

**SOCIO-ECONOMIC CONSTRAINTS TO COMMUNITY PARTICIPATION IN RURAL  
WATER MANAGEMENT IN NDARUGU-THIRIRIKA SUB-CATCHMENT, ATHI  
BASIN, KENYA**

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Master of Science in Hydrology and Water Resources in the School of Pure and Applied  
Sciences of Kenyatta University**

**NOVEMBER 2013**

**DECLARATION**

I declare that this thesis is my original work and has not been presented for a degree or any other award in any other university.

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## **DEDICATION**

I dedicate this work to my mum Mary and my brothers John and George for their encouragement and moral support.

### **ACKNOWLEDGEMENT**

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**ACRONYMS AND ABBREVIATIONS**

ADB	African Development Bank
ANOVA	Analysis of Variance
CBO	Community Based Organization
CDD	Community-Driven Development
CRC	Catholic Relief Services
ERS	Economic Recovery Strategy
FGD	Focus Group Discussion
GTZ	Deutsch Gesellschaft fur Technische Zusammenarbeit (German Technical Cooperation)
IDRC	International Development Research Council
IFAD	International Fund for Agriculture
ISM	Institutional Support Mechanism
Km	Kilometres
KNBS	Kenya National Bureau of Statistics
MDG	Millennium Development Goals
NGO	Non-Governmental Organization
NRSP	Natural Resources Systems Programme
OECD	Organization for Economic Development
O&M	Operation and Maintenance
PRA	Participatory Rural Appraisal

PRSP	Poverty Reduction Strategy Paper
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
SWOT	Strengths, Weaknesses, Opportunities and Threats
UN	United Nations
WHO	World Health Organization
WRMA	Water Resource Management Authority
WRUA	Water Resource Users Association
WWAP	World Water Assessment Program

## ABSTRACT

In rural areas, water availability in the right quantity and quality is an important step towards achieving socio-economic development. Thus, the provision of sustainable water supply has been a central issue in Kenya with priority on low-income rural communities and underdeveloped areas with poor water resources. This has forced many rural communities to embrace community management model in rural water systems. However, despite continued large-scale investment by the government and international donors, the sustainability of community water projects is still very low. Community participation in rural water management is purportedly a key element for community water projects to be sustainable. This study therefore explored on socio-economic constraints to community participation in rural water management in Ndarugu-Thiririka Sub-catchment, identified the opportunities that are available to the communities in rural water management, assessed the impact of community participation in rural water management and examined variations in community participation among the selected projects in the sub-catchment. The study was carried out in four community managed rural water supply projects, namely Kinyathena, Juja Farm, Munyu and Kamunyaka. Different types of data were collected using household questionnaires, in-depth interviews, Focus Group Discussions (FGDs) and Participatory Rural Appraisal (PRA). The data type collected included the socio-economic characteristics of the sample households, level of community participation, socio-economic constraints to community participation, available opportunities to communities in rural water management and the impact of community participation in rural water management. The collected data from the field was organized in Statistical Package for Social Sciences (SPSS) version 17.0 and Microsoft Excel. Descriptive statistics, frequencies and percentages were used to describe and summarize the data while inferential statistics such as chi-square and ANOVA were used to reach conclusions and make generalizations of the population. SWOT Analysis was also used to analyze the strengths, weaknesses, opportunities and threats of community participation in rural water management. Tables, graphs and pie charts were used to present results. ANOVA test results ( $F= 1.67$ ,  $p= 0.018$ ,  $p <0.05$ ) reveal that there is a significant difference in the level of community participation on the basis of monthly income while ANOVA test results ( $F= 1.02$ ,  $p= 0.45$ ,  $p >0.05$ ) and ( $F= 1.22$ ,  $p= 0.21$ ,  $p >0.05$ ) reveal that there is no significant difference in the level of community participation on the basis of the level of education and economic activity respectively. In addition, chi-square test value ( $\chi^2=23.88$ ,  $df=8$ ,  $p= 0.002$ ,  $p <0.05$ ) reveals a significant relationship between age and the level of community participation while Chi-square test value ( $\chi^2=1.72$ ,  $df=2$ ,  $p= 0.42$ ,  $p >0.05$ ) reveals no significant relationship between gender and the level of community participation. The study recommends the government, Non-Governmental Organizations and donors to provide programmes for intensifying agricultural production, credit and rural financial support and to give adequate and continued financial support to the communities involved in rural water management. Capacity building is also required to enhance the ability of communities in rural water management. This will form the basis for ensuring water availability for rural development.

## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.1 Background to the Problem**

The UN Millennium Declaration, 2000, set a target to halve the percentage of world's population without access to sustainable safe drinking water by 2015. This was a stepping stone towards full global coverage by 2025 as in the Global Water Partnership Framework for Action and the African Water Vision (ADB, 2007) and in the Kenya Vision 2030 which aims to ensure water availability and access to all by 2030. About 2.8 billion people (more than 40%) of the world live in river basins faced with some form of water scarcity and 1.6 billion people live in areas of economic water scarcity, where even though water is available, human, institutional and financial capital limit access to water (UN, 2008).

The inability of responsible governments to provide water supply services due to resource constraints has led to the widespread adoption of community managed rural water supply projects since the early 1980's (WHO,1996; World Bank, 2003; Harvey and Reed, 2007). There has also been a shift in paradigm from top-bottom to bottom-up approach in development which recognizes the benefits of engaging the community and allows for local participation in decision making which has been welcomed even in rural water supply (IRC, 2003; Garande and Dagg 2004). Participatory approaches have gained substantial support in the international community (World Bank, 2003) with several international declarations including the Dublin Statement (1992), the Hague Declaration (2000) and the 2003 Water Forum in Kyoto promoting active public participation in decision making in water management.

While the concept of community management has gained widespread acceptance throughout the international development sector and is currently widely applied in rural water supply projects in Sub-Saharan Africa (IRC,2003; Harvey and Reed, 2007), about half of the population in rural Sub-Saharan Africa (SSA) does not have access to reliable and safe water resources (World Bank, 2005). It is estimated that 35% of all rural water system in Sub-Saharan Africa are not functioning (Baumann, 2005) while figures from individual African countries indicate operational failure rates of between 30-60% (Hazelton, 2000; DWD, 2002; Sutton, 2005).

It is estimated that community projects account for about 3000 water supply schemes in Kenya (Mehta *et al.*, 2006; Rukungu *et al.*, 2008). However, a large percentage of Kenya's population lacks access to safe and reliable drinking water (World Bank, 2009; Uwazi, 2010; Kisovi, 2012) and this situation is particularly worse in rural areas compared to urban areas (Kisovi, 2012).

## **1.2 Statement of the Problem**

The move towards effective community participation has encouraged a shift from the traditional top-down to bottom-up approach which empowers a community. Community participation in rural water management is a necessary instrument in the attempt to alleviate poverty associated with inadequate water for basic purposes. For a community water project to be sustainable, the community must own it through their participation from its inception and onwards. However, despite continued emphasis on community participation in rural water management, the sustainability of community water projects is still very low. The study sought to address the existing gap between continued support and emphasis on community participation in rural water management and low sustainability of rural water systems. This has necessitated the need to investigate on factors constraining community participation in rural water management. It is

against this background that this study sought to investigate on socio-economic constraints facing community participation in rural water management in Ndarugu-Thiririka Sub-catchment.

### **1.3 Justification of the Study**

Rural water supply remains critical for socio-economic development in Kenya. Promotion of rural water supply improves the quality of life, increases productivity, food security and alleviates poverty. This study is timely, given the Kenya government effort to achieve the Millennium Development Goals (MDGs) and Kenya Vision 2030 by halving the population without access to safe drinking water by 2015 and ensuring water availability and access to all by 2030 respectively. It is also when many rural areas are experiencing serious water scarcity. Community participation is an important factor in ensuring water availability for rural development. This study generates information on socio-economic constraints to community participation, opportunities available to the community in rural water management and its impact in terms of access to adequate water and catchment management. It also examined the variation in community participation in the study area. The information will hopefully assist development agencies, the government and policy makers in coming up with well designed programs which promote community participation in rural water management.

### **1.4 Research Questions**

- i. What are the socio-economic constraints that hinder community participation in Ndarugu-Thiririka Sub-catchment?
- ii. What are the available opportunities for community participation in rural water management in the sub-catchment?

- iii. What is the impact of community participation in rural water management in the sub-catchment?
- iv. Is there any variation in community participation among the selected projects in the area?

### **1.5 Statistical Hypotheses**

HO<sub>1</sub> Socio-economic factors do not significantly constrain community participation in Ndarugu-Thiririka Sub-catchment.

HO<sub>2</sub> There are no available opportunities to the community in rural water management in the sub-catchment.

HO<sub>3</sub> Community participation has no impact on the livelihoods of community in rural water management.

### **1.6 Research Objectives**

#### **1.6.1 Broad Objective**

The broad objective of this study was to investigate the socio-economic constraints facing community participation in rural water management in Ndarugu-Thiririka Sub-catchment.

#### **1.6.2 Specific Objectives**

The specific objectives were to;

- i. Identify the opportunities available to the community in rural water management in Ndarugu-Thiririka Sub-catchment.
- ii. Assess the impact of community participation in water management in the catchment.
- iii. Examine variations in community participation in the selected community projects.

### **1.7 Significance and Anticipated Output**

The study focused on socio-economic constraints to community participation in Kinyathena, Juja Farm, Munyu and Kamunyaka community managed rural water projects. This study is significant as it is likely to contribute to knowledge and insight on the specific interventions necessary for greater facilitation, maximization and equitable access to and utilization of community managed rural water supply projects. The study also anticipates to add to the existing information and data on community participation in rural water management.

### **1.8 Operational Concepts and Definitions**

This section defines the concepts and terms used in this study.

**Community:** A group of people with common interests who are capable of taking collective decision and action for their common good

**Community Water Project:** A project approved by the Authority (WRMA) and operating under a permit for one or more purposes.

**Community management:** It is where people are organized together to bring about an improvement in their lives, that could not have been attained by individuals. The community members have responsibility, authority and control over the development of the services.

**Rural areas:** These are areas which are not served by main water service provider in charge of urban areas which include villages, scarcely populated areas and small towns.

**Stakeholders:** Those who have interest in a particular decision, either as individuals or as representatives of a group. This includes people who influence a decision as well as those affected by it.

**Participation:** It is a process through which the public influences and shares control over development initiatives, decisions and resources measured in terms of helping to prepare development plan, providing funds to meet initial costs, helping in project implementation, providing support for operation and maintenance in form of money and unpaid labour, making decisions concerning their project, attending project meetings and having control and ownership over the project.

**Sustainability:** It is ensuring that the community has access to potable water supplies as envisaged during the initial stages of the project design both in terms of quantity and quality.

**Opportunity:** An exploitable set of circumstances (both exogenous and endogenous) that enables the community to participate in rural water management.

**Empowerment:** It is strengthening the capacity of the poor people to affect decisions that have a bearing on their lives and removing barriers that prevent them from engaging effectively in political, social and economic activities.

**Community-Driven Development (CDD):** It is development that has high level of community participation and gives the community control over resources and decisions thus empowering them.

### **1.9 Scope and Limitation of the Study**

The study was carried out in four community managed rural water supply projects; Kinyathena, Juja Farm, Munyu and Kamunyaka water projects in Ndarugu-Thiririka Sub-Catchment. The study only focused on socio-economic constraints to community participation in rural water management, opportunities, variations and its impacts without looking at sanitation as this is

dealt with at individual level in the sub-catchment. The study also never looked at the legal and policy framework as it is formulated in the Water Act 2002. Skepticism and suspicion of the community was the major limitation of the study particularly in areas experiencing leadership and water-use related conflicts. This was overcome by making it clear to the respondents that the information given will be kept confidential and will solely be used for my academic work.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Introduction

This section introduces concepts and divergent views held on community management of rural water supply, community participation in rural water management, community participation in water management in Kenya and factors affecting sustainability of community water projects.

#### 2.2 Community management in rural water supply

Community management is widely accepted as the principle management approach for sustainable development of rural water supply in developing countries (Koestler, 2008). In this model, a group of users is established at the level of a village or small town through an election process and this water committee manages all aspects of water services such as operation and maintenance, collection of water tariffs and the improvement of the service (Munger *et al.*, 2008). The water committee enables the community to have a major role in the project, to have a sense of ownership over the scheme and to ensure its ongoing operation and maintenance (Harvey and Reed, 2007). Lockwood (2004) identifies common principles of community management which include participation, control, ownership and cost-sharing. The community must participate in the development process which must continue indefinitely, have direct or indirect control making strategic decisions from the design phase to long term operation and maintenance, have legal and perception of ownership of the system and contribute to recurrent costs. Other concepts of community management model include sustainability, operation and maintenance, cost recovery and Institutional Support Mechanism (ISM) (Koestler, 2008).

The theoretical framework that underpins community management include neoliberal perception on reduced state involvement, water as a basic human right, water as an economic good and people first and empowerment approaches (IRC, 2003). It also evolved as a result of ‘project approach’ adopted by most bilateral organizations and NGOs whereby the implementing agency would construct a number of water systems as part of the project then leave the project area after several months or years (Harvey and Reed, 2007).

According to IRC (2003), community involvement in system construction began in the 1970’s, which developed into community participation in decision making and maintenance in the 1980’s which then developed into community management in the 1980’s and 1990’s. Prior to the introduction of community management in the 1980’s, most rural water supplies were ‘supply driven’ and delivered and managed by government institutions. The efficiency of such management systems was poor because of limited government capacity and commitment. Consequently, sustainability levels were low and it was widely recognized that there was a need to develop more effective mechanisms for management of ongoing water supply operation and maintenance. Increased involvement of the community in development has changed the traditional roles adopted by government and community where governments changed from ‘provider’ to ‘facilitator’ and community from ‘receiver’ to ‘doer’ (Amerasinghe, 2009).

Koestler (2008) in a study on private sector involvement in rural water supply found out that while there is extensive literature on the history and implementation of community management, its challenges and failures are poorly documented (**Table 2.1**). This study therefore sought to investigate on the socio-economic constraints to community participation in rural water management.

### **2.3 Community participation in rural water management**

Community participation is seen as a means to achieve a particular end as it enables communities to better manage their socio-economic environment, to help improve food security, to improve access to basic social services or to reverse the process of natural resource degradation with the ultimate goal of reducing rural poverty and promoting sustainable development (World Bank, 2003). Chambers (2007) also notes that a sharp reduction of poverty can be achieved when powerful professionals become participatory and get closer to and learn more from those who live their lives in poverty.

Participation at the community level has been identified as one of the most essential principles in rural development projects, as it has the potential to give communities access and control over their water resources (OECD, 1985). UN (2003) also identified participation as a criterion for effective governance where all citizens, both men and women, should have a voice, directly or through intermediary organizations representing their interests, throughout the processes of policy and decision making. The Social Development Department adopted a more intuitive and mutually exclusive four-level classification of participation involving information sharing, consultation, collaboration and empowerment ranked in order from the least to the most influence (World Bank, 2003).

According to Chambers (2009), participatory methods give a chance to the voices of those most affected by a project in a way not possible using more conventional methods and can make realities and experiences of the poor people count more. Community participation is a consultative empowerment process designed to establish communities as effective decision-making entities (Guijit and Shah, 1998). A World Bank impact evaluation of community water

supply projects in Sri Lanka confirms that active participation at all stages improves sustainability (World Bank, 1998). Zafar (1994) in his study emphasizes the need for community involvement to ensure continuous benefits of development programmes. The community to benefit from an improved water supply is involved in information sharing, consultation, decision making and initiating action (World Bank, 2003).

Empowerment of stakeholders through participation can improve the environmental management process (Murdock *et al.*, 2005; Simonovic and Akter, 2006; Giordano *et al.*, 2007; Prager and Nagel, 2008) and is also critical for making changes (IFAD, 2004; NRSP, 2004). Rural water experts, the World Bank and other donor agencies, argue that community participation is fundamental to the success of water supplies in rural areas particularly in developing countries (Schouten and Moriarty, 2003). Community participation can ensure that different needs and problems of the community are integrated in the project objectives (Miningka, 2000).

In rural water supply, community participation requires the definition of the term ‘community’ which is defined by the area to which a given water system can realistically serve and to establish an appropriate mechanism for decision making (DeGabriele, 2002; WHO, 2002). It also involves mobilizing a community to become involved in planning and implementing a water supply project (Batchelor *et al.*, 2000).

Amerasinghe (2009) notes that community participation is high during planning and construction and waned after commissioning and it is dependent on several factors such as community leadership and organizational capabilities of the CBO (**Table 2.1**), ability to raise and manage the necessary finances, choice of technology ensuring ability to maintain and meet water quality

needs over the design life, economies of scale, the need to move away from voluntary to paid labour, need for ongoing training and the need for routine monitoring by external agencies. This study explored on socio-economic factors that hinder community participation as a continuous and lifelong process in rural water management. It also explored on the opportunities available to the community to ensure continued community participation in rural water management.

Nisha (2006) argues that household characteristics are relatively more influential on the rate of participation measured in terms of meeting attendance and decision making (**Table 2.1**). This study explored on socio-economic constraints to community participation in rural water management as measured in terms of helping to prepare development plan, providing funds to meet initial costs, helping in project implementation, providing support for operation and maintenance in form of money and unpaid labour, making decisions concerning their project, attending project meetings and having control and ownership over the project.

Pena and Cunha (1997) also examined conditions under which participation does not lead to optimum results. They note that often political and local power, socio-economic hierarchies and lack of information sharing can lead to negative results.

#### **2.4 Community participation in rural water management in Kenya**

The present institutional arrangements for the management of the water sector in Kenya can be traced in the National Water Master Plan of 1974 (GTZ Water Sector Reform Programme, 2007) which aimed to ensure available potable water at a reasonable distance by the year 2000. However by that year, only less than half of the rural population had access to potable water due to government's budgetary constraints experienced in the 1980's. Attention therefore turned to

finding ways of involving other stakeholders in the provision of water services in place of the government, a process that became to be known as ‘handing over’ (Ministry of Land Reclamation, Regional and Water Development, 1997). The criteria for handing over was to be the capacity of the community to take over, ability to pay, capacity to operate and maintain the systems, involvement of women in management and ability and willingness to form a community based group with legal status.

The Sessional Paper No. 1 of 1999 on National Policy on Water Resources Management called for decentralization of operation activities from the central government to other actors and increased involvement of communities in order to improve efficiency in service delivery (Kenya National Water Development Report, 2005). Through the policy, the government was to hand over rural water supplies to communities (GTZ Water Sector Reform Programme, 2007).

The Water Act 2002 was enacted to tackle the worsening situation in water services experienced over the earlier decades (GTZ Water Sector Reform Programme, 2007). The Act defines clear roles for the different actors involved in the decentralized institutional framework. It also led to the separation of institutional services, the decentralization of roles and responsibilities while laying emphasis on the participation of communities in resource management (Ong’or, 2005).

The Water Act (Section 15) gives Water Resources Management Authority (WRMA) the mandate to formulate a catchment management strategy for the management, use, development, conservation, protection and control of water resources within each catchment. One way of promoting an effective catchment management strategy is for Water Resources Management Authority to provide mechanisms and facilities for enabling the public and communities to

participate in managing the water resources (The Water Act Section 15 (3) (e)). The catchment management strategy should encourage and facilitate the establishment and operation of Water Resources Users Associations (WRUAs) as fora for conflict resolution and co-operative management of water resources (Section 15 (5)). The Poverty Reduction Strategy Paper (PRSP), (2003-2007) used to address poverty reduction by Economic Recovery Strategy for Wealth Empowerment Creation (ERS) was to involve communities and local authorities more actively in the management of water resources (Kenya National Water Development Plan, 2005).

