

**AN EVALUATION OF THE FACTORS INFLUENCING  
THE SUSTAINABLE MANAGEMENT OF WATER  
SUPPLY FACILITIES IN  
GACHOKA DIVISION--MBEERE DISTRICT**

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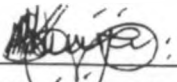
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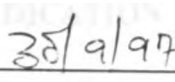
**A THESIS SUBMITTED IN PARTIAL FULFILLMENT  
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**SEPTEMBER 1997**

**DECLARATION**


**This Thesis is my original work and has not been presented for a degree in any other University.**

  
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**DEDICATION**

**This Thesis is dedicated to my Parents**

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**Acronyms**

ASAL	—	Arid and Semi-Arid Lands
BMT	—	Borehole Mobilization Team
CCM	—	Chama Cha Mapinduzi
CWS	—	Community Water Supply
FGD	—	Focus-Group Discussion
FOTIE	—	Field Office Target Impact Evaluation
GOK	—	Government of Kenya
IDWSSD	—	International Drinking Water Supply and Sanitation Decade
LDC's	—	Less Developed Countries
MOWD	—	Ministry of Water Development
NGAGAKA	—	Ngandori, Gaturi, Kagaari
NGO	—	Non-Governmental Organization
NWCPC	—	National Water Conservation and Pipeline Corporation
OED	—	Operations Evaluation Department
SIDA	—	Swedish International Development Authority
SRDP	—	Special Rural Development Programme.
TARM	—	TARM Consultants
TOT	—	Training of Trainers
TWSP	—	Tharaka Water Supply Project
UN	—	United Nations
UNDP	—	United Nations Development Programme
UNICEF	—	United Nations Children's Emergency Fund
USAID	—	United States Agency For International Development
VLOM	—	Village Level Operation and Maintenance
WHO	—	World Health Organization
WSS	—	Water Supply and Sanitation

## ABSTRACT

The purpose of this study was to evaluate the community's management of water supply facilities in Gachoka Division, Mbeere District. Three factors were considered in this study, the reliability of the improved facilities, community participation and institutional framework. The study's objectives were; to explore the different sources of water and ascertain the reliability of improved water supply facilities vis-a-vis the unimproved indigenous sources; to investigate the community's role in the development of the water sources and the effect this has on the sustainable management of the improved water sources and thirdly, to investigate the community's institutional framework by assessing the strength of gender roles in group activities, training and networking. The management of the water supply facilities is explained within the context of the social systems theory. Data collection techniques included the use of a standard questionnaire which was orally administered to one hundred (100) sampled respondents, two focus-group discussions, key informants, desk studies and unstructured interviews. Participatory Research Approach (PRA) was adopted in the process of collecting the data.

The hypotheses that were formulated are; the improved water supply facilities are reliable sources of water and are more preferred and sustainably maintained than the unimproved indigenous water sources; that community participation in design and implementation of the water sources is likely to bring about sustainable maintenance of the water supply facilities and that the development of a strong institutional framework will result in sustainably maintained water sources.

Analysis of the data showed that two improved water supply facilities (boreholes and dams) provide water throughout the year while the rest of the sources (rock catchment tanks, roof catchment tanks, streams and wells) are seasonal in that they provide water during and shortly after the rains. The study found out that quantity and accessibility count more than quality. Another finding is that the community members were by-passed during the development process, hence, never identified themselves with the improved water supply facilities. This

resulted in the facilities being poorly maintained. The trend of unsustainability has in the case of boreholes been tackled through the community mobilization exercise involving the training of caretakers, the committee members as well as the formation of the grass-root organizations. There is a significant trend towards involving women in the management of the water resources.

Given the study findings, it is clear that the community members are capable of sustainably managing these facilities if directly involved in their planning and maintenance. The study recommends the participation of the community members in future planning and development of projects.

## CHAPTER ONE

### INTRODUCTION AND STATEMENT OF THE PROBLEM

#### 1.0 Introduction

The Kenya Government water sector objective as indicated in the 1974 National Water Master Plan is to ensure that every household has palatable water within a distance of four kilometers by the end of the 20th century. In the early 1970's the government launched the Rural Water Supply Programme. The programme was meant to speed up rural water development. The government also endorsed the targets of the International Drinking Water Supply and Sanitation Decade and in 1980 created a National Action Committee to co-ordinate the planning. By 1993, a total of 683 water supply projects were under operation and maintenance (GOK, 1994).

In order to consolidate and strengthen the water supply sector, the government of Kenya created the Ministry of Water Development (MOWD). In 1988, the National Water Conservation and Pipeline Corporation (NWPC) was established under the State Corporations Act of Parliament. The corporations' mandate is to manage and operate major water supply schemes previously operated by MOWD on a commercial basis. NWPC also develops and implements new water supply projects. Both the rural water supply projects and the corporations activities accounted for over 80% of the ministry's total development expenditure in 1993/94 fiscal year. Supplementary players in the water sector are the Non-Governmental Organizations (NGOs) and bilateral donor agencies such as the Swedish International Development Authority (SIDA). These organizations continue to play a leading role in offering valuable contribution towards the provision of water to Kenyans.

It should, nonetheless, be emphasized that the development of water supply facilities has two objectives. The construction of the water supply facilities comes first. The second objective entails the sustenance of the developed facilities. Development planners have for long overlooked the second goal. In effect, the alarming observation in many developing countries is that most of the newly developed water supply facilities breakdown rather

frequently, are abused or abandoned within a relatively short period (McPherson 1986).

During the International Drinking Water Supply and Sanitation Decade (IDWSSD 1980-1990), most of the planned programmes did not only lag behind the target of complete coverage but also many of the schemes already completed never operated in a satisfactory condition. A 1990 GOK -UNICEF basic facilities survey established that only 42% of the households in the rural areas had access to safe drinking water yet the decades' goal was to provide water to all people by the year 1990. In addition to the unfulfilled goals, there arises the risk spiral whereby the problem of inadequate water supply may worsen given the rate at which the population is increasing as well as the increase in the number of malfunctioning facilities.

In order to arrest the problem of unsustainability of the water supply facilities, there has been a re-orientation in policy and practice in rural water development; Narayan (1993). Emphasis has been placed on promoting and supporting community involvement in the planning and management of water supply projects. The purpose is to promote user participation and a sense of ownership in order to achieve sustainability. However, there has hardly been a concerted effort to find out if this goal is realized. It was for this reason that an evaluative study focusing on the sustainable management of the water supply facilities in Gachoka Division was conducted.

## 1.2 Statement of the research problem

To effectively meet a community's demand for water, the facilities supplying the water should always be maintained in good working condition. The community members using the water sources play a significant role in the sustainable maintenance of the facilities. This vital role by the community members is influenced by a number of factors, namely, the reliability of the improved water sources vis-a-vis the indigenous sources, community participation and institutional framework. Thus, how well have these factors been addressed in the process of developing the water facilities and what is their significance in the management and sustainability of the improved water supply facilities in Gachoka Division?

The human potential to develop the necessary skills as well as identify with new projects is influenced by the way the facilities satisfy the community's water supply demand. This study, therefore, commenced by enquiring whether the improved water supply facilities are more reliable sources of water vis-a-vis the indigenous sources. This study, thus, posed the following questions; Is the water at the improved facilities available in adequate amounts and at all seasons? Is the water of good quality? Are the improved sources more popular vis-a-vis the traditional ones? Are there times when the improved sources are more preferred and why?

Another issue that was explored in this study was that of community participation in relation to the development and maintenance of the improved water supply facilities. The introduction of new technologies in a society calls for the adjustment of the peoples socio-cultural attitudes in order to accommodate a new innovation. The development of human capacity through community participation does create a significant impact on the sustenance of improved water supply facilities. Further, the human potential to develop the necessary skills is best captured when the community members are fully involved in developing the water sources. This helps in the shaping of technological innovation to make it fit into the community's socio-cultural realities. It is, therefore, necessary to establish how the improved water supply facilities were introduced and, subsequently, developed in Gachoka Division. What was the community's role in the planning and the subsequent development of the improved water supply facilities? What was the community's role in rehabilitation? Did the community members form of participation result in them identifying with the water sources?.

In order to enhance the developed human potential especially where the developed facilities are communally utilized, the formation of strong institutional organizations is paramount. Like human capacity development, strong institutional organizations are based on the socio-cultural patterns of the society. Thus, to what extent have the recipients of the improved water supply facilities in Gachoka Division developed their institutional resources? How well are Gachoka Division residents trained to handle technical and administrative problems? How efficient are the self-help groups? Do both the men and



women participate in leadership and decision-making concerning the maintenance of the water supply facilities? Has this development enhanced the sustenance of the improved domestic water supply facilities?.

Inter-organizational networking and a mutual relationship between the grass-root organizations and those of the external agencies enhances the sustenance of the improved water supply facilities. Such close collaboration is necessitated by the fact that no single society can be self-sufficient in everything. The effective functioning of the relevant agencies in the study area, such as PLAN International, MOWD. in collaboration with the grass-root organizations strengthens the recipients ability to sustainably maintain the water supply facilities.

The grassroots organizations' policies and those of the external agencies should tally in order to achieve sustainability. To ascertain the aspect of networking, the following questions were addressed; Is collaboration between the various agencies and the grass root organizations sought and valued? Are the relevant staff of different agencies and the local people familiar with each others work?

### **1.3 Objectives**

The broad objective for this study was to evaluate the factors that influence the sustainable management of the improved water supply facilities in Gachoka Division. The following were the specific objectives:

- (i) To explore the different sources of water and ascertain the reliability of the improved water supply facilities vis-a-vis the unimproved indigenous sources.
- (ii) To investigate the community's role in the development of the water facilities and ascertain the effect this has on the sustainable management of the improved water supply facilities.
- (iii) To investigate the community's institutional framework by assessing the level of training, gender roles in group activities and inter-organizational networking in relation to the management of the water supply facilities.

#### **1.4 Justification of the study**

The development of the water supply sector is largely aimed at improving the socio-economic and health status of the recipients and the country at large. Much emphasis in research has been on evaluating whether the relevant socio-economic and health goals have been achieved or not. This emphasis has been at the expense of establishing the chances of these benefits being realized continuously and for a lengthy period. Since this study focuses on the sustainability of the water supply facilities by looking at the factors that make sustainability possible, it fills the gap that has for long been over-looked by scholars and policy makers.

The socio-economic and health benefits arising from an improved water supply will not necessarily be realized by the mere physical provision of the facilities. Further, the provision of an improved water source will not automatically result in the reduction of the occurrence of water related diseases. The beneficiaries will need to consistently and hygienically use water from the improved source. The beneficiaries will only be motivated into using the improved sources on a consistent basis when the improved sources prove to be more reliable than the traditional sources. One of the study's objective was to ascertain the reliability of the improved sources. The study's subsequent outcome is that one can tell whether the improved facilities are used. Therefore, the improved water supply benefits eventually become easy to ascertain.

Another factor that strongly justified this study was that it explored the beneficiaries capacity to sustainably maintain the improved facilities. The new emphasis in development is that of participatory development whereby the recipients get fully involved in the development process. There has been an orientation to this effect in the water supply sector. This study evaluated the extent to which the community in Gachoka Division has been involved in the water supply development process. The findings are then related to the sustainability of the water supply facilities in the area.

The area in which the study was carried out falls under the Arid and Semi-Arid Lands (ASAL) of Kenya. The provision of clean domestic water in this region is a priority because of its being a basic need that has been scarce in the area. By focusing on the sustainable maintenance of the improved water supply facilities, the study helps in finding out the extent to which the problem of domestic water supply has been solved. For development purposes, therefore, a baseline judgement on whether domestic water supply in Gachoka Division has improved is established.

There are other areas in Mbeere district that also fall within the ASAL region. An example of such areas is Siakago Division. Domestic water supply in some parts of these areas is still inadequate. The findings and experiences recorded in this study can be replicated in those areas when improving the supply of water.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

Substantial information has been written on Water Supply and Sanitation (WSS). Much emphasis, though, has been on the hardware components and the problems encountered in developing the WSS sector in the developing world. Of late, however, great emphasis has been placed on intermediate technology as well as the software aspects of the sectors development. The available literature is hereby reviewed under three headings. First, a general overview of some development goals is given, followed by the literature on reliability. Third, literature on human capacity and institutional development is reviewed.

#### 2.1 Development objectives: an overview

In 1977, the United Nations (UN) set the goal of safe rural water supply to be universally reached by 1990. Subsequently, 1980-1990 was declared the International Drinking Water Supply and Sanitation Decade (Widstrand, 1980). In so doing, the UN member governments were responding to an urgent need for clean domestic water supply. This was because an estimated 30,000 people were dying on a daily basis, many of whom died of diseases attributed to lack of safe water and adequate sanitation facilities (Arlosorff et al., 1987).

In 1980, the World Health Organization (WHO) estimated that more than 70% of the worlds rural population was without access to safe and adequate water supply. Over one million villagers (excluding China) were drinking water which was a threat to their health (Arlosorff et al., 1987). The International Drinking Water Supply and Sanitation Decades' (IDWSSD) greatest objective was to reverse this dangerous trend by providing water to the entire populace world-wide. However, as Widstrand (1980) had predicted, this noble

objective was never realized. Therefore, water supply in the rural areas of the developing countries still ranks high in their development agendas.

The Kenya government has had its own elusive but not abandoned goals. At the time of independence, Kenya's adequate and wholesome supply of water was not readily available to the average Kenyan household. In order to overcome this shortcoming the government embarked on initiating and also encouraging the development of water supply projects. The 1974 National master water plan, for instance, aimed at ensuring the availability of domestic water within four kilometers of every household by the year 2000 (GOK 1974). This goal has, however, proved unachievable until the year 2010 (GOK 1994). The government's dedication to the provision of palatable water is once more re-affirmed in the National Plan of Action of 1993 (GOK, 1993).

There has also been a significant re-orientation within the government in relation to water supply. Reflecting on the importance the government of Kenya attaches to the water sector, responsibility for water supply has been shifted from the Ministry of Works to the Ministry of Natural Resources, to the Ministry of Agriculture. In 1974, the Ministry of Water Development was launched. Today there is the Ministry of Land Reclamation, Regional and Water Development (MLRRWD).

In addition to the above re-orientation, the National Water Conservation and Pipeline Corporation (NWCPC) was established in 1988 under the state corporations act of parliament. As an autonomous agency, the prime function of NWCPC is to manage and operate major water supply schemes (previously operated by the MLRRWD) on a commercial basis as well as to develop and implement new water supply projects.

Non-Governmental Organizations (NGOs) have also significantly contributed to the overall development of the sector. A study commissioned by the Swedish International Development

Authority (SIDA) in 1985 on the NGO involvement in the rural water sector established that development of water facilities ranked second to education in importance of investment made by the Kenyan rural and urban communities in the period 1970-1981. During this time, it is reported that 800 new rural water improvement projects were initiated every year by the local communities in collaboration with the NGOs (Tarm 1991).

According to the National Economic Survey, by 1990 there were 339 community schemes, 243 self-help schemes and 53 NGO schemes out of a total of 1570 water supply schemes in the country. By 1991, there were 330 gazetted operational water projects out of which 220 were in the rural areas (GOK-SIDA, 1992). It is, however, unclear on what basis this classification was made. One is, for instance, left wondering what the difference between community schemes and self-help schemes is. The same survey report also revealed that over 700 water projects and programmes in various stages of implementation were pursued by the government. This included assistance to communities in all forms of water development.

## **2.2 Developing a reliable water supply**

It is believed that an improved water supply will minimize the prevalence of water-borne and water-based diseases, therefore, better health for the people and an increase in agricultural production (Halfdon, 1975; Narayan, 1993; Widstrand, 1980). However, most people in the Less Developed Countries (LDCs) lack access to safe and convenient source of water (Shahid, 1981). To them the benefits accruing from an improved water supply are still far-fetched.

Accepting the UNs goal aimed at providing rural communities with safe and adequate water meant that the transfer of technical assistance from the industrialized countries to the LDCs increased (Widstrand, 1980). The technical transfer came in the forms of technological components as well as the human technical assistance, popularly referred to as consultancy services. It has been established that the technological transfer has not been as successful as was anticipated (McPherson, 1987; Narayan, 1993). Similar experiences had also

been recorded prior to the decade by Baldwin *et al.*, (1981) and Widstrand (1980) among others, showing that the process of technological transfer was but another futile development exercise. Manheim, (1972) has attributed the failure of technological transfer to the traditional model of making decisions, that is, through objective analysis. To Manheim, the model is obsolete because the public no longer has faith in the objectivity of the professional analysis and are subsequently unwilling to take recommendations open-heartedly.

According to Beattie, (1964), no human social institutions or relationships can be adequately understood unless the expectations, beliefs and values of the community are taken into account. Development planners need to be aware that they are venturing into societies that have for long known slow and systematic change. New procedures should realize and recognize the importance of the complex interactions and, thus, investigate a much more expanded list of physical, economic and social factors and the process that connects them (McPherson, 1986; Roy and James, 1975). Therefore, an analysis of the socio-cultural values and beliefs of a society is of paramount importance when focusing on factors which may hinder or accelerate the process of social change. This study analyses the extent to which the social aspects were addressed by the development planners in the process of developing the water supply facilities.

The experienced failure of the improved water supply technologies led to a change in emphasis, this time on preference for technologies to be selected using specific criterion which, according to Arlosorff *et al.*, (1987), involved a combination of hardware and software elements. The technological (hardware), human and institutional organizational (software) support elements should be matched in a way that each community recognizes the benefits of the improved supply by making use of the technology used. This form of re-orientation can best be understood to have shed light on the need for community water supply programmes to be planned as a package in order to make best use of the available resources and also to ensure that maximum benefits are achieved from completed projects.

### 2.2.1 Technological appropriateness

In considering the sustainability of water supply projects, the theme of reliability recurs throughout. Subsequently, the concept of appropriate technology has been highly preferred (McGarry and MacMillan, 1986). To Kalbermatten, (1987) technology choice criterion is influenced by the context in which that technology is used. In this case, technology choice is expected to vary from community to community or even from one country to another. The relationship between technology and a community's socio-environmental factors is hereby reviewed.

An appropriate technological innovation performs a similar function to the technologies of the industrialized countries but at much lower cost and more simply. Such an innovation is appropriate to the demanding conditions of the developing world such as low income for a majority of the third world population (Duncan, 1979; McGarry and MacMillan, 1986; Shahid, 1987). According to McGarry and MacMillan, (1986) appropriate technology should be **effective** and do whatever task it is designed to accomplish. One aspect that has to be borne in mind is that there already exists a water source in a particular society. The relative advantage of a new technology, for instance, its reliability, will be of high value to the beneficiaries. If the community's need is to have adequate water for both human and the livestock, the new technology should adequately satisfy this need. The effectiveness of the technology will also vary according to the communities served. A purely pastoralistic society will lay much emphasis on their livestock while a mixed farming group may demand a balance on both human and livestock needs. The technology to be used in improving water supply will, thus, be influenced by the respective demands of a community. The effectiveness of the technology used in relation to the demands will make the technology appropriate. The question addressed in this study is whether the technology used adequately meets the demands of the people in Gachoka Division.

Secondly, appropriate technology should be convenient to the users so that they feel encouraged to use the source. Some of the factors considered include the accessibility and quality of the water provided. It has been reported by Ledge, (1994), among others that



in some instances, the beneficiaries have refused to use borehole water due to the salinity of the water. It is not unusual for ground water to taste saline but most people will associate the salinity with the technology used. Such an attitude is in effect detrimental to the technology used.

The relative ease with which the community gets the water is also a significant aspect of convenience. The distance from the homestead to the water source determines the usage of the source. Cairncross, (1987) argues that people will not necessarily result to using more water due to an improvement in a water source. The most effective way to increase a community's water consumption is to bring the water close to their homes. According to Therkildsen, (1988) hardly will a community by-pass a water source in order to use an improved source, however palatable the latter may be. It is, therefore, necessary to consider the technology to be used in an area, with the sole aim of choosing the appropriate technology that will deliver water close to the peoples homesteads.

Thirdly, the appropriate technology should be **easily maintained** to avoid breakdowns and allow the users to fix equipment. It is unrealistic to instal an equipment that requires great technological expertise for a domestic rural water supply. It would not only be hard to keep it running due to insufficient human skill such as engineering, but also be expensive to maintain. **Affordability** is, thus, the fourth requirement of an appropriate technology. The equipment used should be cheap so that the community members can readily afford them. They should also be readily available in the market and most preferably locally manufactured. Locally manufactured spare-parts are cheaper and readily available vis-a-vis imported ones.

Finally, an appropriate technology should be **adaptable** so that it can be improved or modified. The technology used should be simple so that the beneficiaries get accustomed to it. With time the beneficiaries may decide on how to expand its use. If, for instance, the source was originally designed to meet the immediate human and livestock needs, the community members can later expand on it for other purposes such as irrigation. An

example of an effective adaptability of an appropriate technology has been given by McGovern, (1987). A permanent water hole in north-western Kenya was first developed into a well whereby water was run through gravity flow to the well, then to a tank and a cattle trough further below. The Pokot (the beneficiaries) subsequently came up with two additional developments. A cattle dip was constructed further down the hill. The dip was also fed through gravity flow. Secondly a water supply tunnel was run from the tank to a one hectare garden. By implementing these innovations, the community members proved that they had fully adapted the technology used. This study also lays much emphasis on the appropriateness of the technology used. The findings in appropriateness are related to the sustainability of the improved sources.

