SUSTAINABILITY OF NGO SUPPORTED WATER SUPPLY PROJECTS: THE CASE OF ELCT KONDE DIOCESE SHALLOW WELLS PROJECT IN MBOZI DISTRICT, TANZANIA

BY

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ABSTRACT

Many large water projects that were established and managed by community and central governments in Sub Saharan Africa (SSA) failed mainly due to inadequate community participation in planning and implementation of such rural domestic water supply projects. The Evangelical Lutheran Church in Tanzania - Konde Diocese (ELCT-KOD) in collaboration with Marion Medical Mission (MMM) introduced shallow wells project in Mbozi District in 2002. Out of 1061 shallow wells constructed by ELCT-Konde Diocese in Mbozi district, 45 of them are not functioning. In light of this, a study was done to determine factors influencing sustainability of the shallow wells project. The population for this study consisted of all heads of household. Simple random sampling technique was used to select 20 household heads from each six study villages. This made a total sample size of 120 of household heads. It was found that majority of the respondents (83.3%) participated in meetings related to shallow wells project at the early stage of planning, and that 75.8% of household heads participated fully in discussing locations for digging the shallow wells. Therefore, community involvement in the planning stage of the shallow wells project was satisfactory. The people in Mbozi District play a vital role and are highly responsible for management of the shallow wells project. Nevertheless, the study found the shallow wells technology is highly limited in terms of being easily broken and therefore people are not very much benefiting as it was intended by project initiators. The study recommends that the Government of Tanzania should clearly provide instructions to the community with regard to the use of shallow wells. This may include modifications of water policy that shallow well have to be given priority as the only way to help people living in villages like those in Mbozi District. The village leaders should continue mobilizing villagers to involve themselves in all stages of the shallow wells project for continuing sustainability.

DECLARATION

I, SAMWEL JAIL MWANSASU, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my original work, and has neither been submitted nor being concurrently submitted 0for degree in any other Institution.

_____ _____

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The above declaration is confirmed by

_____ _____

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(Supervisor)

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DEDICATION

The dissertation is dedicated to the Almight God and to my deceased parents the late Mr. Jail Mwansasu, my father and Mrs. Tumwimike Kyosi, my mother. May the Almight God rest their souls in eternal life. “For the Lord himself will come down from heaven, with a loud command, with the voice of the archangel and with the trumpet call of God, and the dead in Jesus Christ will rise first. After that, we who are still alive and are left will be caught up together with them in the clouds to meet the Lord in air. And so we will be with the Lord forever.” 1 Thessalonians.4: 16-17.

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LIST OF ABBREVIATIONS

AT	Appropriate Technology
ELCT	Evangelical Lutheran Church in Tanzania
FGD	Focus Group Discussion
GOT	Government of Tanzania
IWRM	Integrated Water Resources Management
KOD	Konde Diocese
LG	Local Government
MIWR	Ministry of Irrigation and Water Resources (Sudan)
MMM	Marion Medical Mission
NGO	Non-Governmental Organization
O & M	Operation and Maintenance
PRA	Participatory Rural Appraisal
SDIA	Supply Driven Implementation Approach
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Sciences
SRV	Socialist Republic of Vietnam
SSA	Sub-Saharan Africa
TASAF	Tanzania Social Action Fund
URT	United Republic of Tanzania
VG	Village Government
VEO	Village Executive Officer
VWC	Village Water Committee
VWF	Village Water Funds
WB	World Bank
WEO	Ward Executive Officer

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

According to Hodgkin (1994) the USAID Development Assistance Committee described sustainability as the ultimate test of development efforts. Sustainability in water supply is now a dominant concern, affecting decisions for years to come. In spite of the agreement that sustainability should be the goal of development assistance, there continue to be many projects undertaken by USAID and other international non governmental organizations (NGOs) which seem not to be sustainable (Hodgkin, 1994). Many large water projects that were established and managed by community and central governments in Sub Saharan Africa (SSA) failed mainly due to inadequate community participation in planning and implementation of such rural domestic water supply projects (World Bank, 2001).

According to Montgomery *et al*. (2009), for many projects sustainability is uncertain, they work for short periods and collapse after funding institutions cease to provide support both financially and technically. Mwakila (2008) presents a good example in Tanzania where the World Bank had been implementing many water projects, most of them lasting only for a short period due to a number of factors like system failure, lack of regular maintenance, lack of funds, and lack of accountability. Furthermore, Haysom (2006) estimates that 35% of rural water supply projects in Sub-Saharan Africa are not functioning.

The water supply coverage in Mbeya Region is 58.2% and data reveal that a rural household spends on average of 27 minutes to collect water for domestic uses. 23% of rural households in Mbeya Region are still using unprotected sources of drinking water

(URT, 2007). Long distances to sources of drinking water in rural areas entail heavy workload on women and children. In order to alleviate the problem of water shortage, the Evangelical Lutheran Church in Tanzania - Konde Diocese (ELCT-KOD) in collaboration with Marion Medical Mission (MMM), a non governmental organization from USA introduced shallow wells project in Mbozi District in 2002. Marion Medical Mission is an ecumenical Christian, non-profit organization started by Tom Longan in 1985 in Marion, Illinois USA. Marion Medical Mission's purpose is to share the love of Christ with the extreme poor in Africa. One way they do this is by providing a sustainable source of safe drinking water to rural African villages through their shallow wells program. It costs approximately US Dollar 400 to install a shallow well. Wells are built in partnership approach through cooperation with the villagers, thus wells are self-help projects oriented, while MMM only provides shallow wells components (Otte, 2011).

1.2 Problem Statement

The ELCT-Konde Diocese in collaboration with MMM initiated shallow wells project aiming at solving the water shortage problem and reducing the long distance which women and children walk to search for water for home consumption and other economic activities. Out of 1061 shallow wells constructed by ELCT-Konde Diocese in Mbozi District, 45 of them are not functioning. Also it was reported that of the 133 shallow wells which were constructed in Mbozi District in the 1990s by DANIDA, 60 shallow wells were not functioning (URT, 1996). In the light of this, the study seeks to look into factors influencing sustainability of shallow wells project in Mbozi District

1.3 Problem Justification

Despite the efforts made by the government and non governmental organizations in promoting water services in Mbozi District, there are a number of rural water schemes that

are not functioning properly. Little information is available to explain the reasons why many shallow wells are not functioning. This study investigated the causes and possible solutions to sustain such projects. The study also provides information which will be used by the project actors and the beneficiaries in the implementation of project activities. The findings are therefore expected to increase awareness and understanding of contributing factors to the sustainability of the shallow wells project as a way forward for other non-governmental organizations to support social services in Mbozi District.

1.4 Objectives of the Study

1.4.1 General objective

The general objective of this study is to assess factors that influence the sustainability of the shallow wells project in Mbozi District.

1.4.2 Specific objectives

i. To examine community involvement in the planning stage of the shallow wells project.
ii. To identify community roles and responsibilities in the management of the project.
iii. To examine appropriateness of the shallow wells technology implemented by ELCT-Konde Diocese.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The Concept of Sustainability

Sustainability refers to the ability of project beneficiaries to maintain and sustain project activities, services and any measure initiated by a project so as to last long after the expiring of the funding period (Kasiaka, 2004). Sustainability is the continuation of the benefits that result from the activity, with or without the programs or organizations that stimulated the benefits in the first place. The source of those benefits may change but the benefits are still available because the demand for it is strong (Musonda, 2004). Sustainability of shallow wells project in the context of this study is the situation whereby shallow wells services continues to be available for long period of time in the same quantity and quality as was planned.

According to Jones (2011) to keep a water point functioning depends on a complex mix of managerial, environmental, technical, and financial issues. All these different aspects should be considered simultaneously through an integrated approach, since sustainability depends on all of them and weakness in any aspect can lead to the failure of the scheme. According to Vishnudas *et al*. (2008), the following different but interrelated dimensions of sustainability have been identified:

- The water scheme has to be successfully installed, operated, maintained and repaired; ensuring continued flow of benefits in the long term. This entails at least that each stakeholder is committed to a specific role.
- Communities have to be involved throughout the project cycle.
- The water scheme has to be cost effective and desirably financed.

- The technology chosen has not only to provide a reliable and adequate water supply of any acceptable quality, but to be appropriate to the physical environment as well as spare parts affordable and easy to obtain.

2.1.1 Conceptual framework for the study

The conceptual framework by Carter *et al*. (1999) to achieve sustainability for rural water schemes is depicted in (Fig.1). According to these authors, a motivated community is the one that needs the service more and therefore considers the scheme as its own property. As a result, schemes constructed by community motivation are likely to be sustainable (Tarekegne, 2009). Effective operation and maintenance is essential for sustainability as one of the ways through which sustainability can be achieved. Tarekegne (2009) indicated that in case of scarce NGO or government resources, the money collected from stakeholders can be used for capacity building such as the role and responsibility of village water committee, motivation, and training for village technicians. Technicians can play a great role in sustaining the scheme. For example, when a shallow well technician at village level moves to another village or district, another shallow well technician should be given training (Tarekegne, 2009).

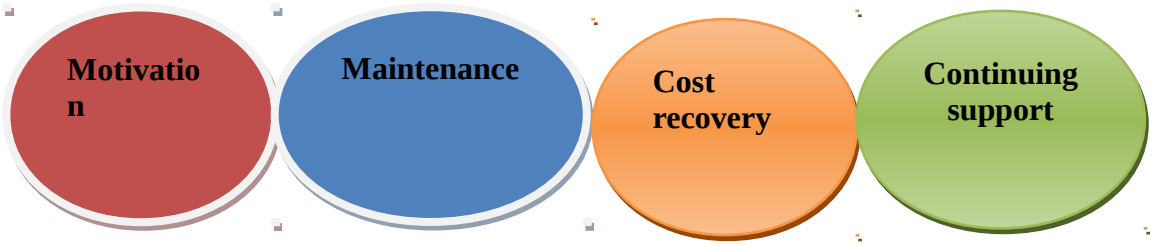

Figure 1: The sustainability chain of water supply
Source: Carter *et al*. (1999)

Haysom (2006) accounts for the fact that understanding and measuring sustainability is so difficult, and solutions are highly context specific. Continuing support, cost recovery, maintenance and motivation have been developed to capture the interlinkages that relate to sustainability. Sustainable development is people centred in that it aims to improve the quality of human life, while living within the carrying capacity of supporting the project or programme (Lutteken and Hagedorn, 2010). Sustainable project determines the extent to which the patterns of community participation are contributing to sustain a project (Khan, *et al.* 2006). Harvey and Skinner (2001) observed that there are three core issues for sustainability, namely minimal external inputs in the long-term, financing of operation and maintenance by users, and continuing flow of benefits over a long period.

It has also been reported by Haddad *et al.* (2007), that sustainability is the capacity to maintain services and benefits to the community without detrimental effects even after "special assistance (financial, technical, managerial) has been phased out, in other words, it is continuing to operate after external support has been stopped. Additional aspects of sustainability include empowerment of local people and self reliance; these reflect concern about principles of accountability and transparency (Haddad *et al*., 2007).

Accountability relates to local people in the community who are willing and able to build a spirit of ownership ready to control their project. Therefore sustainability of a project can only be determined after the end of external support or after the project phase out.

Based on Carter's conceptual framework, in this study sustainability of shallow wells project is influenced by independent variables and intermediate variables which include involvement of the community at all stages of planning, implementation, monitoring and evaluation (decision making on choice of water scheme technology). Intermediate variables include variables such as management of shallow wells and appropriateness of the technology (i.e financing, protection of water source, motivating community, training village water committee, role and responsibility, capacity building of the technicians, availability of spare parts, and maintenance). The household socio-economic/ demographic characteristics (age, sex, education level, marital status and occupation) influence the sustainability of the project by full participation in the implementation of the project activities. The dependent variable is the sustainability of shallow wells project (Fig. 2).