Njogu (2009) in a study on challenges and opportunities for sustainable water supply and demand management in Ruiru Municipality recommends that various institutions mandated with policy formulation should adopt bottom-up decision making process by embracing public participation in planning issues (**Table 2.1**). This study explored on the role of community managed projects in the effort to increase production of water to meet the current demand.

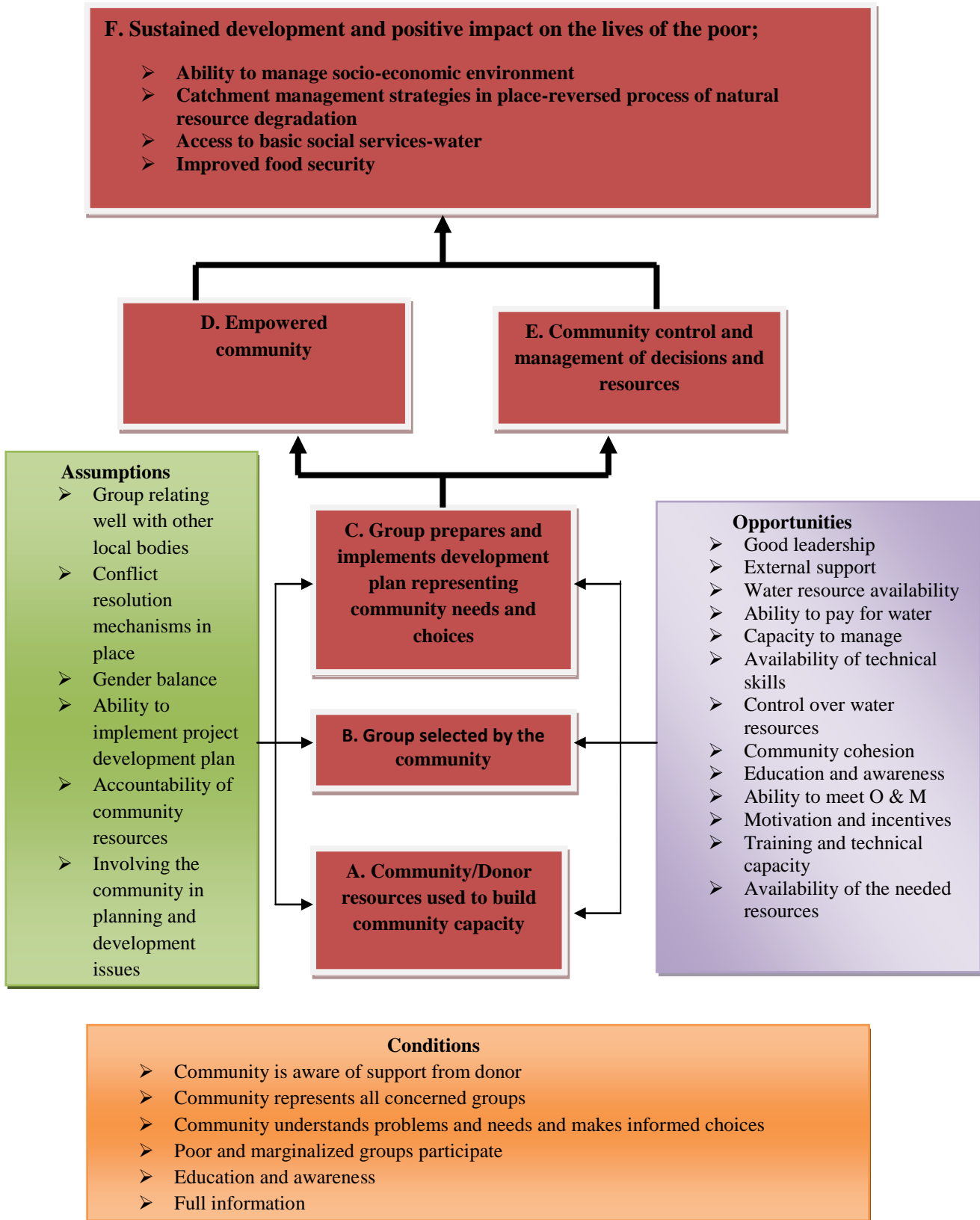
## **2.5 Factors affecting sustainability of community water projects**

Low rural water supply sustainability levels throughout Sub-Saharan Africa indicate severe limitations of community management approach (Harvey and Reed, 2007). Okorie *et al.* (2001), in their study on donor funding and sustainability of rural water supply and sanitation in Swaziland found that the major factors attributed to the unsustainability of many rural water supply schemes include lack of local community education and participation while ADB (2007), argues that the most common problem in rural water supply services is ensuring continuous supply through effective and efficient operation and maintenance. However, Haysom (2006) notes that it is poor financial management that undermines sustainability of rural water supply (**Table 2.1**). IRC and WHO (2000), attribute low rural water sustainability to three major factors.

Technical factors which include technology selection, complexity of technology, its capacity to respond to a demand and a desired service level, its impact on the environment, the technical skills needed to operate and maintain a system (Ahmad and Talib, 2011), availability, accessibility and costs of spare parts and the cost of maintenance. Community factors include availability of technical skills to operate and maintain a service and implement preventive maintenance activities, capacity and willingness to pay, participation of all social groups in the community, financial and administrative management carried out by a legitimate and organized community structure, the felt need for improved service, socio-cultural aspects related to water and individual, domestic and collective behavior regarding hygiene and sanitation. Environmental factors likely to influence sustainability include quality of the water resource and its quantity and continuity and the way the community will manage water resources especially the impact on the environment of community behaviour. Water resource management, pollution control and hygienic behaviour are all crucial for sustaining a water supply service. All these factors revolve within a legal and institutional framework and support activities such as technical assistance, training, monitoring, water quality control and the setting up of alternative financing mechanisms.

## **2.6 Conceptual Framework**

To facilitate an understanding of community participation in rural water management, the study adopted and modified a model by World Bank (2003) on how a typical community-driven activity is expected to work in a particular community (**Figure 2.1**). The model shows the steps in a community-driven process and the conditions under which the steps work, along with the basic assumptions and opportunities that are necessary for the conditions to hold.



**Figure 2.1 A Conceptual Framework showing a Community Driven Process, adapted and modified from World Bank (2003)**

The conditions, assumptions and the opportunities form the key independent variables of the study while the six steps form the dependent variables. The conceptual framework shows that the six-step process begins with community capacity building using community and donor resources. The community then selects a representative water committee which is expected to prepare and implement development plan representing the needs and the choices of the community. The conditions for the process to take place are that the community understands problems and needs and can make informed choices, represents all concerned groups, is aware of possibility of support from donor, can access benefits and costs, poor and marginalized groups can participate, has full information and education and awareness.

During the first three stages of the process, the basic assumptions are that the committee is able to implement project development plan, relates well with other political bodies, has conflict resolution mechanisms in place, accountable with community resource, gender balance and involves the community in planning and development issues of the project. Moreover, certain opportunities should be available to the community to allow continuous participation in rural water management. These include good leadership, external support, availability of water resources, capacity to manage rural water, availability of technical skills, control over water resources, community cohesion during project activities, education and awareness, ability to meet operation and maintenance, training for technical capacity, motivation and incentives and availability of needed resources from the community, donors and others.

With all these conditions, assumptions and opportunities in place, the community is empowered and has control and capacity to manage its decisions and its resources. The community is able to manage its socio-economic environment, has access to basic social services such as water,

improved food security and catchment management strategies are in place for reversed process of natural resources degradation leading to sustainable development and positive impact on the livelihoods of the community.

Communication and information sharing is important in a community-driven activity. It not only impacts on a project, but also determines the understanding that a community has on specific issues and the general status of the project (Garande and Daggs, 2005). Without information which is relevant, timely and presented in a form that is easily understood, the poor cannot take effective action. It is therefore essential that communities have detailed information on what their local representative governments and their community group representatives are supposed to be doing, what resources are available and how they are being used (World Bank, 2002a) In order to include knowledge, expectations, constraints and priorities of the community in the project, it is necessary to have a good communication and information flow between the different stakeholders involved (Sara and Katz, 1998; Moningka, 2000; Rogers and Hall, 2002).

The stimulus for a community-driven activity can come from inside a community or outside, that is, an individual, NGO, government or donor (World Bank, 2003). The Bank however notes that, external support is often required because resource (financial and technical) at the local level may not be sufficient to meet the development needs of a poor community. McCommon *et al.* (1990) identified effective external support as a pre-condition for community participation and must be available from the governments, donors and the private sector. Institutional Support Mechanism (ISM) is designed to produce assistance with the full range of challenges confronting a rural community and is not intended to undermine the primacy of community management, nor engender long-term dependency; rather its aim is to sustain community management over time

(Lockwood, 2002). Amerasinghe (2009) recommends that the government needs to provide some long-term support through on-going training and monitoring of activities of the project to enhance long-term viability.

Empowerment of the poor which is the highest order of participation is central to the fight against poverty (World Bank, 2003). An empowered community is more likely to be pro-active and develop the confidence that would allow them to tackle other issues even beyond the projects' set objects (Garande and Dagg, 2005). To allow for a more equitable development process, disadvantaged stakeholders need to be empowered to increase their level of knowledge, influence and control over their own livelihoods including development initiatives affecting them (FAO, 2007). Stakeholders having input in the planning and management of the resource, should ensure that the interests of women and the poor are fully represented (UN-WWAP, 2006). Agenda 21 also noted that women possess a lot of knowledge and experience of management and conservation of natural resources-including local water resources- as well as good water management skills (UN-WWAP, 2006).

The World Bank Sourcebook on empowerment and poverty reduction (World Bank, 2002a) identified four key elements of successful empowerment which include access to information, participation of the poor people, accountability and local organized capacity. It is also noted in the World Bank Sourcebook that, the underlying expectation in the use of community participation is that, putting communities in charge or actively engaging them in their own development will harness their social capital to improve livelihoods leading to sustainable development (World Bank, 2003). The appropriate level of participation depends on the type of project and socio-economic environment (Eyben and Ladbury, 1995).

**Table 2.1 Selected Literature and Identified Gaps**

<b>Author</b>	<b>Theme/Title</b>	<b>Key findings</b>	<b>Gap identified</b>
Amerasinghe, N.M. (2009)	A study of the factors affecting the sustainability of community managed rural water supply schemes in Sri Lanka.	The results demonstrate that while participation increased a sense of ownership, this alone did not guarantee sustainability. Community leadership and the capabilities of the CBOs are the key factors of project sustainability.	Results also indicate that community participation is high during planning and construction and waned after commissioning. This study explored on socio-economic factors that hinder community participation as a continuous and lifelong process in rural water management. It also explored on the opportunities available to the community to ensure continued community participation in rural water management.
Njogu, J. W. (2009)	Challenges and Opportunities for Sustainable Water Supply and Demand Management in Ruiru Municipality	Findings indicate acute water shortage in Ruiru Municipality as demand greatly surpasses water supply. There are several opportunities for sustainable water supply and demand management in Ruiru Municipality.	The study recommends that various institutions mandated with policy formulations should adopt bottom-up decision making process by embracing public participation in planning issues. This study explores on the role of community managed projects in the effort to increase production of water to meet the current demand.
Haysom, A. (2006)	A study of factors affecting sustainability of rural water supplies in Tanzania.	The results from the study indicate that it is poor financial management that is undermining sustainability in the study area.	The study focused on the finer details which serve to provide useful information on ways to improve financial management in villages which should have a significant positive impact on sustainability. This study sought to explore on other socio-economic factors in addition to financial constraints which affect community participation hence sustainability of community-managed rural water supply projects.

Koestler, L. (2008)	Private sector involvement in rural water supply: Case Studies From Uganda	Results indicate that community management and private sector involvement are not two isolated approaches but they are increasingly combined. It is crucial to think about what benefits from each approach that are desired before a management model can be proposed. The prioritization of benefits should be based on the aim of improving sustainability. Each country is unique and management model depends on the conditions and characteristics of where it is applied.	The study indicates that, while there is extensive literature on the history and implementation of community management, its challenges and failures are poorly documented. Therefore, this study sought to investigate on socio-economic factors constraining community participation in rural water projects thus inhibiting the expected success. It also explored on the impact of community participation in rural water management.
Nisha, K.R. (2006)	Community participation in rural water supply: An analysis using household data from North Kerala	The author found that household characteristics were relatively more influential on the rate of participation measured in terms of meeting attendance and decision making.	The study indicates that making any suggestion and influencing the decision is a higher degree of participation, but a majority of the respondents was not offering any suggestion in beneficiary group meetings. This study explored on socio-economic constraints to community participation in rural water management as measured in terms of helping to prepare development plan, providing funds to meet initial costs, helping in project implementation, providing support for operation and maintenance in form of money and unpaid labour, making decisions concerning their project, attending project meetings and having control and ownership over the project.

**Source: Author (2012)**

## CHAPTER THREE

### 3.0 MATERIALS AND METHODS

#### 3.1 Introduction

This section addresses issues on the research design, the study area, the sample design, target population, sample size and sample frame, data types and sources, data collection and data processing and analysis.

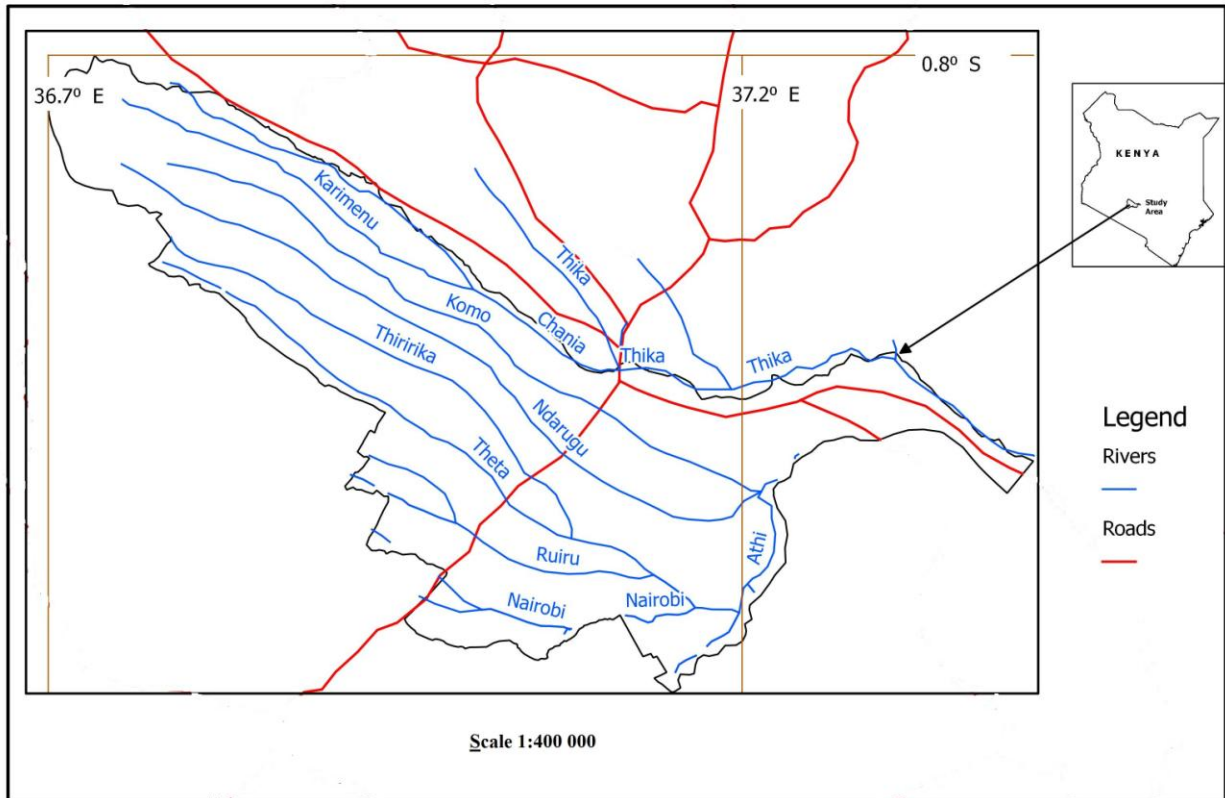
#### 3.2 Research Design

A research design is the conceptual structure within which the research is conducted and constitutes the blue print for the collection measurement and analysis of data (Kothari, 2004). This study used a case study design to describe Ndarugu-Thiririka sub-catchment and each selected community water project as a unit in details, context and holistically.

#### 3.3 The Study Area

Ndarugu-Thiririka Sub-catchment cuts across three administrative districts: Gatundu, Thika West and Thika East districts in Kiambu county (**Figure 3.1**). It covers an area of 1218.5 km<sup>2</sup> with a population of 510408 people, an estimated average density of 435 people per square kilometre and 148,208 households (KNBS, 2009). It is a section of the upper and middle zones of the Athi catchment. Its altitude ranges from 2600-1500m mean above sea level in the upper zone and 1500-560m mean above sea level across the middle zone. The climate varies across the sub-catchment, typically being sub-humid in the upper region and semi-arid in the middle region. The sub-catchment has two distinct rainy seasons; long rains in March-April-May and short rains in October-November. Land use patterns are highly influenced by rainfall patterns, topography

and human activity. Economically, the sub-catchment drains in a highly agricultural and industrialized area.



**Figure 3.1 Ndarugu-Thiririka Sub-catchment**

**Source: Fieldwork (Author, 2012)**

### **3.4 Sample Design**

This study made use of both probability and non-probability sampling designs. In probability sampling design, each unit in the population had an equal chance of being selected while in non-probability sampling design, the interest was in the representativeness of concepts in their varying form. Probability sampling designs such as cluster and random sampling designs were used while non-probability sampling designs included purposive and free sampling designs.

Specifically, cluster sampling was used because of the vastness of the study area. The study area was sub-divided into three geographical clusters which consisted of the administrative districts in the sub-catchment with community water projects.

Purposive sampling was used to select community water projects with the required characteristics in each district, households to be interviewed and also to get people with the required information on socio-economic constraints to community participation in rural water management, its opportunities and impacts.

Simple random sampling was carried out in the selected projects. The sampling frame consisted of the individuals who are beneficiaries of the selected community managed water projects. The households were identified from the community projects office records or the water committee chairpersons. Using the records, the households were listed in a numerical form to establish the actual number of households in each community water project. Random numbers were used to get the desired sample size. The sample size consisted of 200 households purposively selected out of the total 148,208 households in the sub-catchment. The heads of the households listed

were interviewed. In case of their absence, the person available at the homestead was interviewed provided he/she was an adult of sound mind and above eighteen years.

Free sampling, where the units of observation are selected as they become available to the researcher, was used. This is because the area is characterized by a high population and also the fact that, it was not guaranteed to get every member of the selected sample due to their busy daily socio-economic activities.