It is in the choice of technology that most development planners developed the wrong priorities for the LDCs. Therkildsen, (1988) reports that in Tanzania the choice of technology was solely linked to the choice of rural water policy in general. This was at a time when the ruling party in Tanzania (Chama Cha Mapinduzi- CCM), had set the goal of providing free water to the rural people by the year 1991. The donor government, the Netherlands, through their consultants, DHV, had over the years put considerable effort into developing techniques that could reduce construction and maintenance costs of hand-pumps and wells and increase construction speed. The subsequent effect was to increase the possibility of reaching the 1991 goal (Therkildsen 1988). The resulting effects of this approach, as recorded by Therkildsen, was an increased demand for specialized skills in survey, construction and maintenance. In effect, the technology was further alienated from the community.

### **2.3 Service level**

Regardless of the technology chosen, people will prefer an improved water supply only if they value it. The water source should provide an appreciable improvement over the existing traditional sources. In addition to the technology being appropriate it ought to be of greater convenience and also provide better water quality and the quantity required and at the appropriate time(s) (Arlosorff *et al.*, 1987; Okum and Walter 1987). Essentially, this also touches on the service level of the technology.

In considering the service level to be provided by a particular technology, reliability is an important parameter. This author concurs with the assumption on reliability made by Arlosorff *et al.*, 1987, that a reliable source supplying 30 litres per head per day for 95% of the year will be providing a higher level of service than yard-taps designed for 150 litres per head per day but working for an average of only two hours a day due to faults such as leakages, breakdowns, fuel shortages, or limited water available at the intake.

A good example of poor service level that resulted in the non-use of improved facilities has been recorded by Therkildsen (1988). A World Bank's project plan in Mwanza Region of Tanzania was that each water well was to serve a maximum of 300 people and each village was to be provided with seven wells on average. However, political pressure to provide wells to as many villages as possible and the demand that villagers contribute Tsh. 6000 cash for each well (which directly contradicted Tanzanian policy of free water supply at the time and, thus, never materialized), caused the 228 wells constructed through the World Bank project to be spread between 280 different villages. This meant that on average the number of people obtaining water from one well was between 1000 and 1500. In practice, many households in the village provided with a hand-pump continued to use traditional sources rather than queue up at the wells (Therkildsen, 1988).

Further development of water sources should, therefore, be based on earlier experiences. Accordingly, it is essential to ascertain whether or not the already developed supplies are of satisfactory quantity or not. In addition to quantity, the water quality must be put into consideration too. If the quality is poor, efforts should be pumped into ascertaining whether the poor quality results from natural circumstances such as high mineralization of the water or from man-made pollution (Narayan, 1993; Okum and Walter, 1987).

Ignoring a community's perception on quality can lead to the supplying technology being abandoned and, hence, rendering it unreliable. Such an experience has been recorded by Ledge, (1994). In one of the locations in Tharaka, a community's plea to have the quality of water from an installed hand-pump improved supposedly because its consumption

resulted in urinal infections was turned down on technical grounds; that laboratory tests had proved that the water "is fit for human consumption" (Ledge, 1994). In spite of the Tharaka Water Supply Project (TWSP) having had a strong policy on popular participation, the community members still had their own perceptions that, it seems, were not adequately addressed by the concept of popular participation. These are some of the unique and diverse aspects of a community that need to be adequately addressed in development. Water may be safe but unacceptable because of the colour, turbidity, odour or perhaps because of its indifference to what a community is accustomed to. A little taste of salinity will account for a community's attitude towards a water source.

One of the most common methods of improving water quality is disinfection by the use of chlorine (Schumacher, 1977). In order to opt for chlorination, an assessment of the perceived beneficiaries long term financial capability is necessary in order to ascertain whether they can afford the chemical. It is also vital to first ascertain the community members' knowledge on the use of the chemicals and, if not well informed, modalities of disseminating such information becomes necessary. The cost of developing the necessary skills in order to adopt the use of chlorination should also be clearly assessed and related to other options available. The method to be used should be that which the community can readily afford.

Other cost-free methods of treating water have been documented (Schumacher, 1977). Storage of water for 48 hours is one such treatment option. Storage in quiescent conditions allows settlement to occur and it has been shown that extended settlement can reduce the number of micro-organisms in water. It should, however, be realized that prolonged storage can result in the growth of algae. Storage may also allow evaporation to occur, thus, losing the much needed water. Filtration is also a relatively easy form of purifying the water. Filtration through the soil is part of the natural cycle and the percolation of water through permeable soil before it collects below the surface makes ground water more palatable than surface water (Arlosorff *et al.*, 1987; Schumacher, 1977).

While looking into the ways of assuring palatability of a water source, there is also the need to ascertain the extent to which the improved water supply facilities are actually made use of by the perceived beneficiaries (Baldwin *et al.*, 1981; Fano, 1978; Ledge, 1994; Narayan, 1993). Of several aspects of village-level organization which need to be considered in terms of the social appropriateness of water supplies, the organization of the carrying/hauling and the use of water sources is quite important. This is essential because it is possible to sometimes find low levels of consumption at an improved source. A study on water use should be part of the water supply development. This, however, hardly seems to happen.

A mid-term evaluation study by PLAN International (1993), for instance, established that although the mechanical and technical aspects of the water supply projects in Gachoka/Siakago Divisions of Mbeere District had been successfully carried out and even though the average round trip to fetch water had decreased from 4 hours to 1 hour with the provision of boreholes, a considerable number of people still preferred using the unprotected sources of water (PLAN International, 1993). The reasons for this phenomenon have not been given, thus, indicating a lack of information on the water use patterns and the factors that may influence the peoples preference for a particular source. In many areas of Thailand, none of the water sources alone satisfies domestic needs (Arlosorff *et al.*, 1987). Rain water collected from roof run-off and stored in jars and tanks, is generally of good quality, but barely enough to meet the peoples consumption needs. Shallow aquifers usually tapped by open wells, or occasionally by a sealed well with a suction hand-pump are commonly used for drinking and other domestic uses, though bacteriological quality from open wells is unacceptable for drinking. Some wells run dry during the dry season. Deep aquifers, tapped by hand-pumps on drilled wells provide water with acceptable bacteriological quality, but in most areas the chemical quality is poor and the source becomes unacceptable. Though the supply is reliable, it is rarely used for drinking or agricultural needs. Surface water comes from natural lakes and rivers and from man-made ponds. Subsequent development plans have emphasized the development and use of different sources for different purposes. There is, for instance, emphasis on the use of rain water for human consumption.

In Taita Taveta, it was established that during the wet season, 62% of the households collect their water from a piped system while 22% use rivers and streams. However, during the dry season the percentage of piped supply users drops to 43% while 39% use rivers and streams (GOK 1974). The reasons for this trend have not been given. The three case-studies, however, show the significance of establishing the degree to which water sources are used for policy purposes. This is also accorded due consideration in this study, in addition to ascertaining the community's water use patterns and the subsequent significance on the sustainable maintenance of the improved sources.

From the foregoing, it is realized that the reliability of a source will depend on a number of factors such as the technology used, the sources quality, quantity and community preference. It is, therefore, necessary to ascertain these aspects more so after the sectors development re-orientation that has of late been emphasized by development planners.

#### **2.4 Human capacity development**

The introduction of a new technology in society calls for a matched development of the human capacity to manage the innovation. Human capacity development refers to the advancement of the human skills for the purpose of skilful management of an innovation. Thus, project preparation is a process in which planners decide whether a proposed project and its goals can be achieved with the available resources or whether additional resources are necessary (Okum and Walter, 1987). Resources in the water supply sector include water itself, construction materials and equipment, chemicals (where necessary), land, funds and human resources such as the number of required personnel. Additional inputs, otherwise referred to as supportive or software components include community involvement, training and strengthening of institutions.

According to Narayan (1993) capacity building requires an initial investment in time and other resources and is often seen as a factor that delays achieving the more easily managed and measurable production objectives. It has been observed by development planners that this is one of the main reasons why development projects in developing countries have

failed to meet the perceived goals. The World Bank's experience in Mwanza, Tanzania, is once more given. The World Bank planners had capitalized on a 25% financial commitment by villagers for every hand-pumped well constructed (Therkildsen, 1988). Prior consideration was not given to possible community response. The community's contribution was, thus, not forthcoming and the water supply project was subsequently abandoned. The World Bank's prime goal was to count on the number of completed hand-pumps, eventually lacking the patience to involve the community members and, hence, sustainably develop the wells. There are a number of approaches that have been proposed for development purposes. Three of these are reviewed in this section.

**(i) The experimental approach**

Rondinelli, (1983) proposes that rural development planning should take a policy experiment approach. The starting point in this approach is to recognize some key characteristics of rural development activities and the context in which they occur, the complexity, the uncertainty and the corresponding lack of specific knowledge on which to base extensive pre-implementation planning. Regarding development projects as policy experiments does not conform with the normal donor and host country approaches (Therkildsen 1988). Donor agencies and the host country have usually preferred pre-implementation planning that specifies inputs and outputs and timing of activities in detail. The World Bank's experience in Mwanza, Tanzania quoted earlier (Therkildsen 1988) is good evidence of the donor-government development planning. Implementors then have to stick to these plans. Rondinelli's experimental approach requires planners to view social problem solving as an incremental process of social interaction, trial and error, successive approximation and social learning. Engaging in a learning-based approach to planning and implementation moves much of the action from the splendid isolation of the office to the real turbulent conditions in the field. Consequently, Rondinelli sees planning as incremental and adaptive. This is, thus, a project-oriented approach.

Rondinelli's proposal is valuable because it provides a systematic approach to planning and implementation. This happens under conditions of uncertainty and complicity, meaning

that conditions are likely to keep changing. This then calls for utmost care in adapting the experimental approach, more so in the replication stage where considerable adjustments may be necessary.

### **(ii) The programme oriented approach**

Korten, (1980) advocates for a programme oriented approach. Korten asserts that the project oriented approach itself and its emphasis on breaking development into discrete time-bounded pieces might be the core of the problem. He says:

In rural development, few important outcomes are terminal --- constructing an irrigation system is terminal. Improving and sustaining efficient reliable and equitable access to water is not. The many under-utilized irrigation systems which serve only a fraction of their designed service area may serve as sober testimony to the limitations of a terminal approach to development (Korten 1980:508).

Unlike Rondinelli, Korten emphasizes that beyond initial experiments, new development activities must be developed in an adaptive, bottom-up process of programme and organization development through which an adequate fit may be achieved between beneficiary needs, programme outputs and organizational capacity.

Korten's programme approach may best be understood to be emphasizing on the need for skills in building capacity for action through action. Building on, rather than replacing, indigenous knowledge minimizes the risk that programme intervention will undermine the villagers skills and, thus, increase the level of dependence on external experts. These two approaches may serve to broaden another famous concept in recent development endeavour; the concept of community participation.

### **(iii) Community participation**

Popular participation, also known as community participation, has been associated with sustainable development (Baldwin *et al.*, 1992; Cox *et al.*, 1986; Ever-Rosander, 1992; Kalbermatten, 1987), McGarry, 1986; McGarry and MacMillan, 1987; McPherson, 1986;



Narayan, 1993). Paul, (1987) defines community participation as an active process whereby beneficiaries influence the direction and execution of development projects rather than receive a share of the project benefits. Paul's definition is more assertive on the community's role in development than both Korten and Rondinelli. This researcher has taken this definition to be suitable for this paper in that it fits in well with the research prime objective.

Another essential contribution by Paul, (1987) is his conceptualization of the different objects of community participation. He identifies them as **empowerment** of the beneficiaries whereby the beneficiaries are incorporated into the decision-making body. This enables the beneficiaries to play a key role in development. Secondly, Paul also talks of **building beneficiary capacity**. By doing this the beneficiaries are no longer integrated into already designed programmes but are fully involved in all aspects of development starting with the identification of the problem, formulating alternatives, planning activities and allocating resources. Empowering and building beneficiary capacity results in **increased project effectiveness** and **improved project efficiency**. Community participation also encourages **project cost-sharing** (Paul, 1987). It, however, happens that more emphasis in projects has been on the objectives of effectiveness, efficiency and cost sharing rather than on beneficially capacity building and empowerment. In a nutshell, this is tantamount to navigating troubled waters without charts and compass. Sustainability would always be elusive.

Since 80% of the Kenyan population lives in the rural areas, the idea of the community refers principally to those rural dwellers living in widely dispersed villages and settlements. Communities in rural Kenya vary in size although they tend to be ethnically composed. In the history of rural development in Kenya, various communities have always represented the social basis for all development activity. Such activity has long been characterized by a tradition of mutual assistance and co-operation dating from the pre-colonial times. Infact, it is on this mutual strength that the *Harambee* spirit became popular.

In 1974 the Ministry of Water Development was established and a process of centralization was initiated. This undermined the community self-help initiative in water development which had begun in the 1960's through the *Harambee* effort. Gradually, the dependency syndrome which later characterized the people-state development relationships also took root in the water sector. Consequently, the government owned facilities were often perceived as alien to the communities and no commitment was made to maintain them. Many of the constructed water schemes soon became non-functional. In a survey carried out in 1983, it was found that about 87 rural water schemes, representing a potential coverage of more than half a million people, were no longer operational (GOK, 1993).

By 1982, it had become evident that the government could no longer sustain its role as provider. As the 1982 working paper on Government expenditures stated, the onus for development would be shifted from the state back to the people (GOK, 1982). This led to the promulgation of the district focus for rural development strategy in 1983 and to the introduction of cost sharing measures in the provision of all the basic services from 1986 onwards.

It is still doubtful (and the author strives to confirm this in the findings) if most rural water projects are not interventionist in nature, thus, defeating the aims of the District Focus Strategy of involving the communities to a much greater extent in the decision-making process. Community participation in the projects only begins when the decisions to incorporate the community have already been made.

In order to achieve optimal community participation there is the need to mobilize the people to that effect. A vital question to be addressed first is whether the community is in need of an improved facility (McPherson, 1986; Saunders and Warford, 1976). In this case, it is relevant to consider how the project was initiated (Schumacher, 1977). This is vital because the approach on community participation should not regard community participation simply as means and where only their acceptance and resources are solicited. Rather, the community should be regarded as a full partner in the programme. This

implies that projects should be demand driven rather than supply driven. Furthermore, there ought to be checks and balances throughout the planning, design and implementation stages to ensure that both the project and the beneficiaries have the option to continue with implementation or not.

Recorded information shows that many water supply schemes were in the past constructed without involving any form of discussion with the potential users (McPherson, 1986). Some of the proposed systems were socially unacceptable, poorly designed and inappropriately sited. In other cases the users did not understand how to operate or use the new technology. When a breakdown occurred the users felt it was the responsibility of the government or the development agency to make the necessary repairs (Ledge, 1994; McPherson, 1986). This implies that if a project is to be effective, then all the users ought to become participants in all the aspects of the project development, that is, planning, construction, operation and maintenance. Participation alone will, nonetheless, be inadequate in ensuring the sustenance of the water supply facilities. This is because the strengthening of the community's institutional capacity will be a knack to sustainability. This is another area that needs to be developed in order to come up with sustainably developed projects.

## **2.5 The development of new skills.**

Arlosorff *et al's*, (1987) scrutiny of the reasons why past projects have failed to live up to expectations suggests that the single most important factor was the choice of community water supply technology which was not sustainable with the resources available to the community. The important message for planners, therefore, is that the technology chosen should give the community the highest service level that it is willing to pay for, will benefit from and has the institutional capacity to sustain. Recipients should be taught to perform essential tasks such as operation and maintenance.

The idea of training the users in essential tasks arouses the question of gender imbalance in the training process. Development planners have realized that to incorporate women into development programmes is to improve the overall economic development of the country (Kimberley, 1986; Pala, 1980). Elmendorf and Isely, (1981) have identified four essential roles of women in water and sanitation projects. They view women as **acceptors, users, managers, and change agents**. They have also considered the implication of these roles in project design, implementation and evaluation. As the main acceptors of new facilities, women should be involved in planning stage. As users and promoters of changes in behavior, they should be the main recipients of health education programmes accompanying water projects. As the traditional managers of water in their households and in the community, they can play a valuable role in maintenance and management of improved water supplies.

Women are rightly described as the major haulers, drawers, or carriers of water for household and economic use. According to the Delineation Report (ICS, 1992) it is estimated that about one sixth of all the energy expended by women is used in carrying water. Water collection can consume up to 40% of a woman's day. The Kenyan rural labour force survey of 1988/89 indicates that females between the age of 15-64 spend an average of 5.4 hours per day on water collection. Moreover, many of these traditional sources are unprotected and, thus, cause the water to be a major source of diseases that affect women and children in particular. Traditionally, therefore, women have paid a high social cost for providing water to the family and have also paid for this strenuous activity in terms of their health.

It would, therefore, be logical to expect (and this study strives to establish the situation in the study area) that women also receive training in operation, maintenance and health benefits for they are under normal traditional circumstances the most vulnerable. The participation of women in water supply projects can contribute to the achievement of specific objectives such as the functioning and use of facilities (Wijk-Sijbesna, 1985).

Another benefit of empowering the women is that as domestic managers of water needs, women decide where to collect water for various purposes, in various seasons, how much water to collect and how to use it. In their choice of water sources, they make reasoned decisions based on the criteria of access, time, effort, water quantity, quality and reliability (Wijk-Sijbesma, 1985). It eventually comes out clearly that womens' opinions and needs have important consequences for acceptance, use and readiness to maintain new water supplies and for the ultimate health impact of the project. A limitation with Wijk-Sijbesma's as well as Elmendorf and Isely's views is that they portray womens' roles as exclusive from mens roles. This researcher advocates for the mutual strengthening of both males' and females' roles in relation to the type of technology and the socio-cultural circumstances. The prior by-passing of women should not be substituted with the by-passing of men.

Few failures can be fully attributed to the choice of technology because, according to Arlosorff et al., (1987), an analysis of many schemes which have become non-functional reveal that arrangements for routine operation and maintenance were inadequate. Schumacher, (1977) attributes the poor performance of maintenance to the vagueness in the allocation of responsibilities in addition to lack of materials, organization and training needed to carry out the exercise. Lowes, (1987) also observes that although the lack of skilled staff is often evident at some levels of any organizations, it is doubtful that its performance could be substantially improved by training alone. He further points out that many of the deficiencies which are identified indicate the need for organizational reform and the strengthening of management.

In India, for example, a three tier system of operation and maintenance of the India mark II hand-pumps was worked out. The first tier was a caretaker at the village level, to be in charge of a single hand-pump. A block mechanic formed the second tier and dealt with several villages and used more complicated tools. The third tier involved a mobile team at the district level who dealt with major repairs (Arlosorff, et al., 1987). Thus, more than anything else organizational re-orientation is the best way to sustain pumps in this part of India.

In LDC's resources required for operation and maintenance are frequently under-estimated. Countries are often able to attract external resources for development but not for operation and maintenance (Schultzberg, 1978). Maintenance difficulties often arose more from institutional or financial shortcomings than from technical difficulties with the pumps themselves. The GOK has over the years worked out policy guidelines regarding the financial management of the water sector. In the third Development Plan, (1974-78) it was established that a system of user charges should be established in the sector. For urban water supply and sewerage schemes it was stated that they be self-financing as rapidly as possible while in the long run the operation and maintenance costs of all schemes would eventually be covered through water charges.

The Fourth Development Plan, (1979-83) explicitly established the policy that everybody would pay for water services, modified by the fact that water is a basic need. Hence, the government took into account the purchasing power of the individual user groups. For rural supplies the policy was to cover direct costs of operation and maintenance. The Fifth Development Plan, (1984-88) went further to introduce costs recovery as an essential element in the water sector. For rural areas, prices were set to cover direct costs of operation and maintenance while the urban tariffs covered all costs including personnel. The 1986 Sessional Paper No.1 discusses the policy of participant financial contributions to the recurrent cost of government services in general leading to the concept of cost sharing in the fields of health, water supply, agriculture and transport that was well articulated in the 1988-93 Development Plan.

With such policies in mind, there has been an emphasis on the recipients ability to meet financial costs, either partially or wholly. This is a positive trend in ensuring sustainability. It has been effected in the Tharaka water supply project (Ledge, 1994), in Guatemala (Cox *et al.*, 1986), and in some Asian countries (Narayan, 1993) and the results are commendable. It is, however, feared that cost sharing may discourage the "worst - first" strategy whereby priority is not given to the most poor and needy people in development because of their inability to raise enough money for maintenance. In the end, the rural

poorest of the poor who are the most vulnerable people are left without such a vital resource as clean water. This study also explores on the concept of user fee in the study area with a view to ascertaining its effects on the beneficiaries as well as on sustainable maintenance of the improved water supply facilities.

Arlosorff et al., (1987) recommend that rapid progress for meeting basic needs can be achieved only if a large proportion of the population in need received services at the lower end of the cost range, given the obvious difficulties of mobilizing financial resources. Upgrading to a higher service level may then be financed by the community later as benefits from the initial investment and from other sources increase available resources.