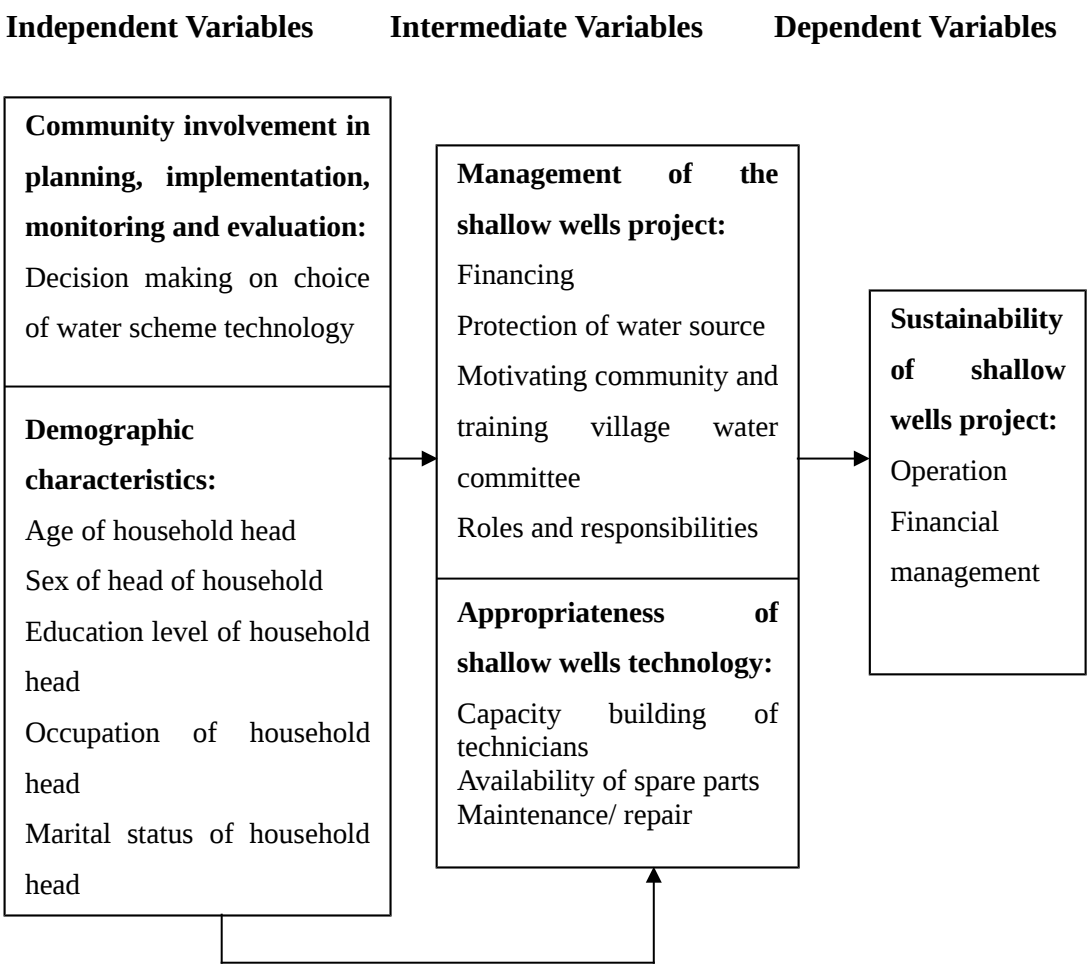

Figure 2: Conceptual framework for the study

2.1.2 Measures of sustainability

Rugumamu (1999) identifies "static" and "dynamic" perspectives of measuring sustainability. "Static" measures the extent to which facilities are functioning at particular point in time, availability of spare parts and affordable cost. "Dynamic" indicators focus on the likelihood that sustainability will be maintained through strategic plan undertaken by the community members themselves to ensure that the project provides services; they focus on problem solving capacity, ability to organize and mobilise resources and take initiatives. According to Tortajada (2003) sustainability may depend on how the project's issues are solved or approached during the operation.

2.1.3 Barriers to water schemes sustainability

The following issues are barriers of water scheme sustainability which may make the project unsustainable: Inadequate maintenance of water scheme in rural areas is increasingly recognized as a major barrier to achieve sustainability (Skinner, 2009); or where the intervention was not desired by the community. Lack of secure long-term financing for operation and maintenance (O & M) is a critical obstacle to ensuring sustainability of water schemes (Breslin, 2010). Even where full community participation or management has been planned from the start, committees may have lost interest or trained village technicians may have moved away (Ademiluyi and Odugbesan, 2008). Failure of some of the rural water schemes has been attributed to inappropriate technology and location of facilities (URT, 2002). Finally, communities may never have felt ownership of the new infrastructure or water scheme technology.

According to Kaliba (2004), sustainability is heavily influenced by how efficiently and consistently community based water projects operate throughout their economic lives. Such efficiency is obviously determined in part by community involvement in planning, implementation and management.

2.2 Community Involvement in Planning, Implementation, Monitoring and Evaluation

The term community participation is sometimes used interchangeably with involvement to refer to community involvement in development projects (Mwakila, 2008). The word participation is similar to the word involvement in the context of this study. Participation in water projects is a historical phenomenon. It can be traced back from the early 1960s when Tanzania gained its independence. During that period, the government formulated a policy of free water for all (Mwakila, 2008). Despite the good intention of the

government, most of the constructed water schemes between 1970s and 1980s failed to achieve sustainability. This was due to a number of factors, among them being the practice of Supply Driven Implementation Approach (SDIA). In this approach, the government became the only initiator, planner and provider of water service interventions. Furthermore, the system was so centralized in such a way that decisions made on water service allocations were externally oriented. The government was to carry out all operations and maintenance of village water schemes. In this context, all water works belonged to the central government. However, the outcome of this trend was a lack of commitment by project beneficiaries as far as issues of water services was concerned.

Furthermore, due to economic crisis that occurred in the same period, all Ministries were forced to reduce expenditure on recurrent costs. Therefore, water scheme operations and maintenance were seriously affected (Mwakila, 2008). The limited success of many development initiatives was attributed to failure to involve people in the design and implementation of projects because communities were left out of the decision making (Armah, 2008). According to Mwakila (2008), this is due to a lack of the community's commitment and a sense of ownership, thereby, no one was responsible to cover operations and maintenance costs. On the other hand, the government by then had no capacity to repair all water schemes, due to its financial crisis. Installed water schemes were deemed broken down or some being partially out of action.

The economic crisis forced the government to introduce cost sharing strategies in construction operation and maintenance of water schemes. Hence, communities were required to actively participate in water project cycles. Cost sharing strategies were to be effected through establishment of Village Water Committees (VWC) and Village Water Funds (VWF). It was through VWC that communities were to participate in the initiation

phase, planning, construction, operation and maintenance of water project activities (Mwakila, 2008).

Mwaseba (1991) has defined participation as a concept referring to the involvement of local people in the activities related to a project. This involves problem identification, decision making, planning, implementation, monitoring and evaluation. Since the success of a project is the main target, popular participation is viewed as a strategy by which the achievement of the goal could be realized. For the purpose of this study, community involvement is defined as the community participation in activities related to shallow wells project, namely problem decision making, planning, implementation, monitoring and evaluation as a means of achieving sustainability of shallow wells project. Community participation is the process whereby people act in groups to influence the direction and outcome of a development programme that will affect them (Mbwambo, 2000). Without local participation and support, many water projects tend to fail. Thwala (2010) defines participation as a process through which stakeholders influence and share control over development initiatives, and the decisions and resources which affect them. Community participation is a means of both the government and the community to accept certain responsibilities and activities.

Nikhah (2009) classified community development into three types, based on the approach: “top down,” “bottom up,” and “partnership.” In top down approach, activities implemented by government are done by the government; and the community does not participate. Thwala (2010) argues that the top down approach silences the community, they do not have a say in any development activities. However, with the bottom approach a project is initiated and managed by the community members themselves. Partnership approach involves the government, or non-state actors and the community to work

together. Nikhah (2009) has indicated that through people's involvement in the decision-making process, in implementing programmes, in their sharing benefits, participation is seen as the means of achieving a set of objectives. It seems that in community involvement as an end, emphasis is laid on participation as a process in which people are directly involved in all activities to sustain a project.

Community involvement has been identified as a primary determinant of project sustainability and its relationship to project effectiveness has been estimated both qualitatively and quantitatively (Peltz, 2008). Stakeholders play various roles at different stages of a project cycle. Roles and responsibilities can be assigned using participatory techniques like Participatory Rural Appraisal (PRA). Involvement of women in decision making, shallow wells location or site selection, technology and community contribution for the construction will promote sustainability of the water project (MIWR, 2009). Participation is a process of equitable and active involvement of all communities in the formulation of development policies and strategies and in the analysis, planning and implementation, monitoring and evaluation of development activities (Whyte, 1986).

Furthermore, Mwakila (2008) observed that participation is considered to be a requirement for project ownership, successful implementation and sustainability of the water scheme project. Participation does not mean acceptance of all ideas from different groups. In participation, there is a need to combine indigenous and intellectual knowledge. However, care must be taken so that intellectual knowledge does not influence indigenous knowledge.

Harvey and Reed (2006) explain that participation can take different forms, including the initial expression of the demand for water service, the selection of technology and its

meeting, the provision of labour and local materials, cash contribution to the project costs and the selection of the management type. According to Haughey (2009), a successful project starts in the planning stage. Through planning stage, the communities are able to comment on the type of technology which is under consideration.

The importance of participation in development projects is underscored by the World Bank (1995), cited by Nkonjera (2008) that it can help to create and maintain stable democracies and good governance as well as economic growth. When poor and marginalized people participate in development projects, they acquire skills and develop attitudes which may facilitate their integration into the wider society. From the Bank's viewpoint, participation also improves the financial and development sustainability of projects, thereby enhancing portfolio performance.

Participation improves project design by reducing the cost of obtaining accurate and site specific data on environmental, social and cultural factors as well as stakeholders' felt needs and priorities. Also, project managers can get input from all groups, including people often marginalized in the development process. A well designed participatory process can help resolve or manage conflict early in the project cycle; participation can reduce the cost of supervision later.

Smith (2006) found that there are numerous reasons which account for the individuals or community's unwillingness in community participation. These include: an unfair distribution of work or benefit amongst members of the community, a highly individualist society where there is little or no sense of community, the feeling that the government or agency should provide the facilities and the agency treatment of community members as being helpless which may make them act as if they are. Community involvement in

general plays a major role in water sector because they are the primary users, guardians and managers of the project (URT, 2002). Furthermore, communities are expected to initiate demand for improvements of facilities since it is to be a demand-driven approach, and not only their participation throughout the project cycle has to be guaranteed, but users are also committed to achieve full cost recovery on ongoing operation and maintenance (Morita, 2008). The risk of not involving the community in the early stage of project planning is that ownership of the water supply system is compromised and consequently community members expect the providers of the water supply to operate and maintain it for them, hence the water supply project will be unsustainable.

2.3 Decision Making and Choice of Technology

Village committees such village government can enhance demand based approaches by bringing decision-making down to the village level where beneficiaries can decide, among other things, for example, the type of technology. Musonda (2004) found that technological choice is crucial to sustainability of rural water supply because the type of technology chosen affects operation and maintenance. If a community is to manage a water supply system the technology used needs to be the type that community stakeholders can maintain with little outside assistance. It must suit the existing locally available skills. Community should have a say in the technology choice and not to consider technology choice to be too technical and beyond the comprehension of community members.

Inappropriate technology is also imported due to political interference whereby some government officials would favour a particular technology even when it may not be the best or appropriate. In other cases donor aid requires that the hardware be purchased from the donor countries which provided the aid. Many system failures are partly attributed to

inappropriate technology from developed countries (Musonda, 2004). It is significant to understand that the level of service must be one that can be maintained by the beneficiaries. Suitable technology, affordable and acceptable technology is very important to stakeholders through selection of the technology and are key elements of sustainable water supply (Gleitsmann, 2005).

2.4 Appropriateness of Shallow Wells Technology

According to Vertesy (2006) there are four characteristics of appropriate technologies as outlined hereafter.

- Continuous effective and reliable functioning.
- Can be used by all user groups.
- Management and finance should be autonomous or only in limited way dependant on external source.
- Shall have no lasting detrimental effects on the environment.
- Appropriate technology (AT) is designed with special consideration to the environmental aspects of the community and requires fewer resources and is easier to maintain.

Technology must be chosen to provide an appropriate level of service for meeting consumer needs now and in the future (Vertesy, 2006). To involve water users' entities in the choice of service level and the selection of a water supply system should be promoted (Harvey and Reed, 2006).

Furthermore, Gleitsmann (2005) observed that selection of the technology in order to provide the required level of service has a major impact on sustainability, especially on

ongoing O&M needs. It needs to be both technologically appropriate to their physical and social environment and financially affordable during the maintenance. Vertesy (2006) argues that to use appropriate technologies which do not require special spare parts should be encouraged.

2.5 Capacity Building of Technicians

Community capacity building especially on technical, financial and management aspects is important for the sustainability of water projects (URT, 2002). The community should be empowered with technical and managerial skills to enable them to own and manage their water project (URT, 2002). Shallow wells technology is a simple technology, at the same time it needs appropriate skills. Fraenkel and Thake (2006) argue that for those who intended to use shallow wells technology are supposed to find information concerning the product they want to install for water lifting. Proper operation, maintenance, capacity building of the village technicians, and village water committee is vital for water schemes to be sustainable (MIWR, 2009).

Herron (2008) has observed that 20% to 50% of the shallow wells hand pumps in Sub Saharan Africa countries are not working at any given time. Too much clearance in bushing can cause the handle to break within two months. Therefore, project owners need to be trained (Herron, 2008). Training village technicians, provision of skills and few tools is a way to sustain the shallow wells hand pump project. Herron (2008) has reported that training shallow wells technicians as a way of capacity building should be carried out by NGOs, or any organization involved in working hand in hand with the community.