### **3.5 Target Population, Sample Size and Sample Frame**

The target population composed of residents in three districts; Gatundu, Thika West and Thika East in Kiambu county, who are served by the selected community water projects. The sampling frame consisted of individuals who are beneficiaries of the selected community managed water projects, water committee officials and resource persons from the Ministry of Water and Irrigation. In order to get a representative sample, a sample size of 200 households was purposively selected from the total 148,208 households in the sub-catchment. The selected households were apportioned according to the proportion of households in the three districts according to 2009 Kenya national population census (KNBS, 2009) (**Table 3.1**) using the formulae;

$$N = \frac{d}{T} \times 200 \quad (\text{Equation 1})$$

Fieldwork, (Author, 2012)

Where

$N$  is the required household sample size in each district

$d$  is the total number of households in each district in the sub-catchment

$T$  is the total number of households in the sub-catchment, which is 148,208 households.

**Table 3.1 Sample size tabulation per district**

District	Households	Community project	Sample size
Thika East	20,441	Munyu	28
Gatundu	55,716	Kamunyaka	75
Thika West	72,051	Kinyathena Juja-Farm	49 48
<b>TOTAL</b>	<b>148,208</b>		<b>200</b>

Source: Author (2012)

### 3.6 Data Types and Sources

The study used both primary and secondary (documentary) sources of data. Primary data included household size, level of education, income, occupation, amount of money paid as water bills in Kenya Shillings and frequency of attending water project meetings of the sample households. They were collected by use of questionnaires, in-depth interviews, Focus Group Discussions (FGDs) and Participatory Rural Appraisal (PRA). Secondary data included documented donor and community resources. They also consisted of government policy papers relevant to the study which were collected and reviewed. The study also made use of secondary data from institutional libraries and published and unpublished research reports and journals.

### **3.7 Data Collection, Processing and Analysis**

Data collection activities were followed directly from the objectives of the study (**Table 3.2**). Household questionnaires (**Appendix 5.1**), key informant interview guide (**Appendix 5.2**) and Focus Group Discussions guide (**Appendix 5.3**) were used to collect data on socio-economic factors hindering community participation in rural water management and its opportunities and impacts. Household questionnaires consisted of both open-ended and close-ended questions. Key informant interviews were carried out to one water committee official in each community water project so as to collect comprehensive, systematic and in-depth information about socio-economic constraints, opportunities and impacts of community participation in rural water management. Five focus group discussions were conducted in order to get more clarification on socio-economic constraints to community participation in rural water management, its opportunities and impacts. One focus group discussion was carried out in each of the selected community water projects except in one community water project which was experiencing water-use related conflicts where two focus group discussions were conducted so as to include the sentiments of the two conflicting sides. Each focus group consisted of 8-10 members with gender and age considerations. Participatory Rural Appraisal guide (**Appendix 5.4**) and SWOT Analysis table (**Appendix 5.5**) were also used where the community was involved in discussions on the socio-economic constraints to community participation in rural water management, the impact of their participation and the strengths, weaknesses, opportunities and threats of community participation in rural water management.

The collected field data was analyzed both quantitatively and qualitatively. The data was coded, classified and analyzed using Statistical Package for Social Sciences (SPSS) version 17.0.

Descriptive statistics, frequencies and percentages were used to describe and summarize the data. Inferential statistics such as chi-square and ANOVA were used to reach conclusions and make generalizations about the characteristics of the population.

Focus Group Discussions and key informant questionnaires were transcribed, edited and coded. Each participant comment was simultaneously assigned a separate line on a page as well as each new thought or idea. Each line was labeled with the participant and group number and then entered into Ms Excel Database, compiled and analyzed quantitatively. Tables, graphs and pie charts were used to present results.

In this study, chi-square was used in the testing of hypotheses of the study and also to find out if there is any significant relationship between community participation in rural management and gender, age, lack of access to adequate water, poor or lack of communication and sharing of information regarding the project, lack of education and awareness relating to rural water management, lack of the required technical skill, inability to pay water tariffs, lack of ownership over the project, lack of external support, inability to meet operation and maintenance costs, complexity of technology used in the project, unavailability of human resources (qualified staff working in the project), availability of other sources of water and lack of motivation.

The chi-square value was computed using the formulae;

$$x^2 = \sum \frac{(O - E)^2}{E} \quad (\text{Equation 2})$$

(Kothari, 2004)

Where  $\chi^2$  = chi-square

$O$  = Observed frequencies

$E$  = Expected frequencies

The frequency used was 200 households. The calculated chi-square ( $\chi^2$ ) value was tested for significance by comparing the computed value to the critical value provided by chi-square ( $\chi^2$ ) table at 0.05 (5%) level of significance. If the value was found to be equal or smaller than the significance level ( $\alpha$ ), the null hypothesis ( $H_0$ ) was rejected and vice versa.

F-test for ANOVA was also used to test the hypotheses and to examine the significance of the difference between community participation and the level of education, monthly income, income generating activity and variations in community participation among the selected community water projects. Test statistic, F, was calculated and compared with its probable value in the F-ratio tables for different degrees of freedom for greater or smaller variances at a 0.05 (5%) level of significance for accepting or rejecting the null hypothesis using the formulae;

$$F = \frac{\sigma_{s_1}^2}{\sigma_{s_2}^2} \quad (\text{Equation 3})$$

(Kothari, 2004)

$\sigma_{s_1}^2$  = variance of the population sample 1

$\sigma_{s_2}^2$  = variance of the population sample 2

If the calculated value of F was greater than the table value of F at 5% level of significance, the F-ratio was regarded as significant and the null hypothesis was rejected. On the other hand, if the

calculated value of F was smaller than its table value, it was concluded that F-ratio is not significant and thus the null hypothesis was accepted.

### **3.8 Pilot Study**

Before the actual study, a reconnaissance was carried out to pre-test the research instruments and check their feasibility and reliability. It consisted of 20 respondents, other than those who constituted the main focus of the study, 4 from each of the selected community water project, who were randomly selected, interviewed and excluded from the actual study.

### **3.9 Ethical Considerations and Confidentiality**

Before the actual study, permission was sought from the relevant authority; the local administration and community water projects officials. During the study, informed consent from the respondents was obtained and the respondents participated out of their own volition. The identity and information given by the respondents was kept confidential.

**Table 3.2 Summary of the Methodology**

Objectives	Variables/Type of data	Methods of Data Collection	Data Analysis
To investigate on socio-economic constraints to community participation in rural water management in Ndarugu-Thiririka Sub-catchment.	Household size, Education, income, external support, leadership, availability of other water sources, sense of ownership, Ability to meet O & M costs, period of stay in the area, economic activity, technical skills	Questionnaires, FGDs, In-depth Interviews, PRA	Calculation of mean and percentage ANOVA Chi-square Frequency SWOT Analysis
To identify the available opportunities to the communities in rural water management.	Availability of reliable water source, External support, Leadership, income	Questionnaires, FGDs, In-depth Interviews, PRA	Calculation of mean and percentage Chi-square Frequency, SWOT Analysis
To assess the impact of community participation in rural water management in the catchment.	Access to adequate water Farming methods used Soil conservation measures	Questionnaires, FGDs, In-depth Interviews, PRA	Calculation of mean and percentage Chi-square
To examine variation in community participation in the selected community projects.	Leadership, Community's input (money and labour), ability to meet O & M costs, decision making, project implementation, control over the project, gender balance, representation of the poor and marginalized	Questionnaires, FGDs, In-depth Interviews	Calculation of mean frequency and percentage, ANOVA

**Source: Author (2012)**

## CHAPTER FOUR

### 4.0 RESULTS AND DISCUSSION

#### 4.1 Introduction

In this chapter, the major results of the study are presented and discussed. Statistical methods such as percentages, frequencies and cross tabulations were used to analyze the socio-economic status of the community, socio-economic constraints to community participation in rural water management, impact of community participation and the variations that exist among the selected community water projects. Statistical tests such as chi-square and ANOVA were carried out to check for the existence of any statistical relationship and difference in the level of community participation and socio-economic factors constraining community participation. Tables, graphs and pie-charts were used to present results.

#### 4.2. Socio-demographic Information of the community

This section gives a detailed description of the community in the sub-catchment in terms of age and sex composition, household size, level of education, income generating activities and their monthly income.

##### 4.2.1 Age and Sex of the respondents

During the study, 200 people were interviewed, of whom 118 were males (40.7%) and 82 were females (59.3%), 35.2% were between 31-40 years, 24.1% were between 21-30 years, 20.1% were between 41-50 years, 13.1% were above 50 years and 7.5% between 18-20 years of age. In all the five age groups, males participated more than females except in the age group between 21-30 years of age (**Table 4.1**).

**Table 4.1 Age and Sex of the Respondents**

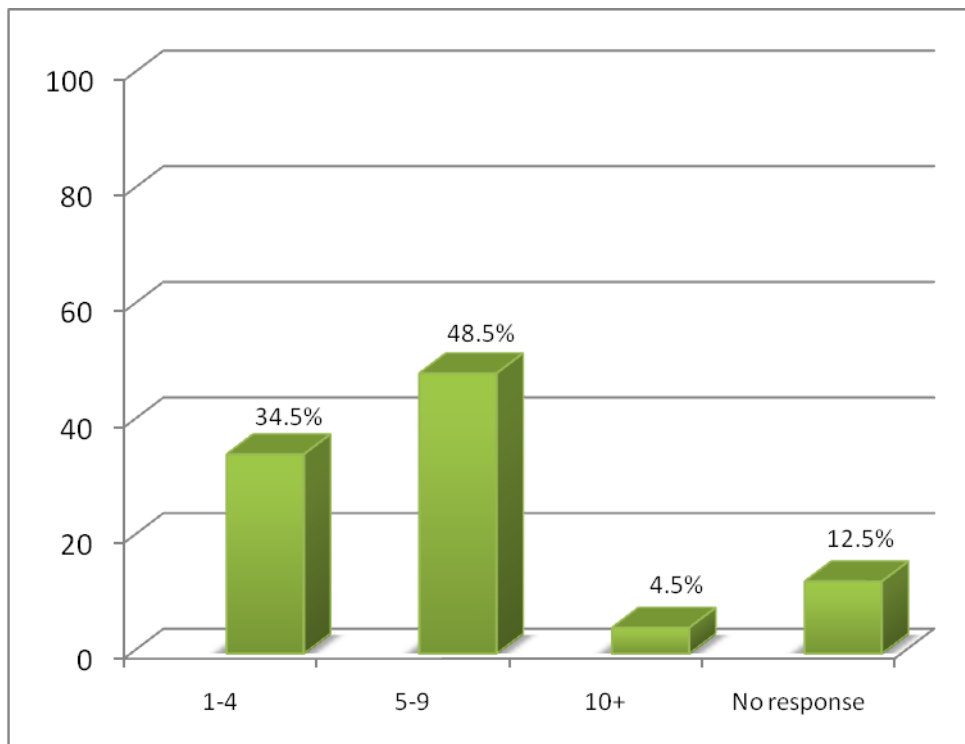
Age (yrs)			Sex of the Respondent		<b>Total</b>
			Female	Male	
18-20	Count	5	10	<b>15</b>	
	% of Total	2.5%	5.0%	<b>7.5%</b>	
21-30	Count	25	23	<b>48</b>	
	% of Total	12.6%	11.6%	<b>24.1%</b>	
31-40	Count	29	42	<b>71</b>	
	% of Total	14.1%	21.1%	<b>35.2%</b>	
41-50	Count	16	24	<b>40</b>	
	% of Total	8.0%	12.1%	<b>20.1%</b>	
50+	Count	7	19	<b>26</b>	
	% of Total	3.5%	9.5%	<b>13.1%</b>	
<b>Total</b>	<b>Count</b>	<b>82</b>	<b>118</b>	<b>200</b>	
	<b>% of Total</b>	<b>40.7%</b>	<b>59.3%</b>	<b>100.0%</b>	

These results indicate that the level of community participation in rural water management increases with age between the age of 21-40 years while it decreases between the age of 41-50 years and above 50 years. In all the five age groups, males participated more than females except in the age group between 21-30 years of age. This may be as a result of the fact that males are more willing to volunteer as respondents (Armah, 2008) and in community development projects than their female counterparts. The high participation of the respondents between the ages of 31-40 years can be attributed to the fact that people are productive at that age and therefore actively participate in community development projects. They are also more aware of the importance of

water in socio-economic development. The age group between 18-20 years is showing the lowest level of participation in rural water management. This is because of the fact that majority in this age group are in school and give least attention to community development issues.

#### 4.2.2 Household size

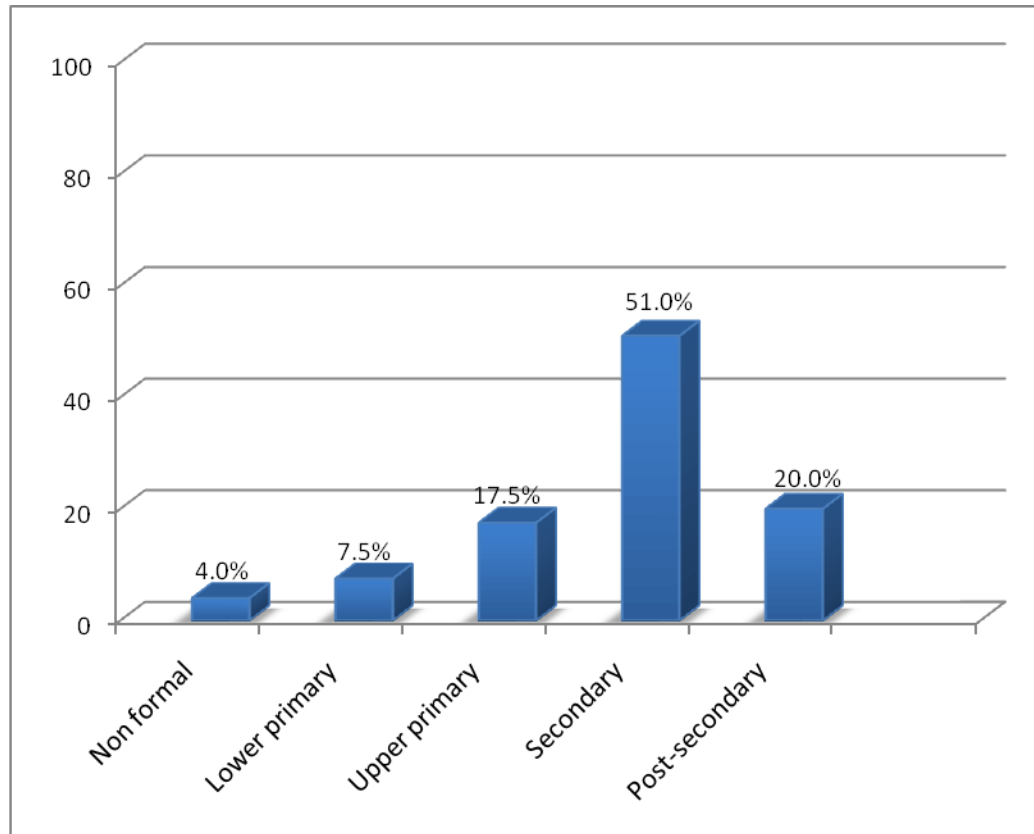
The study shows that, in Ndarugu-Thiririka Sub-catchment, 48.5% of the households have a household size of between 5-9 persons while 34.5% has a household size of between 1-4 persons. Only 4.5% of households have more than ten persons (**Figure 4.1**). This explains why the sub-catchment has a high population according to 2009 National Population Census Report.



**Figure 4.1 Household size**

### 4.2.3 The level of education of the respondents

In the sub-catchment, 51% of the respondents have attained secondary education while 20% has attained post-secondary education. Those with non-formal, lower primary and upper primary represent 4%, 7.5% and 17.5% respectively (**Figure 4.2**).

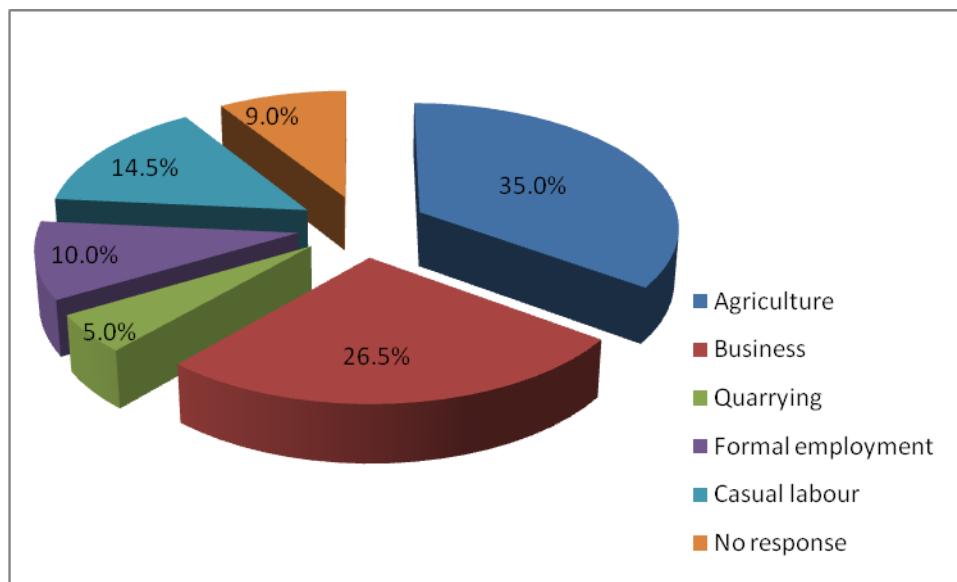


**Figure 4.2 Level of education of the community**

The study findings show that there is a lot of emphasis on secondary and post-secondary education in the sub-catchment. This is in line with the government's policy of increasing transition rates from primary to secondary and enhanced public funding in secondary education (GoK, 2005).

#### 4.2.4 Income generating activities

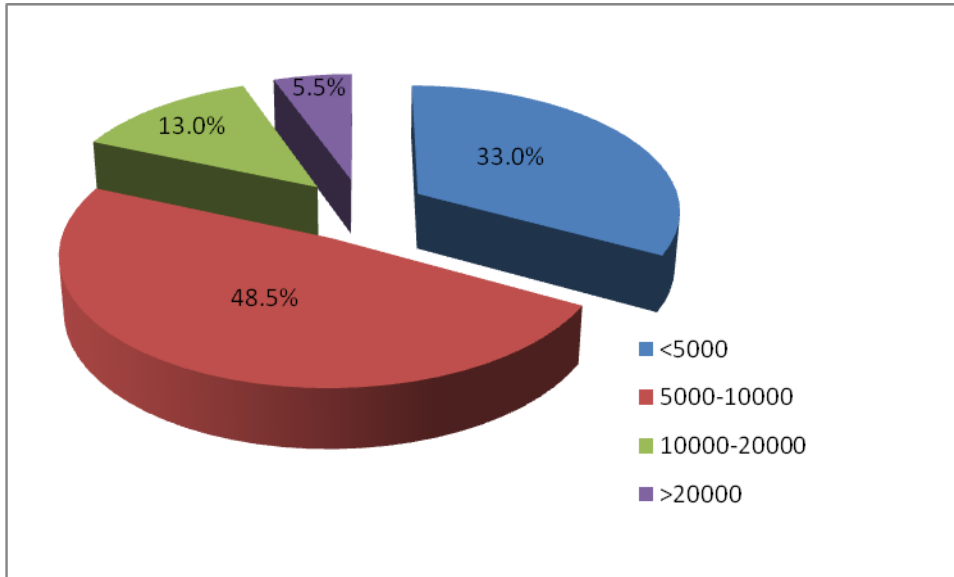
The community in the sub-catchment engages in various income generating activities such as agriculture, business, quarrying, formal employment and casual labour. In the sub-catchment, 35% and 26% of the community practice agriculture and business as their income generating activities respectively. Casual labour, formal employment and quarrying form 14.5%, 10% and 5% of economic activity in the region respectively (**Figure 4.3**).