Successful operation and maintenance is easily achieved when the benefitting community organizes itself into groups. According to McGarry, (1986) grass-root organization should be established to ensure the formation of sound policies, organizational management and consolidation of resources. Nagle and Ghose, (1990) have given an illustration of the successful implementation of the Kwale water project in which the incentive to come together and organize for the maintenance of the facilities acted as an asset to sustainability.

A 1985 document from the Operations Evaluation Department (OED) of the World Bank underlines the significance of developing a strong institutional frame work. The OED report said;

A major contribution to sustainability comes from the development of grass-root organizations whereby project beneficiaries gradually assume increasing responsibility for project activities during implementation and particularly following completion. Where strong grassroots organizations are developed, there are distinct qualities inherent in their growth and in their relationship to project activities. These include some form of decision-making input into project activities, high degree of autonomy and self reliance, a measure of beneficiary control over management of the organization, and the continuing alignment of the project activities with the needs of the beneficiaries (OED, 1985).

Therefore, successful development and maintenance of water supply projects requires strong institutional framework that allocates authority and responsibility in accordance with each stage of the projects development.

Scanning the literature on human capacity and institutional build-up, one can conclude that a dual-focus approach, whereby solutions to performance problems are sought by focusing on both the individual and the system within which the individual works is the most appropriate for the water supply sector. Attention should then be focused on both the individual training needs and the systems development needs.

## **2.6 Developing mutual relationship between organizations**

Effective community participation in a rural water project, according to Cox et al., (1986) requires a relationship of trust between the community and the water supply development agencies. The best way to develop this trust is to make clear from the start what participation is expected of the community and what kind of assistance the water supply organization will make available. The conditions of the assistance should be specified. Detailed agreements on the rights and responsibilities of both the community and the water agency should be thoroughly discussed before either party makes a commitment to the project (Cox et al., 1986; McPherson, 1986; Schultzberg, 1978).

Once an agreement is accepted by both parties it should be formalized. *Agua-del-Pueblo* an NGO in Guatemala requires that 80% of the families in the community put their signatures on a formal agreement before a project starts (Cox et al., 1986). But one would question whether this is a sufficient indicator of sincere community participation and whether it impacts on sustainable adoption of technologies. Community demand is the key indicator of whether an agency and a community can come and stay together long enough to create an improved water situation (Elmendorf and Buckles, 1980).

Lack of communication between communities and agencies usually results in the rejection or misuse of technologies that cannot be adopted to the existing local social behavior and



values. Moreover, it is easier to change technologies than technical feasibility. Elmendorf and Buckles, (1980), thus, conclude that there is ample reason to postulate that the diffusion by which new ideas or innovative practices are disseminated from originator to ultimate users should be the controlling factor in the design of an institutional framework for water project promotion and implementation.

On the whole it is vital that all parties involved in the efforts to improve community water supply such as government agencies, donors, advisors and community leaders recognize and adhere to the principle that it is the local people themselves and not those trying to help them who have the most important role. The community itself must be the primary decision-maker, the primary investor, the maintainer, the primary organizer and the main overseer. Other agencies role should only be to supplement and not supersede the beneficiaries role.

In conclusion the reviewed literature confirms the fact that water supply development is quite demanding, hence, the need to ensure that any form of investment achieves the perceived goals. A further consideration of the factors that influence the success of this sector is the main purpose of this study.

## **2.7 THEORETICAL FRAMEWORK**

### **The social systems theory**

The study is based on the social systems theory. Systems thinking gained popularity in the 1940's. It was adopted as a response to the failure of mechanistic thinking to explain biological phenomena (Flood and Jackson, 1991). The term system may best be understood to mean a set of organized and connected things or parts; that is, a complex whole. A social system, thus, implies stable inter-connections between institutional patterns within society. In this case, a social system exists when and if, for instance, personalities are connected by a series of inter-dependent relationships.

The social system theory is categorized within the more general class of conceptual schemes that are referred to due to their framework of action. Within that framework, the

boundaries of social systems have been defined in terms of their relations, first to each other, then to the personality of the individual and to the cultural systems (Parsons 1967). The social systems theory addresses itself to the beliefs and values of a society that are necessary in comprehending the human social institutions and their relationships.

By defining the social systems boundaries in terms of relationships to each other, to the personality of the individual and to the cultural systems implies that a social system is always open and engaged in a process of interchange within the surrounding environment. Open systems receive energy from the external environment. This, then, means that an open system is homeostatic in that there is self-regulation (Flood and Jackson, 1991). Unlike a closed system such as machines which suffer from wear and tear, an open system is able to offset much of that degradation by allowing external energy which eventually allows it to maintain a steady state. By virtue of the social systems being an open system, there will have to be inputs and outputs within the system (Cortes *et al.*, 1974; Parsons, 1967; Roy and James, 1975). The mode of transformation of some state of the environment external to the system, the inputs - into other states of the environment termed as outputs, will be determined by the structure of the social system. An analysis of the systems structure specifies the set of principles that govern the inter-connection of the systems parts. By using the principles that govern how the system parts are inter-connected the stability of the system can be assessed.

The social systems theory is relevant to this study as well as being applicable in Gachoka Division. The provision of an improved water supply has encompassed a variety of elements - the local people, external agencies like the government agencies, NGOs, new technologies vis-a-vis the traditional methods of tapping water, all of which are organized in the form of an inter-relationship. The main interest in Gachoka Division is on how the human (social) sub-system affects the non-human (technological) sub-system, in order to result in sustainably maintained water supply facilities.

The researcher looked into the inputs that ascertain the sustainable maintenance of the water supply facilities. The sustainability of the supply facilities is hereby termed as an

output. Some of the advantages of the social systems theory that were considered ideal for this study are; being an open system, a myriad of elements can be included as inputs at any stage of the system so as to retain the homeostatic state. This is necessary when there is an open relationship in a changing environment. Another advantage of the social systems theory is that it allows inter-relationship between internal and external elements, thus, promoting responsiveness and change. The facilitating of inputs results in the realization of outputs, thus, ensuring that sustainability is promoted.

The social systems theory has, however, faced some criticism (Flood and Jackson 1991). The emphasis on harmonious relations between the constituent parts fails to recognize that organizations are often conflictual and/or coercive. This shortcoming is, however, invalidated by the fact that in a social system, instability can be followed by injecting more inputs and testing the outputs until a stable system is achieved.

## 2.8 Hypotheses

The study collected data to test three hypotheses. These are:

- (i) The improved water supply facilities are reliable sources of water, hence, are more preferred and sustainably maintained than the unimproved indigenous sources.
- (ii) Community participation in project planning and implementation is likely to bring about sustainable maintenance of the water supply facilities.
- (iii) The development of a strong institutional framework will result in sustainably maintained water sources.

## 2.9 Operational definition of variables

The study has adopted several variables that need to be defined. These variables are in two categories; dependent variable and independent variables.

### Dependent variable

**Sustainable maintenance:** This refers to a situation whereby the beneficiaries through their own initiative as well as the attained skills, keep the water supply facilities in good working condition, avoiding regular break-down.

### **Independent variables**

**Reliable water source:** A reliable water source is that which has a high probability of providing water in quantity, quality and at the time required by the community.

**Community participation:** This refers to the community's involvement in the process of planning and developing the water source with an aim of influencing the direction and execution of the water projects as well as enhancing the community's identification with the developed water sources.

**Institutional framework:** This refers to development in knowledge, skills and group formation. Institutional framework also incorporates the relationship between the community's self-help groups and other external agencies such as the NGOs.

### **Definition of other variables**

**Improved water sources:** Refers to the man-made water sources. In the study area there are the boreholes, dams, protected wells, roof catchment tanks, rock catchment tanks and the piped water supply.

### **Unimproved indigenous water**

**sources:** Refers to the natural water sources that have not undergone any form of modification. In the study area there are the streams, a river and a few unimproved shallow wells

**Project planning:** This refers to the decision-making on project design, costs and human resource in developing a water source.

## **CHAPTER THREE**

### **SITE DESCRIPTION AND RESEARCH METHODOLOGY**

#### **3.0 Study design**

The study was designed to ascertain the sustainable management of the improved water supply facilities in Gachoka Division of Mbeere District. Data were gathered on the reliability of the facilities, on community participation and institutional framework. In order to generate the information, household members were randomly sampled. Households were preferred because the members are the consumers of the water from the improved sources and, therefore, are a key decision making unit. In addition to the participatory approach, interviews with key informants were conducted as well as two focus-group discussions and desk studies. These data were qualitatively analyzed and are presented in chapters four, five and six

#### **3.1 Study area and population**

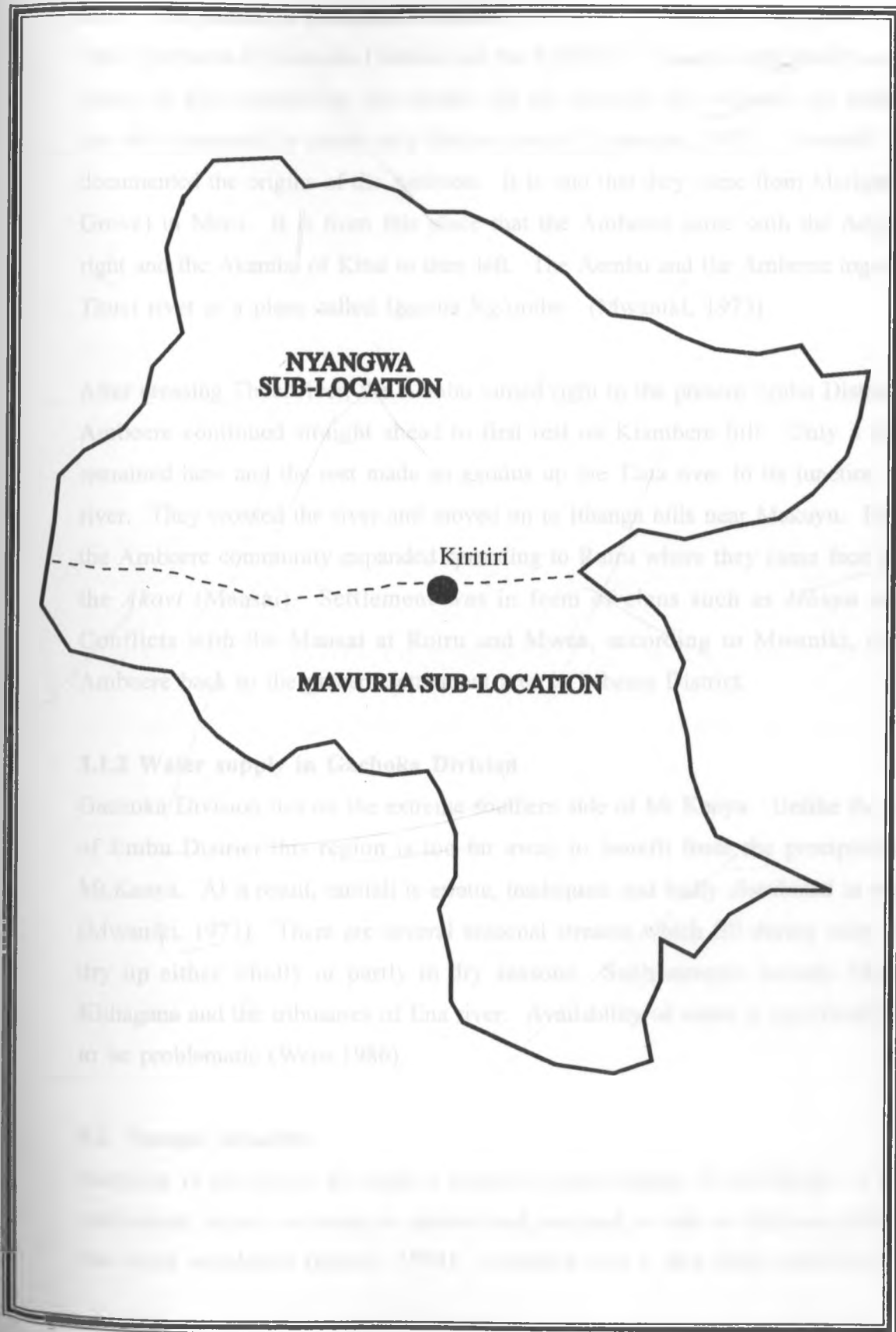
The study was carried out in Gachoka Division of Mbeere District of Kenya. The district is divided into four divisions, namely, Gachoka, Mwea, Siakago and Evurore. This study was conducted in Gachoka Division. There are six locations in Gachoka Division, namely, Karaba, Kiambere, Kianjiru, Mavuria, Mbeti North and Mbeti South. The study was carried out in Mavuria and Kianjiru locations (see maps on page 33 and 34).

# MBERE DISTRICT ADMINISTRATIVE BOUNDARIES



Source:- Map extracted from the old Embu District map

# NYANGWA AND MAVURIA SUB-LOCATION



Source:- Map extracted from the old Embu District map

### 3.1.1 The people of Gachoka Division

The inhabitants of Gachoka Division are the Ambeere. Though linguistically and culturally related to their neighbours, the Aembu and the Akamba, the Ambeere see themselves and are often regarded by others as a distinct group (Brokensha, 1971). Mwaniki, (1973) has documented the origins of the Ambeere. It is said that they came from Mariguuri (Banana Grove) in Meru. It is from this place that the Ambeere came with the Aembu to their right and the Akamba of Kitui to their left. The Aembu and the Ambeere together crossed Thuci river at a place called Igamba Ng'ombe. (Mwaniki, 1973)

After crossing Thuci river, the Aembu turned right to the present Embu District while the Ambeere continued straight ahead to first rest on Kiambere hill. Only a few of them remained here and the rest made an exodus up the Tana river to its junction with Thika river. They crossed the river and moved on to Ithanga hills near Makuyu. From Ithanga the Ambeere community expanded spreading to Ruiru where they came face to face with the *Akavi* (Maasai). Settlement was in form of clans such as *Mbuya* and *Muruli*. Conflicts with the Maasai at Ruiru and Mwea, according to Mwaniki, repulsed the Ambeere back to the present settlement area in Mbeere District.

### 3.1.2 Water supply in Gachoka Division

Gachoka Division lies on the extreme southern side of Mt Kenya. Unlike the upper parts of Embu District this region is too far away to benefit from the precipitation around Mt.Kenya. As a result, rainfall is erratic, inadequate and badly distributed in most periods (Mwaniki, 1973). There are several seasonal streams which fill during rainy season and dry up either wholly or partly in dry seasons. Such streams include Thura, Kiriiri, Kithagana and the tributaries of Ena river. Availability of water is specifically considered to be problematic (Were 1986).

### 3.2 Sample selection

Sampling is the process by which a relatively small number of individuals, or measures of individuals, objects or events is selected and analyzed in order to find out something about the entire population (Russel, 1988). Sampling was in this study necessary in order to



reduce expenditure, save time, permit measurements of greater scope for the purpose of greater precision and accuracy. The sampling procedure also allowed generalization on the basis of a relatively small proportion of the population. During the orientation period in the study area, the researcher noticed that drawing a sample from the entire division would be cumbersome, time consuming and expensive. The researcher also established that some areas within the division had only one or two water sources. Since it was necessary to have both the indigenous and the improved sources for comparative purposes, the researcher had to locate the areas where such sources could be located.

The researcher, with the help of the divisional water officers, subsequently identified Kianjiru and Mavuria locations as the only areas that had both the indigenous and the improved water sources. The multi-stage sampling technique was then used to obtain the units of analysis.

### 3.2.1 Sampling technique and sample size

As mentioned above, the multi-stage sampling method was used in this study. Since the area involved is large with the population scattered all over the area, the immediate advantage of the sampling method was that the sampling field was subsequently narrowed down to small easily accessible chunks. The administrative units were first sampled and then the people. The first step in this sampling process was to sample the sub-locations within Kianjiru and Mavuria Locations. The locations and the sub-locations plus their approximate population are shown in Table 3.1.

**Table 3.1 Approximate population by sub-locations**

LOCATION	SUB-LOCATION	APPROXIMATE POPULATION	TOTAL	NO OF VILLAGES
KIANJIRU	NYANGWA	6,000		5
	MBITA	5000	(18,400)	3
	KIRIMA	7,400		6
MAVURIA	MAVURIA	4,800		6
	GICHICHE	4,281	(15,081)	9
	KITHUNTHIRI	6,000		6

SOURCE: PLAN INTERNATIONAL NEEDS ASSESSMENT REPORT (1993 Pg3).

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SOURCE: PLAN INTERNATIONAL NEEDS ASSESSMENT REPORT (1993 Pg3).

For each of the two locations, numbers were assigned to each sub-location from one to three. The pieces of papers on which the numbers were written were folded and then separately shuffled. One piece of paper was picked from Mavuria Location shuffle and another paper from Kianjiru Location shuffle. The numbers picked represented Kithunthiri and Nyangwa sub-locations. Kithunthiri sub-location is in Mavuria while Nyangwa sub-location is in the relatively new Kianjiru location.

One name from every household was acquired from the sub-area leaders. The names acquired were those of the adult household members. The simple random method of sampling was used to acquire a sample of one hundred adults. The total population (including children) in Kithunthiri and Nyangwa sub-locations is 12,000 people. Only one adult household member was interviewed. Assistance from the village leaders was sought in tracing the household members. Half of the respondents hailed from Kithunthiri sub-location and the other half from Nyangwa sub-location.

It had been envisaged that an equal proportion of men to women would be directly interviewed. Getting the males in their homes even after making appointments was rather hard. Where it became completely impossible to be granted an interview, an immediate alternative, such as interviewing the wife, was sought. The final outcome, thus, was that fifty six percent (56%) of those interviewed are women while forty four percent (44%) are men. Of the 100 respondents, 90% were married and were living with their spouses as at the time of the study. Seven respondents (7%) were single and three (3%) were widowed. The seven percent of the respondents recorded as single are single mothers living at their parental homes. They had been registered by the sub-area leaders independently from their parents in order to benefit from the relief food supplied by Foster Parents PLAN International's food-for-work programme.

Of those sampled, twenty four respondents (24%) were aged between twenty one and thirty years, forty one others (41%) ranged between thirty one and forty while twenty three people (23%) were aged between forty one and fifty years as at the time of the study. There were four respondents (4%) aged between fifty one and sixty years while the rest

(8%) were aged sixty years and above. The above information is clearly presented in Table 3:2

**Table 3:2 Age of respondents.**

AGE	FREQUENCY	PERCENTAGE
21 - 30	24	24
31 - 40	41	41
41 - 50	23	23
51 - 60	4	4
60 and Above	8	8
Total	n= 100	100

A majority of the respondents were, therefore, aged between thirty one and forty. Of the total respondents, seventy three respondents (73%) had lived in the region since birth. Included in this percentage are those who have had children but never left their parental homes as well as other women who had married within their locations of birth, but not necessarily living in the same sub-location. The remaining small proportion (27%) are immigrants, some having settled there as early as the 1970's while others have lived in the area for less than ten years.

### **3.3 Data collection techniques**

#### **3.3.1 Participatory approach**

Participatory approach borrows its field approach from participant observation method. Participant observation has been widely associated with Bronislaw Malinowski who actually used the methodology in researching on the communities in the Trobriand Islands. The concept of participant observation signifies the relation which the human observer of human beings cannot escape, of which involves having to take, in some fashion, in the experience and action of those she or he observes (Russel, 1988).

The researcher adopted the participatory approach method in lieu of participant observation. The difference between participatory approach and participant observation is that of time; how long a researcher stays in the field collecting data. While participant observation method may last for over a year, participatory approach usually takes a few months. For the purpose of this study, the participatory approach method involved taking part in community life in the process of collecting data. During this period, the researcher was based at Kiritiri market. This was the only market where accommodation was available. The market is, however, quite strategic because it is within the two locations where samples for this study were taken.

The participatory approach was advantageous for it facilitated the gathering of qualitative and quantitative data. The approach provided the checking and monitoring of field information that is essential for evaluating data gathered through the use of more controlled methods such as the questionnaires. Participatory approach technique was also a great input to the process of establishing rapport with the informants. The technique helped in reducing the problem of reactivity such that the people needed not change their way of approach to issues by virtue of the researchers' presence. The researcher was, thus, able to participate in the harvesting of maize and millet in the course of socializing with the respondents. The researcher also visited the various water sources, freely interacting with the community members.

Through the participatory approach, the researcher was able to observe the patterns of water use. Fieldwork began in early January 1995, when a variety of water points were in existence. Then came the months of February and early March when the hot season was fully setting in and the seasonal water sources were drying up. The peoples behavior was keenly observed over this transition period, the results of which were related to the data collected through other methodologies. The disadvantage of this methodology is that one often lacks control and finds it hard quantifying the findings. This disadvantages was, however, outshined by the successful integration of the methodology with other methods described below.

### 3.3.2 Interviews

The interviewing method is one of the traditional tools of data collection but, Russel (1988) feels that anthropologists have made relatively little contribution to literature on it, probably because “we do so much interviewing, we just take for granted that it is all a matter of on-the-job training” (Russel, 1988). In simple terms, interviewing means conversation with a purpose. Interviewing includes a variety of procedures used in collecting data through person to person contact.