2.6 Availability of Spare Parts

Shallow wells hand pump comprises various component parts on which proper function depends. According to Masdug *et al.* (2008) spare parts should be available all the time and suggest that spare parts should be manufactured in the country. Nothing can be done if spare parts are not available.

Musonda (2004), in a study of issues regarding sustainability of rural water supply in Zambia argued that lack of spare parts has been a major constraint in the sustainability of water supplies and has been a recurring problem. In some cases it has led to the complete abandonment of the water supply system. If sustainability is to be achieved, it should be ensured that after appropriate technology is chosen, spare parts for that type of technology are made readily available. The National Water Policy (URT, 2002) identifies seven pre-requisites for sustainable rural water supply including availability of spare parts and expertise. The problem of supplying spare parts in rural areas for water schemes and the availability of technicians has often been highlighted (Harvey and Reed, 2006). The simplest solution is to use appropriate technologies which do not require specialist spare parts and components or trained technicians. According to Harvey and Reed (2006) a sustainable spare parts supply has to fulfill the following requirements:

- Available –required components are in stock or rapidly delivered.
- Accessible –awareness of where to find spares outlets and their proximity to the community.
- Affordable-priced within the means of the community.
- Appropriate - of correct specification and in good quality.

Morita (2008) has observed that spare parts should be bought and held at District level, and sold at cost price or affordable price.

2.7 Operations and Maintenance of the Shallow Wells

Operation refers to the everyday running and handling of a water supply. This includes the correct handling of facilities by users to ensure long component life, e.g. the use of handle pump. Few pumps are designed for continuous use required for irrigation while drinking water pumps are often used for watering crops, and this tends to make them break down frequently and to shorten their life (Fraenkel and Thake, 2006). The sustainability of the improved system depends on the degree to which communities can provide regular preventive maintenance and corrective maintenance when needed. Thus, maintenance becomes one of the most important areas of the community to respond, for example, who purchase spare parts, where spare parts are obtained, and how technicians at village level will be trained on maintenance or repair.

According to Danert *et al.* (2009) broken down hand pumps and abandoned shallow wells boreholes are a frequent site across the continent. Harvey (2006) found some criteria which are considered as important prerequisites for sustainable community projects as willingness and ability to manage operation and maintenance, this means that the community will carry out maintenance or repair; and willingness and ability to finance the cost of maintenance in the long term. However communities need to be empowered on how to manage the project, getting full information about availability of spare parts and maintenance, where and how to get it. Management skills related to monitoring must be taken into consideration (Harvey, 2006). The main consideration when determining direct O&M costs for rural water systems is to incorporate recurrent repair costs and future asset replacement.

According to Harvey (2005), in a study on operation and maintenance (O&M) for rural water services found that effective operation and maintenance of water systems is essential if rural water services in low-income countries are to be sustained. Such water schemes are typified by low cost technologies which are relatively inexpensive to operate, maintain and repair. There are several key challenges that must be overcome if operation and maintenance is to be effective and sustainable (Harvey, 2005). These challenges include:

- Lack of long-term financial planning for maintenance.
- Inappropriate technology.
- Lack of technical skills.
- Ineffective supply chains for spare parts.

The National Water Policy (URT, 2002) identifies seven pre-requisites for sustainable rural water scheme as well as communities achieving full cost recovery for operation, maintenance and replacement of the scheme. Sustainability can not be fully realized if communities are not able to maintain their own water project facilities because maintaining of the water supply system on the day- to- day basis ensures that it continues to work for a long time.

2.8 Management of Shallow Wells Project

The National Water Policy in Tanzania (URT, 2002) puts emphasis on community participation and management of water schemes. According to Mtinda (2006), in her study on the sustainability of the rural water supply and sanitation under community management found that community management contributes to the sustainability of water scheme. Pahle (2010) found that effective management of water projects for achieving sustainability, internal factors rather than externals factors must be taken into

consideration because they have a great contribution. Lack of management skills, unrepresentative water communities, technical issues and financial problems must be solved under community management.

Mtinda (2006) argued that communities need to be empowered on how to manage the water projects in terms of governance and provision functions such as availability and supply of spare parts and maintenance. Management skills on how to handle group dynamics, institutional arrangements and monitoring and evaluation of the systems are the important elements for success and sustainability of community managed water supply services. Communities can not do all these activities by themselves; they need support to enhance their performance functions (Mtinda, 2006).

Pahle (2010) argues that decreasing water availability affects not only the ecological system, for example, wetlands but also the social system and the economy. Deo and Khan (2004) identifies the common feature that contributes to the success of the project if stakeholders participate in the decision making, planning, monitoring and service to be established as a way of ownership spirit of the development project.

Non-state actors such as KOD and the communities under community management ensure sustainability of shallow wells hand pump project by focusing on motivation, financing, protection of water sources and training village water committees on their role and responsibilities which considered to be vital for shallow wells project to be sustainable. Kwashie (2010) found that successful community managed water schemes were those in which a local committee had strong and innovative leaders who were able to enforce usage control rules and regulations, implemented their decisions, ensured transparency in handling community finances and adopted prudent administrative and financial management practices.

2.9 Financing the Shallow Wells Project

According to Musonda (2004) supporting water schemes financially influences sustainability of rural water supply, and also the ability to meet the cost of maintenance. Insufficient financing is a major factor in poor maintenance and a reason for project failure as has been reported by Masdugi *et al.* (2008).

Finance is a key element in ordering spare parts, hence in order for the community to meet the cost of maintenance, community has to operate and maintain the project by collecting contributions from stakeholders (Masdugi *et al.*, 2008; Musonda, 2004).There is evidence that sustainable financing mechanisms need to consider at least operation and maintenance and longer term rehabilitation requirements. Even if appropriate mechanisms for collection of funds are in place, no guidelines exist to accurately determine actual costs of repair provision, which may result in service entities collecting insufficient funds to run the project (Garriga and Foguet, 2008).

Harvey (2006) found that there are a number of key measures that need to be fulfilled to ensure sustainable community financing:

- Ongoing costs must be calculated and this information must be packaged in a way that communities can understand in order to make informed decisions;
- People need to be convinced of the concept of paying for the water scheme through appropriate community sensitization.
- Transparent and efficient financial management systems need to be developed.
- Willingness to pay among communities needs to be sustained through ongoing village water committees.

According to Musonda (2004), willingness to support the project is influenced by a number of factors. One such factor is availability of alternative service which is regarded as essential to the long-term sustainability of the project. It has been reported by Harvey (2006) that there are many different mechanisms by which maintenance funds can be collected and stored, and locally appropriate systems should be developed through consultation with communities. The most common funding systems are:

- Reactive financing
- Monthly contributions and
- Pay-as-you-fetch.

Reactive financing simply means that when a system fails or breaks down the community or better-off households come together to pay for repair. Monthly contributions are perhaps the most widespread system whereby each household or head of household in the community is expected to contribute a given amount each month (Harvey, 2008).

Harvey (2006) has indicated that accountability and transparency can go a long way to convince community members to contribute to cost recovery which includes spare parts and other expenses related to water schemes. It is important that users know where their money is going and how it is being used, if they are to be convinced to contribute and to continue contributing. Services which rely on the stakeholders to finance ongoing running costs will only be sustainable if the willingness of stakeholders to pay is sustained. Community members who are willing to finance maintenance costs in the initial stages may soon become unwilling to do so. Harvey (2006) presents an example of possible reasons for this reduced willingness to pay: lack of transparency and accountability

relating to the village water committee, dissatisfaction with water quality/quantity, and time to queue.

2.10 Protection of Water Sources

Pushpangadan and Murugan (2008) found that sources refer to national water source surface or sub-surface from which water is extracted and distributed to the needy community. It may be noted that a perennial water source is a prerequisite for sustainability of a system.Morita (2008), in a study on sustainability assessment of National Rural Water Supply Program in Tanzania has found that environmental and water resources management issues appear to ensure sustainable sources for the water supply systems, since to access safe water entails at least a sustainable water source of sufficient quantity and quality. Through National Water Policy the Government of Tanzania put effort on environmental protection in order to ensure sustainable water sources for water supply (URT, 2002). Water resources management has to be considered to guarantee long-term sustainability of water scheme for example shallow wells project. There is major water stress in some areas in terms of both quality and quantity as a result of local activities which, if not under control, the water source ecology is disturbed.

Lopez (2010) presents impact of environmental degradation as a major concern with respect to water scheme specifically due to deforestation. Nkonjera (2008) argued that in most rural areas of Tanzania, the rural population produces charcoal for sale in order to increase their income and support their livelihood. This population segment cannot be held solely responsible for destroying the environment and cause impacts of sustainability of water schemes. Integrated Water Resources Management (IWRM) implies the integration in a sustainable way of the needs of all users while maintaining a healthy environment. It thus aims to involve all actors such as villagers and organizations to be aware and responsible for water source protection Morita (2008). Local authorities should be capable

to mediate if required, which highlights once more that not only technical training is required but also capacity building on social issues.

2.11 Motivating Community and Training Village Water Committees

Ademiluyi and Odugbesan (2008) argued that without motivation of the community to utilize the new source, sustainability of water scheme is doomed. The user must believe that the new source is preferable to their traditional source. The obvious and immediate benefit of an improved water source is usually access, or proximity, while valuing of health benefits may not be prominent (Carter *et al*., 1999). On the contrary, the taste of water may be unfamiliar, and the universal conservatism of consumers may be an obstacle to change. Thus involvement of the community, to the extent of feeling ownership spirit in them, will usually be necessary to bring about such motivation at the beginning of the project (MIWR, 2009). A significant further obstacle to the motivation of a community to use a new source instead of traditional wells and ready to support an improved shallow wells by contributing money or building materials such as bricks or collecting sand and stones. Through motivation stakeholders should play various roles and responsibilities as a way of making the project sustainable.

According to URT (2002) the community should be empowered with technical and managerial skills to enable them to own and manage their water project through establishing village water committees or water users groups. Tanzania Social Action Fund (TASAF) and community based projects have defined the Village Water Committee or the Water Committee as the representative body of a community regarding development projects; therefore the committees are answerable and accountable to both the Village Council and to the community (Kasiaka, 2004).

The Village Water Committee is essential in strengthening and sustaining established water structures and service. The Village Water Committee is important to enable detailed monitoring and for finding solutions to various problems confronting the proper functioning of their project (Stalker, 2001). In this perspective water committees are elected to manage projects on behalf of the whole community. The Village Water Committee deals with issues such as collecting funds, monitoring and informing village technicians about shallow well damage, then are able to give necessary feedback to the entire community members concerning their water scheme. Communication between the Village Water Committee and Village Council must be a two-way traffic. It requires trust, commitment and openness (Mwakila, 2008).

2.12 Role and Responsibility of Stakeholders

Stakeholders play various roles at different stages of the project cycle. Roles and responsibilities can be assigned using participatory techniques such as PRA (MIWR, 2009). Annis (2006) has outlined responsibilities of the Village Water Committee as to:

- Organize contributions and control finances.
- Make sure community is informed.
- Act as a liaison when dealing with water users.
- Ensure proper operation of the water system.
- Administer technicians; coordinate maintenance and replacement of parts.

According to URT (2002), the roles and responsibilities of stakeholders are clearly defined in the National Water Policy in which people are highly encouraged to participate fully in the provision of water services within their areas of residence.

The general aim of this chapter was to review works on sustainability. Particular attention was paid to the various aspects correlated to the concept of sustainability and factors influencing sustainability of shallow wells project. In the subsequent chapter, attention is directed to the methodology adopted for this study.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Overview

This chapter presents the methods used to collect and analyse data from the study. The chapter is divided into five sections. Section one presents the location of the study area and justification for its selection. Section two presents research design while section three presents the sampling procedures employed. Section four describes data collection which is followed by presentation of data processing and analysis in section five.

3.2 Study Location

The study was conducted in Mbozi District which forms part of Mbeya Region. It was selected for the study because Mbozi District is among the four Districts where shallow wells project activities are mainly implemented by Evangelical Lutheran Church in Tanzania under Konde Diocese. A total of 1,016 shallow wells have been installed in 82 villages (Table 1). In the six villages where the study was conducted there are 234 shallow wells installed (Table 2). Mbozi District (see Fig.3) is bordered by Mbeya District to the east, Ileje District to the south, Sumbawanga District to the north-west and Chunya District to the north. Administratively, the District is divided into 6 divisions, 26 wards, and 175 villages with a total of 119 308 households (Mbozi District Council, 2010).

Mbozi District occupies a total area of 9679 square km which is about 967 900 ha. Arable land is 766 640 ha. Area for forest reserves is 93 738 ha, and settlement is 78 322 ha, while the area covered by water is 29 200 ha. Topographically, the District lies at an altitude ranging from 900 m to 2 750 m a.s.l. and the District is divided into two zones: (i)

the lowland or rift valley zone which lies between 900 m to 1 400 m a.s.l. and the highlands rising between 1 400 m to 2 750 m a.s.l (Mbozi District Council, 2010).