**Figure 4.3 Income generating activities of the community**

#### 4.2.5 Monthly income of the community

The study shows that 48.5% of the respondents in the sub-catchment earn a monthly income of between 5000-10000 Kenya Shillings. Another 33% of the respondents earn less than 5000 Kenya Shillings, while only 13% and 5.5% of the respondents earn between 10000-20000 and more than 20000 Kenya Shillings respectively (**Figure 4.4**). These figures were recorded by the researcher in the month of April and May 2012.

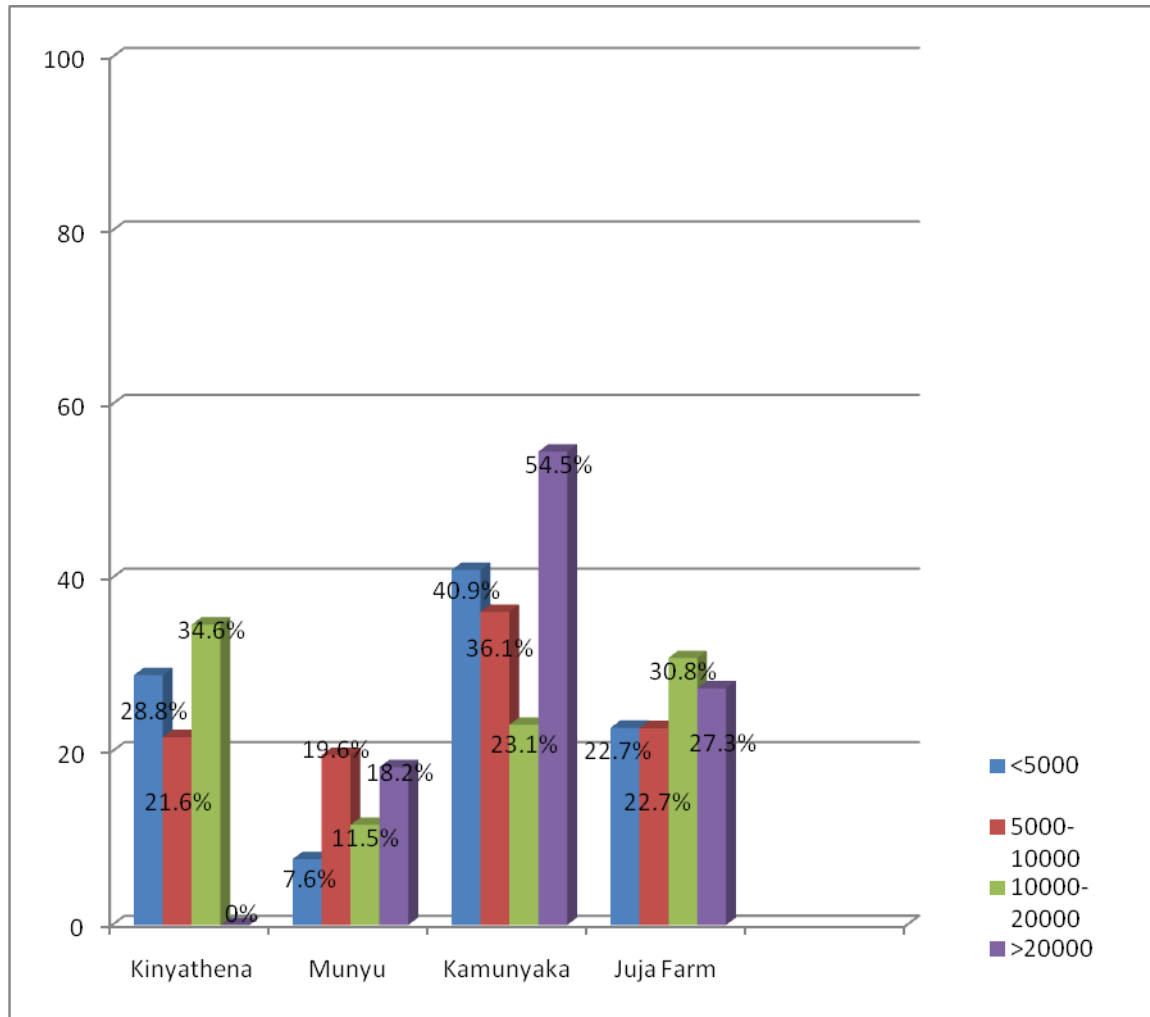


**Figure 4.4 Monthly income of the community in Kenya Shillings**

According to the Economic Survey 2010, the average monthly wage income per employee in Kenya's private and public sectors stood at 12,685 and 12,301 Kenya Shillings respectively (Business Daily, 2011). This study therefore indicates that 81.5% of the community in Ndarugu-Thiririka Sub-catchment earns less than the average monthly income wage for employees in public and private sectors.

Findings from the study show that Kamunyaka community water project with 54.5% has the highest sample population earning more than 20,000 Kenya Shillings per month in the sub-catchment, followed by Juja Farm with 27.3% and Munyu with 18.2%. The percentage of the respondents earning less than 5,000 Kenya Shillings per month is also high at Kamunyaka

community water project with 40.9%, followed by Kinyathena with 28.8% and Munyu with 7.6% (**Figure 4.5**).



**Figure 4.5 Monthly income of the selected community water projects**

### **4.3 Socio-economic constraints to community participation in rural water management**

The broad objective of the study was to investigate socio-economic constraints that influence community participation in rural water management in Ndarugu-Thiririka Sub-catchment. In this

section, the research findings of the socio-economic factors that were hypothesized to constrain community participation in rural water management in the sub-catchment are highlighted and discussed.

The level of community participation in rural water management in Ndarugu-Thiririka Sub-catchment was analyzed to give a detailed description and also to provide a clear impression of how the situation is on the ground in the sub-catchment as far as community participation in rural water management is concerned.

During the study, 61.5%, showed an average level of participation in rural water management while 21% showed low level of participation. Only 17.5% of the respondents said to have a high level of participation (**Table 4.2**).

**Table 4.2 Level of community participation in the Sub-catchment**

	Frequency	Percentage (%)	Cumulative Percentage (%)
Low level	42	21.0	21.0
Average level	123	61.5	82.5
High level	35	17.5	100.0
Total	200	100.0	

These results indicate low level of community participation in rural water management in the sub-catchment. The implication of low level of community participation in rural water management is low sustainability of community water projects thus hindering socio-economic

development. This is contrary to a World Bank impact evaluation of community water supply projects in Sri-Lanka that confirms that active participation by users at all stages improves sustainability (World Bank, 1998). Lockwood (2004) also outlined participation as one of the principles of community management and further argued that the community must participate in the development process which must continue indefinitely.

In rural water management, the community is expected to participate in various activities such as helping to prepare development plan, providing funds to meet initial costs, helping in project implementation, providing support for operation and maintenance in form of money and unpaid labour, making decisions concerning their project, attending project meetings and having control and ownership over the project. IRC and WHO (2000) posit that participation of communities (all social groups and both men and women) throughout the whole project cycle is essential since it is a way to motivate, make responsible and build the capacities of communities in their new tasks and functions.

The socio-economic constraints that were hypothesized to constrain community participation in rural water management include monthly income, level of education, income generating activity, gender and age. More specific socio-economic constraints include lack of access to adequate water, poor or lack of communication and sharing of information regarding the project, lack of education and awareness relating to rural water management, lack of the required technical skill, inability to pay water tariffs, lack of ownership over the project, lack of external support, inability to meet operation and maintenance costs, complexity of technology used in the project, unavailability of human resources (qualified staff working in the project, availability of other sources of water and lack of motivation.

From the research findings, the monthly income ANOVA test results were ( $F= 1.67$ ,  $p= 0.018$ ,  $p <0.05$ ) while the level of education ANOVA test results were ( $F= 1.02$ ,  $p= 0.45$ ,  $p >0.05$ ). On the other hand, the economic activity ANOVA tests results were ( $F= 1.22$ ,  $p= 0.21$ ,  $p >0.05$ ) (Table 4.3).

**Table 4.3 ANOVA Results of socio-economic constraints to community participation**

		Sum	of	Mean Square	F	Sig.
		Squares	Df			
Level of education	Between Groups	32.880	33	.996	1.020	.447
	Within Groups	162.115	166	.977		
	Total	194.995	199			
Monthly income	Between Groups	33.725	33	1.022	1.685	.018
	Within Groups	100.655	166	.606		
	Total	134.380	199			
Economic activity	Between Groups	119.313	33	3.616	1.217	.211
	Within Groups	493.082	166	2.970		
	Total	612.395	199			

The monthly income of the community with ANOVA test results ( $F=1.69$ ,  $p= 0.018$ ,  $p <0.05$ ) is one of the socio-economic factors that significantly constrains community participation in rural water management in the sub-catchment. Results on monthly income indicate that 81.5% of the respondents earn less than 10,000 Kenya Shillings per month. Kenya National Bureau of Statistics ranks lower income earners as those spending less than 23,670 Kenya Shillings per month (Business Daily, 2012). Therefore, 94.5% of the respondents in Ndarugu-Thiririka Sub-

catchment who earn less than 20,000 Kenya Shillings can be classified as low income earners. This figure is higher than 72% of low income earners in Kenya according to Economic Survey 2011. According to IRC (2003), in rural water management, community members are expected to contribute to initial system installation costs and to meet all ongoing maintenance and repair costs through regular payment of appropriate tariffs. Therefore, according to this study, low income earners may not be in a position to meet the financial demands of their community water projects.

The study findings also reveal that the level of education with ANOVA test results ( $F= 1.02$ ,  $p= 0.45$ ,  $p >0.05$ ) and the income generating activity with ANOVA tests results ( $F= 1.22$ ,  $p= 0.21$ ,  $p >0.05$ ) do not significantly constrain community participation in rural water management. This study therefore supports Nisha (2006) who in a study on community participation in rural water supply found that household characteristics were relatively more influential on the rate of participation defined based on attendance of meetings and making decisions. The author further notes that, even though, as per capita increased, participation rate also increased, the occupation of household head and percentage of earners in the family was highly insignificant.

This implies that regardless of the level of education and the economic activity of the community, people will always participate in rural water management. Amerasinghe (2009) in a study on the factors affecting the sustainability of community managed rural water supply schemes in Sri Lanka also concludes that, it cannot necessarily be concluded that the higher the number of educated persons, the better the management capacity. This is contrary to Nisha (2006) who found that the level of education of the head of the household significantly influences beneficiary participation. This could be because Nisha (2006) definition of

participation is limited to attending meetings and decision making only unlike this study which looks at participation as a process through which the public influences and shares control over development initiatives, decisions and resources which affect them by helping to prepare development plan, providing funds to meet initial costs, helping in project implementation, providing support for operation and maintenance in form of money and unpaid labour, making decisions concerning their project, attending project meetings and having control and ownership over the project.

However, further analysis of the study reveals that the monthly income of the community significantly constraints community participation depending on other factors such as the level of leadership and the available opportunities in rural water management. This is evidenced by the fact that, even though the community at Kamunyaka community water project has a relatively higher monthly income, where 54.5% of the respondents earn more than 20,000 Kenya Shillings per month, compared with Munyu water project, where only 18.2% of the respondents earn that amount of income per month (**Figure 4.5**), its level of community participation in rural water management is relatively low (**Figure 5.1**). The figure shows that 68% of the respondents in Munyu community water project felt there is a high level of community participation unlike Kamunyaka where only 6.1% of the respondents said there is high level of participation. The level of leadership and available opportunities also vary significantly between the two community water projects. From the findings of the study, 33.8% of the respondents in Munyu water project felt their leadership is good unlike 3.9% of the respondents who felt the same in Kamunyaka water project (**Figure 5.2**). Moreover, 60% of the respondents in Munyu community

water project said the level of available opportunities is high compared to 6.1% in Kamunyaka community water project (**Figure 5.3**).

From the research findings, Chi-square test value for gender was ( $\chi^2=1.72, df=2, p= 0.42, p>0.05$ ). These findings indicate that there is no significant relationship between gender and the level of community participation in rural water management. During the study, 21% of the respondents who showed low level of community participation, 11.5% were males while 9.5% were females. Consequently, 17.5% of the respondents who showed high level of community participation, 12% were males while 5.5% were females. Of the 61.5% of the respondents with average level of community participation, 35.5% were males while 26% were females (**Table 4.4**).

**Table 4.4 Level of participation \* Gender of the respondent Cross tabulation**

		Sex of the respondent			<b>Total</b>
		Female	Male		
Level of participation	Low level	Count	19	23	<b>42</b>
		% of Total	9.5%	11.5%	<b>21.0%</b>
Average level		Count	52	71	<b>123</b>
		% of Total	26.0%	35.5%	<b>61.5%</b>
High level		Count	11	24	<b>35</b>
		% of Total	5.5%	12.0%	<b>17.5%</b>
<b>Total</b>		<b>Count</b>	<b>82</b>	<b>118</b>	<b>200</b>
		<b>% of Total</b>	<b>41.0%</b>	<b>59.0 %</b>	<b>100.0%</b>

Therefore, this study shows that both males and females participate equally in rural water management. This is due to the fact that both males and females have realized the benefits that

accrue from access to adequate water. This contradicts Nisha (2006) who concludes that sex of the household head was another influencing factor affecting participation. Thus, the community in Ndarugu-Thiririka Sub-catchment has realized the important role played by both men and women in rural water management. It has also supported one of the Dublin principles for the management of water resources by recognizing the central role played by women in providing, managing and safeguarding water. It is also in line with the World Bank views of the third Millennium Development Goal “to promote gender equality and empowerment” as a central component to its overall mission to reduce poverty and stimulate economic growth (World Bank, 2002; World Bank, 2003; World Bank, 2007; Leino, 2007; Whittington et al., 2009).

The community in this study therefore emphasizes on overall community participation of both males and females measured in terms of helping to prepare development plan, providing funds to meet initial costs, helping in project implementation, providing support for operation and maintenance in form of money and unpaid labour, making decisions concerning their project, attending project meetings and having control and ownership over the project. This supports Prokopy (2004) who examines participation of women in water committees in 45 villages in two Indian states and who concludes that women’s participation as measured by monetary contribution, attendance of committee meetings and asking questions at meetings does not matter for project success but overall community participation does.

An analysis of age as a constraint to community participation in rural water management led to chi-square test value of ( $\chi^2=23.8$ ,  $df=8$ ,  $p= 0.002$ ,  $p<0.05$ ). These results reveal that there is a significant relationship between the age of the members of the community and the level of community participation in rural water management.

Findings from the study indicate that between the ages of 21-50 years, representing 79.4% of the respondents, people are participating more in rural water management than 20.6% of the respondents who represent the population between 18-20 years of age and those above 50 years of age. Out of 17.1% of the respondents with a high level of participation, 12% is between the ages of 21-40 years. However, the percentage of the respondents showing low levels of participation is also high between the ages of 21-40 years which represent 13.5% out 21.1% of the total sample population showing low levels of community participation. Generally, across all the age groups, the study reveals 17.1% high level participation, 21.1% low level of participation and 61.8% average level of participation (**Table 4.5**).

**Table 4.5 Age (yrs) \* Level of participation Cross tabulation**

Age (yrs)			Level of participation			<b>Total</b>
			Low level	Average level	High level	
18-20	Count	9	6	0	<b>15</b>	
	% of Total	4.5%	3.0%	.0%	<b>7.5%</b>	
21-30	Count	12	25	11	<b>48</b>	
	% of Total	6.0%	12.6%	5.5%	<b>24.1%</b>	
31-40	Count	15	42	13	<b>70</b>	
	% of Total	7.5%	21.1%	6.5%	<b>35.2%</b>	
41-50	Count	4	31	5	<b>40</b>	
	% of Total	2.0%	15.6%	2.5%	<b>20.1%</b>	
50+	Count	2	19	5	<b>26</b>	
	% of Total	1.0%	9.5%	2.5%	<b>13.1%</b>	
<b>Total</b>	<b>Count</b>	<b>42</b>	<b>123</b>	<b>34</b>	<b>199</b>	
	<b>% of Total</b>	<b>21.1%</b>	<b>61.8%</b>	<b>17.1%</b>	<b>100.0%</b>	

This is due to the fact that persons between 21-50 years of age are highly energetic, productive and economically stable unlike persons between 18-20 years and above 50 years of age. Moreover, out of 17.1% of the respondents with a high level of participation, 12% are between the ages of 21-40 years. However, the percentage of the respondents showing low levels of participation is also high between the ages of 21-40 years which represent 13.5% out 21.1% of the total population showing low levels of community participation. This shows that there are other underlying factors that constrain community participation within that age bracket.

This study also analyzed other specific socio-economic constraints to community participation in rural water management in the sub-catchment. These include lack of access to adequate water, poor or lack of communication and sharing of information regarding the project, lack of education and awareness relating to rural water management, lack of the required technical skills, inability to pay water tariffs, lack of ownership over the project, lack of external support, inability to meet operation and maintenance costs, complexity of technology used in the project, unavailability of human resources (qualified staff working in the project), availability of other sources of water and lack of motivation (**Table 4.6**).

**Table 4.6 Other socio-economic constraints to community participation**

<b>Socio-economic factors</b>	<b>Pearson chi-square value</b>	<b>Df</b>	<b>Asymp. Sig. (2-sided)</b>
Inability to meet O & M costs	1.963 <sup>a</sup>	4	<b>0.069</b>
Lack of access to adequate water	18.013 <sup>a</sup>	8	<b>0.021</b>
Complexity of technology used in the project	8.894 <sup>a</sup>	8	<b>0.351</b>
Poor/lack of communication and sharing of information regarding the project	31.944 <sup>a</sup>	8	<b>0.000</b>
Lack of education and awareness relating to rural water management	16.973 <sup>a</sup>	8	<b>0.030</b>
Lack of required technical skills in rural water management	19.846 <sup>a</sup>	8	<b>0.011</b>
Unavailability of human resources (Qualified staff working in the project)	14.679 <sup>a</sup>	8	<b>0.066</b>
Inability to pay water tariffs	21.626 <sup>a</sup>	8	<b>0.006</b>
Availability of other sources of water	7.290 <sup>a</sup>	8	<b>0.506</b>
Lack of ownership over the project	40.194 <sup>a</sup>	8	<b>0.000</b>
Lack of motivation/incentives	14.488 <sup>a</sup>	8	<b>0.070</b>
Lack of external support	16.298 <sup>a</sup>	8	<b>0.038</b>

From the findings, lack of access to adequate water ( $\chi^2=18.013, df=8, p= 0.021, p<0.05$ ), poor or lack of communication and sharing of information regarding the project ( $\chi^2=31.944, df=8, p= 0.000, p<0.05$ ), lack of education and awareness relating to rural water management ( $\chi^2=16.973, df=8, p= 0.030, p<0.05$ ), lack of the required technical skills in rural water management ( $\chi^2=19.846, df=8, p= 0.011, p<0.05$ ), inability to pay water tariffs ( $\chi^2=21.626, df=8, p= 0.006, p<0.05$ ), lack of ownership over the project ( $\chi^2=40.194, df=8, p= 0.000, p<0.05$ ) and lack of external support ( $\chi^2=16.298, df=8, p= 0.038, p<0.05$ ) significantly constrain community participation in the sub catchment.