For this study, both structured and unstructured interviews were carried out. Unstructured interviewing was necessary during the first days in the field. The informal interviewing was ideal especially because of the researchers participatory approach in the field. The two methods are well combined when endeavouring to settle in and getting to know the lay out of the study area in detail. Informal interviewing was also used throughout the field work to build greater rapport with the community members.

A structured questionnaire was also administered as an instrument of data collection. The questions were translated into the local *Kimbeere* language. Administering the questionnaire was easy for this researcher because he comes from the Ambeeres neighbouring community, the Aembu. Therefore, he comprehensively understood the local language. The use of the questionnaire was favourable in that it was possible to reach all kind of informants. Unlike self-administered questionnaire, personal interviews enabled the researcher to solicit information from the young and the old, the literate and non literate alike. During the interviews, it was possible to clarify questions that were unclear to the respondents. Though time consuming the use of structured interviews was very interesting and enlightening to the researcher.

### 3.3.3 Focus-group discussions

A Focused-Group Discussion (FGD) is a group discussion that gathers together people from similar backgrounds or experiences to discuss a specific topic of concern to the researcher. The main theme of FGDs is that they purely rely on discussion. An FGD is

formally constituted and operates within a fixed time frame and in accordance with clearly spelled out rules of procedure. For the purpose of this study, two FGDs were held. The first to be organized was in Nyangwa sub-location. There were nine discussants. The researcher also requested the assistance of a former four graduate whose work was to take notes as the discussion went on. The discussion took place under a tree at a small market called Utau. This is where the assistant chief usually conducts his *barazas*. It was, therefore, not an unusual place for the discussants.

The second FGD followed a week later in Kithunthiri sub-location. Only six discussants turned up. The rains had began the previous night and most people had to start planting. It is a common phenomenon for the people to start planting as soon as the rains begin. The researcher considered it a great luck for the six discussants to have turned up. The discussants actually said that they had to turn up so as not to let the researcher down. This was taken to be a sign of friendship that had developed between the researcher and the community members. The discussion was held at a place called Karimari, a short distance from Kiritiri market. The afternoons were most preferred by the women who, because of having to prepare lunch for their school going children during the morning hours, could not avail themselves any other time. The men did not have problems in availing themselves at the arranged time. While the first group discussion was attended by five women and four men, the second one was attended by four women and only two men.

In addition to having had a helper to take notes of the proceedings in both groups, the researcher also made short notes. These were later compared and complemented by the researcher. The integration of the information gathered through this method with that of the structured questionnaire greatly improved the researchers understanding of the information given.

### 3.3.4 Key informants

Key informants are those community members who are likely to be well conversant with issues happening within their society as well as recalling the past. Russel, (1988) describes

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Key informants are those community members who are likely to be well conversant with issues happening within their society as well as recalling the past. Russel, (1988) describes



key informants as those people who are reflective, articulative and observant. Those contacted as key informants included the present and former local leaders (chiefs, assistant chiefs, sub-area leaders, councillors, self-help group leaders and elders). The informal nature of interviewing enabled the researcher to gather diverse information on the water sector in the study area. Discussion with key informants at PLAN International offices at both Embu and Kiritiri offices gave the researcher an insight on how the NGO related with the communities in the process of developing the water supply facilities.

### **3.3.5 Desk studies**

This study has made extensive use of written materials from the public libraries and PLAN International offices. Familiarization with the development in the water supply sector was necessary. Various documents on the development of the sector have been very helpful. A few other documents on the development of the water supply sector were acquired from private Libraries like PLAN International, SIDA and the world bank libraries. Literature on the Ambeere was also acquired from published works of Stanley Mwaniki (1973), Muriuki (1974), Brokensha (1971), Glazier (1985). The gathered literature was used to compare and contrast the findings of this study.

### **3.4 Data analysis**

Data acquired through the administration of the standard questionnaire were coded and analyzed. Frequencies, percentages and cumulative percentages were acquired. Other data gathered through the other methods of data collection were qualitatively analyzed. Tables were also made use of in presenting the data. It should be noted that some questions generated more than one answer. Once computed, the percentage did not always add up to one hundred. The same also applied to the questions that had two sections whereby the answer to the second question depended on the first question. On the whole, qualitative methods of examining the relation between the variables have been used.

### **3.5 Problems encountered**

The researcher is pleased to observe that the study was successfully undertaken. There were, however, a few incidences that tended to deter the success.

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The most disturbing problem was that of the researcher being mistaken for an employee of PLAN International, the NGO that the inhabitants of this area are most acquainted with due to its role in the water supply sector. It was a hard task explaining to the people the goals of this study. Most people felt that the researcher should, after all, be in a position to help in improving the water supply sector. Some people expected the researcher to prevail upon PLAN International to provide facilities in areas that they had not been to. Second, the area is extensive and the population is correspondingly extensively distributed. Getting from one household to another was tiring, though getting from one sub-area to another was more tiring. It is difficult to find faster means of communication such as passenger service vehicles plying other routes other than the tarmacked Embu-Kiritiri-Kivaa road. The only means of communication available to the researcher was a bicycle. Covering the entire study area still remained extremely tiring.

Third, Kiritiri market is very popular among the inhabitants. Locating the people on Mondays and Thursdays (market days) in their homes was hardly possible. Most people would be in the market buying or selling and socializing. The researcher also observed that most people spent their Sundays going to church and later on visiting friends or being visited. This observation was proved by the fact that a meeting scheduled for a Sunday afternoon by the Nyangwa sub-location assistant chief was ignored by the community. It was later on conferred to this researcher that getting people to attend meetings on a Sunday was highly improbable. This also left the researcher with only four days of active questionnaire administration and, hence, tended to delay the exercise.

## CHAPTER FOUR

### THE MBEERE COMMUNITY

#### 4.0 Introduction

Chapter four is based on an ethnographic survey of the Ambeere. First their origin, migration and final settlement in their present homeland is given. Their socio-cultural and economic organization in a region that many development planners have described as marginal due to its inadequate rainfall is given. The final section of chapter four gives an highlight of different water supply facilities found in Gachoka Division.

#### 4.1 The Ambeere: origin and migration

The Ambeere are one of a number of politically acephalous groups comprising the central tribes of the north-eastern Bantu. Among this large cluster of people inhabiting the periphery of Mt. Kenya and the continuous plains south and east of the Tana river, the Agikuyu and the Akamba are the largest in number. Smaller related people include the Andia and Agicugu of Kirinyaga District, the Aembu and the Ambeere, who inhabit the Embu and Mbeere Districts respectively and finally the Ameru groups including the Atharaka, Acuka, Mwimbi, Imenti, Igembe, Atigania and Igoji, all of whom inhabit Meru and Tharaka-Nithi Districts.

Among these central Kenya Bantu communities, the name *mbeere* means first. The Ambeere derive their name from this ordinal number. The Ambeere refer to themselves as the "first people" (*andu a mbere*) for they believe that they were the first people to get to the region south and south-east of Mt. Kenya (Glazier, 1985). Lambert, (1950) related the migration of the Ambeere to that of their Bantu neighbours and also suggested dates for these large-scale movement from the 14th to the 18th centuries. Lambert believed that these Bantu groups had migrated from Schungwaya or Mbwa. However, the alleged coastal origin only figures prominently in the oral tradition of the Ameru (Glazier, 1985; Mwaniki, 1973).

The probable historical relationship between the Ambeere and other groups on the Mt. Kenya region is possible if the tradition of migration as narrated by various ethnic groups is taken into consideration. Muriuki, (1974) has recorded the myth whereby the Ambeere say that a fight was provoked by a serious quarrel between sons of two brothers. After this episode one of the brothers decided to migrate. He eventually became the ancestor of the Ambeere. Infact, the Ambeere regard the Aembu as children of their daughters.

Mwaniki, (1973) has, on the other hand, documented the Meru origin fashion whereby the Ambeere trace their origin from Mariguuri (Banana Grove). Both Mwaniki and Muriuki report that after crossing Thuci river, the Ambeere migrated following the Thagana river and halted near the Kiambere hill. Only a few of them remained at Kiambere while others crossed the Thagana river into the area presently occupied by the Akamba. A majority of the Ambeere migrated westward from Kiambere area until they reached Ithanga hills, at the confluence of Thika and Thagana rivers (near Makuyu). From Ithanga, the Ambeere expanded spreading to Ruiru, where they came face to face with the *Akavi* (Maasai). Settlement at Ithanga hills was in the form of clans such as *Mbuya* and *Muruli*. Conflicts with the Maasai at Ruiru and Mwea, according to Mwaniki, repulsed the Ambeere back to their present settlement area in Mbeere District. This is the area that was referred to as Mbeere Division in the 1970's but has since been sub-divided into Siakago, Gachoka, Mwea and Evurore Divisions of Mbeere District.

Significantly, Igamba-Ng'ombe has been commemorated as the north-east dispersal point of the Ambeere in the periodic *Nduiko* or investiture ceremonies which marked the passage of ritual authority from one generation set to the next. This ritual is now commemorated through oral tradition because "the ritual recreation in *nduiko* of the original migration through Igamba-Ng'ombe was observed for the last time in 1932" (Glazier, 1985).

Except for a western land boundary with Central Division, the area occupied by the Ambeere is composed of river boundaries, yet, it is the area that is most deprived of

domestic water supply in the entire Embu and Mbeere Districts. To the north, Thuci river marks the boundary of Mbeere and Tharaka-Nithi Districts as it presents the northern margin in the area occupied by the Ambeere. Tana river runs along both the eastern and a part of the southern boundary. Thiba river, which has its confluence with the Tana on the southern margin of Mbeere District forms the remaining part of the southern boundary.

#### **4.2 Socio-cultural and economic organization of the Ambeere**

Linguistically and culturally the Ambeere are closely akin to the Aembu (Glazier 1985). Patrilineal, shallow lineages, age-sets and dual generation classes define the fundamental features of the pre-colonial social organization in Mbeere. The basic settlement unit in Mbeere is *Ituura*. *Ituura* is a group of homesteads with between 200 and 500 inhabitants usually from different clans. An *Ituura* is often understood to be synonymous to a village. Generally, the inhabitants of Mbeere District lack nuclear villages. In all the four divisions, there are socially and geographically defined collection of scattered homesteads. Each homestead is built on a separate land holding worked by the family which occupies it. A number of such villages are usually administered as a sub-location. There could be five or so villages in a single sub-location.

Within the Ambeere's small villages, localized agnatic groups of kinsmen reside in homesteads (*micii*). The homestead includes a cluster of huts inhabited by a man and his wife or wives and children and at times with other kin, especially brothers. In anthropology, this is referred to as the minimal lineage. A group of agnates in a homestead are able to trace their patrilineal ancestry to a named historic forbearer (Njeru, 1978). The senior male maintained the greatest authority within the homestead, usually making decisions on pertinent issues such as the allocation of gardens and on how to look after livestock. Brokensha, (1971) says that the male head can resort to at least two critical sanctions in order to reinforce his authority in the homestead. One of these two sanctions is the secular power, whereby he can, for instance, deny his deviant son access to any of his property. Mbeere man can also resort to using the supernatural sanction in which the fear is in the power of his curse. These powers, more so the supernatural

sanction (which was allegedly widely used during the adjudication of land in the 1970's) were found to have some influence in the management of some water supply facilities in the study area.

Prior to the land adjudication exercise in the 1970's land in Mbeere was owned communally under clan ownership and leadership. Members of a clan owning land had free access to and use of land provided they did not take it as personal property and start selling or misusing it. The water sources found on a clan land, such as the wells and streams, were also communally owned. When the land adjudication process was completed, all the land uses were affected by the individualization that emerged. Women in Mbeere never owned property because all the property, including the water sources, were eventually controlled by men on whose land these water sources were found. Women's land rights continued to be usufructuary. This rationale was further fostered during the individualization of land tenure when land was distributed only to the males as legal land title holders.

The region occupied by the Ambeere receives little rainfall, which happens to be low and unreliable with poor soils. For this reason, Mbeere District has experienced relative deprivation in terms of economic development. The regions' geographical characteristics make it a relatively poor area in terms of agricultural resources. The poor climatic conditions in this region made it be disregarded by the colonialists too. Typical of the early description of the land-scape is the following brief statement by R.G. Stone, District Commissioner in 1916; "The Embeere (sic) live in a stony waterless country and their crops are poor. They were formerly rich in cattle but lost most of it (livestock) in tribal warfare". Indeed, oral tradition glorifies the Ambeere's experience at Ithanga and on the Mwea plains as a time of immense livestock wealth, but maasai incursions eventually decimated the Ambeere herds and forced them to migrate to their present homeland.

It is hardly surprising that early observers emphasized the marginal economic potential of much of the land especially due to water problems. Two rainy seasons separated by periods of little or no precipitation establish the rhythm of socio-economic life in Mbeere

District. The long rains normally commence in March and run their course by the end of May. A dry season then sets in until October. Under normal circumstances, the short rains commence in October continuing periodically through November or December. Thus, the Ambeere expectation is for two food harvests per year, although these will vary in yield depending almost solely on the quantity and timing of the rains. Marked internal variations in rainfall in Mbeere District as well as distinct variations at a single recording station from year to year should be taken as normal.

Given the climatic conditions in Mbeere District, the Ambeere are mainly a peasant community who practice a mixed economy of herding and cultivating although the emphasize on one or the other economic mode can vary between groups or within a single group. For instance, the low plains stretching along Tana river across from *Ukambani* offer stockkeepers a more suitable environment than they can find among their counterparts in areas such as Nyangwa, Mbita and Gachoka sub-locations. The most commonly grown food crops are the *Katumani* maize, sorghum, millet, beans, peas (cow peas and pigeon peas) cassava and bananas. These crops ecological requirements indicate that the area occupied by the Ambeere is a marginal one. The Ambeere derive in the order of 47% of their income from crop production and another 17% from livestock (Nyaga 1986).

The erratic and variable rainfall on the lower regions of Mbeere District has led to series of famines. These famines are dated through collation with both official rainfall statistics and district reports documenting food shortages. Some of the names the Ambeere confer on the famines are poignant reminders of the suffering regularly endured over the generations. Other names simply recall events taking place at the time of a particular shortage. The famine cycle to many people in Mbeere District appears to be roughly every five years although shorter intervals are not uncommon.

### **4.3 Domestic water supply sources**

The region occupied by the Ambeere was some years back particularly striking because of the immense stretches of stony, waterless, landscape supporting only a scattered pastorally



oriented population. Rainfall represented the most critical limiting factor in Mbeere District ecology. This also resulted in the lack of water for domestic use. Indeed, prior to the late 1970's the fact was that in dry seasons a majority of the people in Mbeere had to walk a distance of five miles and over each way to fetch water for domestic use. It was a known fact that women left their homes before dawn to return only after darkness and that children were kept away from school because they had to fetch water (GOK 1969). From an economic point of view the significant point is that the dry season coincides with the time for preparation of land in order to commence planting as soon as the rains fall.

With time, however, there has been a significant contribution towards improving the water sector in this marginal area. These efforts have resulted in the emergence of a number of man-made water sources, namely, roof catchment tanks, rock catchment tanks, dams, boreholes and a piped water supply system. Other water sources in the area are rivers, streams and wells. A more focussed highlight on the various water sources is given.

#### **4.4 Water sources in the study area**

One of the study's objective was to establish the water supply sources in the area. This was established immediately the study commenced. The information was gathered from an officer in the Ministry of Land Reclamation, Regional and Water Development (MLRRWD) who happened to be a resident in the study area. There are eight (8) different water sources in the area namely: **rivers, streams, wells, dams, piped supply, roof catchment tanks, rock catchment tanks and boreholes.**

##### **4.4.1 Rivers**

In the whole of the study area there is only one permanent river, Thiba, that lies on the western border of Nyangwa Sub-Location with Mwea Division. The river is at present widely used by the people living nearby for domestic as well as small scale irrigation purposes. There are plans to pump water from the river (from a place called *Ndia Mathenge*) for domestic use. The researcher's subsequent enquiry on the above plan revealed that it was developed many years back but its implementation is still in its infancy.

#### 4.4.2 Streams

A number of streams can be found in the region during the rainy season and shortly after. The most popular in the two sub-locations are Kiriiri and Rwa-Mburi streams. The Ambeere say that Kiriiri used to be a huge river. One day, freshly circumcised boys went to bathe in the river in lieu of river Thiba. A *Kithumbiri* (dress made of animal skin and worn by the boys) was swept by the river and the river subsequently dried up. It is said that a he-goat would have to be sacrificed at the site to cleanse the stream. This ritual exercise could, however, not be carried out because such cultural practices have been subsequently undermined by modern way of life. African religious practices have been eroded by the adoption of christian doctrine.

#### 4.4.3 Wells

The adaptation of appropriate technology to the traditional art of digging wells by hand has greatly improved the degree to which water acquired from the wells has been protected from contamination and, thus, becoming a reliable and palatable source of water. In the study area, the wells have been the traditional sources of water. Key informants revealed that sacrifices were offered at the wells to prevent the water from drying up. This ritual was locally known as *Kumundira Mburi*. According to one key informant, the people were always aware of the climatic patterns through the guidance of the stars and the moon. The positioning of, for instance, the moon at a particular site signified that there would be drought. This is when the elders of the various clans teamed up to sacrifice a spotless goat. Women and children never participated in the ritual, though, an elder who once participated in a ritual ceremony told the researcher that there was great unity among all community members during this time. The ritual has since ceased due to conversion to christianity and because of other agents of socio-cultural change. In essence, therefore, the community members have for long cherished sustainability of their water sources.

PLAN International introduced improved methods of protecting water acquired from the wells, thus, making it more palatable. A pre-cast concrete ring has been used to line the wells. This is because concrete rings have the advantage for relatively shallow wells in soft ground where the

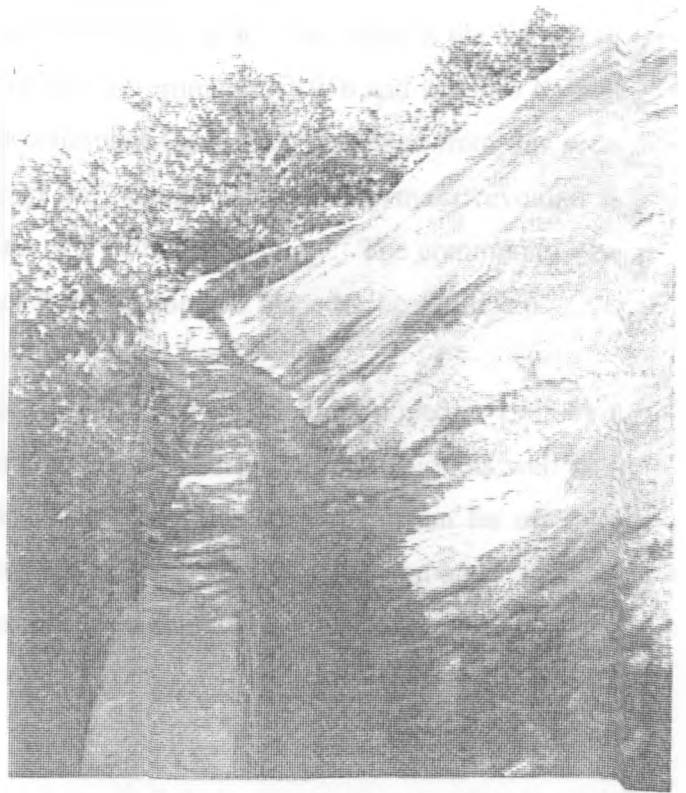
sides of the well need continuous support and new rings can be added at the top as they become necessary. The cylindrical lining of the well is extended above the surface to a height of one meter, thus, forming an elevated wall around the top of the well. A concrete apron is then laid on the ground surface extending from the elevated wall to a distance of about two to three meters on all sides. The apron is vital in that the water from the well is protected from pollution. The elevated wall prevents the surface wastes from running into the well and also helps prevent rubbish, animals and insects from falling in. The concrete apron around the well seals any space between the well lining and the sides of the excavation which could allow dirty surface water to percolate into the well. Drainage of the apron is provided so that spilled water is led away some distance from the well before being discharged into land. Protection of the well is finalized by sealing the top of the elevated wall with a slab. A tap is then fixed to a connecting pipe where the community fetches the water from. This method of protecting the wells is one of the cheapest method of providing a small water supply for a rural area where ground water sources are adequate. The method, too, has the advantage of economic appropriateness in capital short areas because it is cheap to instal and requires very low maintenance costs. It is also socially appropriate in areas where self-help methods are regarded as essential approaches to development.