Table 1: Shallow wells installation in Mbozi District by wards

Name of Ward	No. of villages	No of shallow wells
Chiwezi	3	53
Halungu	3	39
Igamba	5	35
Ihanda	10	146
Isandula	8	73
Isansa	4	48
Itaka	4	46
Mlangali	2	9
Mlowo	2	13
Msia	6	78
Myovizi	6	108
Ndalambo	3	20
Nkangamo	4	35
Nyimbili	9	194
Ruanda	4	61
Tunduma	2	3
Vwawa	6	58
Total	**82**	**1016**

Source: ELCT/KOD (2009)

Table 2: Shallow wells installation in six villages by wards

Divisions	Wards	Villages	Total
Vwawa	Vwawa	Old vwawa	15
		Isangu	15
	Nyimbili	Nyimbili	30
		Mpanda	44
Iyula	Myovizi	Mahenje	40
		Ichesa	22
Total	**3**	**6**	**171**

Source: ELCT/ KOD (2009)

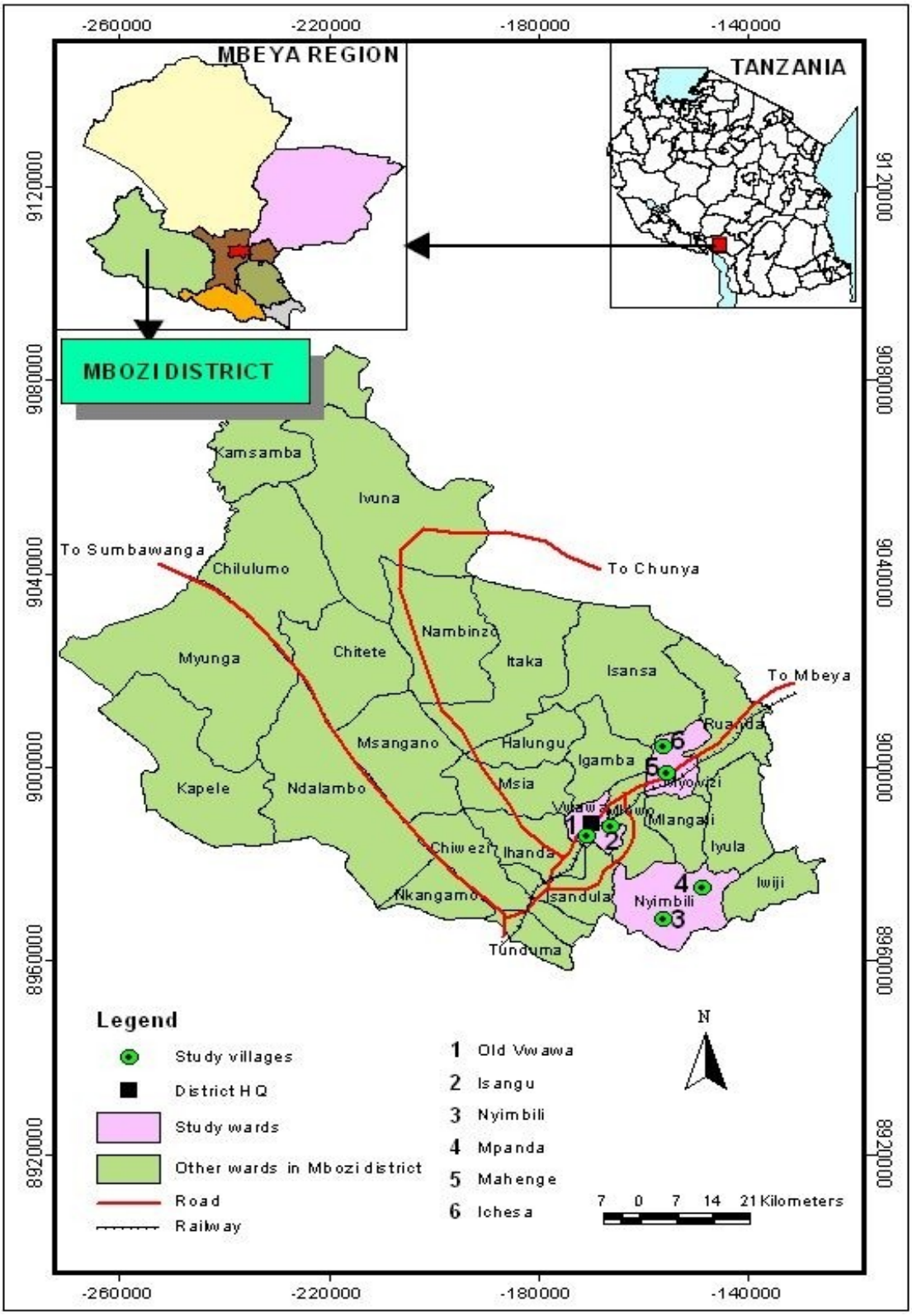

Figure 3: Map of Mbozi District showing study villages

3.3 Research Design

A cross-sectional research design was used in this study because it allows data to be collected at one point in time with minimal financial resources (Casley and Kumar, 1998; Kothari, 2004). This design was used to generate quantitative and qualitative data about factors influencing sustainability of shallow wells project. This design was found to be useful because of time limitation and resource constraints.

3.4 Population

The population from which the sample for this study was drawn consisted of all heads of household in Mbozi District. The total number of households in Mbozi District is 119 308, while the study area consisted of six villages with 2 400 households.

3.5 Sampling Techniques and Sample Size.

Purposive sampling and multistage sampling techniques were employed. A multistage sampling technique was employed to select two divisions, three wards and six villages for the study based on the number of water wells installed by the Lutheran Church. Iyula and Vwawa divisions were covered by the study with their respective wards which are Myovizi from Iyula division; and Vwawa and Nyimbili from Vwawa division. Purposive sampling technique was used to obtain six villages. These villages were selected on basis of them having shallow wells project. The villages covered by the study with their respective wards in brackets are Old Vwawa and Isangu (Vwawa), Nyimbili and Mpanda (Nyimbili), Mahenje and Ichesa (Myovizi). Simple random sampling technique was used to select 20 household heads from each village in six villages. This made a total sample size of some 120 of household heads. This sample size is reasonable according to Boyd's *et al*. (1981) formula (Appendix 1).

3.6 Data Collection Methods

Both quantitative and qualitative techniques were used to collect data from the sample. Questionnaires were used to collect data from heads of household in Mbozi District, and key informants. Focus group discussions (FDGs) were used to collect primary data from the respondents.

3.6.1 Primary data

Both quantitative and qualitative data collection methods were used to obtain the data. The main instrument for quantitative data was a structured questionnaire containing both closed and open-ended questions (see Appendix II). Data collection began in the second week of October 2011 and was completed after five weeks. Primary data for this study were obtained from the heads of household within selected villages in Mbozi District. Data collection was done by the researcher himself to maintain consistency and accuracy of the data.

Furthermore primary data were obtained from shallow wells field officers, KOD as key informants. Closed and open-ended questions were used for data collection. Key informants were asked to give their views on shallow wells technology (Mark V hand pump technology).

3.6.2 Focus Group Discussions (FGDs)

The focus group discussions were conducted to collect data for the study. The participants in FGDs were five members from the Village Water Committee (VWC) and five members among Village Government leaders. Six sessions of the FGDs, one at each village was conducted after finishing the questionnaire survey. The researcher was the moderator while notes were recorded by a primary school teacher. During the discussions the

moderator introduced the topic or asked a question and allowed the group members to discuss or to provide an answer. The discussion in each session lasted about three hours. Checklist of questions for discussion was used.

3.6.3 Secondary data

Most of the secondary data such as records on the number of wards and villages at which the shallow wells were installed and numbers of shallow wells installed were used to improve the study. These were obtained from various resource centres such as Sokoine National Agricultural Library (SNAL), Evangelical Lutheran Church in Tanzania / Konde Diocese (ELCT-KOD).Other secondary data were also obtained from published and unpublished documents and the internet.

3.7 Data Processing and Analysis

Quantitative and qualitative data from the field survey were coded and analysed using the Statistical Package for Social Sciences (SPSS) version 12.0. Descriptive statistics such as means, frequencies and percentages were computed. Moreover, the recorded and summarized data from FGDs and key informants were recorded.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Demographic Characteristics of the Respondents

This section focuses on the following demographic characteristics of the respondents: age, sex, education level, occupation, and marital status, as seen in Table 3 below.

Table 3: Demographic characteristics of household heads in the study area (n=120)

Variables	Frequency	Percentage
Age group (Years)		
20-35	51	42.5
36-60	63	52.5
61-80	6	5.0
Total	**120**	**100**
Sex		
Male	88	73.3
Female	32	26.7
Total	**120**	**100**
Marital status		
Married	89	74.2
Single	11	9.2
Separated	8	6.7
Widowed	7	5.7
Divorced	5	4.2
Total	**120**	**100**
Education level		
Informal	14	11.7
Primary	95	79.2
Secondary	11	9.1
Total	**120**	**100**
Occupation		
Farmer	111	92.5
Business person	4	3.3
Employed	5	4.2
Total	**120**	**100**

4.1.1 Age

Results in Table 3 show that the majority (52.5%) of the household heads are aged between 36 and 60 years while 42.5% of the household heads are between 20 and 35 year of age. On the other hand, 5.0% of them were above 61 years. The age of an individual can affect productivity or involvements in community activities. According to Mandara (1998) and Mtenga (1999), household heads are considered economically productive from the age of 16 to 64 years. The ages below 16 are children some of who attend school and others are too young to participate in community activities such as collecting stones for shallow wells project. The age group above 64 is considered less economically active. In general, the results show that the majority of household heads were in their prime productive age and could therefore be expected to contribute to the development of their respective villages.

4.1.2 Sex of household head

The findings in Table 3 show that the majority of household heads, 73.3%, were men while women formed only 26.7%. The smaller percent of female headed households compared to men in the study area can be explained that, as many other parts of Tanzania, men are the decision makers and control most resources, also active in community activities (Pereka, 1998).

4.1.3 Marital status of household head

Results in Table 3 reveal that about three-quarters of the household heads (74.2%) were married. However, few single, separated, widowed and divorced persons representing 9.2%, 6.7%, 5.8%, 4.2% of all the household heads, respectively, were observed.

4.1.4 Education level of household head

Most of the household heads in this study had acquired primary education representing 79.2% of the total household heads (Table 3). This shows that a high proportion of household heads had attained formal education. Level of education is very important for their ability to utilize efficiently the advice and information offered by government or non government organizations leaders related to the project such as shallow wells project. (Regnar *et al.*. 2002).

4.1.5 Occupation of household head

During the study, household heads were asked to state their main occupation. The results in Table 3 show that the majority of household heads (92.5%) were engaged in farming, while 4.1% were employed and the rest, 3.3%, were engaged in business.

4.2 Community Involvement in Project Planning and Implementation

Community involvement in project activities is very important because it builds a sense of ownership and commitment among the local people (Igbal, 2007). Involvement can take many forms, for example, stakeholders or beneficiaries may be involved in planning, management or even contributing money, labour and ideas. Respondents were asked to state their involvement in project planning and implementation. Results are presented in Table 4.

Table 4: Community involvement in project planning and implementation (n= 120)

Involvement variable	Frequency	Percentage
Participation in project planning meetings	100	83.3
Contribution of ideas in the meeting	61	50.8
Suggestions made during planning meeting (n=60)		
Introduction of water fund	32	26.7
Proposed contribution of unskilled labour and local materials	12	10.0
Proposed provision of skilled labour	8	6.7
Initiating Village water committee	8	6.7
Suggestions on location to dig shallow well	91	75.8

4.2.1 Participation in project planning meetings

Results from the study area presented in Table 4 show that four-fifths of respondents (83.3%) participated in meetings related to shallow wells project at the early stage of planning. About 16.7% of the respondents had not attended the meeting. This means that majority of the respondents participated in meetings aimed at involving villagers to understand the new water scheme. Igbal (2007) observed that sustainability of the project depends on how expected beneficiaries were involved in decision making. Haughey (2009) states that a successful project starts in the planning stage where the communities are able to comment on the type of technology which is under preparation. Therefore it is essential that beneficiaries participate in the project planning process, being fully informed of the cost and benefits of the project, including their responsibilities and limitations of the system, which allows communities to make rational decisions whether they accept the project or not (Carada, 2002).