Access to water is influenced by environmental factors which influence sustainability and they include the quality of water resource, its quantity and continuity (IRC & WHO, 2000). It was found that lack of access to water affects participation in two ways. First, lack of access to adequate water may motivate the community to actively participate in rural water management hoping to get adequate water in future. On the other hand, lack of access to adequate and quality water makes some communities give up in their participation in rural water management and opt for other means.

Furthermore, external support is often required because resource (financial and technical) at the local level may not be sufficient to meet the development needs of a poor community (World Bank, 2002a). McCommon *et al.* (1990) also identified effective external support as one of the preconditions of community participation and must be available from the governments, donors and the private sector. The lack of such long-term support increasingly is being seen as one of the main impediments to the sustainability of rural water systems (Lockwood, 2002). Garande and Dagg (2005), in their study in Molino Water Project, found that, although the community

was confident that they would be able to self-manage the facility, they felt there should be some kind of long-term support in place from NGO in order to achieve sustainability of the project.

In addition, local groups and individuals are often without access to information and are excluded from decision-making and thus lack capacity to act (UN-WWAP, 2006). Communication and sharing of information, not only impacts on a project but also determines the understanding that a community has on specific issues and general status of the project (Garande and Dagg, 2005). The Empowerment Sourcebook (2002) notes that without information that is relevant, timely and presented in a form that is easily understood the poor cannot take effective action. It is essential that communities have detailed information on what their local representative governments and their community group representatives are supposed to be doing, what resources are available and how they are being used. Moningka (2000) notes that in order to include the knowledge, expectations, constraints and priorities of the community in the project, it is necessary to have a good communication and information flow between different stakeholders involved.

From the findings, the level of education ANOVA test results ( $F= 1.02$ ,  $p= 0.45$ ,  $p >0.05$ ) reveals that there is no significant difference in the level of community participation on the basis of level of education. However, chi-square test value ( $\chi^2=16.973$ ,  $df=8$ ,  $p= 0.030$ ,  $p <0.05$ ) indicate that lack of education and awareness relating to rural water management significantly constrain community participation in rural water management. This implies that the level of education of members of the community does not significantly constrain community participation in rural water management but education and awareness relating to rural water management does. This research therefore supports Haddad *et al.* (2007) who note that without training, the ability of

people in the different participating agencies to scale up is very limited. Communities need a great amount of training over a long period of time to be able to take rural water supply management (Blagbrough, 2001). Amerasinghe (2009) also highlights that the government needs to provide some long-term support through on-going training and monitoring of project activities to enhance long-term viability.

On the other hand, the study reveals that socio-economic factors such as inability to meet operation and maintenance costs, ( $\chi^2=1.963, df=8, p= 0.069, p>0.05$ ). complexity of technology used in the project ( $\chi^2=8.894, df=8, p= 0.351, p>0.05$ )., unavailability of human resources (qualified staff working in the project) ( $\chi^2=14.679, df=8, p= 0.066, p>0.05$ )., availability of other sources of water ( $\chi^2=7.290, df=8, p= 0.506, p>0.05$ ). and lack of motivation ( $\chi^2=14.488, df=8, p= 0.07, p>0.05$ ) do not significantly constrain community participation in rural water management in Ndarugu-Thiririka Sub-catchment. Therefore, regardless of the inability to meet operation and maintenance costs, the level of complexity of technology used in the project, unavailability of human resources, availability of other sources of water and lack of motivation, the community participates in rural water management.

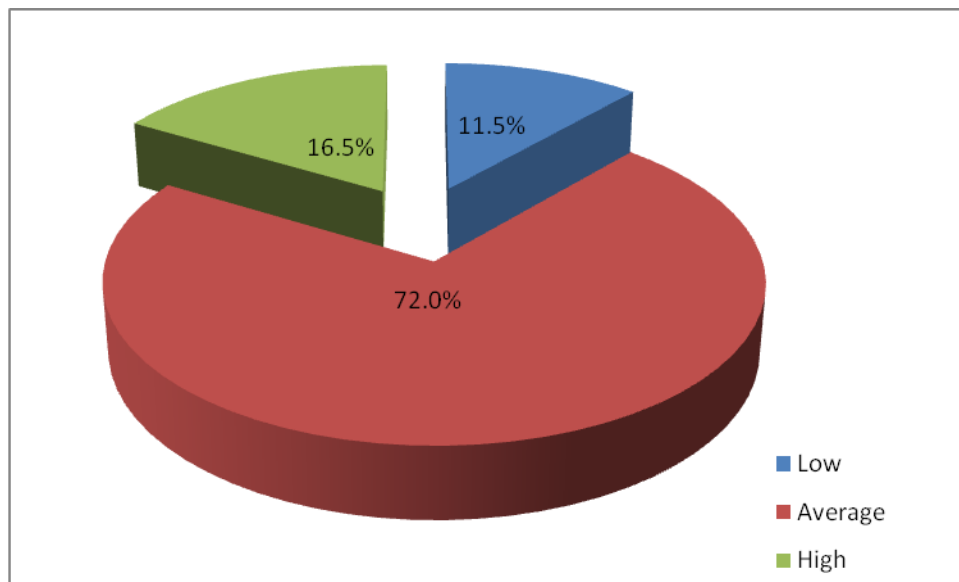
#### **4.4 The available opportunities to the community in rural water management**

The first specific objective of this study was to identify the available opportunities to the community in rural water management in Ndarugu-Thiririka Sub-catchment. In this section, the results of a number of opportunities that were hypothesized to be available to the community in rural water management in the sub-catchment are presented and discussed. They include good leadership, external support, availability of water resources, ability to pay for water, capacity to manage rural water, availability of the required technical skills, gender balance in leadership,

control over water resources, community cohesion during project activities, education and awareness, ability to meet operation and maintenance and motivation and incentives.

During the study, 72% of the respondents said that opportunities are moderately available, while 16.5% and 11.5% said the opportunities are highly and lowly available respectively (**Figure 4.6**).

These results indicate moderate availability of opportunities for the community to participate in rural water management.



**Figure 4.6 Level of availability of opportunities**

The opportunities that the community in the sub-catchment feels are highly available to them include good leadership (44%), water resources availability (45.5%), ability to pay for water (52.5%), capacity to manage rural water (44.5) and gender balance in leadership (40.5%). On the other hand, the community feels that external support (35%), community cohesion during project activities (49%), education and awareness (42%) and motivation and incentives (51%) are lowly

available while control over water resources (44.5%) and ability to meet operation and maintenance costs (49%) are moderately available (**Table 4.7**).

**Table 4.7 Various opportunities and their level of availability to the community**

Opportunities	Level of availability of opportunities (%)		
	Low	Average	High
Good leadership	36	20	44
External support	35	47	18
Access to water/water resources availability	12	42.5	45.5
Ability to pay for water	10.5	37	52.5
Capacity to manage rural water	22.5	33	44.5
Availability of technical skills	31.5	34	34.5
Gender balance in leadership	35.5	24	40.5
Control over water resources	26.5	44.5	29
Community cohesion during project activities	49	31	20
Education and awareness	42	38.5	19.5
Ability to meet Operation and Maintenance cost	14.5	49	36.5
Motivation and incentives	51	30	19

However, the study shows that the opportunities that the community feels are highly available are below average (<50%), except for the ability to pay for water (52.5%), (**Table 4.7**). Results in **Figure 4.6** and **Table 4.7** therefore indicate a gap between the available opportunities and utilization of the available opportunities. This is shown by the fact that the community feels 72% of the opportunities are moderately available but the opportunities that the community feels are highly available to them are below average. Thus, the community in Ndarugu-Thirika Sub-catchment has not made optimum utilization of the opportunities available for community participation in rural water management. This contradicts Esman and Uphoff (1984) who emphasized that opportunities for rural people to manage their own affairs, shape public decisions and participate in activities that affect their economic productivity and quality of life are essential for accomplishing broad-based rural development.

On the other hand, the community feels that external support, community cohesion during project activities, education and awareness and motivation and incentives are lowly available while control over water resources and ability to meet operation and maintenance costs are moderately available (**Table 4.7**). These results indicate that with adequate external support, community cohesion during project activities, education and awareness, control over water resources and ability to meet operation and maintenance cost, the level of community participation in rural water management can be improved leading to improved livelihoods of the community. Participation in group activity should enhance social cohesion, increase the capacity of rural communities to attract resources from governments and enable them to respond to change (Alexander, 1995; Curtis and Lockwood, 2000).

The community also highlighted other opportunities available to them which can be used to improve the level of community participation in rural water management (**Table 4.8**). Results indicate that 39.3% of the respondents highlighted the use of Constituency Development Fund (CDF), while 16.1% highlighted training and capacity building to enlighten the community on rural water management, 10.7% highlighted water rationing to allow water availability to all people being served by a particular community water project, 10.7% highlighted management by private company especially community water project with water conflicts , 10.7% highlighted water treatment to ensure water quality and 12.5% highlighted use of water harvesting techniques and sinking community boreholes where it is possible.

**Table 4.8 Examples \* Opportunities available Cross tabulation**

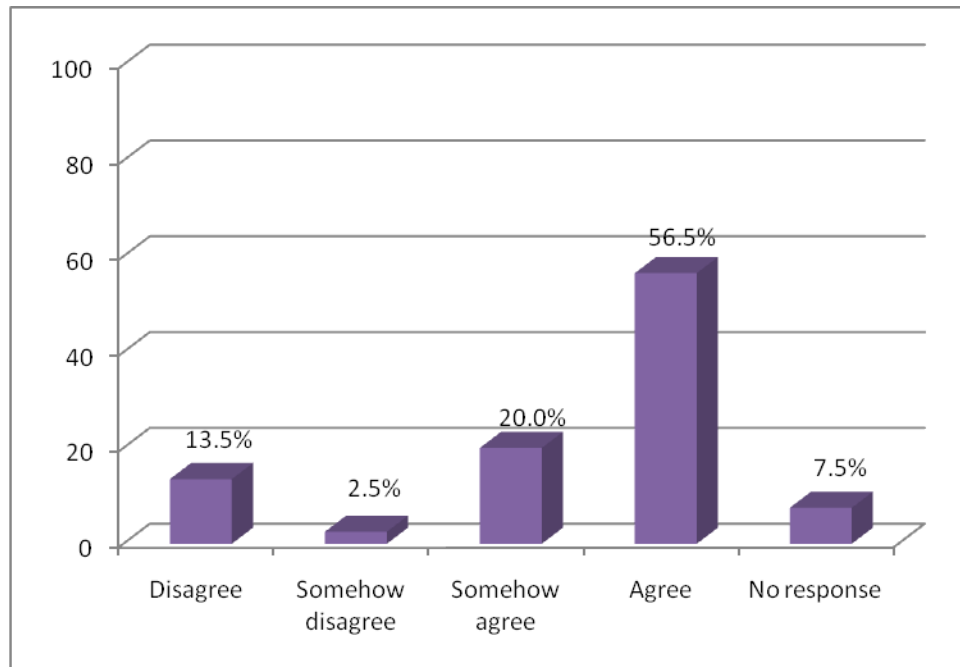
		Opportunities available	
		Yes	Total
CDF	Count	22	<b>22</b>
	% of Total	39.3%	<b>39.3%</b>
Training/ capacity building	Count	9	<b>9</b>
	% of Total	16.1%	<b>16.1%</b>
Water rationing	Count	6	<b>6</b>
	% of Total	10.7%	<b>10.7%</b>
Management by private body/ company	Count	6	<b>6</b>
	% of Total	10.7%	<b>10.7%</b>
Treatment/ improve on quality	Count	6	<b>6</b>

	% of Total	10.7%	<b>10.7%</b>
Boreholes/water harvesting	Count	7	<b>7</b>
	% of Total	12.5%	<b>12.5%</b>
<b>Total</b>	<b>Count</b>	<b>56</b>	<b>56</b>
	<b>% of Total</b>	<b>100.0%</b>	<b>100.0%</b>

#### **4.5 The impact of community participation in rural water management in the sub-catchment**

The second specific objective of this study was to assess the impact of community participation in rural water management in the sub-catchment. In this study, the major impacts of community participation in rural water management were hypothesized to be constant access to adequate water and catchment management through the use of proper farming methods and soil conservation measures. World Bank (2003) argues that the principle impact of a community-driven development approach is expected to be sustained development and positive impact on the lives of the poor. Further, Zooneveld (2001) in assessing participation in local governance found that participation worked better when citizen felt that the initiative had concrete aims that were likely to have a direct positive impact on their daily lives. UN-WWAP (2006) also notes that improved governance is essentially about improving people's livelihood opportunities, while providing backbone for governments worldwide to alleviate poverty and increase the chances of sustainable development.

Findings indicate that 56.5% of the respondents agreed that community participation in rural water management has improved the livelihoods of the local community while 13.5% disagreed (Figure 4.7).



**Figure 4.7 Impact of community participation in rural water management**

Thus, on average, community participation in rural water management has made impacts on the livelihoods of the community in the sub-catchment. This study therefore supports World Bank (2003) argument that community participation is seen as a means to achieve a particular end as it enables communities to better manage their socio-economic environment, to improve access to basic social services or to reverse the process of natural resource degradation with the ultimate goal of reducing rural poverty and promoting sustainable development.

Results in **Table 4.9** show that from the total population that agreed that community participation in rural water management has made impact in their livelihoods by providing water for domestic uses (26.4%), livestock farming (10.5%), construction (3.6%) and crop farming(kitchen gardening) (0.9%). In addition, 17.3% and 10.9% of the respondents felt it has led to reduced time wastage when looking for water and general development respectively.

However, 5.5% and 1.8% of those who disagreed said community participation in rural water management has led to water-use related conflicts and inadequate water supply respectively.

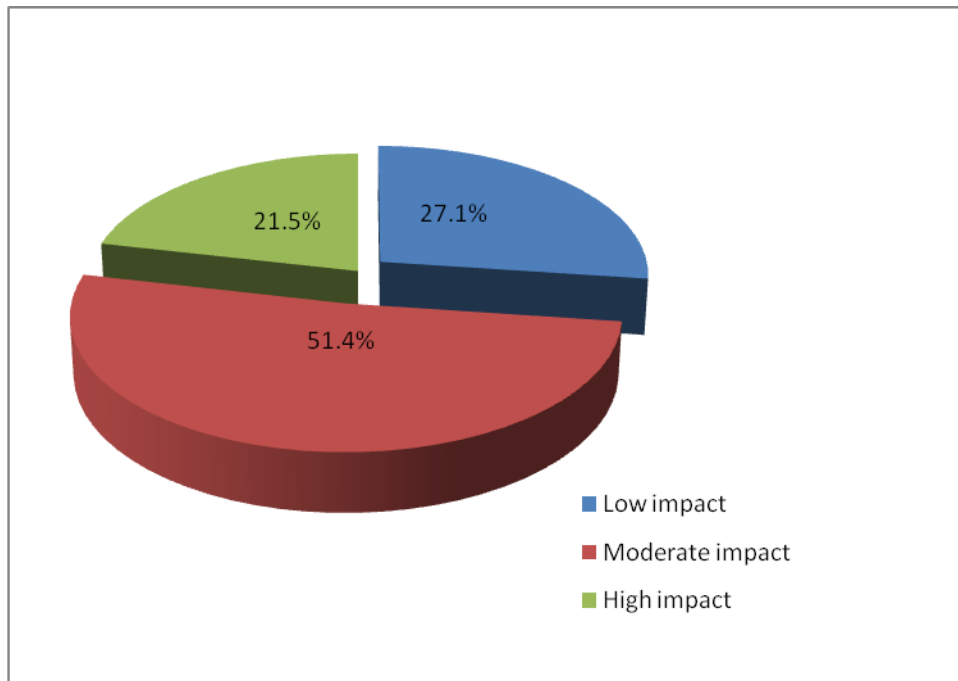
**Table 4.9 Explanation \* Improved community livelihood Cross tabulation**

		Improved community livelihood					<b>Total</b>
		Disagree	Somehow disagree	Somehow agree	Agree	No response	
Domestic use	Count	0	0	11	29	0	<b>40</b>
	% of Total	0%	.0%	10.0%	26.4%	.0%	<b>36.4%</b>
Livestock Farming	Count	0	0	5	11	0	<b>16</b>
	% of Total	.0%	.0%	4.5%	10.0%	.0%	<b>14.5%</b>
Crop Farming	Count	0	1	1	1	1	<b>4</b>
	% of Total	.0%	.9%	.9%	.9%	.9%	<b>3.6%</b>
Construction	Count	0	0	1	4	0	<b>5</b>
	% of Total	.0%	.0%	.9%	3.6%	.0%	<b>4.5%</b>

Reduces time wastage	Count	1	0	1	19	2	<b>23</b>
	% of Total	.9%	.0%	.9%	17.3%	1.8%	<b>20.9%</b>
Led to Conflict	Count	6	0	0	1	0	<b>7</b>
	% of Total	5.5%	.0%	.0%	.9%	.0%	<b>6.4%</b>
General development	Count	0	0	1	12	0	<b>13</b>
	% of Total	.0%	.0%	.9%	10.9%	.0%	<b>11.8%</b>
Inadequate water supply	Count	2	0	0	0	0	<b>2</b>
	% of Total	1.8%	.0%	.0%	.0%	.0%	<b>1.8%</b>
<b>Total</b>	<b>Count</b>	<b>8</b>	<b>1</b>	<b>20</b>	<b>76</b>	<b>3</b>	<b>110</b>
	<b>% of Total</b>	<b>9.1%</b>	<b>.9%</b>	<b>18.2%</b>	<b>69.1%</b>	<b>2.7%</b>	<b>100.0%</b>

#### 4.5.1 Constant access to adequate water

Community participation in rural water management is expected to lead to constant access to adequate water for improved livelihoods of the community. The study reveals that 51.4% of the community felt that their participation has made moderate impact as far as constant access to adequate water is concerned while 27.1% and 21.5% felt it has made low and high impact respectively (**Figure 4.8**).



**Figure 4.8 Impact on constant access to adequate water**

Water availability is an essential component in socio-economic development and poverty reduction (UN-WWAP, 2006). The study reveals that 51.4% of the community felt that their participation has made moderate impact as far as constant access to adequate water is concerned while 27.1% and 21.5% felt it has made low and high impact respectively (**Figure 4.8**). The results show average impact of community participation as far as constant access to adequate water is concerned in the sub-catchment. This contradicts ADB (2007) argument that in order to meet the 2015 Africa Water Vision and Millennium Development Goals (MDGs) target, rural people will need to be provided with access to water. Therefore, in order to avert the negative impacts of inadequate access to water in rural areas, there is a need for more emphasis on community participation in rural water management. This is because water is needed for most

productive activities, and inadequate access to water limits the livelihood options of the people, particularly in rural areas (IDRC, 2002).

#### **4.5.2 Catchment management**

Community participation has an impact on the livelihoods of the community in catchment management. In this study, catchment management has been looked at in terms of use of proper farming methods and soil conservation measures.