#### **4.4.4 Rock catchment tanks**

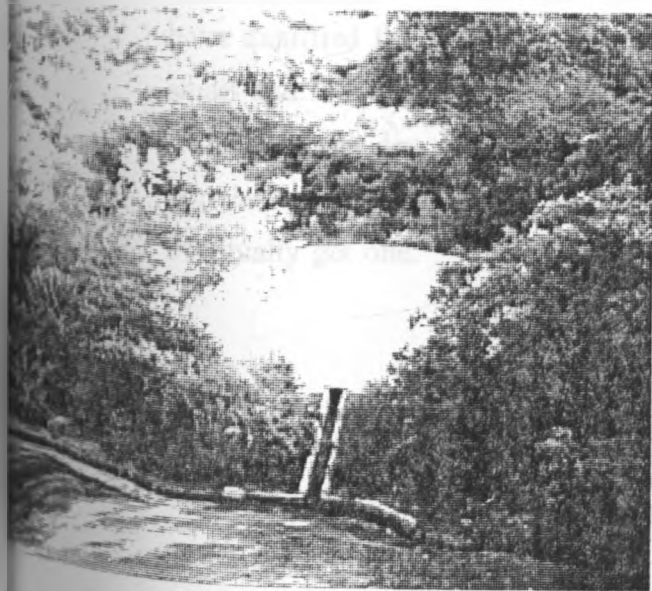
This is a form of rain water harvesting that makes use of very elementary technology. A huge natural rock is used, hence, the term rock catchment. A wall approximately fifty centimeters high is constructed round the edges of the rock. A tunnel is then connected to a tank. Once the rains come, the droplets falling on the surface of the rock spill down and since the rock edges are covered by the wall, the water runs to the tanks via the tunnel (refer to picture on page 52).



The Ciambingo Rock



Wall preventing water from spilling over



Tunnel connected to the water tank



Tanks where...

There are two of these types of water sources in the study area. The oldest is the Kanjari rock catchment, which was constructed by the colonial government in 1956 and supplies Nyangwa secondary school with water. The adjacent community has never benefitted from this source. All the three tanks are reserved for use at the school. A key informant revealed that arrangements were in progress to donate one tank to the community. The community would then have to instal their own pipes and choose an appropriate place to locate the tap.

The second rock catchment is at Ciambingo. This source was first developed in 1965 by the Kenya government. In 1988, PLAN International assisted in the renovation as well as the construction of a second 450m<sup>3</sup> water tank. Water from this source is meant for use by the surrounding community and at Kiritiri market. Of these two facilities, (Kanjari and Ciambingo), none is functioning appropriately and the reasons for the mal-function will be discussed under the maintenance section in chapter six.

#### **4.4.5 Roof catchment tanks**

This is a rain-harvesting technology that is used by households who have iron-sheet roofed houses and a tank. A majority of the people have managed to put up such houses but run short of funding to construct or buy the tanks. In addition to those who have managed to put up tanks at their homesteads, PLAN International came up with a programme to assist the residents construct 5.4m<sup>3</sup> water jars. In order to qualify for PLAN International's assistance in constructing a water jar, one has to participate in a raffle. A single household can only participate in the raffle once inspite of what they win. Hence, very few residents have qualified for water jars in this programme. In addition, the water jars are rather small and those who have them are advised to use the water for drinking only. Many water jars run dry during the dry season. They have, nonetheless proved to be very popular because many of those who did not have them kept on wishing that they would eventually get one.

#### **4.4.6 Dams**

There are seven earth dams in the study area, three at Kerwa region, two at Mayori area and two at Rugogwe. Four of the dams (three at Kerwa and one at Rugogwe) were constructed by the government in the early 1980's while the other three were constructed by the Catholic Church. Apart from two dams, one at Rugogwe and the other at Mayori area which usually dry up during the dry season, the others retain water throughout the year.

#### **4.4.7 Boreholes**

PLAN International-Embu reports that their Embu (now Mbeere) water availability project started in full swing in 1988. This was after a major evaluation study was done (Field Office Target Impact Evaluation-FOTIE). The evaluation study revealed that 84% of the water source samples obtained from Gachoka Division failed to meet the standards of portability as defined by the World Health Organization (WHO). Eventually, the method selected to address the problem was the development of boreholes. The personnel at PLAN International felt that borehole drilling would be the most cost-effective method (though the modalities of assessing cost-effectiveness were not specified in the report availed to this researcher) of water supply that would field greater benefits. Subsequently, PLAN International contributed US\$ 166,800 and USAID contributed US\$ 300,000. A total of 123 boreholes have been drilled in Gachoka Division. The Afridev hand-pumps have been used (refer to pictures on page 55).



The researcher pumping water from Gataka borehole



Community members sited around their borehole during a meeting

A few other boreholes had been drilled by the Catholic church. Some residents in the study area revealed that a borehole had been drilled by some white men at Irabari area. The hand-pump was recently rehabilitated by PLAN International. Efforts to establish who the white men were proved futile.

Wells equipped with hand-pumps are among the simplest of community water supply technologies in use. In addition, ground water is normally of much better quality than surface water. Filtration through the soil is part of the natural cycle and polluted surface water is often substantially purified by percolation through permeable soil before it collects below the surface as ground water. Though hand-pumps draw comparatively small amounts of water from the aquifer (a stratum or zone below the earth's surface which yields ground water to a well in sufficient quantities for the required use), their effectiveness and reliability can be substantially influenced by proper consideration of the local ground water conditions. Problems typically arise when designers fail to recognize seasonal movements in water table, when low-yielding aquifers are developed without allowance being made for the draw-down which will arise during pumping, or when the chemical quality of the water makes it unpalatable.

According to PLAN International (1993), geological formations in Gachoka Division are composed mainly of basement rock formation characterized by low permeability with high seasonal fluctuations combined with high draw-downs. The same report indicates that hydro-geological investigations were not carried out precisely and patiently and, thus, recommends the same. The recommendations came after 123 boreholes had been drilled. The effects of the poor planning and design will be revealed in the subsequent parts of this report.

#### **4.4.8. Piped water supply**

In the early 1970's the Government of Kenya (GOK) started the Special Rural Development Programmes (SRDP) in the Arid and Semi-Arid Lands (ASAL) of the country. In Embu District the SRDP covered four locations in the then Mbeere Division.



These locations are Evurore, Nthawa, Mavuria and Mbeti Locations. The then Mbeere Division has since been upgraded into a district. The district is divided into four divisions, namely, Gachoka, Mwea, Evurore and Siakago.

The Mbeere pilot project area was considered a most appropriate unit for the Special Rural Development (SRD) because it was considered small enough for experimentation to be feasible and large enough for the inclusion of infrastructural components. The size of the pilot area was about 630 square miles (approximately 1630 square kilometers). The SRD scheme for water supply in Mbeere included three projects plus the repair of a fourth. The Siakago-Mavuria-Mbeti scheme was by far the biggest and the only more sophisticated project of the four projects. The Siakago-Mavuria-Mbeti scheme is the only one relevant to this study since the rest of the water sources were developed in areas outside of Gachoka Division where this study was based.

The Siakago-Mavuria-Mbeti water scheme is based on an intake near the 4000 feet contour line on Ena river. From here the water is pumped into a reservoir about 500 ft high on the hillside 5.5 miles west of Siakago town. The water is then conveyed by gravity through a piped network to communal water supply points in Siakago and half of Riandu sub-locations in Nthawa location and Kiamuringa, Gachoka and one-third of Gachuriri sub-locations as well as in most parts of Mavuria location. The total length of the pipeline is about 55.5 miles. The water points were initially spaced at intervals not exceeding two miles. At the time of developing the water supply scheme, it was estimated that about 25,000 people would be served (GOK 1969).

This expansive water scheme has eventually turned out to be a disappointment to the people in Gachoka Division especially in Mavuria location. The excessive and uncontrolled irrigation of tobacco farms in Siakago Division has resulted in reduced water pressure such that the water does not get into the reservoir tanks at Kirima, near Kiritiri market. The researcher found out that the Mavuria location residents may receive water from the piped sources only once or twice in a year. It was, however, reliably learnt from

the government officers in charge of water supply in Embu town (provincial headquarters) that water meters were being installed in Siakago Division. The government officers hope that the installation of water meters will compel Siakago Division residents to reduce their high rate of water consumption in order to avoid high bills, for payment would henceforth be based on the meter reading. It is then hoped that there would be enough pressure so that water gets into the reservoir tanks near Kiritiri. If water was to start flowing into these tanks, the people on the lower parts of Gachoka Division (Mavuria, Kiambere, Machang'a and Iria Murai regions) would start getting water.

It should also be noted that the population in Mbeere District has increased. There are about 33,481 people in Kianjiru and Mavuria locations alone, yet the whole SRDP had been designed to supply water to about 25,000 people only (in both Siakago and Gachoka Divisions). In reality, the installation of water meters will not be a solution to the low water pressure since the number of consumers has increased. Most of the people in some parts of Siakago Division that were served by the SRDP already have their own connections. If water was to start flowing to Gachoka Division, more people would require their own connections, on top of resuming the use of the now abandoned public stand pipes. A re-design of the water project with an aim of expanding the service level to cater for the increased population is, on top of installing the water meters, a viable alternative to water supply problems in Mbeere District.

## CHAPTER FIVE

### RELIABILITY OF THE WATER SUPPLY FACILITIES

#### 5.0 Introduction

Chapter five mainly focuses on the factors that ascertain the reliability of the improved water facilities. The researcher felt that the community members' willingness to devote their time, energy and resources to a specific project is largely influenced by the possibility of receiving maximum benefits from such a project. It, therefore, became necessary to first ascertain whether the improved water supply facilities provide water in quality, quantity and at the service desired by the community members.

#### 5.1 The use of the improved water sources

The information given in chapter four on the variety of the water sources in Gachoka Division shows that there were only three water sources in the study area prior to the development of other sources. These sources are the rivers, streams and the wells. Out of the eight different water sources in the study area, five of them, namely, boreholes, dams, rock catchment tanks and the piped water sources have, with time, been introduced in Gachoka Division.

Given the conspicuous presence of the man-made water sources, this study delved into ascertaining these sources' reliability in relation to water supply. The researcher first asked the respondents to state their duration of residence in Gachoka Division so that their first-hand experiences in connection to water supply could be related to the respondents opinion on changes that have occurred within the water supply sector in the area. An assessment of the impact of the improved facilities is related to the respondents experience prior to the installation of new facilities. A majority of the respondents (73%) had lived in Gachoka Division for the entire period of their life.

A moderate proportion of respondents (41%), however, emphasized that water supply was very problematic. Apart from the wells and streams that formed during the rainy seasons

only two other alternative sources of water were available; Thiba and Thura rivers to the west and east of Kiritiri market respectively. Substantial amount of time was devoted to fetching of water for use in the house as well as taking the livestock to the rivers where they are watered. Congestion of both human and livestock at these water sources was a common phenomenon. There were times when Thura river could dry up and the people scooped sand from the river bed in order to reach the water under-neath.

Thirty eight respondents (38%) were less emphatic in their explanation about the availability of water prior to the development of new water supply facilities. The general response among this percentage of respondents was that they managed to cope, though water was still a problem. Most of these people live near well sites that never completely dried up, though water could substantially reduce especially during the dry season. Some of these wells, such as Karavari, Kariguri and Ciambingo wells can still provide water throughout the year to-date. To those living by the river sides, the water is always plenty.

Other explanations given in relation to the availability of water were that some few years back the rains were much heavier than present times. Similarly, more water was retained underground for long. This retention is no longer possible because the sand that used to cover the water under-neath, hence, reducing the rate of evaporation, has been extensively harvested for construction purposes. Water has, thus, been exposed to rapid evaporation. A further constraint on the indigenous water sources has been the increase in population, meaning that more people have had to rely on the few water sources.

In a session at an FGD, the discussants clarified that access to water sources was, indeed, problematic. It was possible to spend an average of five hours daily in search of water. This was also confirmed by PLAN International. The discussants further revealed that water was most acute during the dry seasons (between July and October). This season is locally known as *Thano*. This information makes it clear that water has been a scarce commodity in this part of Gachoka Division. It is, therefore, rational to belief that any initiatives to develop the water supply sector would be embraced by the community. But

this study emphasizes on the fact that the community's willingness to appreciate the improved facilities is subject to a number of factors, among them the reliability with which the improved supplies serve the purpose they are meant for. The recipients ability to maintain the facilities will also be determined by the role that the community played during the design and construction phase as well as the development in human skills and the kind of relationship and assistance the community members maintain with the external agencies.

The next question requested the respondents to give the reasons for preference of a source, with a hope to generating information on what encouraged or deterred the community members in selecting a water source. It was indicated by thirty seven respondents (51%) that the sources they used are the only ones they had, while nineteen respondents (26%) said that the sources they used are nearby where they live. In addition, a small proportion of the respondents (21%) preferred the sources they used for hygienic purposes. This information is clearly presented in Table 5.1.

**Table 5.1 Reason for preference of sources used**

Reason	Frequency	%
No other source available	37	51
Nearby (proximity)	19	26
Safe (hygienic)	15	21
B/H hard to pump	1	2
TOTAL	n=72	100

From the foregoing, it is seen that a majority of the respondents had only one source from which to fetch water from while others emphasized the need for a water source to be close to the users dwelling units as well as being hygienic. A number of respondents gave more than one answer. Their responses are presented in Table 5.2

**Table 5.2 Reasons for preference of sources used**

Reasons	Frequency	%
Only source available		
Permanent	17	61
It is nearby		
It is permanent	3	28
It is hygienic		
It is nearby	8	11
TOTAL	n=28	100

Two other aspects should not go unnoticed. First, the concept of reliability is rather relative in that different people will use different parameters to ascertain the reliability of a source. In this study, for instance, nineteen respondents (26%) preferred the water source they most used by virtue of the source being close to their homesteads, while fifteen respondents (21%) emphasized on the need for a particular water source to be hygienic, in addition to other respondents who gave more than one answer to the same question. Therefore, what may be termed as an unhygienic water source to a person and, thus, unreliable for consumption because of its uncleanness may be reliable to another person due to the source's closeness and, hence, easy access.

Second, only a small proportion of respondents (21%) gave priority to the health aspects of the source used. This implies that there are other aspects such as proximity that are more valued than the health aspects. Most respondents seemed aware of the need to consume clean water and were even aware of some simple purification methods such as boiling the water before drinking but hardly was this prioritized. Some respondents said that the purification processes were time-consuming. The implication, therefore, is that the provision of an improved source need not necessarily result in improved health for the beneficiaries as is assumed by the development planners.

Caincross, (1987) states that the dilemma between the beneficiaries attitude and maximizing health benefits can be solved by providing the rural people with water sources that deliver water close to their homes. This is at present not possible in Gachoka Division because the type of water supply facilities developed in the study area (boreholes, dams, wells) do not adequately solve the problem of proximity. The only other supply that would have adequately delivered water close to peoples homes is the Siakago-Mavuria-Mbeti water scheme which unfortunately happens to be very unreliable. The only advantaged people are those who live close to where these sources are located. The rest still have a daily distance to cover. This explains the reason why a majority of the respondents emphasized more on proximity of the water source than its cleanliness. A more applicable approach in the study area is that of health education aimed at changing the peoples knowledge, attitudes and practice so as to eventually improve on their health status. This study reviews the health education package on the section on training in chapter six.

As earlier indicated in Chapter four, most boreholes in the study area were drilled by PLAN International from 1988. It was not until 1990 that the hand-pumps were installed and began to be used. The dams had been developed by the government in the early 1980's under the soil conservation programme. The researcher found out from the area residents that only one borehole at Iria Murai was in use prior to the 1990's. Another borehole at Irabari had long broken down. Apart from the rock catchment tanks at Ciambingo and the piped water supply no other man-made source was in use before the 1980's.

This study asked the respondents to state for how long they have been using the water sources they highly relied on for their domestic water needs. The information acquired appears in Table 5.3.

**Table 5.3 Duration of use**

Duration	Frequency	%
Before 1980	30	30
1980-1990	33	33
From 1990	37	37
TOTAL	n=100	100

The question emphasized on the most preferred source, but the beneficiaries use of other sources is not overruled. The data in Table 5.3 shows that a cumulative total of seventy respondents (70%) had began using their favourable sources after 1980. The majority in this category (37%) began using the most preferred sources in the 1990's. Thirty respondents (30%) had been using the sources they preferred prior to the 1980's, which implies that they still used the same sources long before the dams had been constructed in the early 1980's. It appears that as new facilities were availed a substantial number of the community members (70%) have shifted to using the improved water sources more than the sources they used before given that the man-made resources were non-existent before 1980. The man-made water sources, therefore, have had an impact on the water use patterns in the area. This means that the beneficiaries have been more attracted to the use of the improved water supply facilities.

The above information is further confirmed by the fact that a substantial number of respondents (86%) reported that the streams, unprotected wells and rivers had been their water sources prior to the development of the dams and the boreholes. Some respondents indicated that they had shifted from the use of dams to boreholes because the boreholes were more hygienic than the dams. According to PLAN International, clean water was by 1994 available to 54% of the population within a radius of four kilometers round trip in Gachoka Division.

As in the focus on the health aspects in relation to preference of a water source, PLAN International's assumption that 54% of the Gachoka population consume clean water can be



disputed. This assumption by Plan International is logically based on the number of boreholes available in Gachoka Division (123 boreholes in all). It is also true, as was established in the FGDs that a majority of the people relied on the boreholes for water especially for drinking purposes. This is, however, not the case all year round. The researcher observed that boreholes become very unpopular during the rainy seasons but are so much treasured during the dry seasons when other sources dry up. What this called for, then, was for an evaluation of the water use pattern in the area. This is because water use pattern is directly related to reliability in that people will pay attention to a source only when they need it. The findings on the use of different sources during different seasons is given in detail in chapter six.

## 5.2 Problems encountered at the water sources

The relative ease with which the water is collected influences the degree to which a source can be held reliable and, thus, its sustainability. Factors considered in relation to this are time taken to and back from the water source and how much time and energy is devoted in drawing the water. Scholars have argued that hardly will a community by-pass a traditional source in order to fetch water from an improved source (Schumacher, 1977; Therkildsen, 1988). A perturbing discovery in this study was that a majority of the respondents (76%) encountered some difficulties at the sources they used. The difficulties experienced are presented in Table 5.4 and Table 5.5 (Table 5.5 represents answers from respondents who gave more than one answer).

**Table 5.4 Problem encountered in fetching water**

Problems Encountered	Frequency	%
Long Queues	25	62
Long Distance	8	20
Scooping	7	18
TOTAL	n=40	100

Table 5.4 shows that the beneficiaries complaints are varied, with the highest number of respondents (62%) complaining of having to queue for long at the water source. Information gathered from the FGDs and other informants revealed that queuing was the single most problematic issue especially at the boreholes. The problem of having to queue was also particularly experienced during the *Thano* season. Eight respondents (20%) complained of having to cover a long distance in order to get to the water source. This problem was most mentioned by respondents in Mutus area where the community members have for long relied on dams for water. No other sources were readily available in the area. A number of respondents gave more than one answer to the same question. The responses are presented in Table 5.5

**Table 5.5 Problems encountered in fetching water**

Problems encountered	Frequency	%
Piped supply unreliable Rationing	18	50
Long queues Rationing	8	22
Long distance Scooping	8	22
Turned away for non- payment Long queues	2	6
TOTAL	n=36	100

A small proportion of respondents (22%) complained of the long distance in addition to the method of drawing water at Ciambingo tanks where the feeder pipes on site had blocked and the beneficiaries had to scoop water using a container attached to a rope. This system of drawing water is not only tiring but risky to the users, especially the children. The chairman of the water source explained to the researcher that there have been plans to rectify the situation but they are always overtaken by events, such as the onset of the rains before the work is done. The respondents, nonetheless, indicated that in spite of the problems experienced in fetching water from the various sources, they are always assured of getting water.

One aspect that comes out clearly here is that a majority of the people (bearing in mind that 24% of the respondents reported that they did not experience any problems) were inconvenienced. This is expected to largely influence the degree to which such respondents devote themselves to the maintenance of the sources. This may, after all, explain the observed phenomenon of using different sources. People prefer using the source where the least problems are encountered while other sources are used when no other alternative is available.

The small number of respondents complaining of being turned away for non-payment of user-fee (6%) indicated that the committee members are not very strict on defaulters, yet they complained to the researcher that non-payment of user fee was the greatest problem they were experiencing in relation to community's response to responsibility. According to a borehole attendant, it is usually very difficult to deny one access to water, bearing in mind the community members belief that water is freely given by God. They, therefore, allowed the beneficiaries to draw water on the understanding that they would later pay their bills. This pledge is, however, hardly honoured. The problem here is that of planning how to fit the cultural belief (that water is given by God) to the expectations of the new roles the community should play.

According to Schumacher (1977), there are a number of human factors in water supply design whose implications are technical rather than social. He has given an example of the ergonomic design (the work and the working conditions) of hand pump's. Pumping water from a deep well is unnecessarily exhausting if the pump hand is too long or too short, or is placed at the wrong height for the arms muscles to be used efficiently. The borehole mobilization team (PLAN International 1995) reports that the boreholes were equipped with pumps which had their pedestal averaging 500 mm high between the plant level and the pump base plant. In some cases, the pedestal height was 250 mm. This height fell below the allowable minimum height of 590 mm. Due to this fault, the community has had to twist the pump spouts sideways (at an average angle of 40-45 degrees) to accommodate the commonly used twenty litres water containers.

Most of the boreholes in the study area are very deep (up to 60m). The pump handles should be 1.1 m long. The setting of the handle determines the achievement of full strokes and has a greater mechanical advantage. In addition, the clearance between the concrete pedestal and steel pedestal plate is 80 mm and this space cannot accommodate the spanner during pump head dismantling and re-assembling in the process of maintenance. This has necessitated chipping off of concrete pedestal to fit in the spanner.