4.2.2 Contribution of ideas in the meeting

A village meeting is a place where all issues related to village development are conveyed to the villagers by the village government. In most cases village general assembly is conducted once every 3 months, where the communities get opportunities to give their suggestions and comments on different matters related to village development (Kuusi, 2009). Water supply services are among the issues which are supposed to be addressed and discussed by the communities. Results in Table 4 show that 50.8% of the respondents contributed ideas in the planning meeting. There are different levels in which a person can claim to have participated in project activities, by attending a meeting even though the individual may not contribute any idea, or by actively engaging in dialogue (Kasiaka, 2004). Active participation in meetings brings a positive implication as to where both leaders and villagers will decide with one consent on how to run the project. Common decision will always lead to project sustainability.

4.2.3 Suggestions made during planning meeting

Results in Table 4 show that 26.7% of the respondents suggested introducing water fund, while 10% of households proposed contribution of unskilled labour and local materials linked to shallow wells project. About 6.7% of households proposed provision of skilled labour and 6.7% suggested initiating Village Water Committee. While 50% of the respondents had not attended the meeting concerning shallow wells project at the early stage of planning, findings reveal that most of the respondents had not participated in the planning stages for the establishment of the water scheme (improved shallow wells) in their villages. Armah (2008) pointed out that limited success of many development initiatives was attributed to failure to involve people in the design and implementation of projects because communities were left out of the planning process. Sustainable projects depend on the extent to which the patterns of community involvement are contributing to

sustain a project (Khan *et al.*, 2006). It is essential that users participate in the project planning process, being fully informed of the costs and benefits of the project, including their responsibilities and of limitations of the system, which allows communities to make rational decisions whether they accept the project or not (Carada, 2002).

4.2.4 Suggestions on location to dig shallow well

Results in Table 4 indicate that three quarter of household heads (75.8%) participated fully in discussing where to locate improved shallow wells in their respectively hamlets. Nikhah (2009) argues that community involvement in decision making through community assembly creates ownership. Osumanu (2010) affirms that involvement of stakeholders early on in the process of development of a water supply is critical in order to ensure the sustainability of the project such as the shallow wells project.

4.2.5 Project implementation

There are different levels in which a person can claim to have participated in project activities; possibly one may actively be involved in supplying local building materials such bricks or providing free labour. However, to realize project sustainability, this person will have to participate in all stages of the project management as has been reported by Kasiaka (2004).

4.2.6 Labour and cash contribution

Results in Table 5 reveal that two thirds the households (66.7%) were involved in contributing labour and cash during shallow wells implementation. This was part and parcel of beneficiaries supporting their new water scheme introduced by the Evangelical Lutheran Church in Tanzania through Konde Diocese. About 18.3% of households contributed only labour and 8.6% of households contributed cash only as a means of

sustaining the project. So far, 6.7% of households did not contribute anything. Kasiaka (2004) pointed out that stakeholders should have a purpose, and to achieve this purpose each stakeholder is required to contribute skills or other resources. Stakeholders in the area under study participated in different ways at different stages.

Table 5: Distribution of respondents by labour and cash contribution (n= 120)

Contribution	Frequency	Percentage
Labour and cash	80	66.7
Labour only	22	18.3
Cash only	10	8.3
Don't know	8	6.7
Total	120	100
Cash contributed		
Tsh. 500	51	42.5
Tsh. 200	18	15.0
Tsh. 1 000	8	6.7
Tsh. 300	5	4.2
Tsh. 400	4	3.3
More than Tsh. 1 000	4	3.3
Don't know	30	25.0
Total	120	100
Labour (activities performed)		
Collecting stones and sand	40	33.3
Digging	36	30.1
Collecting bricks	15	12.5
Food preparation	7	5.8
Don't know	22	18.3
Total	120	100

4.2.6.1 Labour contribution

Results in Table 5 confirm that respondents were involved in different activities performed (manual work) at the time of shallow wells project implementation. One third of respondents (33.3%) participated in collecting stones and sand while 30.0% of respondents were involved in digging, and 12.5% of the respondents were involved in collecting bricks. The rest 5.8% of respondents were involved in preparation of meals for those who participated in digging, and activities requiring skilled persons. Others, 18.3%

of households did not make any contribution. Annis (2006) points out that the community is supposed to maintain their agreements which direct them to take part in all activities related to water supply system as directed by the donor.

4.2.6.2 Cash contribution

The study found that 42.5% of respondents contributed Tsh. 500 each, 15% of respondents contributed Tsh. 200 while 6.7% of respondents contributed Tsh. 1 000. Furthermore, Table 5 reveals that 4.2% of respondents contributed Tsh. 300, and 3.3% of respondents in the study area contributed more than Tsh. 1 000 each. However, 25.0% of respondents did not contribute any money. SRV (2000) points out that to ensure adequate and timely financial resource, not only for construction of the water scheme but also for management, and replacement of the broken shallow wells. Harvey and Reed (2007) argue that communities are supposed to build up a sense of responsibility for financing the upkeep of the water scheme.

4.3 Community Roles and Responsibilities in Project Management

The role of local community in the management of water supply projects has received international recognition in the last decade (Mtinda, 2006). Some donors also showed emphasis on community participation in management of projects (Doe and Khan, 2004). The respondents were asked to explain their roles and responsibilities with regard to shallow wells projects. Their explanations were summarised and are presented in the following sections:

4.3.1 Persons responsible for shallow wells maintenance/ repair

The study shows that the majority 79.2% of respondents mentioned trained person (skilled, shallow well technician) as responsible for shallow wells maintenance or repair at

village and hamlet level (Table 6). A skilled person is answerable to uphold reliability of shallow wells operation. A few (0.8%) of the respondents mentioned that the Lutheran Church is responsible, while 20% of respondents know nothing about shallow wells maintenance or repair. Maintenance is a key factor for maintaining sustainability of shallow wells project. Harvey (2006) states that sustainability of the improved water systems depends on the degree to which communities can provide regular preventive maintenance and corrective maintenance when needed. Thus, maintenance becomes one of the most important aspects of the community to contribute. Musonda (2004) points out that maintenance is critical to the sustainability of a water scheme; therefore inadequate arrangement for maintenance is the major cause of failure. Sustainability cannot be fully realized if communities are not able to maintain their own water scheme such as shallow wells, because maintaining the water scheme on a day – to – day basis ensures that it continues to work for a long time.

Table 6: Distribution of responsible for shallow wells maintenance (n=120)

Responsible for shallow wells maintenance/repair	Frequency	Percentage
Trained person	95	79.2
Lutheran Church	1	0.8
Don’t know	24	20.0
Total	120	100

4.3.2 Responsibilities of the village government

Data in Table 7 show that majority of the respondents do not understand responsibilities of village government regarding shallow wells project. Effective performance depends on how you understand your responsibilities to ensure that intended project was properly operated and maintained. According to the Government of Tanzania (GoT) statutes, the village government is the basic structure of the government with overall responsibility for any development initiative within the village (Miert and Binamungu, 2007). Results show

that 6.7% of the respondents pointed out that the village government is responsible for encouraging stakeholders to support the project financially, while 5.0% of the respondents indicated that the village government leaders are responsible for creating awareness to all villagers concerning safety of shallow wells fitted with hand pump. Also, 4.2% of them explained that the village government is accountable for protecting shallow wells hand pumps from intentional or unintentional destruction by imposing village rules, for example, children less than six years are not allowed to use hand pump. 2.5% of the respondents observed that the village government (VG) is responsible for portraying importance of shallow wells fitted with hand pump to all, hence shallow wells as a source of domestic water consumption should be maintained by beneficiaries. It is surprising that 81.6% of the respondents did not know anything about village government responsibilities. The basic powers and responsibilities of village councils, which are common to all district authorities are listed in Section 111 of the Local Government (District Authorities) Act 1982 (Kuusi, 2009).

Table 7: Distribution of respondents by responsibilities of village government (n= 120)

Responsibilities of village government	Frequency	Percentage
To encourage stakeholders on supporting shallow wells project	8	6.7
To create awareness to villagers concerning safety of shallow wells	6	5.0
Shallow wells to be protected to avoid destruction	5	4.2
Maintaining shallow wells as a source of domestic water consumption	3	2.5
Don’t know	98	81.6
Total	120	100

4.3.3 Training technicians

Results from the study area reveal that two-thirds (69.2%) of the respondents state that special training for shallow wells technicians was conducted at the initial stage of

implementation as a way of capacity building. This training was conducted to prepare them to carry out the projects once completed. Training was initiated by KOD in collaboration with the NGO MMM and aimed to produce skilled villagers, so that mechanical problems could be solved by using skilled persons at the village level. Capacity building on technical skills and other aspects is important for sustainability of water projects (URT, 2002).

4.3.4 Technicians involved during the initial stage of implementation

Respondents were asked whether trained technicians were involved during the initial stage of the project implementation to be familiar with shallow wells technology. Data from the study area show that 78.3% of the respondents reported that village technicians were involved at the initial stage of implementation. Mwakila (2008) argued that village technicians should be selected among community members for convenience of providing maintenance or repair services to the communities. Hence, they need to be equipped with basic knowledge and skills on how to repair shallow wells hand pumps in case of breakdown.

4.3.5 Spare parts

Results concerning the question of spare parts show that 52.5% of the respondents said that spare parts were available. Availability of shallow wells spare parts is very important to ensure sustainability of the project. At least half of the respondents were not aware about spare parts. Masdug *et al.* (2008) observed that spare parts should be available all the time and suggested that spare parts should be manufactured in the country. Nothing can be done if spare parts are not available. Musonda (2004) reported that good operation and maintenance is frequently constrained by lack of spare parts and by the absence of local manufacturing. Morgan (1990) cited by Musonda (2004), argues that spare parts

should be stocked within the community store or by water committee to ensure that spare parts are available when needed.

The study shows that 41.7% of the respondents mentioned Vwawa town (headquarters of Mbozi District) as a possible place to get spare parts, while 0.8% mentioned KOD head office as a place where spare parts could be found. The rest of the respondents (57.5%) did not know where spare parts could be bought (Table 8). According to the study, majority are lacking information as to where shallow wells spare parts can be purchased.

Table 8: Where spare parts can be purchased (n= 120)

Place spare parts can be purchased	Frequency	Percentage
Vwawa town	50	41.7
Konde Diocese head office	1	0.8
Don't know	69	57.5
Total	120	100

Three-quarters (76.9%) of the respondents were not satisfied with shallow wells services throughout the year just because their shallow wells hand pumps were out of order (broken) as shown in Table 9. Others (11.5%) were not satisfied with shallow wells services from their water point simply because their wells dried, and 5.8% of the respondents indicated that water point (installed shallow wells hand pump) devices such as pump rod had been stolen. The rest (5.8%) of respondents reveal that the water smelled and appeared reddish / yellow which caused the shallow wells to be abandoned. Reddish water was reported in Mpanda, Old Vwawa and Ichesa villages. Johns (2010) focus on durability of shallow wells devices as a way of shallow wells project to be sustainable, using original spare parts. An importer of shallow wells hand pumps spare parts must ensure that the product is tried and tested in the most extreme situation. Roger (1982) observed that seasonal variations in rainfall and the occasional drought affect the height of the underground water level. This can result in unreliable service.

Table 9: Distribution of respondents by reasons associated with lacking shallow wells services (n= 52)

Reasons associated with lacking shallow wells services	Frequency	Percentage
Shallow wells devices broken	40	76.9
Shallow wells dried	6	11.5
Shallow well devices stolen	3	5.8
Shallow wells' water appear reddish/ yellow colour/bad smell	3	5.8
Total	52	100.0

4.3.6 Willingness to contribute cash

The study shows that four-fifths of the respondents (91.7%) contributed money willingly in order to sustain the shallow wells project implemented by Evangelical Lutheran Church in Tanzania/Konde Diocese. Their cash contribution is part of community involvement and as a way of enhancing project ownership. Only 5.8% of the respondents lacked the spirit of willingness to pay, they felt that shallow wells project is church's property and everything will be solved by the church which is a wrong perception. Surprisingly, 2.5% of the respondents did not understand the concept of contributing cash willingly in their village or hamlets. Kaliba (2004) observed that at village level where water supply projects are to be operated and managed, costs are to be met with funds raised within communities. Thus beneficiaries' willingness to payment of costs is very important to sustain the project. Harvey (2006) argues that community members who are willing to finance O&M costs in the initial stages may soon become unwilling to do so. There are many possible reasons for this reduced willingness to pay, including lack of transparency and accountability relating to the water management committee (Harvey, 2006).

4.3.7 Cost recovering

Results show that 33.7% of the respondents contributed Tsh 1 000 each. Around a quarter of respondents (26.1%) contributed Tsh 500 each. Also 15.2% of the respondents contributed an amount of Tsh 400 each. Moreover, 15.2% of the respondents contributed

Tsh 200 and 9.8% of the respondents contributed more than Tsh. 1 000 each (Table 10). Finance is a key element in ordering spare parts and cost recovery in order for the community to meet the cost of maintenance. Masdugi *et al.* (2008) and Musonda, (2004) found that stakeholders in the study area contribute money to create sustainability of shallow wells hand pumps and the community has to operate and maintain the project by collecting contributions from stakeholders.