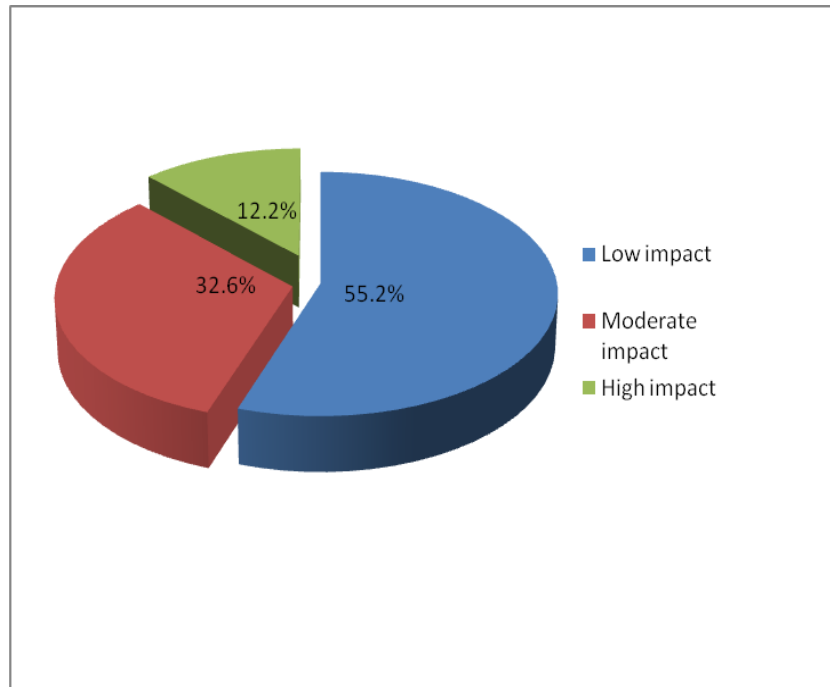
Community participation in rural water management is also expected to have a positive impact as far as catchment management initiative is concerned. According to the Water Act 2002, Water Resource Management Authority (WRMA) should facilitate community participation in catchment management through Water Resource Users Associations in each catchment area. Water users associations have an important role to play in maintaining local water networks as well as mobilizing communities Brikke (2004). As CRS (2005) emphasizes, wherever possible, water projects should be incorporated into the existing watershed management plans and should promote multiple uses of water as a means of conserving and using efficiently this scarce resource.

Water managers around the world agree that the only way forward to catchment management is through an inclusive and integrated approach to water resource management (UN-WWAP, 2006).

##### **4.5.2.1 Use of proper farming methods**

During the study 55.2% of the respondents felt that community participation has made low impact on the use of proper farming methods as far as catchment management is concerned in

the sub-catchment. Meanwhile, 32.6% and 12.2% of the sample population felt that the impact of community participation was moderate and high respectively (**Figure 4.9**).



**Figure 4.9 Impact on the use of proper farming methods**

These findings indicate that community participation in rural water management in the sub-catchment has made low impacts on catchment management through the use of proper farming methods (**Plate 4.1**).



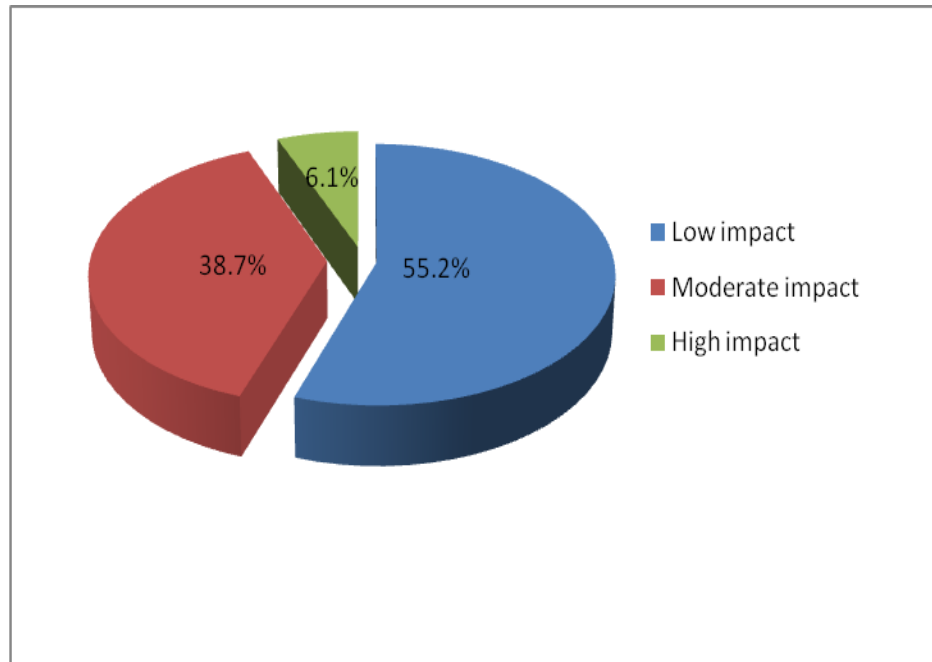
**Plate 4.1 Improper farming methods in the upper section of the sub-catchment at Kamunyaka.**

**Source: Fieldwork (Author, 2012)**

#### **4.5.2.2 Use of soil conservation measures**

According to the findings of this study, 55.2% of the respondents in the sub-catchment felt that there is low impact of community participation on the use of soil conservation measures as far as

catchment management is concerned. Only 6.1% of the respondents felt that there was a high impact (**Figure 5.0**).



**Figure 5.0 Impact on the use of soil conservation measures**

Therefore, community participation in rural water management has made low impact on the use of soil conservation measures in the sub-catchment (**Plate 4.2**).



**Plate 4.2 A section of the sub-catchment with poorly protected soil at Gachege**

**Source: Fieldwork (Author, 2012)**

The research findings also reveal that community participation in rural water management in Ndarugu-Thiririka Sub-catchment emphasizes more on constant access to adequate water than catchment management through the use of proper farming methods and soil conservation measures. This contradicts Amerasinghe (2009) findings that improved resource management in catchment areas helps to serve water quality needs and also ensure water availability.

Findings from the study indicate that there is overemphasis on constant access to adequate water and little emphasis on catchment management which has led to drying up and seasonality of streams which were hitherto perennial (**Plate 4.3**).



**Plate 4.3 A distributary of Ndarugu that was perennial now flows during wet seasons only due poor catchment management**

**Source: Fieldwork (Author, 2012)**

Thus, community participation in rural water management should prioritize on catchment management for continued water availability in the right quality and quantity.

#### **4.6 Variations in community participation in Ndarugu-Thiririka Sub-catchment**

The third specific objective of the study was to examine variations that exist among the selected community water projects in the sub-catchment. In this section, the findings of the variations that exist among the selected community water projects in Ndarugu-Thiririka sub-catchment are highlighted and discussed. In this study, variation in community participation in rural water management has been expressed in terms of the level of community participation, leadership categories, level of available opportunities and the impact of community participation to the community in the sub-catchment.

The results of the variations will help in giving a clear picture of why some community water projects are successful while others fail. There have been great differences in project performance among communities due to many factors rooted in socio-economic structures of the community (Lammerink, 1998; Lammerink *et al.*, 1999).

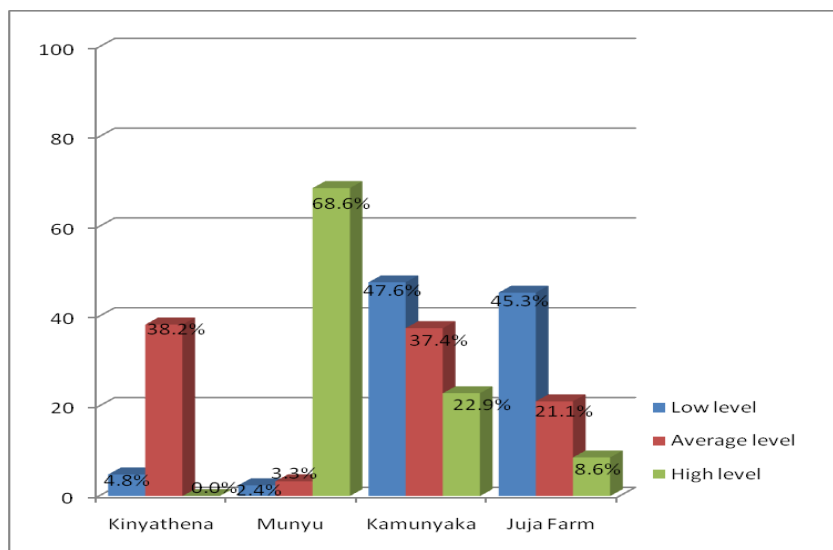
##### **4.6.1 Variations in the level of community participation in the sub-catchment**

The level of community participation in rural water management was classified into low, average and high levels. The ANOVA test results on the variations in the level of community participation in rural water management in the sub-catchment were ( $F= 32.23$ ,  $p= 0.000$ ,  $p < 0.05$ ) (**Table 5.0**). These results indicate that there exists a significant variation in the level of community participation among the selected community water projects in the sub-catchment.

**Table 5.0 ANOVA Results on the variations in the Level of participation**

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	25.357	3	8.452	32.232	.000
Within Groups	51.398	196	.262		
	76.755	199			

From the study, 68.5% of the community in Munyu, 22.9% in Kamunyaka and 8.6% in Juja Farm community water projects felt that their level of community participation is high. High level of community participation is non-existent in Kinyathena. Furthermore, Munyu, Kamunyaka, Juja Farm and Kinyathena community water projects showed low levels of community participation of 2.4%, 47.5%, 45.2% and 4.8% respectively and an average level of participation of 8.3%, 37.4%, 21.1% and 38.2% respectively (**Figure 5.1**).

**Figure 5.1 Variations in the level of community participation**

These results indicate a general low level of community participation in rural water management in the sub-catchment. Except for Munyu community water project, high level of community participation is below average in the other projects. Kamunyaka and Juja Farm are leading in low level of community participation in rural water management. Study findings from multiple comparisons indicate that Munyu community water project is leading in terms of community participation in rural water management followed by Kinyathena, Kamunyaka and Juja Farm community water projects (**Table 5.1**). The level of community participation in rural water management in Munyu community water project is significantly different from the other projects while Kinyathena community water project is significantly different from Munyu and Juja Farm. However, there is no significant variation between Kamunyaka and Juja Farm and between Kamunyaka and Kinyathena.

**Table 5.1 Multiple comparisons in the level of community participation in the sub-catchment**

(I) Name of water project	(J) Name of water project	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Kinyathena	Munyu	-.83392*	.11998	.000	-1.1448	-.5230
	Kamunyaka	.12135	.09432	.573	-.1230	.3657
	Juja Farm	.29252*	.10399	.028	.0230	.5620
Munyu	Kinyathena	.83392*	.11998	.000	.5230	1.1448
	Kamunyaka	.95527*	.11219	.000	.6646	1.2460
	Juja Farm	1.12644*	.12044	.000	.8144	1.4385
Kamunyaka	Kinyathena	-.12135	.09432	.573	-.3657	.1230
	Munyu	-.95527*	.11219	.000	-1.2460	-.6646
	Juja Farm	.17117	.09490	.275	-.0747	.4171
Juja Farm	Kinyathena	-.29252*	.10399	.028	-.5620	-.0230
	Munyu	-1.12644*	.12044	.000	-1.4385	-.8144
	Kamunyaka	-.17117	.09490	.275	-.4171	.0747

**\* The mean difference is significant at the 0.05 level.**

These variations in the level of community participation are as a result of differences in the level of participation in various project activities (**Table 5.3**) monthly income, type of leadership and available opportunities. This supports Eyben and Ladbury (1995) argument that the appropriate level of participation depends on the type of project and socio-economic environment. However, the low level of community participation experienced in the selected community water projects contradicts the second Dublin principle for the management of water resources which postulates

that water development and management should be based on participatory approach, involving users and planners and policy makers at all levels.

In rural water management, the community is expected to participate in various project activities. The ANOVA test results on the variations in the level of community participation in various activities in the sub-catchment (**Table 5.2**). indicate significant variations in terms of helping to prepare development plan ( $F=18.73$ ,  $p= 0.000$ ,  $p <0.05$ ), providing funds to meet initial costs ( $F=13.72$   $p= 0.000$ ,  $p <0.05$ ), helping in project implementation ( $F=15.76$ ,  $p= 0.000$ ,  $p <0.05$ ), providing support for operation and maintenance in form of money and unpaid labour ( $F=11.40$ ,  $p= 0.000$ ,  $p <0.05$ ), making decisions concerning their project ( $F= 37.96$ ,  $p= 0.000$ ,  $p <0.05$ ), attending project meetings ( $F=15.22$ ,  $p= 0.000$ ,  $p <0.05$ ) and having control ( $F=29.11$ ,  $p= 0.000$ ,  $p <0.05$ ) and ownership over the project ( $F=30.30$ ,  $p= 0.000$ ,  $p <0.05$ ).

**Table 5.2 ANOVA Results of variations in community participation in various project activities**

		Sum	of			
		Squares	Df	Mean Square	F	Sig.
Preparing development plan	Between Groups	67.603	3	22.534	18.729	.000
	Within Groups	235.817	196	1.203		
	Total	303.420	199			
Meeting initial costs	Between Groups	57.830	3	19.277	13.721	.000
	Within Groups	275.365	196	1.405		
	Total	333.195	199			

Project implementation	Between Groups	53.624	3	17.875	15.760	.000
	Within Groups	222.296	196	1.134		
	Total	275.920	199			
Providing Money/ unpaid labour for O&M	Between Groups	41.241	3	13.747	11.400	.000
	Within Groups	236.354	196	1.206		
	Total	277.595	199			
Building community capacity	Between Groups	23.493	3	7.831	7.126	.000
	Within Groups	215.382	196	1.099		
	Total	238.875	199			
Making decisions of the project	Between Groups	116.786	3	38.929	37.958	.000
	Within Groups	201.009	196	1.026		
	Total	317.795	199			
Attending project meetings	Between Groups	51.771	3	17.257	15.221	.000
	Within Groups	222.209	196	1.134		
	Total	273.980	199			
Control over the project	Between Groups	97.280	3	32.427	29.112	.000
	Within Groups	218.315	196	1.114		
	Total	315.595	199			
Sense of ownership	Between Groups	103.650	3	34.550	30.295	.000
	Within Groups	223.530	196	1.140		
	Total	327.180	199			

Results in **Table 5.3** show that Munyu community water project is leading in all the project activities except in the ability to use donor and community resources to build community capacity where Kamunyaka leads. Kinyathena community water project is second to Munyu in terms of helping to prepare development plan, providing support for operation and maintenance in form of money and unpaid labour while Kamunyaka and Juja Farm are second in providing funds to meet initial costs, helping in project implementation and having control over the project and sense of ownership respectively.

The results also indicate that the level of community participation in Munyu community water project is significantly different from the rest of community water projects in helping to prepare development plan, providing funds to meet initial costs, helping in project implementation, making decisions, having control over the project and a sense of ownership. The study findings also indicate that there is no significant difference among Kinyathena, Kamunyaka and Juja Farm community water projects in helping to prepare development plan, providing funds to meet initial costs, helping in project implementation and having a sense of ownership. However, there is significant difference between Kamunyaka and Juja Farm in providing funds to meet initial costs, helping in project implementation and having control over the project between Kinyathena and Kamunyaka in the ability to use donor and community resources to build community capacity, between Juja Farm and Kinyathena in making decisions.

**Table 5.3 Multiple Comparisons in level of community participation in various project activities**

Dependent Variable	(I) Name of (J) Name		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
	water project	of water project				Lower Bound	Upper Bound
Helping to prepare development plan	Kinyathena	Munyu	-1.38916*	.25699	.000	-2.0551	-.7233
		Kamunyaka	.34942	.20202	.311	-.1741	.8729
		Juja Farm	.23512	.22275	.717	-.3421	.8123
	Munyu	Kinyathena	1.38916*	.25699	.000	.7233	2.0551
		Kamunyaka	1.73858*	.24031	.000	1.1159	2.3613
		Juja Farm	1.62428*	.25798	.000	.9558	2.2928
	Kamunyaka	Kinyathena	-.34942	.20202	.311	-.8729	.1741
		Munyu	-1.73858*	.24031	.000	-2.3613	-1.1159
		Juja Farm	-.11430	.20328	.943	-.6411	.4124
	Juja Farm	Kinyathena	-.23512	.22275	.717	-.8123	.3421
		Munyu	-1.62428*	.25798	.000	-2.2928	-.9558
		Kamunyaka	.11430	.20328	.943	-.4124	.6411
Providing funds to meet initial costs	Kinyathena	Munyu	-1.19916*	.27770	.000	-1.9187	-.4796
		Kamunyaka	-.30447	.21831	.504	-.8701	.2612
		Juja Farm	.54294	.24071	.112	-.0808	1.1667
	Munyu	Kinyathena	1.19916*	.27770	.000	.4796	1.9187
		Kamunyaka	.89469*	.25968	.004	.2218	1.5676
		Juja Farm	1.74210*	.27877	.000	1.0197	2.4645
	Kamunyaka	Kinyathena	.30447	.21831	.504	-.2612	.8701
		Munyu	-.89469*	.25968	.004	-1.5676	-.2218
		Juja Farm	.84741*	.21967	.001	.2782	1.4166
	Juja Farm	Kinyathena	-.54294	.24071	.112	-1.1667	.0808
		Munyu	-1.74210*	.27877	.000	-2.4645	-1.0197
		Kamunyaka	-.84741*	.21967	.001	-1.4166	-.2782
Helping in project implementation	Kinyathena	Munyu	-1.36242*	.24951	.000	-2.0090	-.7159
		Kamunyaka	-.31908	.19614	.366	-.8273	.1892

		Juja Farm	.29634	.21627	.520	-.2641	.8568
	Munyu	Kinyathena	1.36242*	.24951	.000	.7159	2.0090
		Kamunyaka	1.04334*	.23331	.000	.4388	1.6479
		Juja Farm	1.65876*	.25047	.000	1.0097	2.3078
	Kamunyaka	Kinyathena	.31908	.19614	.366	-.1892	.8273
		Munyu	-1.04334*	.23331	.000	-1.6479	-.4388
		Juja Farm	.61543*	.19737	.011	.1040	1.1269
	Juja Farm	Kinyathena	-.29634	.21627	.520	-.8568	.2641
		Munyu	-1.65876*	.25047	.000	-2.3078	-1.0097
		Kamunyaka	-.61543*	.19737	.011	-1.1269	-.1040
Providing support for O & M in form of money/unpaid labour	Kinyathena	Munyu	-.28712	.25728	.680	-.9538	.3795
		Kamunyaka	.41092	.20225	.180	-.1132	.9350
		Juja Farm	1.04549*	.22301	.000	.4676	1.6234
	Munyu	Kinyathena	.28712	.25728	.680	-.3795	.9538
		Kamunyaka	.69804*	.24058	.021	.0747	1.3214
		Juja Farm	1.33261*	.25827	.000	.6634	2.0019
	Kamunyaka	Kinyathena	-.41092	.20225	.180	-.9350	.1132
		Munyu	-.69804*	.24058	.021	-1.3214	-.0747
		Juja Farm	.63457*	.20352	.011	.1072	1.1619
	Juja Farm	Kinyathena	-1.04549*	.22301	.000	-1.6234	-.4676
		Munyu	-1.33261*	.25827	.000	-2.0019	-.6634
		Kamunyaka	-.63457*	.20352	.011	-1.1619	-.1072
Building community capacity	Kinyathena	Munyu	-.59324	.24560	.077	-1.2296	.0432
		Kamunyaka	-.88169*	.19307	.000	-1.3820	-.3814
		Juja Farm	-.42730	.21288	.189	-.9789	.1243
	Munyu	Kinyathena	.59324	.24560	.077	-.0432	1.2296
		Kamunyaka	-.28844	.22966	.592	-.8835	.3066
		Juja Farm	.16595	.24655	.907	-.4729	.8048
	Kamunyaka	Kinyathena	.88169*	.19307	.000	.3814	1.3820
		Munyu	.28844	.22966	.592	-.3066	.8835
		Juja Farm	.45439	.19428	.093	-.0490	.9578
	Juja Farm	Kinyathena	.42730	.21288	.189	-.1243	.9789