The above two examples are some of the technical faults that affect the sustainability of a source. Though the community members were quiet on these faults, the innovative rectifications (twisting of the spout and chopping of the concrete pedestal) indicates the extent to which a needy community can strive to achieve what they want. Moreover, this is an indicator that the community has appreciated the boreholes reliability and would, therefore, be willing to keep on using them.

Another technical shortcoming according to a report by PLAN International(1993) is that borehole test-pumping was done for only six hours in lieu of the recommended thirty six hours. Six hours cannot be considered adequate to give accurate and reliable borehole yields. In fact, a number of boreholes' water level fall below the pump intake level after pumping for a short while. This is rather common during the dry season (July-October). In some places, it takes up to thirty minutes for the recharge to occur. This in itself is an aspect of unreliability and may force the users to seek alternatives sources. The problem is unfortunately most acute during the dry seasons, when the alternative sources dry up too.

The subsequent effect has been that the consumers have to queue for a long time, (this confirms the consumers complaint) as in the case of Kavondori and Andu a Nyaga boreholes. Queuing does not only occur at the boreholes. The community members are also subjected to long queues at the wells too. The researcher observed that the community members could wait for as long as one hour for the recharge to occur at the Karavari well. Many other wells eventually dried up as the weather became hotter. In spite of the low yields, the boreholes and the dams remained in use throughout the year. This, then, suggests that they are more reliable than all other sources.

### 5.3 Daily availability of water

In order to conclusively ascertain the reliability of the improved water sources, this study looked into the availability of the water especially when it is wanted by the beneficiaries. This was necessary because a reliable water source is that which can supply water in quantities required by the beneficiaries. The water should also be available at the times that it is most wanted by the beneficiaries. To gain an insight into these aspects this study first enquired, on average, the number of times water is fetched in a day. The findings are presented in Table 5.6.

**Table 5.6 Number of times water is fetched in a day.**

No. of times water is fetched	Frequency	Percentage
Once	8	8
Twice	38	38
Thrice	34	34
Four times	9	9
Five or more times	11	11
Total	n=100	100

A majority of the respondents (72%) go to the water source about two or three times in a day. This information should, however, not be used to ascertain the quantity of water consumed per household. The researcher observed that a majority of the household members use the twenty litre container (*mutungi*). The number of household members going to the water source per trip varied depending on the availability of the adult household women and children who usually fetch the water.

Another factor that made it hard to quantify the amount of water consumed is the fact that many other containers may be used. For instance, small children carry small, perhaps five litres container. The men usually use the ox-carts to ferry the water and, subsequently, larger containers are used. It is doubtful, however, that the World Health Organizations (WHO)

quantity recommendation of a minimum twenty litres per person per day for drinking, bathing and washing clothes is achieved. The respondents also said that the water is not enough for their basic needs. Most of the respondents kept on asking the researcher to inform the relevant authorities that an expansion of the current supply is necessary.

Reliability is further influenced by the availability of water at the time it is wanted (Arlosorff *et al.*, 1987). In this study, respondents were asked to state the times they most frequently needed water and the data gathered are presented in Table 5.7.

**Table 5.7 Time when water is most frequently needed**

Times when water is most needed	Frequency	%
Early morning (6.00 - 10.00 am)	10	10
During the Day (10.00 - 4.00 pm)	1	1
Evening (4.00 pm and after)	5	5
Morning, Day, Evening	16	16
Morning, Evening	58	58
Morning, Day	9	9
Day, Evening	1	1
Total	n=100	100

The times water is fetched in a day shows the water use peak hours. From the foregoing it is clear that a cumulative 72% (Table 5.6) of the respondents fetch water about two or three times in a day. Further, a cumulative 74% of the respondents will need water in the mornings and evenings. For the sources to be judged to be reliable, the community members must be assured of getting water at those times. This is, however, not so in Gachoka Division because a substantial number of respondents (80%) indicated that they experienced water shortage in the months of July, August, September and part of October. This season, popularly known as *Thano* was discussed during the FGDs. The discussants vividly recalled how they undergo hard times due to water shortage. The discussants revealed that this

still happens inspite of the additional water facilities. The chairman of Gataka borehole revealed that the Gataka hand-pump remains in use for twenty-four hours during this season. The community members usually form long queues at the source and water is usually fetched throughout the night. A number of other committee members in other areas of the study told the researcher that they usually never allow their hand-pumps to remain in use for many hours for this makes them susceptible to breakdowns. The beneficiaries are instead arranged in groups which then fetch water in shifts. Water supply, therefore, remains problematic inspite of the interventions already in place. In spite of this problem, the beneficiaries are assured of some water even during the *Thano* period, unlike before the improved facilities had been developed.

The researcher had anticipated that a substantial number of respondents would indicate that water would also be most needed during the day because of watering the livestock. The respondents said that the animals are watered by those who went grazing them. In the process of grazing, they would drive them to a water point such that it was not necessary to water them at home. There is a dam at Kerwa (Maciara dam) that is specifically meant for watering the livestock. No drawing of water for human consumption occurs at this dam. The animals are also watered at the borehole sites. This is, however, highly discouraged by PLAN International because the animals usually destroy the vegetation around the borehole such that the area becomes dusty. The dust subsequently contaminates the water from this source. Another problem experienced in watering the animals at the boreholes is that the need to construct water troughs for the animals was over-looked by the planners. It is now that PLAN International is encouraging the borehole consumer groups to construct water troughs at the borehole sites so as to make the watering of livestock less cumbersome.

The scale of benefits, as has been seen is influenced by the service level, the distance water is hauled from the water point to the dwelling place, queuing plus filling time for each water hauler. Another scale of benefits is the reliability with which water is available at the water point both in quantity and quality. The study findings have proved that the availability of improved water sources, namely, the tanks, water jars, dams and boreholes have to some extent improved the water supply situation in Gachoka Division. After all, a majority of the respondents

(86%) indicated that they had benefitted from the improved sources. With much more devotion to providing more sources, the problem of water supply in Gachoka Division may with time be minimized, if not eradicated.



## CHAPTER SIX

### HUMAN CAPACITY AND INSTITUTIONAL DEVELOPMENT

#### 6.0 Introduction

Successful Community Water Supply (CWS) programs comprise of hardware and software elements. These support elements should be systematically matched in such a way that each community recognizes the benefits of the improved supply, and can afford the costs of operation and maintenance. The community should also possess the skills, spare-parts, materials and tools needed for operation and maintenance. Since it has been indicated that the community has appreciated the benefits of the improved facilities by virtue of their popular use, it is necessary to consider whether the community has developed the necessary inputs and throughputs that are necessary in sustaining the outputs (benefits). Chapter six looks into the aspects of community participation and institutional framework.

#### 6.1 Human Capacity and Institutional Development

Community participation entails an active process in which the community members take a key role in influencing the planning, design and implementation of development programmes. Where a participatory approach to development is adopted, the recipients eventually take full control of the projects. The immediate benefits arising from an active participation by the beneficiaries are the empowerment of the recipients and also enhancing their capacity to sustainably maintain the project. Recent policy in the development of community water supply has emphasized on the aspect of community participation in the development process (Baldwin, *et al.*, 1981; Narayan, 1993; Paul, 1987).

The study sought to know whether the respondents were involved in identifying (to the external agencies such as PLAN International) the improvement of water supply as a priority need for them. Over half of the respondents (54%) said that they were involved in decision making. Of the 54%, forty five respondents (83%) clarified that their contribution was done at *harazas* whereby they were asked whether they had agreed to the ideas that were

discussed. Nine respondents (17%) said that they were consulted by virtue of having been the local leaders then, either as chiefs, assistant chiefs or councillors.

According to Mbithi and Barnes, (1974) and Njiro, (personal communication) *barazas* cannot be taken to be effective channels for communication. Odoul (1990) advances this argument by observing that women will usually not attend *barazas* due to other domestic roles they have to perform. Any decisions made at *barazas* will, therefore, exclude women's opinions. There is also no guarantee that the women get informed of what transpires at *barazas* since they mostly rely on the attendants, usually husbands to receive the message. That notwithstanding, the men too may be passive participants at *barazas*. Hardly do *baraza* attendants have the opportunity to express their opinion. Mbithi and Barnes observes that there are very many issues that are discussed at *barazas*, such as the government policies, so that hardly is there time to address key development issues at length. Even though decision-making can never be by 100% of the community members only a minute proportion (17%) of the respondents may have had an effective impact on the identification of water as a priority need. More significantly, only the councillors had been elected by the community.

The rest of the representatives were civil servants. The rest of the respondents (46%) were asked to explain the reason why they were not involved in identifying water supply as a priority need and the information given indicates that a majority of them (52%) were never consulted. During interviews with key informants, it was revealed that most of the development issues were channelled through the local administration. The administrators were then asked to convene a *baraza* whereby the community members were briefed on the programmes to be undertaken. All decisions to improve water supply in the area, when and how it was to be done was all done without effectively involving the community members.

## **6.2 Siting of the water sources**

Respondents were asked whether they had been consulted in relation to the siting of the water sources. Only seven respondents (7%) indicated that they had actively participated

in deciding on the areas that the water sources were to be developed, for they were in local leadership positions then. Though this study did not establish any biased selection of water source in relation to where they are located, a number of repercussions have been reported. The researcher found out that Kavondori borehole in Nyangwa sub-location had been lying unused due to wrangling between members of two villages, (Nyangwa and Kerwa villages) who happen to share the same hand pump. The borehole is located at the border of these two villages. Since PLAN International always strove to be neutral in the process of its development activities, no caretaker had been trained once the pump was installed. This was because the two groups opposed the selection of members from either group for training. Each group preferred its own people for training. In case of a breakdown, the beneficiaries had to hire a caretaker, an undertaking that the beneficiaries could not afford. The wrangling has all the same been resolved and as at the time of this study, there was a strong committee leadership with officials from both sides. A few of the committee members have been trained as caretakers. In fact, the committee group is the only one headed by a lady in the entire study area. The rest of the groups have men as their leaders.

Most of the boreholes in the study area have been drilled on private land. An official at PLAN International's office (Kiritiri) told this researcher that the NGO had the intention of drilling the boreholes in public land (for example schools and markets). Subsequent exploration in these public areas revealed that the plan was unviable because little ground water was found in those areas. Therefore, drilling was done in areas where water could be located. Exploration was done by a professional engineering group who recommended the drilling of boreholes in areas that were found appropriate. No-one cared on whose piece of land the boreholes were drilled. A study done by PLAN International (1993) revealed that all the borehole committee members interviewed had not acquired a single written agreement between the community and the land owners. By implication, PLAN International is to blame because they never highlighted this requirement to the community members. The procedure requires the beneficiaries to obtain consent of the land owners by having them (the owners) sign land leaseform. Copies are then sent to the local

administration and to the Ministry of Lands and Settlement. These land forms ought to have been signed before any further action on the project was done. This did not happen in Gachoka Division.

Since no agreement on land was signed and since the community was not involved in choosing the site, a number of confrontations between the individual owners and the community members have been reported with the most notable ones occurring at Irabari borehole in Kithunthiri sub-location and also at Nyangwa, in Nyangwa sub-location. The beneficiaries of the Irabari borehole reported that the owner of the piece of land where the Irabari borehole is located has been locking the hand-pump at will. Furthermore, since he is a member of the Seventh Day Adventist church, no-one is allowed to draw water from the borehole on Saturdays. Seventh Day Adventists believe that no work should be done on Saturdays. The borehole had as per the time of this study broken-down and, since the land owner lives far from this hand-pump, his household members do not get affected by his actions and the subsequent consequences. The committee members were in a dilemma not knowing what to do. Warning from the local administration (including the assistant chief in Kithunthiri sub-location, a beneficiary of the source), are saliently repulsed. The only mediator between the community members and the elder was his son, who unfortunately died in January 1995. The community members are currently suffering since their nearest source of water is non-functional and there are no signs of peace with the land owner in sight.

A more complicated controversy on land ownership has been reported at Nyangwa. The Chairman revealed that the owner of the piece of land where Nyangwa borehole was drilled died before he had transferred the piece of land to the community. His sons claim that their father left a curse that would haunt whoever would sub-divide his land. Brokensha, (1971) have indicated that the head of the house's supernatural powers (the alleged power of his curse) were the most dreaded powers among the Ambeere. This still seems to be the case since none of the family members has attempted to demarcate that piece of land. As at the time of the study, this borehole had not been registered with the Ministry of

Culture and Social Services. Most of the other borehole user groups were, nonetheless, raising money to purchase the pieces of land on which the boreholes are located. By the time the researcher left the study area, the Gataka group members had arranged to conduct a *Harambee*. Such plans confirm the seriousness with which the beneficiaries are appreciating the facilities.

Land issues can be lethal especially among Kenyan societies where land is highly valued. Apart from land being a source of livelihood for a majority of the Kenya population, it is also a sign of wealth and hardly will someone wish to release an iota of it without compensation. It is possible to argue that the development planners may have had no choice other than by-pass the community in relation to the siting of the water sources, especially the boreholes whereby their drilling site is dictated by the availability of underground water. Incidentally, the boreholes seem to be the only water sources that are at the center of controversy over land in the study area. The dams were constructed prior to the demarcation of land and the subsequent allocation of title deeds.

In spite of the technical aspects that had to be considered in putting up a water source, the community members should have been given the chance to offer their opinion on the site they most preferred. Discussions should have been held between the community members and the technical experts. The technical experts should then have given priority to the community's choice. If the members' choice proved to be technically impossible (such as a site being in a place where no underground water can be found in the case of boreholes), the technical experts then would have had a duty to explain in the most lucid terms possible the reasons behind the difficulty. The site chosen should then have been acquired by the community through the laid down procedures, that is, obtaining consent of use from the land owner, and copies sent to the local administration and Ministry of Land and Settlement. All this should have been done before any other work was undertaken.

### **6.3 Technology used**

The choice of technology is linked to the choice of rural water policy in general and to operation and maintenance policy in particular. The need to create self-reliance has an effect on the technology choice for it tends to promote technologies for which Village Level Operation and Maintenance (VLOM) is possible. In addition to financial resources, other necessary resources considered in choosing technology include physical resources (water and energy) and organizational resources, (manpower and institutions). The choice of technology is, thus, based on these principles.

In Gachoka Division, PLAN International opted for boreholes for they were found to be the most cost-effective. The campaign for hand pumps in the rural water supply development was widely advanced during the water decade. Further, PLAN International opted to protect the wells in order to make them clean. The government, on the other hand, constructed dams as a campaign against soil erosion. The piped water supply project was done under the governments' Special Rural Development Programme (SRDP). The general need to provide water sources easily accessible to the community has all the same been emphasized by all the development agents. The community was, however, never asked to make a choice on the type of technology to use in the development of the source.

### **6.4 Construction of the water sources**

Only twenty nine respondents (29%) were involved in the construction of the various sources. Their participation was limited to either ferrying sand to the site or clearing the site in readiness for construction. A majority are in this case the respondents who have had water jars constructed through the help of PLAN International. It is, nonetheless, noted that where the provision of a path to public water source like a well or borehole was necessary so as to allow for the delivery of construction materials, a majority of the respondents (70%) were involved. The community members were also asked to participate in the construction of water tanks at the local schools. This method of participation is, however, not voluntary in that it was compulsory for every parent in a particular school to participate. There was always the threat of the child being expelled from school in case the parent failed to attend communal work. Further probing of the respondents established that this form of contribution hardly contributed to the

enhancement of the community's participatory role in development. Most respondents felt that they participated in the school's development by virtue of being parents in that school and not necessarily because they are members of the society in which the school is located. The organizational approach to development work in schools does not also give or even encourage the community members without children in the specific schools to participate in its development. From the foregoing, it is clear that user role in the development of the water sources was rather weak.

Some key informants told the researcher that they had actively participated in the construction of the tanks at the Ciambingo source way back in 1965 when the first tank was constructed. According to the Chairman, unskilled labour, water used in constructing the tank and the sand were provided by the community. The rest, (cement, ballast, bricks, pipes and technical aspects) were provided by the county council. This confirms that popular participation in development is not a new concept in this area.

#### **6.5 Rehabilitation of water sources**

Some sources such as the dams and the rock catchment tanks at Ciambingo have undergone rehabilitation. Rehabilitation is a fundamental aspect of sustainable development. It was, therefore, felt necessary to know the community's contribution towards rehabilitation work and thirty one respondents (31%) stated that they had been involved in the rehabilitation process. Thirty nine respondents (39%) indicated that they were never involved in the rehabilitation work while the rest of the respondents (30%) stated that they are non-beneficiaries of the rehabilitated facilities and, thus, could not participate. The form of the respondents contribution appears in Table 6.1

**Table 6.1 Form of contribution towards rehabilitation**

Role	Frequency	%
Fencing	4	4
Bush clearing	15	15
Transporting sand/water	12	12
N/A	69	69
Total	n=100	100

A majority of the respondents (69%) did not participate in the rehabilitation exercise. Almost half of the non-participants (30 respondents) had not been asked to participate while the rest (39 respondents) used water sources that had not undergone any form of rehabilitation. As in the case of schools, the community members participated in areas where they had a vested interest.

The work done in the rehabilitation of these facilities was the clearing of the bush growing along the edges of the dam, fencing the dams and carrying of sand and water for repair and construction of a second tank at Ciambingo. Scooping out sand and soil from the dams was sponsored through the county council by PLAN International. Construction of the tank was also co-sponsored by PLAN International.

A fundamental issue arose in the FGDs in relation to the rehabilitation process. The researcher established that PLAN International had used the food-for-work approach to woo people to participate in the rehabilitation work. This was viewed to be a form of self-help. The problem with this form of self-help among the Ambeere is that it is not clearly focused on the traditional organization of work parties. When there was community work to be done in Mbeere, it was asked for by a family. This was in the local language called *Irima*. Those called to the work party by a family were those who were mutually related to the particular family. The main force behind the work party was that it was based on reciprocity, whereby a community member also had a right to community assistance so long as one participated in assisting other community members when called upon. This form of community development was interrupted during the colonial period when community members were subjected to forced labour. With the attaining of independence, the voluntary concept of *Harambee* was encouraged. The introduction of self-help groups resulted in the establishment of bureaucracies with chair-persons to mobilize the people. The returns out of self-help initiative are not necessary reciprocal, as was the case with traditional work parties. Though the self-help concept is justified by the subsequent reduction in costs, it does not necessarily contribute towards human capacity build-up.



Since there was no appropriate capacity build-up, the self-help approach adopted by PLAN International in Gachoka Division did not guarantee that the facilities would be sustainably maintained. The community, for instance, was after the rehabilitation meant to regularly clean the surroundings of the dams. The tunnels that had been dug during the rehabilitation process were meant to be regularly unblocked (due to the eroded soil). Some vegetation in the form of trees and grass was to be planted along the tunnels in order to reduce the rate of soil erosion. The current picture at the dams is dismaying. The tunnels are blocked and much soil has continued to collect at the dams. This reduces the volume of water the dam can hold, in addition to making the water extremely dirty. The few trees that were planted during the rehabilitation process have dried up, since they were not taken care of.

At Ciambingo the second tank has hardly been in use due to a fault in the first tank. The water is meant to flow to the lower tank after the upper one has filled up. The upper tank has, however, cracked a few inches below where the pipes connecting the upper tank to the lower one are such that water reaching that level is lost. A beneficiary at the source revealed that the problem has been there for the last two rainy seasons. Asked why the problem had not been rectified, she said that the source belonged to PLAN International and that the recipients hoped they (PLAN) would one day repair the tank. The informants attitude had not been changed by the self-help form of contribution she had participated in.

From the foregoing, it is evident that the community had been by-passed in the water supply development process. By-passing is a consequence of the control-oriented planning and implementation approach. When a donor agency circumvents parts of the recipient institutions and procedures, the aim is to gain better control over planning and implementation. Narayan (1993) has expressed the fear that user participation would be ignored for it is time consuming. Significantly, there is the fundamental difference between a participatory and a non-participatory approach which, as has been argued out by Therkildsen (1988), lies in the perception of the development process itself.

PLAN International did not know the subsequent problems of by-passing until the mistake had been made. According to the Borehole Mobilization Team's (BMT) Needs Assessment

Report (1993), the non participation of the users resulted in them not identifying with the facilities. As a result the users always went for assistance from PLAN International's office every time there were breakdowns. The beneficiaries had realized the reliability of the facilities but could not sustain them. Since the facilities were PLANs, the NGO had an obligation to keep servicing the facilities for the community.

PLAN International was uncomfortable with the unfolding phenomenon. They had to get the community to participate in the operation and maintenance as well as identifying with the facilities. Participation can be taken as a means and as an end, and the difference between the two is distinct. Regarded as a means, participation aims at mobilizing the intended beneficiaries to participate in the activities for which the contents have basically been determined from outside. In this case, user acceptance, knowledge and resource commitments are solicited. The users are made to accept externally funded activities. Resources are also solicited to match external assistance.

Participation regarded as an end aims at empowering the intended beneficiaries so that they may share in the control of resources, organize to control their means of livelihood and take action to bring about structural changes that increase their power. The conception of participation as an end tallies with Pauls'(1987) definition quoted earlier. The essence in participation as an end is that the community gets involved from the very beginning of a development process. This had not happened and, thus, the approach is not applicable in Gachoka Division.