Table 10: Cash contributed, cash collector and duration of contribution (n= 92)

Variables	Frequency	Percentage
Cash contributed		
Tsh. 1 000	31	33.7
Tsh. 500	24	26.1
Tsh. 400	14	15.2
Tsh. 200	14	15.2
More than Tsh. 1 000	9	9.8
Total	92	100
Cash collector		
Village water committee	74	80.4
Ten cell leader	13	14.1
Shallow wells technician	2	2.2
Don’t know	3	3.3
Total	92	100
Duration of contribution		
Once per year	91	98.9
Monthly contribution	1	1.1
Total	92	100

4.3.8 Cash collector

It was found that 80.4% of the respondents identified Village Water Committee as the cash collector of cash contributions at village level or hamlet level. About 14.1% of the respondents showed that ten cell leaders were working on collecting contributions for shallow wells hand pumps’ requirement, and 2.2% of the respondents indicated shallow wells technicians as responsible for collecting money for shallow wells project, while 3.3% of them failed to state or to mention who was the cash collector. Table 10 depicts

cash collectors in the study area. Cost recovery for shallow wells project depends on financial management. Cash collectors played a vital role on collecting cash contributions which were used for shallow wells project to be sustainable.

4.3.9 Duration of contributions

Results in Table 10 show that 98.9% of the respondents contributed cash once per year, while 1.0% of them paid their contribution every month. There are many different mechanisms by which maintenance funds can be collected. The most common funding system according to Harvey (2008) is reactive financing, this mechanism is applied when a system breaks down. Monthly contribution is perhaps the most widespread mechanism whereby each stakeholder or household head is expected to contribute a given amount monthly. Most respondents in the study area contribute a given amount once per year; it is possible that both mechanisms are applied.

4.3.10 Setting amount of contribution

Majority of the respondents (79.2%) as shown in Table 11 participated in setting amounts of cash to be contributed whereas 9.2% of the respondents did not participate in setting amount of cash contribution in order to sustain shallow wells fitted with hand pumps. Community's involvement in decision making motivates them to support shallow wells project (Musonda, 2004).

Table 11: Setting amount of contribution, receipt, bank account and income (n= 120)

Variables	Frequency	Percentage
Involved in setting amount of contribution		
Yes	95	79.2
No	11	9.2
Don't know	14	11.6
Receipt document issued		
Yes	16	13.3
No	91	75.8
Don't know	13	10.9
Existence of bank account		
Yes	2	1.7
No	118	98.3
Don't know	0	0
Income and expenditure report presented		
Yes	63	52.5
No	40	33.3
Don't know	17	14.2

Respondents were asked whether they received a receipt after cash contribution or not. Results in Table 11 shows that three-quarters (79.2%) of the respondents responded negatively concerning payment receipt, they said that no receipt was provided. However, 13.3% of them responded positively by saying that they had received a receipt and one group of 10.8% of the respondents did not know anything about a receipt whether it was provided or not. These percentages show that financial management regulation is not maintained properly or they know nothing about financial management.

Miert and Binamungu (2009) observed that in remote areas people find it too costly to operate bank accounts at District headquarters. Some beneficiaries have substituted official banking to a local revolving fund system under which they lend money to people and get interest after a mutually agreed period, revolving fund is operated in one hamlet in old Vwawa village to maintain their water fund. That is why the study found that almost

all respondents (98.3%) indicated that no bank account for shallow wells project was maintained (Table 11). It is surprising that 1.7% of respondents depicted that shallow wells project had a bank account without indicating where it is. Obviously cash contributed by beneficiaries remains in the hands of cash collectors.

Results in Table 11 also depict that 52.5% of the respondents from the study area agreed that income and expenditure report was presented before the village general meeting or hamlet meeting. But 33.3% of them reported that income and expenditure of cash contribution was not disclosed while 14.2% was not aware if it was presented or not. Study found that VWC was not holding regular meetings with the rest of community members to presented financial matters to the community members. Many respondents said that information was known only by VWC members and Local Government leaders. Therefore some villagers or hamlets leader in the study area are not serious on financial management report.

4.3.11 Payment of shallow wells technicians

Results in Table 12 show that 60.8% of the respondents explained that trained shallow wells technicians at village or hamlet levels were paid an allowance after shallow well hand pump is repaired, while 19.2% of the respondents reported that shallow wells technicians are not paid, and 20% of respondents did not know whether shallow wells technicians were paid or not. Salary or allowance is a way of motivation, and motivated persons should perform their duty effectively.

Table 12: Distribution of respondents by payment of shallow wells technicians (n= 120)

Payment of shallow wells technicians	Frequency	Percentage
Yes	73	60.8
No	23	19.2
Don't know	24	20.0
Total	120	100

4.3.12 Selection Village Water Committee

Improved water schemes such as shallow wells fitted with hand pumps are for public use. Thus shallow wells need to be managed by people who are elected democratically and responsible to the beneficiaries through effective management of maintaining efficiency and consistency of shallow wells project. Results show that half (50%) of respondents were involved in selecting Village Water Committee as shown in Table 13, while the other half of respondents explained that they were not involved in selecting village water committee members. It might be possible that in some villages, Village Water Committees at village level or hamlet were not selected democratically.

Table 13: Selection and activeness of Village Water Committee, (n=120)

Variables	Frequency	Percentage
Selection of the VWC		
Yes	60	50.0
No	60	50.0
Total	120	100.0
VWC is active		
Yes	62	51.7
No	57	47.5
Don't know	1	0.8
Total	120	100
Causes VWC to be inactive (n= 57)		
Lack of training	32	56.1
Lack of motivation	13	22.8
Meetings are not conducted	12	21.1
Total	57	100

Table 13 reveals that 51.7% of the respondents appreciated that the Village Water Committee (VWC) was active in performing their respective duties, while 47.5% of the respondents were not impressed by the VWC performance, and described the VWC as not active, and 0.8% of respondents did not know whether VWC were active or not active. URT (2002), emphasized the importance of Village Water Committees and that the effectiveness of VWC improves the project performance.

Results show that 56.1% of the respondents mentioned that VWC members were lacking training on management skills (Table 13), while 22% of the respondents explained that Village Water Committees are missing motivation since they are not paid. Besides, 21.1% of them stated that VWC members were not active because shallow wells meetings are not held regularly. Village Water Committees need skills of management through seminars at village level as a way of capacity building.

4.3.13 Training of Village Water Committee

Results show that four-fifths (93.3%) of the respondents pointed out that Village Water Committee members were not trained to know their daily duties concerning shallow wells fitted with hand pumps implemented by Lutheran Church (Table 14), while, 2.5% of the respondents stated that VWC were trained, and 4.2% of the respondents did not know about VWC training. Results reveal that no effort was made by the Church or Mbozi District Council to provide management skills training regarding the roles and responsibilities of Village Water Committees. Lack of training to many VWC implies a threat towards project sustainability since those untrained VWC members will not be able to run well the project.

Table 14: Distribution of respondents by VWC training and meetings (n=120)

Variables	Frequency	Percentage
Training of VWC		
No	112	93.3
Yes	3	2.5
Don't know	5	4.2
Total	120	100
Regularly VWC meetings		
No	87	72.5
Yes	33	27.5
Total	120	100

4.3.14 Village Water Committee meeting

Village Water Committee meeting is a place where all issues related to shallow wells fitted with hand pumps are resolved then conveyed to the beneficiaries. Results indicate that 72.5% of the respondents explained that VWC meetings were not held regularly. Official meeting is a place whereby different issues presented, discussed and final agreements made for implementation. Only 27.5% of the respondents agreed that the village water committee meets regularly (Table 14). The reason for not conducting public meetings was because VWC members did not want to be questioned by the community members, so meetings were often deferred.

4.3.15 Problems facing Village Water Committee

Results in Table 15 show that 12.5% of the respondents explained that some people are not willing to support shallow wells hand pump project financially. Furthermore, 10% of respondents said that majority of VWC members do not understand their duties related to shallow wells fitted with hand pump, and therefore fail to perform their duties well. 6.7% of respondents mentioned that VWC members face the challenge that shallow wells points are not enough to meet community needs, while 3.3% of the respondents mentioned that shallow wells fitted with hand pumps are not secure since people steal shallow wells parts,

for example, pump rods. 1.7% of respondents indicated shortage of shallow wells technicians at village level as a problem facing VWC. This problem occurs because few technicians shifted to other villages or districts searching for better life. 0.8% of the respondents revealed that shallow wells project did not have bylaws. About half (54.2%) of respondents were not aware of the problems facing village water committee, while 10.8% of respondents explained that there were no problems facing Village Water Committees.

Miert and Binamungu (2009) have reported that stakeholders were unwilling to contribute money because the village government has for a long time convinced the rural people that it was government responsibility to provide water and it would do so free of charge. Naturally, this historical fact has been deeply entrenched in the minds of rural people despite the government's failure to maintain the rural water schemes. Furthermore, communities were reluctant to contribute their money if they sensed that the village government or any government official such as Village Executive Officer (VEO) or Ward Executive Officer (WEO) was involved.

Table 15: Distribution of respondents by problems facing VWC (n= 120)

Problems facing village water committee	Frequency	percentage
People are not willing to support shallow wells project financially.	15	12.5
VWC members do not understand their duties.	12	10.0
Shallow wells points are not enough to meet needs.	8	6.7
Shallow wells fitted with hand pumps are not safe.	4	3.3
Shortage of shallow wells technicians.	2	1.7
Shallow wells project does not have bylaws.	1	0.8
No problems.	13	10.8
Don't know.	65	54.2
Total	120	100

4.3.16 Accountability for water source protection

Results in Table 16 show that 69.2% of the respondents argued that villagers in the project are answerable for water source protection instead of depending on certain groups. 25.8% of the respondents mentioned that the Village Water Committee is responsible for water source protection and 5.0% of respondents indicated that village government is accountable for water source protection. The findings depict that the majority (as shown in Table 16) were of the opinion that every person is accountable for water source protection.

Table 16: Water source protection and protection techniques (n=120)

Variables	Frequency	Percentage
Accountable persons for water source protection		
Villagers	83	69.2
Village water committee	31	25.8
Village government	6	5.0
Total	120	100
Protection techniques		
Agriculture activities close to water sources prohibited	28	23.3
Grazing livestock near water sources not allowed	20	16.7
Natural vegetation maintained	19	15.8
Planting trees encouraged	17	14.2
Cutting trees near water sources prohibited	13	10.8
Don’t know	23	19.2
Total	120	100

4.3.17 Protection techniques

It was found that there are several techniques or methods practised by the community to ensure that water sources are protected as a way of making shallow wells project sustainable. Table 16 shows that 23.3% of the respondents explained that agricultural activities close to water sources are prohibited. Besides, 16.7% of the respondents indicated that grazing livestock near water sources is forbidden and 15.8% of respondents revealed that natural vegetation is maintained to avoid destruction of the ecosystem. 14.2% of the respondents described that planting trees near water sources is encouraged,

especially those types of trees which are recommended by foresters, while 10.8% of respondents emphasized that cutting trees near water sources is not allowed. However, 19.2% of respondents failed to describe methods applied to protect water sources. Environmental and water resources management issues appear to ensure sustainable sources for the water supply systems, since to access safe water entails at least a sustainable water source of sufficient quantity and quality (Morita, (2008). Protection of water sources is the most important aspect for achieving sustainability of the water schemes. Therefore respondents mentioned this as one of the areas to be taken into consideration.

4.3.18 Perceived ownership of shallow wells project

Data from study area affirm that 88.3% of the respondents said that shallow wells project was owned by the village government. About 6.7% of them said that shallow wells project was owned by ELCT-KOD, while 5.0% of respondents thought that shallow wells project was owned by Mbozi District Council. These percentages show that the community believes that the project is under the village government. Okuni and Rockhold (1995) affirm that communities contribute locally available materials and labour towards their water scheme; for this reason construction work is done jointly by the beneficiaries and project technicians. This strengthens their sense of ownership and responsibility which influences sustainability of water scheme.

Table 17: Distribution of respondents by perceived owner of shallow wells project (n= 120)

Owner of shallow wells	Frequency	Percentage
Village government	106	88.3
ELCT-KOD	8	6.7
Mbozi District Council	6	5.0
Total	120	100

4.3.19 Shallow wells monitoring responsibility

Monitoring is part of the project cycle. Howlett and Nagu (2001) have reported that monitoring assesses whether project inputs are being delivered, used as intended, and are having the initial effect as planned. Monitoring is concerned with the collection, processing and analysis of data for measuring performance. The study found that 31.7% of the respondents indicated village water committee as being responsible for shallow wells monitoring. About 30.0% of the respondents show that villagers and Village Water Committees have the task of monitoring the project. Other respondents mentioned ten cell leaders (12.5%), shallow wells technicians at village level (6.7%) and hamlets chairperson (5.8%) while 13.3% of the respondents did not know as shown in Table 18. The responses indicate that all community members are responsible for monitoring the project. This implies that the project is sustainable as all community members feel part and parcel of the project. Being owned by the village government, the shallow wells project is likely to be sustainable as community members will be taking care of it as their own property.

