in accordance with their income level and the price should be charged based on volume of their water consumption. This can enable efficient use and sustainability of water supply.

Development of scheme technology standardization rule at regional level. This helps for better provision of spare parts and creation of skilled local technicians. The use of appropriate technologies which are low cost, easy to maintain, simple to use and readily available is one response to the challenge of sustainability.

Enderta Woreda water, mine and energy Office need to be equipped with adequate trained manpower and adequate resources such as motor cycles. In addition, supervision mechanisms should be established to ensure that services are maintained and project rules are implemented correctly when new projects are set. Hence, more works from the rural water, mining and energy office is also expected to persuade cabinets of Enderta Woreda government to have budget support

There need to have strong involvement of local communities especially women in development endeavors from start to end. In order to achieve this, community-mobilization works need to be strengthened

Working on integrated watershed management activities should be conducted to better conserve water resources. Water resources should be conserved and recharged by the natural aquifer covering the water catchments with forests that can regulate water flow and minimize reduction of water table.

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**Appendixes**

**Appendix 1. What is the average income of the household per year in birr?**

| Annual income(Birr) | Frequency | Percent |
| --- | --- | --- |
| <3500 | 52 | 32.5 |
| 3501-5500 | 36 | 22.5 |
| 5501-7500 | 32 | 20.0 |
| 7501-9500 | 32 | 20.0 |
| >9500 | 8 | 5.0 |
| **Total** | **160** | **100.0** |

**Appendix 2. Questionnaire to be filled by water users.**

**Introduction**

The aim of this questionnaire is to collect data needed for a thesis in **“Sustainability Challenges of Rural Water Supply Schemes: A Case Study in Enderta Woreda, Tigray Region Ethiopia.”** The information you provide is believed to have a great value for the success of this research. Moreover, the information you provide is used for academic purpose requirement for the partial fulfillment of MA degree in Development Studies and will be kept strictly confidential. I highly appreciate in advance to your kind cooperation in providing the necessary information.

**Thank you!**

**General Instructions**

1 .Please put **(X)** sin in the given box that appropriately represents your response in the multiple choice questions.

2. To the questions with alternatives that do not match to your response, please write your appropriate response on the space provided.

**Questionnaire to be filled by water users**

Date of interview………………….........

Respondent code ………………Tabia…………… Village/Qushet ……..………

**Part I. Demographic characteristics**

1. Age of respondent………….

2. Indicate your sex. a. Male b. Female

3. Educational status:

a. Illiterate e. Preparatory

b 1-4 grade f. TVET certificate

c. 5-8 grade g. Diploma

d. 9-10 grade

4. Marital status:

a, Never Married c. Widowed

b. Married e. Divorced

5. Religion

a. Orthodox c. Catholic

b. Muslim d. Other specify…………………

6. In addition to farming in what activities do you engaged?

a. Farmer only d. crafts men

b. Student e. Trader

c. Daily laborer f. Other specify…………………

7. What is the average income of the household per year in birr?

a. <3500 c.5501-7500

b. 3501-5500 d.7501-9500 e. above 9500

**Part II. Sustainability factors of rural water supply schemes**

***a . Financial factor***

8. Do you support the idea that users should pay water fees?

a. Yes b. No

9. If your response is **“yes”** specify your reason……………………………………..

10. If your response is **“No”** specify your reason…………………………………..

11.Do you pay fee monthly for the water service supply?

a. Yes b. No

12. If yes how much do you pay monthly? \_\_\_\_\_\_\_\_\_\_

13. If your answer for question number 12 is No, what are your reasons?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. How do you see the payment of water supply service?

a. Expensive b. Fair c. Inexpensive

15. Do you have problems in paying tariff (ability to pay?)

a. Yes b. No c. Sometimes

16. Does the society have the capacity to contribute the funds used to build water schemes?

a. Yes b. No c. don’t know

17. Which maintenance problem is held by the community fund?

a. Gasket replacement c. Silt clearing

b. Gracing d. Other specify…………..

18. What are the main sources of income for maintenance costs? Rank them accordingly.

a. Tariff c. Support from Woreda/region

b. additional contribution d. Donations

e. other specify………………

19. Do you think the collected money is used for maintenance?

a. Yes b. No c. don’t know

***Technical factor***

20. Whose idea was it to choose the type/ technology of the project?

a. The community d. Governmental offices

b. Local leaders’ e. others specify………………

c. NGOs

21. Who is mainly responsible for maintenance activities?

a. The community d. Governmental offices

b. Local administrators’ e. others specify………………

c. NGOs

22. How do you evaluate the water service supply?

a. fair c. Very good

b. good b. Excellent

23. How many times does the scheme breaks in a year?

a. Once in a year c.three times a year

. b. twice a year d. More than three times a year

e. Never broken

24. How soon is it maintained after breakdown?

a. within a month c. After three months

b. After two months d. Greater than three months

25. What do you think the major reasons for the breakdown/non-functionality?

a. absence of guard c. Disagreement among users by location factor

b. Improper utilization d. dryness

**Part III. Rural water supply services under community-based management.**

26. Who is the owner of the scheme?

a. community c. don’t know

b. local Gov’t d. others specify……….

27. Whose idea was it to build the project?

a. The community c. NGOs

b. Local leaders’ d. Governmental offices

28. What were your major sources of water before the project?

a River c. Well

b. Dam d. Un protected spring e. other specify……

29. What was the average distance you travel to get water?

a. **<** 500m c.751-1000m

b. 501-750m d.>1000m

30. Whose idea was it to choose the location area of the project?

a. The community c. NGOs

b. Local leaders’ d. Governmental offices

31. How do you see your participation in the planning process?

a. low c. high

b. medium d. very high

32. How do you evaluate your participation in the implementing process?

a. low c. high

b. medium d. very high

33. How do you see your participation in the monitoring process?

a. low c. high

b. medium d. very high

34 How do you see the administration system of water service in the village? a. low c. Very good

b. good b. Excellent

35 .If your answer for question number 35 is low explain why you are not satisfied…………………………………………

***Part. IV The participation of stake holders in sustainability of water supply.***

***A. For both men and women***

36. Have you participated in the development processes of the water project?

a. Yes b. No

37. If yes, what was your contribution during the scheme construction?

a. Cash c. Labor

b. Idea d. local materials e. Other specify………………

38. If no, what makes you not to participate?……………………….

***B. Women’s participation (for women only)***

39. What was your participation during the over all project development?

a. Planning c. Monitoring

b. implementation d. evaluation

40. What is the average time do you take fetch water?

a. Less than 15minutes c.30 minutes up to one hour

b. 15-30minutes d. Greater than one hour

41. Does the present source of water help you to reduce your time to fetch water?

a. Yes b. No c. don’t know

42. Have you been given special encouragements to participate in the water committee?

a. Yes b. No