In 1993, PLAN International in conjunction with USAID contracted a group of five professionals to carry out a mobilization exercise in Gachoka Division (PLAN 1993). The purpose of the mobilization project was to enhance the community's ownership and their potential to sustainably maintain the facilities. The core components of the project outreach as regards training and mobilization of the user groups and committed members included community organizational skills, the need to involve women in group activities, project management skills and hand-pump maintenance and repair. The expected benefits to the target population as a result of the mobilization primarily relate to a higher

productive human resource. The project was focused on the community's ability to effectively work together for their common good.

This study also enquired on the institutional aspects of the beneficiaries. This was after the mobilization team had been into the area. The teams activity may have had an impact on the information gathered on the institutional aspects. The researcher feels that this may not have been the case had this study been carried out before the mobilization activities. The researcher got to know of the mobilization teams' activities at the time of collecting the data. But this did not have any negative effects on the study. The researcher proceeded to collect data on institutional framework.

### **6.6 Self-help organization, membership and training**

Institutional build-up is very vital for sustainable development. This is because institutional development has been equated with social appropriateness. Social appropriateness has mainly been used to mean appropriateness within the local community. The criteria examined have all been derived from the idea of helping the community to provide for itself more successfully. Organization of such groups needs to be thought out very consistently at the village level. This was duly considered in the study area. A majority of the respondents (74%) in the study area are affiliated to a water group. Included in this category are those who have enrolled as members of their respective water sources. The information acquired from the respondents and even the group leaders shows that some people have registered as members in more than one source. This was meant to assure them of a source of water incase one of the sources became faulty or dried up.

A number of respondents (26%) have not registered themselves with any group. Some members reported that they had formed groups in the process of digging extension trenches for the piped water supply. These groups have eventually become dormant. For instance, no

meeting has been called for over five years. Such respondents were recorded as non-members. A more precise presentation of the reasons for non-membership is shown in Table 6.2.

**Table 6.2 Reasons for not having enrolled in a group.**

Reasons for Non-Membership	Frequency	%
Group dis-integrated	16	61
In permanent employment	5	19
Husbands are the registered members	3	12
No response	2	8
Total	n=26	10

From this information it is clear that the majority of the respondents (61%) had once been members of a group. Two aspects can be deduced here. First, the idea of teaming up (associative strength) for a common goal does exist. Second, mobilizing such a group would hardly be an uphill task. Such groups were, according to the Water Financial Management report - WAFIM (1993) successfully used in the privatization process of the Ngandori -B (popularly known as *NGAGAKA*) water project in Embu District. The above data shows that very few women were non-participants (12%). This implies that the women are equally active in the water group activities.

The study also found out that less than half of the respondents (40%) were involved in other groups that are independent of the water source groups. While this might indicate a more focused concentration on the water group by most of the community members, it could as well be a weakness in that participation in water group activities does not inspire members into greater initiatives. The success of a group should give rise to other group activities like a tree nursery group that initiates a commercial tree project. McGovern (1987) has recorded his experience in Pokot whereby the formation of a successful water supply group expanded its activities into other areas like irrigation and construction of a cattle dip.

The study also found out that meetings are not a common phenomenon in the study area. Over half of the respondents (57%), for instance, said that they may attend meetings only once per year. A further twenty one respondents (21%) said that meetings can be held only three times in a year. Bearing in mind the aspects that count in managing a communal water source such as the need for corrective and operative maintenance and the cleaning of the water source the researcher had anticipated on average four meetings annually. Further enquiries revealed that the committee officials usually announced the meetings through school children who in turn informed their parents. The advantage of this methodology outweighs other alternative methods like putting up a written notice at the water source since not all people will regularly visit the water source. Also, not all people in the area know how to read.

The researcher, indeed, ascertained that water group meetings are organized only when water gets scarce especially during the *Thano* season (July - October) and at times between late January and mid-March. Most of the committee members interviewed told the researcher that meetings convened during other periods hardly succeed. The reasons for this are that at these periods people will have alternative sources of water such as the streams, water jars at home as well as the wells. They, therefore, tend to mind less about their obligation to sustenance of other water sources such as the boreholes. The water use patterns, thus, has an effect on sustainability. Another reason given for non-attendance of meetings was that the community members are busy working on their *shambas*. It was revealed that planting has to be done as soon as the rains fall.

Training of the recipients in skills such as the operation and maintenance of new facilities is essential in sustaining them. Lowes (1987) observes that training of the water beneficiaries was the biggest resource need during the International Drinking Water Supply and Sanitation Decade (IDWSSD). After the mobilization exercise had been carried out by PLAN International, 17% of the respondents had undergone training in borehole operation, preventive and corrective maintenance. A substantial number of the committee members have also undergone training in book-keeping, finance and managing bank accounts. The training was done by PLAN International officials.

All the aforementioned training was offered to the committee members only. One prerequisite to training was that those to be trained had to have been elected as committee members by their respective group members. The risk of this method failing is potential because once voted out of the committee, the caretakers refuse to offer their free services as is expected of them. An incidence has been reported in Rugogwe area whereby the persons trained as caretakers (in their capacity as committee members) have refused to repair the hand-pump because the group members later on voted them out of office. There is virtually no-one who can now repair the pump since the caretakers have subsequently withdrawn. The mentioned borehole was at the time of this study broken down. A member of the mobilization team told the researcher that they hoped other community members would learn from their trained counterparts by observing what was done during the repair process. Having had some of the caretakers and committee members trained as recently as January 1995, it might have been a bit too early for the researcher to access the presumed way of learning how to technically maintain the hand-pumps.

The researcher also discovered that some of the manuals used in the training of the caretakers in the area had been developed by the United Nations Development Programme (UNDP) for the purpose of Training of Trainers (TOT) during the IDWSSD. These materials are slightly complicated for the caretakers. A member of the mobilization team acknowledged this shortcoming. She also revealed that some of the caretakers had problems in remembering some parts by name, although they could explain their purposes in the hand-pump when shown. They could also remember their appropriate fitting. The training offered by PLAN International will, therefore, have to be judged with time.

### **6.7 The participation of women in water groups activities**

It has come to be accepted by development planners that incorporating women into the development programmes is to improve the overall economic development of the country. This study found out that women are getting more involved in the management of water sources through active participation in group activities. Table 6.3 exemplifies this.

**Table 6.3 Comparative composition of committee members**

Water sources (Boreholes only)	No. of men	No. of women	Total	No. of women in top position
Gataka B/H	7	6	13	1
Kavondori B/H	6	5	11	3
*Rugogwe B/H	3	9	12	1
Kwa Ithanje B/H	4	7	11	1
Andu a Nyaga B/H	4	8	12	1
Kaai B/H	3	7	11	1
Kambindi B/H	6	9	15	1
Nyangwa B/H	4	4	8	2
Gatirari B/H	7	6	13	1
*Irabari B/H	5	8	13	0
TOTAL	49	69	118	12

\*Irabari and Rugogwe boreholes were at the time of collecting the data broken down.

The data on the composition of committee members of the boreholes shows that though the majority of the committee members (59%) are women only twelve (12) of them are in key leadership positions. The key leadership positions in this case are the chair-person, secretary and treasurer. It is, nonetheless, observed that women are active participants in leadership activities. This may be as a result of the central role they play in relation to water consumption. The small number of women in top leadership position may be attributed to the local peoples cultural belief, as in most other African societies, that the men occupy the top leadership positions where their opinion is widely respected. This subsequently resulted in the marginalization of women in leadership.

At the FGD most of the discussants articulated the fact that there were no true role divisions between men and women. This was, however, annulled by the fact that a majority of the women stated that men were more suited to doing harder work such as digging holes and

construction work while the women involved themselves in cleaning the water supply facilities. The discussants were further asked to give reasons as to why there were no women committee members in other sources such as the tanks at Ciambingo. No one gave a convincing reason. This proved that women had been elected to the committees of various groups because the mobilization team had insisted on the same. It is, therefore, hoped that the crucial role women play in these committees will be spread to other sectors such as making decisions on socio-economic issues as well as other water sources apart from the boreholes.

Strength of women participation in decision making was witnessed at Gataka area during a meeting of the Gataka borehole group members, which was one among the many group meetings the researcher attended. In the Gataka case a proposal by a committee member to employ a female attendant at the hand-pump was vehemently opposed by the women present at the meeting. The women said that they preferred a man for the position because women were less sympathetic to their fellow women in case one had not paid the monthly fee and that men were better placed to promptly solve problems such as pushing or disorderliness. The women were definitely the best placed to choose an attendant since they are the ones who use the sources most frequently.

The dimension of electioneering may be added here as a probable reason for the low positions women are elected to in the committee leadership. The registered members of a particular borehole first elect the committee members. The elected committee members then re-group and elect each other to the specific positions. The larger community is thus, denied the right to choose, for example, their chair-person. Infact, there is only one borehole group, that is Kavondori, that is headed by a chairlady. It was impossible to establish why the women elected to the committee leadership could not use their majority vote, for instance in the case of Rugogwe and Kambindi borehole groups (see Table 6.3) to elect other women to key positions.

The community should also set and follow its own rules so as to effectively make use of and manage the facilities. A substantial number of the respondents (79%) stated that there



are rules that are enforced at the sources they used. Most of the rules apply at the boreholes and dams. At the dams, for instance, the community members are not supposed to water their livestock at the dams meant for human consumption. In relation to boreholes, the rules differed from one group to another. Some groups have organized shifts and each consumer is expected to fetch water at the time the shift one is allocated to is set to be at the water source. Queuing is a compulsory rule at the boreholes visited. The observation made is that even where no rules had been set, the people are courteous. At the wells, for instance, the people have to queue as they wait for the water recharge to occur. The very elderly people are always excused and need not queue. The study also found out that in the case of boreholes, the committee set the rules, which were later passed to the community members to approve. Twenty nine respondents (29%), however, stated that the community members directly set the rules. All the same, the above confirms the community's participatory role in setting the rules.

### 6.8 User fee

Willingness to contribute is related to the community's expectations of the water supply facility. If the supply does not provide what is expected, then, willingness to contribute to the operation and maintenance of the system will decrease. In the study area, a majority of the respondents (83%) paid some fee at the source that they used. Most of these sources are the boreholes and, to a lesser degree, the piped supply and the rock catchment tanks. Table 6.4 presents this information more explicitly.

**Table 6.4 Sources where user fee is paid**

Source	Frequency	%
Boreholes	58	70
Piped supply	14	17
Rock catch tanks	11	13
Total	n=83	100

The GOKs Fourth Development Plan (1979) explicitly established the policy that everybody has to pay for water services. Schultzberg (1978) rightly observed that in the (LDCs) resources required for operation and maintenance are frequently underestimated. Countries are often able to attract external resources for development but not for operation and maintenance. This, then, called for the need to develop and implement cost recovery policies to minimize subsidies by, for instance, the government. This is possible through appropriate tariff structures or by contribution from the users for operation and maintenance. The latter model has been used in the study area.

In essence, most payments occur at the boreholes. This should be expected because of the necessary operation and maintenance costs that have to be carried out in order to keep the hand-pumps functional. Though fourteen respondents (17%) said that they paid for the piped connections, the researcher established that the water office at Kiritiri had temporary ceased collecting the revenue because "no services were being offered." The piped supply hardly supplies water to the people. The mode of payment differed from one area to another as shown in Table 6.5.

### 6.5 Mode of paying user fee.

Mode of Payment	Frequency	%
Monthly	40	48
Seasonally	31	37
Daily	12	15
Total	n=83	100

Table 6.5 shows that half of those who pay user fees usually pay on monthly basis. It is, nonetheless, disturbing that a moderate proportion (37%) will pay money only when they need to make use of the source. A case in point was recorded at Kavondori hand-pump. Some time in February, when this researcher was in the field, the particular group committee met and one of the meeting's resolution was to begin charging the consumers (charging had ceased for sometime). The consumers were expected to pay Kshs twenty (20) for that month. Other

seasonal sources were drying up. That night unexpected rains were experienced. On finding an attendant at the hand-pump, the people opted to scoop the water that had collected on river beds that night.

This is in itself a threat to sustainability because the group will not be in a position to accumulate enough money for maintenance. It is, in fact, feared that if the user groups fail to accumulate enough money now, they may have problems in sustaining the facilities in future. This is because as the facilities grow older, more money will be spent especially on items such as centralizers and pump rods (in the case of the hand-pumps) which are expensive and are already consuming most of the money spent on repairs. The costs of repairs today are on the lower side since most groups are having the pump rods welded. The strength of the contribution method is by all means questionable especially when not all household members pay. A major weakness in the financial management by the grass root groups is that none of the groups has opened a bank account. The prerequisite to opening a bank account is the registration of the group as a grass-root welfare organization. Registration is done at the Ministry of Culture and Social Services. Only two user groups (Gataka and Kavondori, both in Nyangwa sub-location) have been registered. The money raised by the other group members is kept by the committee members, an exercise that has resulted in the mis-appropriation of funds. In Kithunthiri sub-location, for instance, the Andu a Nyaga borehole group members complained to the researcher that some committee members had misused their contributions, but since those people are close friends of one of the local administrators, no action had been taken to ascertain the truth.

Frustrated by the silence of the local administration against corrupt officials, the Andu a Nyaga borehole group members went ahead and dismissed the entire committee and elected a new group into office. The local administration was further compelled by the group members to recognize the new officials. Unfortunately, the new group did not manage to recover the money alleged to have been mis-appropriated. A similar case of mis-appropriation of funds has also been reported at Ciambingo water source. The researcher found out that the group members had refused to contribute towards the repair of the faulty system, even after they had been made

to understand that PLAN International would no longer assist them in maintaining the source. At this source the peoples anger is aggravated by an official who has specialized in selling water to institutions during the dry season such that the water gets finished rather fast. This forces the area residents to start walking long distances and spending a lot of time (and in some cases money) in search of water at a very early stage of the dry season.

PLAN International has in its mobilization programme been encouraging the various groups to open bank accounts. The issue of mis-appropriation which was used to strongly justify the need to open bank accounts is rather sensitive and could not be raised during the FGDs and interviews with key informants. The discussants were rather asked to give reasons why no bank accounts were operational and the general feeling raised was that opening a bank account required money (minimum deposit). The discussants felt that it would not be easy for the group members to contribute money that would otherwise not be for their immediate benefit. There is logic in this argument given the fact that some members (37%) preferred paying money only when they were in need of using the particular water source or when a source had to be repaired.

The reason why there are no groups with banks accounts is an attitudinal one. The mobilization team would have contributed towards the change of attitudes had they highlighted the other benefits of opening bank accounts, such as the money deposited in a bank account earning interest, saving more money for use in the future and the like. It was unfortunate the mobilization team had only highlighted the need to bank the money collected in order to avoid mis-appropriation.

From the foregoing it is clear that the initial lack of user participation has had an impact on the sustainability of the facilities. The mobilization model coupled with the reliability of the improved facilities has encouraged institutional development. The community water use patterns has not substantially changed. This has to some extent affected the community's willingness to contribute towards the sustainability of the improved water supply facilities as is evidenced in some groups' mode of payment.

## 6.9 Maintenance of the water sources

Most of the improved water sources will in one way or the other require some attention in order to keep functioning. The community members must play a part in maintaining these sources. The enthusiasm of the beneficiaries can be cultivated (and subsequently become easier to sustain), during the construction phase. This is when the community members should be encouraged to identify with the projects, develop them and sustain them.

As has been seen, the community was largely by-passed during the project design and construction phase. The mobilization activity undertaken by PLAN International has aroused the community's need to maintain the water facilities for themselves. A majority of the respondents (75%) said that they reported any faultness on the facilities to the elected committee members and/or the caretakers. This is in contrast to the observation by the BMT (1993) in which it was reported that in case of faultness, the community members always sought assistance from PLAN International. This proves that the people's attitude towards maintenance has changed. A small number of respondents (16%) said that they usually informed the government officials. This was in direct reference to the government employees at the dams and the MLRRWD water officials at the Kiritiri water office.

A substantial number of respondents (75%) further said that it was the work of the caretakers to do the repair works. The reason given was that the caretakers had been trained to undertake repair work. The fact that only a small number of respondents (25%) said that it is the responsibility of either the government or PLAN International to do the repair work may be an indicator that the community has appreciated the central role they ought to play in maintenance. Moreover, a majority of the respondents (78%) stated that they helped in the process of repairing the water sources. This shows the degree of the active role the members are taking in maintenance. The collective role taken by the community members especially in repairing the hand-pumps, whereby the removal and replacement of the pipes needs a lot of careful manual work is a good indicator of community identification with the

projects. The emerging success in the community's ability to maintain the facilities proves Lowes (1987) point that performance is significantly improved when capacity building encompasses training in technical skills as well as organizational reform.

The researcher also confirmed that most of the repair works are done in a week or two. This happens where strong institutional development has been developed as is the case with the Gataka group. This hand-pump is repaired as soon as a problem occurs. One of the caretakers lives nearby and like other caretakers he always has the essential spare-parts at hand. It is only when major repair works like welding have to be done that time is taken to repair the pump, since welding can only be done at Kiritiri market. At this source, it is compulsory for every member to contribute a monthly fee of twenty shillings. Money is always at hand in case of a major breakdown.

#### **6.10 Self-help groups and PLAN International.**

PLAN International got involved in the water supply sector in Gachoka Division in 1988. This was after a major Field Office Target Impact Evaluation report (FOTIE) revealed that 85% of the water sources sampled in Gachoka Division did not meet the minimum standards of palatability as defined by WHO. As a result, 123 boreholes have been drilled in Gachoka Division.

The commencement of the drilling exercise did not take into consideration the vital role the community members should have played, which is having to fully involve the community members in planning, design, construction operation and maintenance. The beneficiaries were sidelined to the detriment of the improved water supply facilities. The resultant trend of unsustainability began to be tackled in 1993, and thereby beginning an era of close collaboration between PLAN International and the community members in the water supply sector. Table 6.6 shows the areas in which networking has been established between PLAN International and the community members, courtesy of the BMT.

**Table 6.6 Borehole mobilization project activities**

Activity	Expected Targets (Feb 1995)	Actual Achievements (Feb 1995)	Achieved % (Feb 1995)
Leaders meetings	8 locations	3 locations	38
Community sensitization	8 locations	3 locations	38
Village community meetings	120	22	18
Committee structuring and caretaker selection	120	21	18
Committee training	120	2	18
Borehole construction, installation and rectification	57	25	44
Borehole fencing	120	24	20
Caretaker training	120	18	15
Handing over of boreholes	93	19	20

**Source: Community Mobilization Report, PLAN International-EMBU(1995)**

The data shown covers the whole of Gachoka Division. From Table 6.6 it is seen that though the mobilization team had not achieved most of its targets, the project component is geared towards the enhancement of sustainable maintenance on boreholes. In detail the mobilization teams' mobilization model included the following:

- (i) **Meeting with leaders** - the local administration leaders; chiefs and assistant chiefs are informed of the planned activities. They are also requested to assist where necessary, such as in the convening meetings.
- (ii) **Community sensitization** - Whereby the borehole leaders are informed of the presence of the mobilization team, its activities and the expected community contributions, such as ideas on how to manage the boreholes.
- (iii) **Village community meetings** - This is where all the beneficiaries of a particular borehole meet at the site of the borehole (where possible). The members are then educated on health aspects and how to elect suitable leaders for the project. (The activity of creating health awareness and the need to elect proactive leaders seems to

be weak in approach in that the mobilization team is not adapting its method to the local community but is instead trying to make the local community adapt to the project. It is more appropriate for the project team to discuss and evaluate issues on health and leadership with the community than teaching the community members on the same).

- (iv) **Committee structuring and caretaker selection** - This is where the community members elect the group representatives out of whom caretakers are selected.
- (v) **Committee training** - A few committee members are trained in leadership skills, book-keeping and operating bank accounts.
- (vi) **Caretaker training** - The caretakers are trained to dismantle, investigate a problem, repair and re-assemble the hand-pump.
- (vii) **Handing over of the borehole** - The necessary rectification of the borehole is done such as the changing of galvanized mild steel rods with stainless steel rods where excessive corrosion is detected. The facility is then handed over to the community for management, operation and maintenance. A liability release clause is signed showing that the beneficiaries are ready to operate and maintain the facility.

The model adopts all the aspects of participation as a means, in order to ensure that user acceptance, knowledge and resource commitments is achieved. The success of the mobilization model is ascertained by a comment by one of the respondents who said;

When PLAN International drilled the boreholes, we were never consulted. Everyone believed that the hand-pumps belonged to PLAN and it was their responsibility to maintain them. It has, however, dawned on us that we are the immediate beneficiaries because we rely on them for water even during the *Thano* (dry) season. We need not go far away to look for water. With the training given by PLAN, we have come to accept that these sources are ours and must therefore take responsibility in maintaining them.