Table 18: Respondents' opinion on shallow wells project monitoring responsibility (n= 120)

Project monitoring	Frequency	Percentage
Village water committee	38	31.7
Villagers and village water committee	36	30.0
Ten cell leader	15	12.5
Shallow wells technician	8	6.7
Hamlets chairperson	7	5.8
Don't know	16	13.3
Total	120	100

4.4 Appropriateness of Shallow Wells Technology

The shallow wells technology is categorized into a group of appropriate technology, which is technology designed in such a way that it requires fewer resources, and is easier to

maintain. Vertesy (2006) argued that technology must be chosen which provides an appropriate level of service for meeting consumer needs now and in the future.

Table 19: Appropriateness of shallow wells technology (n= 112)

Variable	Frequency	Percentage
Technology is the choice of villagers	79	65.8
Opinion regarding shallow wells technology		
Favourable	112	93.3
Unfavourable	8	6.7
Total	120	100
Reason supporting shallow wells technology		
Clean and safe water	85	75.9
Simple technology to repair	20	17.9
Easy to get spare parts	7	6.3
Total	112	100

4.4.1 Shallow wells technology being the choice of villagers

Results in Table 19 confirm that 65.8% of households agreed that shallow wells technology is their choice technology for water scheme. Musonda (2004) found that technological choice is crucial to sustainability of rural water supply because the type of technology chosen affects operation and maintenance. Harvey and Reed (2007) present a comment related to choice technology that community should be given a choice of technologies which they can adapt. The type of water technology in place has great influence on the sustainability of water schemes. Brikké and Bredero (2003) argue that the community should select the technology with support from the agency. This will contribute to the sustainability of the technology and increase the number of community members who will use it.

Besides, respondents gave their opinions regarding shallow wells technology. Results in Table 19 portray stakeholders' opinions regarding shallow wells technology fitted with

hand pumps operating in study area for domestic and economic water. The study found that 93.3% of the respondents felt that the shallow wells technology is good, while 6.7% of respondents felt that shallow wells technology is poor. Majority observed that shallow wells technology fitted with hand pump is good. Impact of shallow wells fitted with hand pumps as a source of domestic water drives them to explain their feeling concerning shallow wells technology compared with traditional wells which were used before a new water scheme was installed. For the time being stakeholders are safe from contaminated water supply through traditional wells as shown in (Plate 1.)

Plate 1: Fetching water from a traditional well

4.4.2 Reasons supporting shallow wells technology

Results in Table 19 show that three quarter (75.9%) of households prefer shallow well technology because they collect safe and clean water from them, while 17.9% of the respondents recommended shallow wells technology as a simple technology to repair. Moreover, 6.3% of the respondents favour shallow wells technology because spare parts are available. This implies that the respondents had favourable opinion with regard to shallow wells technology. According to Masdugi *et al.,* (2008) spare parts should be available all the time and suggest that spare parts should be manufactured in the country. Nothing can be done if spare parts are not available. Nkongo (2009) points out that sustainability of rural water supply schemes depends on several factors including spare parts availability.

4.4.3 Limitations of shallow wells technology

Data from the study area presented in Table 20 show that majority of the respondents said that shallow wells technology is very delicate (easy to break) according to 63.3% of the respondents. About 2.5% of the respondents said that older women fail to operate the T-bar handle pump as a means to extract ground water. Others 34.2% did not know anything about shallow wells technology limitations.

Plate 2: An abandoned shallow well

Table 20: Distribution of respondents by reason for shallow wells technology being poor (n= 120)

Reason	Frequency	Percentage
Easy to break (delicate)	76	63.3
Older women fail to pump	3	2.5
Don't know	41	34.2
Total	120	100

4.4.4 Operational sustainability of the shallow wells installed by Lutheran Church

Findings from the study area show that only 65.8% of the respondents indicated that shallow wells constructed by ELCT– Konde Diocese are still operating or functioning at the time of this study. It seems therefore that there are problems which threaten sustainability of shallow wells since of the shallow wells installed in study area only 65.8% are working creating a gap of 34.2%. There are several factors which sustain water schemes such as shallow wells technology. Vishnudas *et al.* (2008) observed that a water

scheme has to be successfully installed, operated, maintained and repaired, Therefore beneficiaries play a big role to ensure the sustainability of shallow wells project.

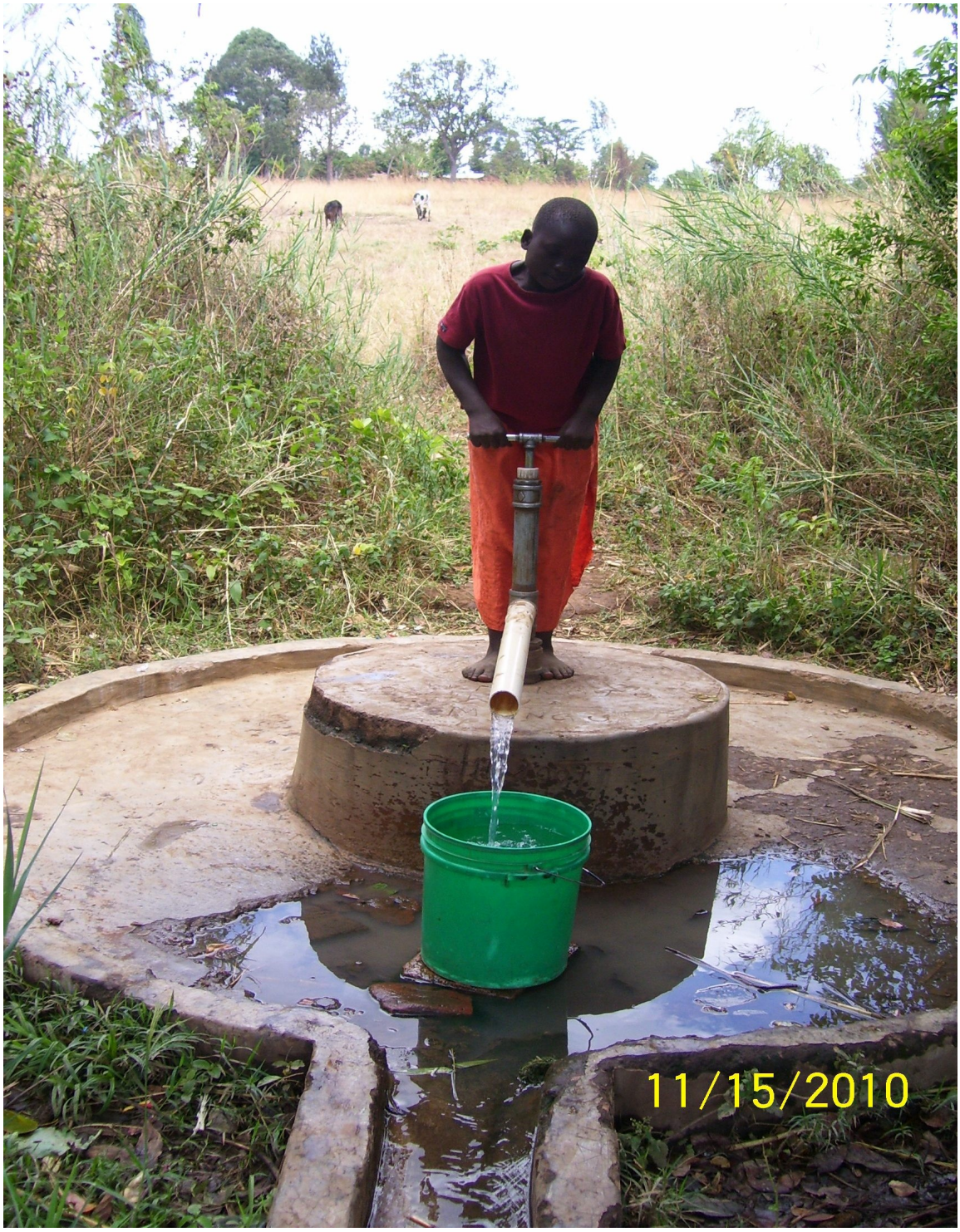

Plate 3: Functioning shallow well

Plate 4: A shallow well with a broken hand pump

Data from the study area indicate that 85% of the respondents stated that shallow wells have not been functioning for quite some time due to frequent mechanical problems related to breakdown. It has been reported by Brikké and Bredero (2003) that shallow wells hand pumps require frequent checkups by skilled persons to maintain their reliability. Lack of sense of communal ownership left many of the installed water systems in poor state as shown Plate 4 which shows a shallow well with broken hand pump in one of the villages in Mbozi District.

4.5 Opinion on Shallow Wells Project Sustainability

The study found that more than three-quarters (78%) of the respondents were of the view that shallow wells fitted with hand pumps are sustainable, while 22% of the respondents said that shallow wells hand pump project as a source of water supply is not sustainable (Fig. 4). Kimberly (1998) cited by Mwakila (2008), found that sustainability in water projects means ensuring water supply services and interventions continue to operate satisfactorily and generate benefits over time as expected. Sustainability is all about ability to maintain initial project service standards. On the other hand, to achieve this it has to be planned from the very beginning of the project so as to ensure prerequisites for long-term sustainability. Strategies are aimed at seeing that sustainable projects are in place and are in good working order. Skinner (2009) argues that inadequate maintenance of water scheme in rural areas is increasingly recognized as a major barrier to achieve sustainability.

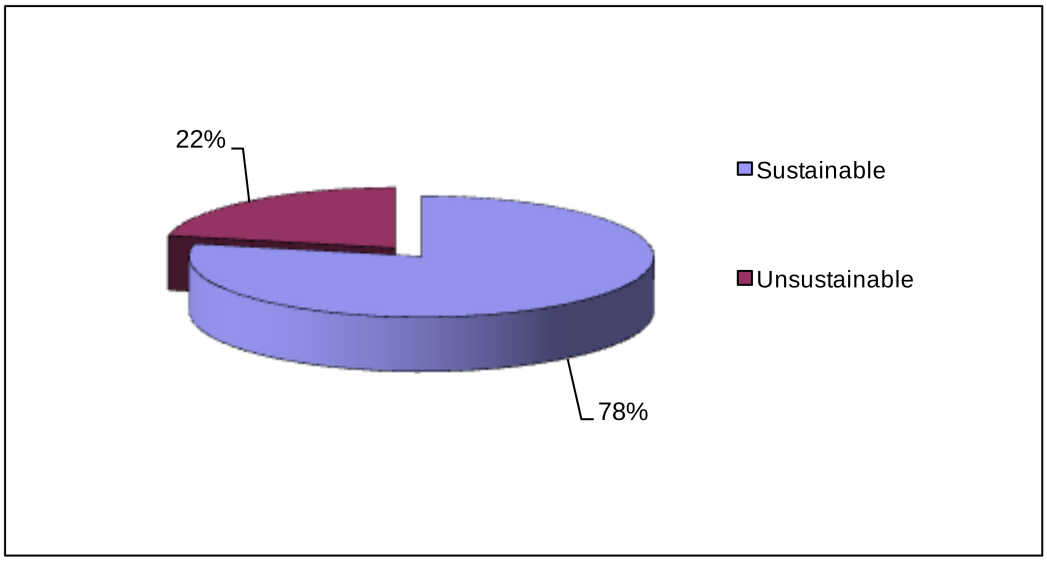

Figure 4: Respondents' opinion on shallow wells project sustainability

Respondents were asked to state their reasons for their opinions. The results are presented in Table 21 below.

Table 21: Reasons given for sustainability and unsustainability

Variable	Frequency	Percentage
Reasons for sustainability (n= 94)		
Villagers are willing to support the project	34	36.2
Shallow wells technology is simple to repair	26	27.7
Spare parts are available	24	25.5
Water available throughout the year	10	10.6
Total	94	100
Reasons for unsustainability (n= 26)		
Shallow wells are not functioning	13	50.1
Shallow wells technology is weak	7	26.9
Extracted water is not safe and clean	3	11.5
Shallow well has dried up	3	11.5
Total	26	100

36.2% of the respondents state that the technology is sustainable because villagers are willing to support the project. 27.7% of respondents said that installed shallow wells technology is simple to repair and 25.5% of respondents observed that spare parts are easy to obtain, making it sustainable (Table 21). The rest of the respondents pointed out that water is available throughout the year making the technology sustainable.

Carter *et al.* (1999) have reported four factors concerning sustainability of water schemes, among of them is the continuing support to the project. Tarekegne (2009) stated that available spare parts and effective maintenance are necessary for sustainability of shallow wells hand pumps. The choice of shallow wells technology must go hand in hand with the existing locally available skills to maintain the shallow wells project. Water supply services throughout the year refers to water schemes being maintained in a condition which ensures sustainability of shallow wells project that benefits stakeholders over a period of time (Musonda, 2004).