		Munyu	-.16595	.24655	.907	-.8048	.4729	
		Kamunyaka	-.45439	.19428	.093	-.9578	.0490	
Making decisions	Kinyathena	Munyu	-1.65728*	.23726	.000	-2.2721	-1.0425	
		Kamunyaka	.70712*	.18652	.001	.2238	1.1904	
	Munyu	Juja Farm	.11139	.20566	.949	-.4215	.6443	
		Kinyathena	1.65728*	.23726	.000	1.0425	2.2721	
		Kamunyaka	2.36440*	.22186	.000	1.7895	2.9393	
	Kamunyaka	Juja Farm	1.76868*	.23818	.000	1.1515	2.3859	
		Kinyathena	-.70712*	.18652	.001	-1.1904	-.2238	
		Munyu	-2.36440*	.22186	.000	-2.9393	-1.7895	
	Juja Farm	Juja Farm	-.59572*	.18768	.009	-1.0820	-.1094	
		Kinyathena	-.11139	.20566	.949	-.6443	.4215	
		Munyu	-1.76868*	.23818	.000	-2.3859	-1.1515	
		Kamunyaka	.59572*	.18768	.009	.1094	1.0820	
Attending project meetings		Kinyathena	Munyu	-.44053	.24946	.293	-1.0869	.2059
			Kamunyaka	.80364*	.19611	.000	.2955	1.3118
		Juja Farm	.89711*	.21623	.000	.3368	1.4574	
Munyu	Kinyathena	.44053	.24946	.293	-.2059	1.0869		
	Kamunyaka	1.24418*	.23327	.000	.6397	1.8486		
	Juja Farm	1.33764*	.25043	.000	.6887	1.9865		
Kamunyaka	Kinyathena	-.80364*	.19611	.000	-1.3118	-.2955		
	Munyu	-1.24418*	.23327	.000	-1.8486	-.6397		
	Juja Farm	.09347	.19733	.965	-.4179	.6048		
Juja Farm	Kinyathena	-.89711*	.21623	.000	-1.4574	-.3368		
	Munyu	-1.33764*	.25043	.000	-1.9865	-.6887		
	Kamunyaka	-.09347	.19733	.965	-.6048	.4179		
Having control over the project	Kinyathena	Munyu	-1.77058*	.24727	.000	-2.4113	-1.1299	
		Kamunyaka	.36735	.19438	.236	-.1363	.8710	
		Juja Farm	-.23682	.21433	.687	-.7922	.3186	
	Munyu	Kinyathena	1.77058*	.24727	.000	1.1299	2.4113	
		Kamunyaka	2.13793*	.23122	.000	1.5388	2.7371	
		Juja Farm	1.53376*	.24822	.000	.8906	2.1770	

	Kamunyaka	Kinyathena	-.36735	.19438	.236	-.8710	.1363
		Munyu	-2.13793*	.23122	.000	-2.7371	-1.5388
		Juja Farm	-.60417*	.19559	.012	-1.1110	-.0973
	Juja Farm	Kinyathena	.23682	.21433	.687	-.3186	.7922
		Munyu	-1.53376*	.24822	.000	-2.1770	-.8906
		Kamunyaka	.60417*	.19559	.012	.0973	1.1110
Sense of ownership over the project	Kinyathena	Munyu	-2.16256*	.25020	.000	-2.8109	-1.5142
		Kamunyaka	-.17375	.19669	.814	-.6834	.3359
		Juja Farm	-.19345	.21687	.809	-.7554	.3685
	Munyu	Kinyathena	2.16256*	.25020	.000	1.5142	2.8109
		Kamunyaka	1.98882*	.23396	.000	1.3826	2.5951
		Juja Farm	1.96911*	.25117	.000	1.3183	2.6199
	Kamunyaka	Kinyathena	.17375	.19669	.814	-.3359	.6834
		Munyu	-1.98882*	.23396	.000	-2.5951	-1.3826
		Juja Farm	-.01971	.19792	1.000	-.5326	.4931
	Juja Farm	Kinyathena	.19345	.21687	.809	-.3685	.7554
		Munyu	-1.96911*	.25117	.000	-2.6199	-1.3183
		Kamunyaka	.01971	.19792	1.000	-.4931	.5326

**\* The mean difference is significant at the 0.05 level.**

These variations in community water project activities have led to variations in the level of community participation in the sub-catchment hence varying levels of performance among the selected projects. The level of community participation in various project activities is directly proportional to the level of community participation and the level of project performance in rural water management. Successful rural development projects tend to be those that are flexible, provide for active participation of beneficiaries and are sensitive to local conditions and cultures (Kottak, 1991; Uphoff, 1991). This study also supports other researches which conclude that projects with higher level of community participation performed better (Evans and Appletons,

1993; Narayan, 1995; Sara and Katz, 1998; Isham and Kahkonen, 1999; Isham and Kahkonen, 2002; Prokopy, 2005).

#### **4.6.2 Variations in the leadership of community water projects in the sub-catchment**

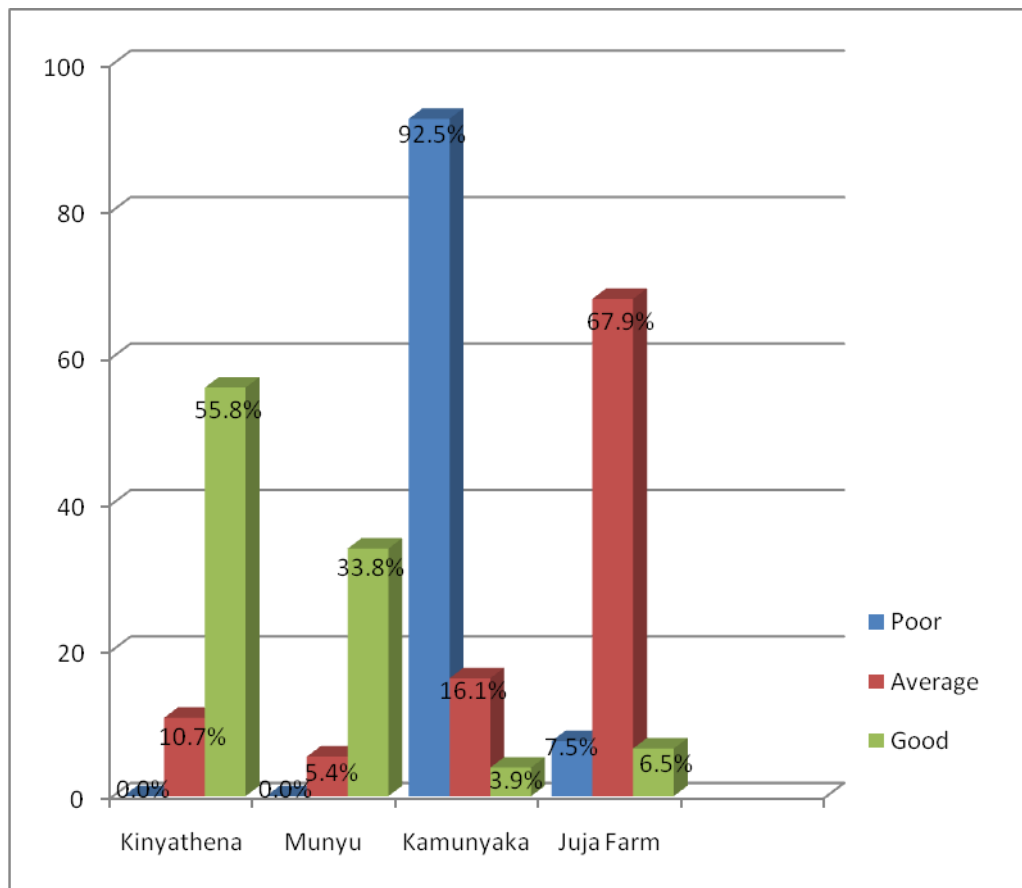
In this study, leadership was categorized into poor, average and good based on leadership characteristics such as gender balance, representation of the poor and marginalized, ability to solve water related conflicts, relationship with local government, donors and NGOs, ability to implement project development plan, accountability of community resources, involving the community in planning and development issues and sharing of the information concerning their project.

The ANOVA test results on the variations in the level of leadership in community water projects in the sub-catchment (**Table 5.4**) reveal that there exists significant variations among different community water projects in terms of gender balance ( $F=161.70$ ,  $p= 0.000$ ,  $p <0.05$ ), representation of the poor and marginalized ( $F=129.32$ ,  $p= 0.000$ ,  $p <0.05$ ), ability to solve water related conflicts ( $F=130.26$ ,  $p= 0.000$ ,  $p <0.05$ ), relationship with local government, donors and NGOs ( $F=10.55$ ,  $p= 0.000$ ,  $p <0.05$ ), ability to implement project development plan ( $F=77.146$ ,  $p= 0.000$ ,  $p <0.05$ ), accountability of community resources ( $F=137.33$ ,  $p= 0.000$ ,  $p <0.05$ ), involvement of the community in planning and development issues ( $F=127.36$ ,  $p= 0.000$ ,  $p <0.05$ ) and sharing of the information concerning their project ( $F=91.65$ ,  $p= 0.000$ ,  $p <0.05$ ).

**Table 5.4 ANOVA Results of leadership variations in the sub-catchment**

		Sum of Squares	Df	Mean Square	F	Sig.
Gender balance	Between Groups	281.241	3	93.747	161.699	.000
	Within Groups	113.634	196	.580		
	Total	394.875	199			
Representation of poor/ marginalized	Between Groups	261.281	3	87.094	129.322	.000
	Within Groups	131.999	196	.673		
	Total	393.280	199			
Ability to solve water- related conflicts	Between Groups	250.803	3	83.601	130.262	.000
	Within Groups	125.792	196	.642		
	Total	376.595	199			
Relationship with local government, donors and NGOs	Between Groups	27.354	3	9.118	10.552	.000
	Within Groups	169.366	196	.864		
	Total	196.720	199			
Ability to implement project development plan	Between Groups	161.310	3	53.770	77.146	.000
	Within Groups	136.610	196	.697		
	Total	297.920	199			
Accountability of community resources	Between Groups	275.440	3	91.813	137.327	.000
	Within Groups	131.040	196	.669		
	Total	406.480	199			
Involvement of the community in planning and development of the project	Between Groups	288.430	3	96.143	127.356	.000
	Within Groups	147.965	196	.755		
	Total	436.395	199			
Sharing information concerning the project	Between Groups	265.520	3	88.507	91.652	.000
	Within Groups	189.275	196	.966		
	Total	454.795	199			

Results indicate that 55.8% of the respondents in Kinyathena, 33.8% in Munyu, 6.5% in Juja Farm and 3.9% in Kamunyaka community water projects said their leadership was good while 10.7%, 5.4%, 67.9% and 16.1% of the respondents felt their leadership was average respectively. While poor leadership is non-existent, according to the community in Kinyathena and Munyu water projects, in Kamunyaka and Juja Farm community water projects, 92.5% and 7.5% of the respondents respectively said to have poor leadership (**Figure 5.2**). These results reveal that while Kinyathena has good leadership on average, Juja Farm has average leadership and Kamunyaka has poor leadership.



**Figure 5.2 Leadership variations in the sub-catchment**

Results from multiple comparisons (**Table 5.5**) indicate that Munyu community water project leads in ability to solve water related conflicts, ability to implement project development plan, accountability of community resources, involvement of the community in planning and development issues and sharing of the information concerning their project while Kinyathena leads in gender balance, representation of the poor and marginalized and in relationship with local government, donors and NGOs. In all areas where Munyu is leading, Kinyathena is second and where Kinyathena leads Munyu is second except in relationship with local government, donors and NGOs where Juja Farm is second. In all the other characteristics of leadership Juja Farm is third while Kamunyaka is fourth in ranking.

Further analysis reveals that there is significant difference in the levels of leadership from one community water project to the other in the ability to solve water related conflicts, ability to implement project development plan, accountability of community resources, involvement of the community in planning and development issues and sharing of the information concerning their project. In the rest, the difference in between one community water project and another is significant and or insignificant (**Table 5.5**).

**Table 5.5 Multiple Comparisons in the level of leadership in the sub-catchment**

Dependent Variable	(I) Name of water project	(J) Name of water project	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Gender balance	Kinyathena	Munyu	.11541	.17839	.917	-.3468	.5777
		Kamunyaka	2.72725*	.14024	.000	2.3639	3.0906
		Juja	1.79932*	.15463	.000	1.3986	2.2000
	Munyu	Kinyathena	-.11541	.17839	.917	-.5777	.3468
		Kamunyaka	2.61184*	.16681	.000	2.1796	3.0441
		Juja	1.68391*	.17908	.000	1.2199	2.1479
	Kamunyaka	Kinyathena	-2.72725*	.14024	.000	-3.0906	-2.3639
		Munyu	-2.61184*	.16681	.000	-3.0441	-2.1796
		Juja	-.92793*	.14111	.000	-1.2936	-.5623
	Juja	Kinyathena	-1.79932*	.15463	.000	-2.2000	-1.3986
		Munyu	-1.68391*	.17908	.000	-2.1479	-1.2199
		Kamunyaka	.92793*	.14111	.000	.5623	1.2936
Representation of the poor/ marginalized	Kinyathena	Munyu	.46305	.19227	.079	-.0352	.9613
		Kamunyaka	2.76641*	.15115	.000	2.3748	3.1581
		Juja Farm	1.65774*	.16666	.000	1.2259	2.0896
	Munyu	Kinyathena	-.46305	.19227	.079	-.9613	.0352
		Kamunyaka	2.30336*	.17979	.000	1.8375	2.7692
		Juja	1.19468*	.19301	.000	.6946	1.6948
	Kamunyaka	Kinyathena	-2.76641*	.15115	.000	-3.1581	-2.3748
		Munyu	-2.30336*	.17979	.000	-2.7692	-1.8375
		Juja Farm	-1.10867*	.15209	.000	-1.5028	-.7146
	Juja Farm	Kinyathena	-1.65774*	.16666	.000	-2.0896	-1.2259
		Munyu	-1.19468*	.19301	.000	-1.6948	-.6946
		Kamunyaka	1.10867*	.15209	.000	.7146	1.5028
Ability to solve water-related conflicts	Kinyathena	Munyu	-.65869*	.18769	.003	-1.1450	-.1723
		Kamunyaka	2.28213*	.14755	.000	1.8998	2.6645
		Juja Farm	.88010*	.16269	.000	.4585	1.3017

	Munyu	Kinyathena	.65869*	.18769	.003	.1723	1.1450
		Kamunyaka	2.94082*	.17551	.000	2.4860	3.3956
		Juja Farm	1.53879*	.18842	.000	1.0506	2.0270
	Kamunyaka	Kinyathena	-2.28213*	.14755	.000	-2.6645	-1.8998
		Munyu	-2.94082*	.17551	.000	-3.3956	-2.4860
		Juja Farm	-1.40203*	.14847	.000	-1.7867	-1.0173
	Juja Farm	Kinyathena	-.88010*	.16269	.000	-1.3017	-.4585
		Munyu	-1.53879*	.18842	.000	-2.0270	-1.0506
		Kamunyaka	1.40203*	.14847	.000	1.0173	1.7867
Relationship with local government, donors and NGOs	Kinyathena	Munyu	.52639	.21779	.077	-.0379	1.0907
		Kamunyaka	.85025*	.17121	.000	.4066	1.2939
		Juja Farm	.10757	.18878	.941	-.3816	.5967
	Munyu	Kinyathena	-.52639	.21779	.077	-1.0907	.0379
		Kamunyaka	.32386	.20365	.387	-.2038	.8516
		Juja Farm	-.41882	.21863	.225	-.9853	.1477
	Kamunyaka	Kinyathena	-.85025*	.17121	.000	-1.2939	-.4066
		Munyu	-.32386	.20365	.387	-.8516	.2038
		Juja Farm	-.74268*	.17228	.000	-1.1891	-.2963
Ability to implement project development plan	Juja Farm	Kinyathena	-.10757	.18878	.941	-.5967	.3816
		Munyu	.41882	.21863	.225	-.1477	.9853
		Kamunyaka	.74268*	.17228	.000	.2963	1.1891
	Kinyathena	Munyu	-.56158*	.19560	.023	-1.0684	-.0547
		Kamunyaka	1.80888*	.15376	.000	1.4104	2.2073
		Juja Farm	.61012*	.16954	.002	.1708	1.0494
	Munyu	Kinyathena	.56158*	.19560	.023	.0547	1.0684
		Kamunyaka	2.37046*	.18290	.000	1.8965	2.8444
		Juja Farm	1.17170*	.19635	.000	.6629	1.6805
Kamunyaka	Kinyathena	Kinyathena	-1.80888*	.15376	.000	-2.2073	-1.4104
		Munyu	-2.37046*	.18290	.000	-2.8444	-1.8965
		Juja Farm	-1.19876*	.15472	.000	-1.5997	-.7978
	Juja Farm	Kinyathena	-.61012*	.16954	.002	-1.0494	-.1708
		Munyu	-1.17170*	.19635	.000	-1.6805	-.6629

Accountability of community resources		Kamunyaka	1.19876*	.15472	.000	.7978	1.5997
	Kinyathena	Munyu	-.81703*	.19157	.000	-1.3134	-.3206
		Kamunyaka	2.32929*	.15060	.000	1.9391	2.7195
		Juja Farm	.96386*	.16605	.000	.5336	1.3941
	Munyu	Kinyathena	.81703*	.19157	.000	.3206	1.3134
		Kamunyaka	3.14632*	.17913	.000	2.6821	3.6105
		Juja Farm	1.78089*	.19231	.000	1.2826	2.2792
	Kamunyaka	Kinyathena	-2.32929*	.15060	.000	-2.7195	-1.9391
		Munyu	-3.14632*	.17913	.000	-3.6105	-2.6821
		Juja Farm	-1.36543*	.15154	.000	-1.7581	-.9728
Involving the community in planning and development issues	Juja Farm	Kinyathena	-.96386*	.16605	.000	-1.3941	-.5336
		Munyu	-1.78089*	.19231	.000	-2.2792	-1.2826
		Kamunyaka	1.36543*	.15154	.000	.9728	1.7581
	Kinyathena	Munyu	-.06826	.20356	.987	-.5957	.4592
		Kamunyaka	2.70574*	.16003	.000	2.2911	3.1204
		Juja Farm	1.67815*	.17645	.000	1.2209	2.1354
	Munyu	Kinyathena	.06826	.20356	.987	-.4592	.5957
		Kamunyaka	2.77400*	.19035	.000	2.2808	3.2672
		Juja Farm	1.74641*	.20435	.000	1.2169	2.2759
	Kamunyaka	Kinyathena	-2.70574*	.16003	.000	-3.1204	-2.2911
Sharing information on project		Munyu	-2.77400*	.19035	.000	-3.2672	-2.2808
		Juja Farm	-1.02759*	.16103	.000	-1.4448	-.6103
	Juja Farm	Kinyathena	-1.67815*	.17645	.000	-2.1354	-1.2209
		Munyu	-1.74641*	.20435	.000	-2.2759	-1.2169
		Kamunyaka	1.02759*	.16103	.000	.6103	1.4448
	Kinyathena	Munyu	-.08867	.23023	.981	-.6853	.5079
		Kamunyaka	2.59073*	.18099	.000	2.1217	3.0597
		Juja Farm	1.57440*	.19957	.000	1.0573	2.0915
	Munyu	Kinyathena	.08867	.23023	.981	-.5079	.6853
		Kamunyaka	2.67940*	.21529	.000	2.1215	3.2373
	Juja Farm	1.66307*	.23112	.000	1.0642	2.2620	
	Kamunyaka	Kinyathena	-2.59073*	.18099	.000	-3.0597	-2.1217

	Munyu	-2.67940*	.21529	.000	-3.2373	-2.1215
	Juja Farm	-1.01633*	.18212	.000	-1.4882	-.5444
Juja Farm	Kinyathena	-1.57440*	.19957	.000	-2.0915	-1.0573
	Munyu	-1.66307*	.23112	.000	-2.2620	-1.0642
	Kamunyaka	1.01633*	.18212	.000	.5444	1.4882
<b>* The mean difference is significant at the 0.05 level.</b>						

The study indicates that leadership in rural water management depends on various leadership characteristics such as gender balance, representation of the poor and marginalized, ability to solve water related conflicts, relationship with local government, donors and NGOs, ability to implement project development plan, accountability of community resources, involvement of the community in planning and development issues and sharing of the information concerning their project. The more a community incorporates these leadership characteristics in rural water management, the better the leadership and the higher the project performance.