Apart from mobilization on the maintenance of boreholes, PLAN International has also assisted in the construction of a water tank at Ciambingo. This was undertaken jointly with the community members. PLAN International also assisted the community members



in the rehabilitation of the dams under the food for work programme. It is, however, unfortunate that the mobilization teams' activities are focused on the maintenance of boreholes only. This has led to the neglect of other sources such as the dams and the water tanks. This neglect is attributed to the fact that most of the community members who use the dams and the water tanks are concentrated in areas where no boreholes have been drilled. These people resort to using the boreholes during the dry season when other sources dry up. Those around the dams, for instance, at Kerwa area, hardly use the boreholes since the dams can provide water throughout the year. These people are, therefore, not a target group of the mobilization team. That notwithstanding, the mobilization teams' activities have helped in reducing the high level of dependency reported in the Needs Assessment Report. 72% of the respondents said that the improved water supply sources are community owned. The FGD discussants agreed that the community members have appreciated the role they are expected to play in sustaining the facilities.

#### **6.11 Self-help groups, the government and other external organizations**

Unlike PLAN International, no other organization has established close collaboration with the community in relation to the improvement of the water sector. The government of Kenya was the first to initiate water supply projects. Under the Special Rural Development Programme (SRDP), the government installed the piped water supply. The community members were involved in that they formed self-help groups. The group members then assisted in the digging of water trenches from the main pipes to the public stand posts. The piped water supply has with time become very unreliable in that the water never reaches the consumers in the study area. The self-help groups have dis-integrated. The Kiritiri water supply office functions independent of the community, with full-time government employees. It seems that the community members become least interested in water sources that do not meet their needs, as Arlosorff *et al.*, (1987) have alleged.

The dams in the study area were also constructed by the government in the early 1980's. The community members did not play any role in the process of their construction. For a long time, therefore, the community has not identified with the dams. No effort was, for instance, made to clean the dams. In fact, the same dams were on the verge of getting fully blocked by sand and water growing plants, until PLAN International offered to assist in rehabilitating them.

In the course of PLAN International's mobilization activities, the governments assistance in the areas of public health, social development assistants, and engineers was sought but the response received by PLAN International was minimal (PLAN 1995). The problem of compensation and lack of commitment from some of the government officials became apparent after about five months into the activity. The joint exercise was subsequently dropped. It, therefore, seems that the chiefs and their assistants have been the only perpetually committed government representatives. This was further evidenced by the fact that the Kiritiri water office did not have up-to-date records on the number of water sources developed by the NGO. This information was readily available at the chiefs offices.

The churches have also not been widely involved in the development of the water supply sector. Apart from the catholic church, no other church has initiated or collaborated with the community in developing the water sector. Even with the catholic church, only fourteen respondents (14%) indicated that they had benefitted from the catholic church project. This was in reference to the earth dams at Rugogwe and Mayori areas.

PLAN International had intended to involve the church in the exercise of enhancing sustainability of the boreholes. The NGO had proposed to the catholic church in the area (which also happens to be the most widely distributed church) to stock borehole spare-parts which they would then sell to the community members. No evidence was adduced to prove that the catholic church had accepted the idea, neither was there a denial of the same. But the fact that the NGO is now advising the community on where to acquire the spare-parts in Erabu

town as well as in Nairobi proves that the catholic church did not honour PLANs request.

From the foregoing, it is clear that the community's prior by-passing particularly by PLAN International, was counteracted through the mobilization model which is based on the concept of participation as a means. The data availed shows that the model is realizing its goal of promoting the sustainable maintenance of the water supply facilities. Since the mobilization models's target is on the boreholes, much evidence of its success is, therefore, evidenced on the maintenance of boreholes more than any other source.

On inter-organizational networking , PLAN International appears to be the only external agency that is diligently working with the local groups for sustainable maintenance of the water supply facilities. This study, thus, establishes that the NGOs contribution to human capacity and institutional development in the form of community mobilization has greatly enhanced the community's ability to sustainably maintain the boreholes. The same cannot be said of other improved water supply facilities in the area.

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## CHAPTER SEVEN

### CONCLUSION AND RECOMMENDATIONS

#### 7.0 Introduction

This chapter focuses on the study's conclusion and recommendations arising from the findings discussed in chapter five and six.

#### 7.1 Conclusion

The main aim of this study was to establish whether the water sources developed in Gachoka Division are being sustainably managed by the community members. Three factors were considered; reliability of the water sources, community participation and institutional framework. The study's hypotheses were that the improved water supply facilities are more reliable sources of water and, hence, are more preferred and sustainably maintained than the unimproved indigenous sources, that community participation in project planning and implementation is likely to bring about sustainable management of the water sources and that the development of a strong institutional framework will result in sustainably managed water sources.

This study was guided by the social systems theory. Various data collection techniques were used. These included the use of a standard questionnaire, focus-group discussions, interviews with key informants, use of secondary data and observation. The data collected were analyzed and descriptive statistics have been used.

The data gathered on reliability indicates that the improved water sources such as the dams and boreholes are widely used by the community members to meet their domestic water needs. The dams and boreholes can supply the recipients with water throughout the year. A majority of the respondents indicated that they preferred the sources they mostly relied on because most of the other sources are unreliable. Other improved water sources in the area especially the

water jars and rock catchment tanks are usually used during and shortly after the rainy season. Like other sources in the study area such as the streams and wells, these sources are seasonal in nature.

The study findings indicate that water supply becomes most acute during the period between July and October, when most seasonal streams virtually dry up. A majority of the respondents, however, indicated that though they underwent some difficulties in getting the water such as queuing for a long period (62%) as well as water rationing during the aforementioned period (22%), they were always assured of getting some water. This was viewed to be much better than the period prior to the provision of the improved water sources when the area residents usually trekked long distances in search of water. Even though the water quantity may not be adequate, it is not as scarce as it was about fifteen years ago.

A majority of the respondents indicated that they most needed water in the mornings and evenings(72%). In order to meet this demand, most boreholes remain operational during these times but are locked during the low-peak hours. Those using the dams could fetch water at their own convenient times. The availability of water at the times the recipients need it most indicated that these sources are reliable. A majority of the respondents (86%) indicated that the improved water supply facilities had been of great assistance to them in relation to the availability of water for domestic use.

Another finding of this study is that the recipients were not actively involved in the design and development of the water supply facilities by either PLAN International or the government, (the only organizations that have played an active role in the development of water supply facilities). Only a few community members were directly consulted, most of who were in leadership positions. A few of the community members participated in the implementation of the piped water supply scheme. Their involvement was by way of digging trenches. Similarly, only a few people were involved in the rehabilitation of the water sources. The by-passing of the beneficiaries in the development process resulted in the lack of human growth such that the community members could not even identify with the improved facilities. The facilities were perceived as PLAN's or government projects.

A mobilization approach adopted by PLAN International has reversed the trend of unsustainability. The beneficiaries now contribute towards the maintenance of the water sources. A few of the beneficiaries have been trained as caretakers (17%) while it is hoped that a substantial number of other beneficiaries will learn the same from the already trained caretakers. The beneficiaries have also formed groups and have, thus, strengthened their capacity to run the water supply facilities. Available data indicates that the women in the study area are getting involved in the management of the water sources. Out of a total of 118 officials of ten different boreholes, 59% are women. The top positions of the sources chairmen, secretaries and treasurer are dominated by 18 men (60%) and 12 women (40%).

The mobilization exercise, however, falls short of credit for two main reasons. First, the build up on human and institutional strength is evidenced among borehole users such that other improved water sources like the dams and the rock catchment tanks are poorly managed. The necessary inputs such as strong group organization with a clear outline and policy on how to manage other sources is conspicuously lacking. Secondly, the mobilization exercise has wrongly synonymized self-help for traditional work parties. The mis-conception of the two concepts and their subsequent use in the area has resulted in failure as is the case with dams. The food-for-work method used in mobilizing the beneficiaries to participate in the rehabilitation process did not help in motivating them to adopt routine maintenance. This is, therefore, not an effective way of involving the community in development.

The study also revealed the water use pattern in the study area. A majority of the community members made use of different sources. Those who rely on the boreholes for water during the dry season could as well use the seasonal sources such as streams, water jars, wells and rock catchment tanks at Ciambingo during the wet season. While the number of registered users at a source like the boreholes kept on fluctuating depending on the season, the reported user behavior had an adverse effect on the management of the water sources in that some of the recipients committed themselves, mostly in the form of user fee, during the dry seasons only, when other seasonal sources dried up. In essence, the respective groups have not accumulated enough resources needed for routine operation and maintenance.

Finally this study established that the beneficiaries were strongly associating with PLAN International. This networking has largely occurred during the mobilization exercise. The catholic church's collaboration with the community in connection to sustainable management of the water supply facilities had been proposed to the church by PLAN International, but the same was not evidenced in the process of research. The government is functioning independent of the community members through the MLRRWD officials.

The government implemented projects, that is the dams and the piped water supply are poorly maintained and highly unreliable respectively. Where collaboration is evidenced as is with PLAN International and beneficiaries through the mobilization exercise, sustainable management is being experienced.

### **7.2.1 Recommendations**

In view of the study findings, a number of recommendations are made. First, this study has ascertained that the improved water supply facilities especially the boreholes and the dams have minimized the problem of water supply. It is, nonetheless, emphasized that water is still not adequate in this area. There, therefore, arises the need to come up with more water supply projects. The community's plans of pumping water from Thiba river can go a long way in alleviating the inadequacy of water supply. Such a project, thus, deserves attention. More boreholes should also be drilled, particularly in areas such as Mutus where the area residents are in the middle of unreliable sources such as the streams and the piped supply.

Second, in the event of developing new sources, the beneficiaries should be involved in all the development stages, from decision-making to design, implementation and maintenance. The relevant training on operation and maintenance should also be offered during the process and not after as was the case in the already developed facilities in Gachoka Division. Full user participation will enhance the sustainability of the developed water supply facilities.



Third, the researcher also recommends that unplanned sand harvesting be stopped because it has resulted in less water being retained below the ground level. Once the sand is scooped, the water on the ground is exposed to rapid evaporation. In effect, the community members have continued to loose the ground water sources, resulting in congestion in other areas like the boreholes. This recommendation is further strengthened by the fact that underground water is cleaner than surface water, since the former will have been sieved of unpalatable materials by the sand. Besides, these sources can be used for watering the livestock. There is, therefore, the need to diligently safeguard the underground water sources before the aquifer is affected.

Fourth, the study recommends for an elaborate recording of the beneficiaries water use pattern since the study has proved that the use of different sources at different times has an adverse effect on sustainable maintenance. The benefits of such a study are that planning for water supply development in the area puts the beneficiaries interests into consideration. The overall advantage is that health campaign can be adequately addressed by encouraging the beneficiaries to use hygienic sources such as the boreholes and water jars for consumption purposes while other sources are used to satisfy other domestic needs like washing of clothes. No source would eventually be neglected at any particular time.

Fifth, the study has established that the beneficiaries were facing problems in getting water. These problems ranged from long queues to long distances being covered in order to get to the water sources as well as the scooping of water from the tanks at Ciambingo. Such problems do not auger well for the sustainable maintenance of the water supply facilities. These problems deserve immediate attention by the community and development agencies. The group leaders should mobilize the beneficiaries to solve such problems. The problem of having to wait for long so as to get the water can be solved through the implementation of more water supply facilities with the full involvement of the beneficiaries. The planning and implementation of more facilities should be matched with the population increase to avoid over-reliance on a few sources. The ascertaining of the population growth should also determine the type of water supply to be developed. A piped water supply, though more expensive to implement, can supply more people with water than boreholes or protected wells.

Sixth, the study advocates for the rehabilitation of facilities such as dams so as to make them more palatable. In this case, simple appropriate technology can be used. This would involve the use of ballast and sand. The ballast should first be laid on the ground all over the dam. Sand would then be put on top to cover the ballast. The water that runs to the dams would percolate through the sand, with the undesirable elements being sieved by the sand. A tap would then be connected to the lower wall of the dam where the beneficiaries can draw water from. The sand may be changed with time, depending on how well the catchment area has been developed. A well developed catchment area will reduce the amount of elements such as soil, sand, leaves or rocks that are eroded into the dam. This method will not only ensure that the water quality is good, but will also reduce the evaporation rate since the water will have been covered by the sand. Such a conservation process would eventually enhance the reliability of the source as well as its sustainability.

Seventh, the researcher further recommends that all the grass-root groups formed in area be registered with the ministry of Culture and Social Services. This should then be followed by the opening of bank accounts. In addition to ensuring transparency and accountability, the registration of the groups and opening of accounts would strengthen their organizational structure such that the members develop the capacity to maintain the water supply facilities on short and long-term basis.

Finally, inter-organizational collaboration should be promoted and strengthened, more so with the government agencies such as the MLRRWD. The BMT, the brain child of PLAN International, should broaden its functions to cover other water supply facilities such as the dams. The community members should also be provided with the technical aspects of developing the cattle troughs at the borehole sites. This will make watering of the animals at these sites much easier and convenient.

### **7.2.2 Future research**

This research is not exhaustive. Further research should be undertaken to ascertain the long term effects of the mobilization model adopted by PLAN International. Research should also be carried out on the health benefits of the improved water supply facilities in Gachoka Division.

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## APPENDIX I

## QUESTIONNAIRE

The following questionnaire was administered at the household level.

Questionnaire number \_\_\_\_\_ Time/Date \_\_\_\_\_

- 1) Name? \_\_\_\_\_
- 2) Age? \_\_\_\_\_
- 3) Sex? \_\_\_\_\_
- 4) Marital Status? \_\_\_\_\_
- 5) Sub-location? \_\_\_\_\_
- 6) Location? \_\_\_\_\_
- 7) For how long have you been a resident of this sub-location/location? \_\_\_\_\_
- 8) How was the domestic water supply situation ten years ago/when you first settled here? \_\_\_\_\_
- 9) Where do you fetch your water for the following uses from?
  - a) Cooking \_\_\_\_\_
  - b) Drinking \_\_\_\_\_
  - c) Bathing \_\_\_\_\_
  - d) Washing Clothes \_\_\_\_\_
  - e) Watering your Livestock \_\_\_\_\_
- 10) Who fetches the water for use in the house? \_\_\_\_\_
- 11) Have you always fetched water from the source(s) you have mentioned?
 

Yes \_\_\_\_\_

No \_\_\_\_\_
- 12) If No, what other sources do you use? \_\_\_\_\_
- 13) Where did you use to get your water from before the improved sources were developed? \_\_\_\_\_
- 14) For how long have you been using the preferred sources? \_\_\_\_\_
- 15) Why do you prefer using the source(s) mentioned? \_\_\_\_\_
- 16) Are there difficulties/problems experienced in getting the water from the source(s) you use?
 

Yes \_\_\_\_\_

No \_\_\_\_\_

- 17) If Yes, what, are the difficulties/problems experienced? \_\_\_\_\_
- 18) How many times in a day is water fetched for use by the family members?
- (i) Once \_\_\_\_\_
  - (ii) Twice \_\_\_\_\_
  - (iii) Thrice \_\_\_\_\_
  - (iv) Four times \_\_\_\_\_
  - (v) Five times (and more) \_\_\_\_\_
- 19) What time do you find it convenient to fetch water?
- (i) Early Morning (Before 10.00)
  - (ii) During the day (Between 10.00am and 4.00pm)
  - (iii) Evening (After 4.00pm)
- 20) Do you always get water at the time you prefer?
- Yes \_\_\_\_\_
- No \_\_\_\_\_
- 21) How do you water your Livestock?
- (i) Drive them to the water source \_\_\_\_\_
  - (ii) Carry water to the homestead \_\_\_\_\_
- 22) Do you experience water shortage?
- (i) Yes \_\_\_\_\_
  - (ii) No \_\_\_\_\_
- 23) What time/season of the year do you experience water shortage? \_\_\_\_\_
- 24) Have the improved water supply facilities been of help as sources for domestic water?
- (i) Yes \_\_\_\_\_
  - (ii) No \_\_\_\_\_
- 25) Were you involved in;
- a) Identifying water supply as a priority need?
    - (i) Yes \_\_\_\_\_
    - (ii) No \_\_\_\_\_
  - (a1) If yes, how were you involved? \_\_\_\_\_
  - (a2) If No, Why were you not involved? \_\_\_\_\_
  - b) Choosing the site and type of technology to be used in developing the water source(s)
    - (i) Yes \_\_\_\_\_
    - (ii) No \_\_\_\_\_

- (b1) If Yes, how were you involved? \_\_\_\_\_
- (b2) If No, Why were you not involved? \_\_\_\_\_
- c) Construction of the improved facilities?
- (i) Yes \_\_\_\_\_
- (ii) No \_\_\_\_\_
- c1) If Yes, in what way were you involved? \_\_\_\_\_
- c2) If No, Why were you not involved? \_\_\_\_\_
- d) Rehabilitation of the sources?
- (i) Yes \_\_\_\_\_
- (ii) No \_\_\_\_\_
- d1) If Yes, how were you involved? \_\_\_\_\_
- d2) If No, why were you not involved? \_\_\_\_\_
- 26) Are you a member of the community water group(s)
- (i) Yes \_\_\_\_\_
- (ii) No \_\_\_\_\_
- 27) If No, why are you not a member? \_\_\_\_\_
- 28) What other groups are you enrolled in?
- (i) Social Welfare groups \_\_\_\_\_
- (ii) Economic Welfare groups \_\_\_\_\_
- (iii) Health groups \_\_\_\_\_
- (iv) None \_\_\_\_\_
- 29) Are water issues discussed in such other groups?
- (i) Yes \_\_\_\_\_
- (ii) No \_\_\_\_\_
- 30) Do you attend the water supply groups meetings?
- (i) Yes \_\_\_\_\_
- (ii) No \_\_\_\_\_
- 31) If No, why? \_\_\_\_\_
- 32) How often do you attend meetings?
- (i) More than four meetings in a year? \_\_\_\_\_
- (ii) Three meetings in a year? \_\_\_\_\_
- (iii) Two meetings in a year? \_\_\_\_\_
- (iv) One meeting in a year? \_\_\_\_\_
- 33) How do you get to know when members should meet? \_\_\_\_\_

- 34) Have you received training related to the maintenance of the water sources?  
(i) Yes \_\_\_\_\_  
(ii) No \_\_\_\_\_
- 35) If yes, What have you trained on?  
(i) As a caretaker of the water source(s) \_\_\_\_\_  
(ii) In leadership skills? \_\_\_\_\_  
(ii) Not applicable \_\_\_\_\_
- 36) Where were you trained? \_\_\_\_\_
- 37) Who offered the training?  
(i) PLAN \_\_\_\_\_  
(ii) Government \_\_\_\_\_  
(iii) Others (Specify) \_\_\_\_\_
- 38) How long was the training? \_\_\_\_\_
- 39) Are there rules applied in relation to the use of the water sources?  
(i) Yes \_\_\_\_\_  
(ii) No \_\_\_\_\_
- 40) If Yes, what are the rules? \_\_\_\_\_
- 41) Who set the rules?  
(i) The government \_\_\_\_\_  
(ii) PLAN International \_\_\_\_\_  
(iii) The committee members \_\_\_\_\_  
(iv) The community/group members \_\_\_\_\_
- 42) Have you witnessed a time when people fail to follow the rules?  
(i) Yes \_\_\_\_\_  
(ii) No \_\_\_\_\_
- 43) If yes, what action is taken? \_\_\_\_\_
- 44) Do you pay money at the water source(s)  
(i) Yes \_\_\_\_\_  
(ii) No \_\_\_\_\_
- 45) For what source is money paid? \_\_\_\_\_
- 46) How often do you pay the money?  
(i) Daily \_\_\_\_\_  
(ii) Weekly \_\_\_\_\_  
(iii) Monthly \_\_\_\_\_

- (iv) Yearly \_\_\_\_\_
  - (v) Seasonally \_\_\_\_\_
  - (vi) Other (Specify) \_\_\_\_\_
- 47) To whom do you pay the money? \_\_\_\_\_
- 48) To who do you communicate to incase of faultness of the water supply facility?  
\_\_\_\_\_
- 49) Who is responsible for repairs? \_\_\_\_\_
- 50) Give reason for your answer to question 49? \_\_\_\_\_
- 51) What role do you play incase of a breakdown? \_\_\_\_\_
- 52) How long does it take to have a faulty system repaired?
- (i) A day \_\_\_\_\_
  - (ii) Less than a week \_\_\_\_\_
  - (iii) Less than a month \_\_\_\_\_
  - (iv) Less than a year \_\_\_\_\_
  - (v) Over a year \_\_\_\_\_
  - (vi) Not applicable \_\_\_\_\_
- 53) What form of assistance have you received from
- (a) The Church \_\_\_\_\_
  - (b) PLAN Internaitonal \_\_\_\_\_
  - (c) The government \_\_\_\_\_
  - (d) Any other agency (specify) \_\_\_\_\_
- 54) Who now owns the improved water supply facilities?
- (i) The community? \_\_\_\_\_
  - (ii) The government? \_\_\_\_\_
  - (iii) PLAN International? \_\_\_\_\_
  - (iv) Others (Specify) \_\_\_\_\_

**Focus-Group Discussion Guiding Points**

- 1 The availability of water for domestic use before the implementation of the improved water supply facilities.
- 2 The recent development's impact on the availability of water for domestic use.
- 3 The community's role in the development of the improved water supply facilities.
- 4 The community's role in the maintenance of the improved water supply facilities
- 5 The external agencies and the grass-root community organization's collaboration in relation to water supply and the nature of the relationship.