Those who thought the technology is unsustainable had their reasons. Half of the respondents (50.0%) said that shallow wells are not sustainable for the reason that they were not functioning. This is probably because repairing, maintenance or any problem related to shallow wells technology is not promptly solved. Failure of some of the rural water schemes has been attributed to inappropriate technology and location of facilities (URT, 2002). More than a quarter (26.9%) of the respondents pointed out that shallow wells technology operated in Mbozi District was not durable. Mtinda (2006) observed that the type of water technology in place has a big influence on the sustainability of water schemes.

At the same time, 11.5% of the respondents claimed that water extracted was not safe and clean. Contamination is possible where waste disposal site seeps down into the ground water, where it can be brought up by water supply well. Agriculture is also source of ground water pollution (Helperin *et al.,* 2001 and Cherry, 2010). Through groundwater contamination, it is possible to use unsafe and unclean water from groundwater sources. While 11.5% of the respondents stated that the shallow wells have dried, that is why they are not sustainable. Roger (1982) has observed that seasonal variations in rainfall and the occasional drought affect the height of the underground water level for that reason is possible for shallow well to be waterless. Usefulness of shallow wells hand pumps technology depends on the water table.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Based on the findings of the study, the following conclusions are made with regard to shallow wells project sustainability:

Community involvement in the planning stage of the shallow wells project was satisfactory and that is why some wells are still working to the time of this study.

The people in Mbozi District with collaboration of their village government leaders play a vital role and are highly responsible for management, mo of the shallow wells project. In that they feel part and parcel of the project. However, it is sad to learn that there are some people who still do not know their roles and responsibilities regarding shallow wells project.

The shallow wells technology is delicate and therefore people are not very much benefiting from them as it was intended by project initiators. It should be learnt that the type of technology used is not appropriate.

There are three major factors for shallow wells project sustainability. These are related to community willingness towards supporting the project, simplicity of the technology for repairing and availability of spare parts. Nothing can be done if stakeholders are not willing to support the project and spare parts are not available.

The study highlight that the shallow wells project is sustainable despite some threats to its sustainability. Threats include lack of funds for paying shallow wells technicians, delicacy of the shallow wells technology, reluctance of community members in paying the annual contributions and lack of support from the central government.

5.2 Recommendations

In light of the conclusions above, the study makes the following recommendations:

Donors are urged to use “bottom up” approach in implementing shallow wells projects that will enable the community to involve themselves fully in all stages of the project.

The people in Mbozi District should be educated for them to understand that the shallow wells project is their own assert and so they have to be more responsible for sustaining it in various ways including cash and labour contributions.

The village leaders should continue mobilizing villagers to involve themselves in all stages of the shallow wells project for continuing sustainability

The project recommends the Government of Tanzania and donors to introduce and fund the use of deep wells technology (borehole) instead of shallow wells technology. Donors are also urged to continue funding the project and are advised to use qualified people in surveying proper areas and decide type of wells durable for the place.

5.2.1 Recommendation for further research

A research is recommended on durability of shallow wells technology applied in Mbozi District as it was concluded that the shallow wells technology was delicate, this would help donors to choose an appropriate technology regarding water services provisions.

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APPENDICES

Appendix 1: Sample size calculation

Sample size formula:

n/N ×100 =C

C represents a figure greater or equal to five percent of household heads

N is the total of households in the village

n is the number of household heads selected (Boyd *et al*. 1981) formula.

Sample size

n/N × 100 = C

n/2400 ×100 = 5

100n = 12 000

n = 12 000/100 = 120

Therefore, sample size carry 120 respondents

Appendix 2: Questionnaire

Introduction

Good morning/afternoon,

My name is …….., from Sokoine University of Agriculture, Morogoro. In collaboration with Mbozi District Council, we are carrying out a study in the district to investigate factors that influence the sustainability of shallow wells fitted with hand pumps. Information will be treated confidentially; therefore you are requested to be free to write any information.

Geographical Location

Ward_____

Village_____

Questionnaire number_____

Date of research_____

I. Respondents background Information

1 Sex 1 Male [ ] 2 Female [ ]

2 Age_____(fill)

3 Marital status. Tick (√)

1 Married [ ]
2 Never married [ ]
3 Divorced [ ]
4 Separated [ ]
5 Widow [ ]

4 What is your education level? Tick (√)

1 Informal education [ ]
2 Primary education
3 Ordinary secondary education [ ]
4 Advanced secondary education [ ]
5 College [ ]
6 University [ ]

5 Occupations. Tick (√)

1 Farmer [ ]
2 Business person [ ]
3 Employed [ ]
4 Traditional healer [ ]

II Involvement of Community in shallow wells project in planning, implementation, monitoring, and evaluation.

How the communities participated in formulation shallow wells project

1 Contributed ideas in the meeting. Tick (√)

1. Yes [ ]
2. No [ ]

2 Contributed cash: Tick (√)

1. Yes [ ]
2. No [ ]

3 Did not participate: Tick (√)

1. Yes [ ]
2. No [ ]

4 Attended the meeting but made no suggestion: Tick (√)
1. Yes [ ]
2. No [ ]
5 Discussed where to dig improved shallow wells: Tick (√)
1. Yes [ ]
2. No [ ]
6 What main issues were discussed in village meetings? (mention)

7 What was or is your contribution to the implementation of the project? Tick (√)
1. Cash [ ]
2. Labour [ ]
3. Labour and cash [ ]
8. If your answer is cash, how much you contributed

9. If your answer is labour, mention activities you performed
10. Shallow wells technology as a water source scheme is a choice of villagers? Tick (√)
1. Yes [ ]
2. No [ ]
11. What is your opinion regarding shallow wells technology? Tick (√)
1. Good [ ]
2. Poor [ ]
12. If your answer is good, what is your reason?
13 Who owns the shallow wells project? Tick (√)
1 Mbozi District Council [ ]
2 Village Government [ ]
3 ELCT-KOD [ ]
14 Who is responsible for shallow wells monitoring?

III Appropriateness of shallow wells technology

1 Shallow wells hand pumps have been constructed in this village before Lutheran church implemented shallow wells hand pump project? Tick (√)
1 Yes [ ]
2 No [ ]
2 If your answer is yes**,** this/these shallow well(s) is/are still operated? Tick (√)
1Yes [
2 No [ ]
3 I don't know [ ]
3 If your answer is No why these shallow wells are not function?
4 Currently shallow wells constructed by Lutheran church are operate? Tick (√)
1 Yes [ ]
2 No [ ]
5 It has been happen shallow well (s) broken? Tick (√)
1 Yes [ ]
2 No [ ]

6 For how long has it been out of order? Tick (√)
1 One day ago [ ]
2 One week ago [ ]
3 More than a week [ ]

7 Who is involved in supervising shallow wells daily? Tick (√)
1 The District Council [ ]
2 The village government under Village Water Committee [ ]
3 Central government [ ]
4 Lutheran church Konde Diocese [ ]
8 Who is responsible for shallow wells maintenance/repair if it is happen to damage/ broken? Tick (√)
1 The District Council [ ]
2 Trained person who is a water user [ ]
3 I don't know [ ]
4 Lutheran church [ ]
9 Trained technicians were involved during the project implementation to be familiar with shallow wells technology? Tick (√)
1 Yes [ ]
2 No [ ]
10 Technicians attendants in this village have got any special training on shallow well maintenance? Tick (√)
1 Yes [ ]
2 No [ ]
3 I don't know [ ]
11 Shallow wells technology spare parts are available? Tick (√)
1 Yes [ ]
2 No [ ]
3 I don't know [ ]
12 If shallow well hand pumps broken where did you expect to purchase spare parts? Tick (√)
1 Vwawa town [ ]
2 Mbeya city [ ]
3 Malawi [ ]
4 Zambia [ ]
5 By consulting Konde head office [ ]
13 Since the project of shallow wells phase did you experience the problem of shallow well broken or not operate? Tick (√)
1 Yes [ ]
2 No [ ]
14 If your answer is yes what solution were taken?

15 Who is responsible to buy spare parts? Tick (√)
1 Lutheran church [ ]
2 Expert from Mbozi district [ ]
3 Village water committee [ ]
4 Village water technician [ ]
16 Stakeholders satisfied with shallow wells services through out the year? Tick (√)
1 Yes [ ]
2 No [ ]
17 If your answer is No, why?

18 What is your opinion concerning sustainability of shallow wells project? Tick (√)
1Sustainable [ ]
2 Is not sustainable [ ]

19 Why do you think is sustainable or not sustainable? (Refer question number 18

IV Management of shallow wells project

1 How the villagers prepared or afford to maintain a running cost of shallow wells project Tick (√)

1 Domestic water users contributes money [ ]
2 Village incomes support running cost [ ]
3 Depends of external and internal donors [ ]

2 Villagers are willing to pay money in order to sustain the project? Tick (√)

1 Yes [ ]
2 No [ ]

3 If your answer is Yes (refer question number 2) how much you pay?_____

4 Do you pay this money. Tick (√)

1 Every month [ ]
2 Once per year [ ]

5 Who collect this contribution? Tick (√)

1 Village water committee [ ]
2 Village executive officer [ ]
3 Other (specify_____

6 If you contribute money do you get a receipt document? Tick (√)

1 Yes [ ]
2 No [ ]

7 There is Bank Account for shallow wells project fund? Tick (√)

1 Yes [ ]
2 No [ ]

8 If your answer is Yes which Bank? Tick (√)

1 NMB [ ]
2 NBC [ ]
3 CRDB [ ]
4 I don't know [ ]
5 Other Bank (specify)_____

9 If your answer is I don't know where this fund saving take place?

10 Villagers were participated in setting amount of payment to sustain the project? Tick (√

1 Yes [ ]
2 No [ ]
3 I don't know [ ]

11 Financial management are maintained careful regarding to income and expenditure? Tick (√)

1 Yes [ ]
2 No [ ]

12 Trained technicians are paid? Tick (√)

1 Yes [ ]
2 No [ ]

13 Do you involved to select village water committee members? Tick (√)

1 Yes [ ]
2 No [ ]

14 Village Water Committee is very active to perform their duties? Tick (√)

1 Yes [ ]
2 No [ ]

15 If your answer is No what is the cause or reasons contributes Village Water Committee to be un active?

16 Village Water Committee has got any training concerning their duties? Tick (√)

1 Yes [ ]
2 No [ ]

17 If your answer is yes who provided training to Village Water Committee? Tick (√)

1 KOD [ ]
2 Community Development Officer [ ]
3 Department of Water-Mbozi District [ ]
4 Other-(specify)_____

18 Village Water Committee meet regularly as being agreed frequency?

1 Yes [ ]
2 No [ ]

19 What is the role and responsibilities of village Government related to shallow wells project?

20 What problems facing Village Water Committee and Village Government related to shallow wells project after the project phase?

21 Who is answerable for water source protection? Tick (√)

1 All villagers [ ]
2 Village government [ ]
3 Village Water Committee [ ]

22 How water sources protected

Thank you very much

Questionnaire for key Informants:

I Background Information

1 Age……

2 Sex 1 Male [ ] 2 Female [ ] Tick (√)

3 Marital status Tick (√)

A Married [ ]

B Single [ ]

II Shallow wells technology (Mark v)

1 What is the total cost of mark V hand pumps devices of shallow wells project? _____

2 It is possible for shallow well hand pump to be out of function? Tick (√)

1 Yes [ ]

2 No [ ]

3 If lifting devices broken can be repaired at the village level? Tick (√)

1 Yes [ ]

2 No [ ]

4 If your answer is Yes who is answerable_____

5 If the answer is No , where the process of repairing could be take place _____

6 What is the maintenance cost per single lifter? _____

7 It is viable to get spare parts in Tanzania? Tick (√)

1 Yes [ ]

2 No [ ]

8 Konde Dioceses has made an effort to prepare village technicians among water users in order to handle shallow wells maintenance? Tick (√)

1 Yes [ ]

2 No [ ]

9 How long is the hand pumps lifter expected to last?_____

Thank you very much i wish you prosperity in your works

Questions for guiding focus group discussion

1 What problems were facing communities before shallow wells hand pump implemented by church?
2 Do you think your problems are over?
3 Communities have been involved in initial stage of planning shallow wells hand pumps project?
4 If shallow wells hand pump broken are you sure to get spare parts on time?
5 Who is going to repair if damage happen?
6 If some water users refused to pay money for water fund, what steps could be taken?
7 Water users are willing to contribute money to sustain shallow wells hand pump services?
8 For those trained as village technicians they perform their work without payments?
9 How do you maintaining the place where shallow wells hand pumps located?
10 What factors contributes sustainability of shallow wells hand pumps project?
11 What factors hinder sustainability of shallow wells hand pumps project?
12 Did you participate in shallow wells project evaluation?