#### **4.6.3 Variations in the level of available opportunities in rural water management**

In this study, the level of available opportunities was classified into low, average and high levels based on good leadership, external support, availability of water resources, ability to pay for water, capacity to manage rural water, availability of the required technical skills, gender balance in leadership, control over water resources, community cohesion during project activities, education and awareness, ability to meet operation and maintenance and motivation and incentives.

The ANOVA test results on the variations in the level of available opportunities were as follows; good leadership (F=108.9, p= 0.000, p <0.05), external support(F=15.67, p= 0.000, p <0.05),

availability of water resources( $F=11.148$ ,  $p= 0.000$ ,  $p <0.05$ ), ability to pay for water ( $F=2.70$ ,  $p= 0.46$ ,  $p >0.05$ ), capacity to manage rural water( $F=10.29$ ,  $p= 0.000$ ,  $p <0.05$ ), availability of the required technical skills( $F=24.42$ ,  $p= 0.000$ ,  $p <0.05$ ), gender balance in leadership( $F=58.27$ ,  $p= 0.000$ ,  $p <0.05$ ), control over water resources( $F=10.43$ ,  $p= 0.000$ ,  $p <0.05$ ), community cohesion during project activities( $F=14.33$ ,  $p= 0.000$ ,  $p <0.05$ ), education and awareness( $F=23.35$ ,  $p= 0.000$ ,  $p <0.05$ ), ability to meet operation and maintenance( $F=16.27$ ,  $p= 0.000$ ,  $p <0.05$ ) and motivation and incentives( $F=38.97$ ,  $p= 0.000$ ,  $p <0.05$ ), (**Table 5.6**).

**Table 5.6 ANOVA test results of variations in the level of available opportunities**

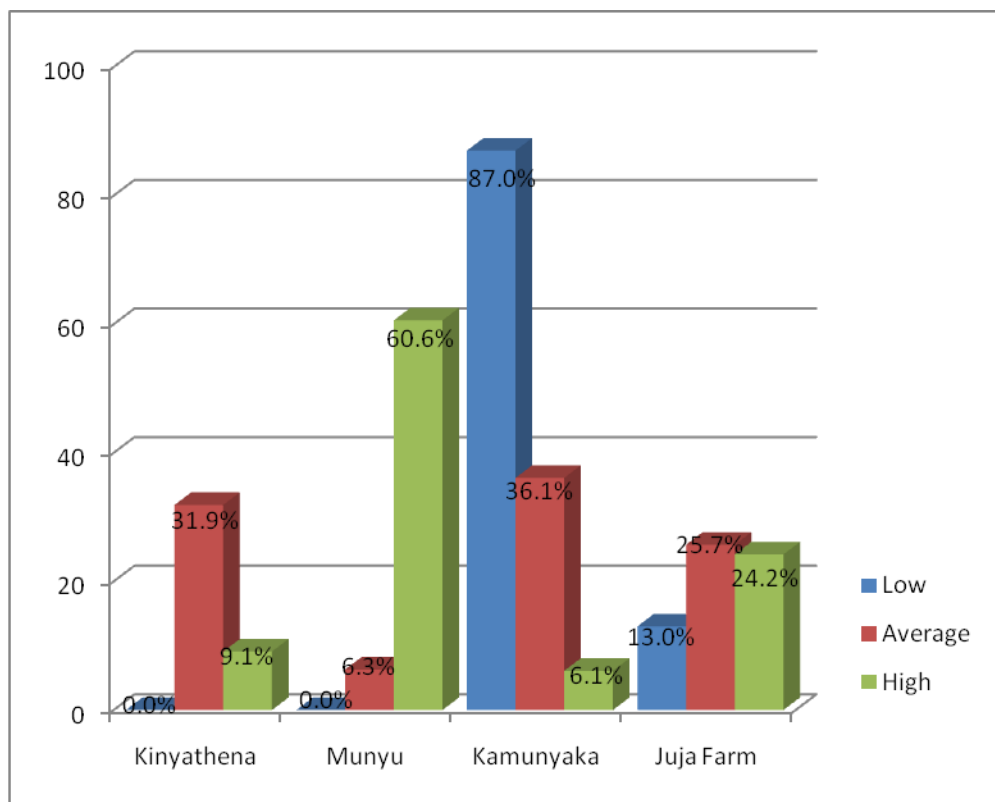
		Sum of Squares	df	Mean Square	F	Sig.
Good leadership	Between Groups	99.204	3	33.068	108.902	.000
	Within Groups	59.516	196	.304		
	Total	158.720	199			
External support	Between Groups	19.384	3	6.461	15.667	.000
	Within Groups	80.836	196	.412		
	Total	100.220	199			
Access to water	Between Groups	13.491	3	4.497	11.148	.000
	Within Groups	79.064	196	.403		
	Total	92.555	199			
Ability to pay	Between Groups	3.609	3	1.203	2.707	.046
	Within Groups	87.111	196	.444		
	Total	90.720	199			
Capacity to manage	Between Groups	16.912	3	5.637	10.287	.000
	Within Groups	107.408	196	.548		
	Total	124.320	199			

Availability of technical skills	Between Groups	35.868	3	11.956	24.423	.000
	Within Groups	95.952	196	.490		
	Total	131.820	199			
Gender balance	Between Groups	71.419	3	23.806	58.267	.000
	Within Groups	80.081	196	.409		
	Total	151.500	199			
Control over water resources	Between Groups	15.261	3	5.087	10.428	.000
	Within Groups	95.614	196	.488		
	Total	110.875	199			
Community cohesion	Between Groups	21.796	3	7.265	14.328	.000
	Within Groups	99.384	196	.507		
	Total	121.180	199			
Education/ awareness	Between Groups	29.715	3	9.905	23.345	.000
	Within Groups	83.160	196	.424		
	Total	112.875	199			
Operation costs	Between Groups	18.410	3	6.137	16.273	.000
	Within Groups	73.910	196	.377		
	Total	92.320	199			
Motivation/ incentives	Between Groups	44.654	3	14.885	38.968	.000
	Within Groups	74.866	196	.382		
	Total	119.520	199			

These results show a significant difference in the level of available opportunities in rural water management based on good leadership, external support, availability of water resources, ability to pay for water, capacity to manage rural water, availability of the required technical skills, gender balance in leadership, control over water resources, community cohesion during project

activities, education and awareness, ability to meet operation and maintenance and motivation and incentives.

From the study, 60% of the respondents in Munyu, 24.2% in Juja Farm, 9.1% in Kinyathena and 6.1% in Kamunyaka said that the level of available opportunities is high while 6.3%, 25.7%, 31.9% and 36.1% of the respondents in these community water projects respectively said the level of available opportunities is average. On the other hand, 87% and 13% of the respondents in Kamunyaka and Juja Farm respectively felt that the level of available opportunities is low (Figure 5.3).



**Figure 5.3 Variations in the Level of available opportunities**

These results indicate that the community at Munyu community water project has more opportunities available to them in rural water management than other projects while the community at Kamunyaka community water project has the lowest.

Results from multiple comparisons (**Table 5.7**) indicate that Munyu is leading in the availability of water resources, capacity to manage rural water, availability of the required technical skills, gender balance in leadership, control over water resources, community cohesion during project activities, education and awareness, ability to meet operation and maintenance and motivation and incentives while Kinyathena and Kamunyaka are leading in good leadership and external support respectively. However, Kamunyaka has the lowest level of available opportunities in terms of good leadership, availability of water resources, ability to pay for water, capacity to manage rural water, availability of the required technical skills, gender balance in leadership, control over water resources, community cohesion during project activities, education and awareness, ability to meet operation and maintenance.

In between the community water projects, the variations in the the level of available opportunities differ significantly among some selected community water projects while in others, the difference is insignificant. These results indicate that the more the opportunities are available to a community, the higher the level of community participation in rural water management and the higher the level of project performance.

**Table 5.7 Multiple Comparisons in the level of available opportunities in the sub-catchment**

Dependent Variable	(I) Name of water project	(J) Name of water project	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Good leadership	Kinyathena	Munyu	.15341	.12910	.635	-.1811	.4879
		Kamunyaka	1.66133*	.10149	.000	1.3984	1.9243
		Juja Farm	.66922*	.11191	.000	.3792	.9592
	Munyu	Kinyathena	-.15341	.12910	.635	-.4879	.1811
		Kamunyaka	1.50792*	.12072	.000	1.1951	1.8207
		Juja Farm	.51580*	.12960	.001	.1800	.8516
	Kamunyaka	Kinyathena	-1.66133*	.10149	.000	-1.9243	-1.3984
		Munyu	-1.50792*	.12072	.000	-1.8207	-1.1951
		Juja Farm	-.99212*	.10212	.000	-1.2567	-.7275
	Juja Farm	Kinyathena	-.66922*	.11191	.000	-.9592	-.3792
		Munyu	-.51580*	.12960	.001	-.8516	-.1800
		Kamunyaka	.99212*	.10212	.000	.7275	1.2567
External support	Kinyathena	Munyu	.61717*	.15046	.000	.2273	1.0070
		Kamunyaka	-.32598*	.11828	.032	-.6325	-.0195
		Juja Farm	-.18240	.13042	.502	-.5203	.1555
	Munyu	Kinyathena	-.61717*	.15046	.000	-1.0070	-.2273
		Kamunyaka	-.94315*	.14069	.000	-1.3077	-.5786
		Juja Farm	-.79957*	.15104	.000	-1.1910	-.4082
	Kamunyaka	Kinyathena	.32598*	.11828	.032	.0195	.6325
		Munyu	.94315*	.14069	.000	.5786	1.3077
		Juja Farm	.14358	.11902	.624	-.1648	.4520

	Juja Farm	Kinyathena	.18240	.13042	.502	-.1555	.5203
		Munyu	.79957*	.15104	.000	.4082	1.1910
		Kamunyaka	-.14358	.11902	.624	-.4520	.1648
Access to water/water resource availability	Kinyathena	Munyu	-.15904	.14880	.709	-.5446	.2265
		Kamunyaka	.51710*	.11698	.000	.2140	.8202
		Juja Farm	.11395	.12898	.813	-.2203	.4482
	Munyu	Kinyathena	.15904	.14880	.709	-.2265	.5446
		Kamunyaka	.67614*	.13914	.000	.3156	1.0367
		Juja Farm	.27299	.14938	.264	-.1141	.6601
	Kamunyaka	Kinyathena	-.51710*	.11698	.000	-.8202	-.2140
		Munyu	-.67614*	.13914	.000	-1.0367	-.3156
		Juja Farm	-.40315*	.11771	.004	-.7082	-.0981
Ability to pay for water	Juja Farm	Kinyathena	-.11395	.12898	.813	-.4482	.2203
		Munyu	-.27299	.14938	.264	-.6601	.1141
		Kamunyaka	.40315*	.11771	.004	.0981	.7082
	Kinyathena	Munyu	-.27516	.15619	.295	-.6799	.1296
		Kamunyaka	.12466	.12279	.741	-.1935	.4428
		Juja Farm	.09481	.13539	.897	-.2560	.4456
	Munyu	Kinyathena	.27516	.15619	.295	-.1296	.6799
		Kamunyaka	.39981*	.14605	.034	.0214	.7783
		Juja Farm	.36997	.15680	.088	-.0363	.7763
	Kamunyaka	Kinyathena	-.12466	.12279	.741	-.4428	.1935
		Munyu	-.39981*	.14605	.034	-.7783	-.0214
		Juja Farm	-.02984	.12355	.995	-.3500	.2903
	Juja Farm	Kinyathena	-.09481	.13539	.897	-.4456	.2560
		Munyu	-.36997	.15680	.088	-.7763	.0363
		Kamunyaka	.02984	.12355	.995	-.2903	.3500
Capacity to manage rural water	Kinyathena	Munyu	-.08234	.17344	.965	-.5317	.3671
		Kamunyaka	.61804*	.13634	.000	.2647	.9713
		Juja Farm	.13605	.15033	.802	-.2535	.5256
	Munyu	Kinyathena	.08234	.17344	.965	-.3671	.5317
		Kamunyaka	.70037*	.16218	.000	.2801	1.1206

		Juja Farm	.21839	.17411	.593	-.2328	.6695
	Kamunyaka	Kinyathena	-.61804*	.13634	.000	-.9713	-.2647
		Munyu	-.70037*	.16218	.000	-1.1206	-.2801
		Juja Farm	-.48198*	.13719	.003	-.8375	-.1265
	Juja Farm	Kinyathena	-.13605	.15033	.802	-.5256	.2535
		Munyu	-.21839	.17411	.593	-.6695	.2328
		Kamunyaka	.48198*	.13719	.003	.1265	.8375
Availability of technical skills	Kinyathena	Munyu	-.25334	.16393	.412	-.6781	.1714
		Kamunyaka	.85383*	.12887	.000	.5199	1.1878
		Juja Farm	.24235	.14209	.324	-.1258	.6105
	Munyu	Kinyathena	.25334	.16393	.412	-.1714	.6781
		Kamunyaka	1.10718*	.15329	.000	.7100	1.5044
		Juja Farm	.49569*	.16456	.015	.0693	.9221
	Kamunyaka	Kinyathena	-.85383*	.12887	.000	-1.1878	-.5199
		Munyu	-1.10718*	.15329	.000	-1.5044	-.7100
		Juja Farm	-.61149*	.12967	.000	-.9475	-.2755
	Juja Farm	Kinyathena	-.24235	.14209	.324	-.6105	.1258
		Munyu	-.49569*	.16456	.015	-.9221	-.0693
		Kamunyaka	.61149*	.12967	.000	.2755	.9475
Gender balance in leadership	Kinyathena	Munyu	-.07882	.14976	.953	-.4669	.3092
		Kamunyaka	1.33591*	.11773	.000	1.0309	1.6410
		Juja Farm	.75595*	.12981	.000	.4196	1.0923
	Munyu	Kinyathena	.07882	.14976	.953	-.3092	.4669
		Kamunyaka	1.41473*	.14004	.000	1.0519	1.7776
		Juja Farm	.83477*	.15034	.000	.4452	1.2243
	Kamunyaka	Kinyathena	-1.33591*	.11773	.000	-1.6410	-1.0309
		Munyu	-1.41473*	.14004	.000	-1.7776	-1.0519
		Juja Farm	-.57995*	.11846	.000	-.8869	-.2730
	Juja Farm	Kinyathena	-.75595*	.12981	.000	-1.0923	-.4196
		Munyu	-.83477*	.15034	.000	-1.2243	-.4452
		Kamunyaka	.57995*	.11846	.000	.2730	.8869

Control over water resources.	Kinyathena	Munyu	-.16890	.16364	.731	-.5929	.2551
		Kamunyaka	.55571*	.12864	.000	.2224	.8890
		Juja Farm Farm	.16156	.14184	.666	-.2060	.5291
	Munyu	Kinyathena	.16890	.16364	.731	-.2551	.5929
		Kamunyaka	.72460*	.15302	.000	.3281	1.1211
		Juja Farm	.33046	.16427	.187	-.0952	.7561
	Kamunyaka	Kinyathena	-.55571*	.12864	.000	-.8890	-.2224
		Munyu	-.72460*	.15302	.000	-1.1211	-.3281
		Juja Farm	-.39414*	.12944	.014	-.7296	-.0587
	Juja Farm	Kinyathena	-.16156	.14184	.666	-.5291	.2060
		Munyu	-.33046	.16427	.187	-.7561	.0952
		Kamunyaka	.39414*	.12944	.014	.0587	.7296
Community cohesion during project activities	Kinyathena	Munyu	-.49894*	.16683	.016	-.9312	-.0666
		Kamunyaka	.33563	.13115	.054	-.0042	.6755
		Juja Farm	-.36820	.14461	.056	-.7429	.0065
	Munyu	Kinyathena	.49894*	.16683	.016	.0666	.9312
		Kamunyaka	.83458*	.15600	.000	.4303	1.2388
		Juja Farm	.13075	.16748	.863	-.3032	.5647
	Kamunyaka	Kinyathena	-.33563	.13115	.054	-.6755	.0042
		Munyu	-.83458*	.15600	.000	-1.2388	-.4303
		Juja Farm	-.70383*	.13197	.000	-1.0458	-.3619
	Juja Farm	Kinyathena	.36820	.14461	.056	-.0065	.7429
		Munyu	-.13075	.16748	.863	-.5647	.3032
		Kamunyaka	.70383*	.13197	.000	.3619	1.0458
Education/ awareness	Kinyathena	Munyu	-.86418*	.15261	.000	-1.2596	-.4687
		Kamunyaka	.24766	.11997	.169	-.0632	.5585
		Juja Farm	-.36777*	.13228	.030	-.7105	-.0250
	Munyu	Kinyathena	.86418*	.15261	.000	.4687	1.2596
		Kamunyaka	1.11184*	.14270	.000	.7421	1.4816
		Juja Farm	.49641*	.15320	.008	.0994	.8934
	Kamunyaka	Kinyathena	-.24766	.11997	.169	-.5585	.0632

		Munyu	-1.11184*	.14270	.000	-1.4816	-.7421
		Juja Farm	-.61543*	.12072	.000	-.9282	-.3026
	Juja Farm	Kinyathena	.36777*	.13228	.030	.0250	.7105
		Munyu	-.49641*	.15320	.008	-.8934	-.0994
		Kamunyaka	.61543*	.12072	.000	.3026	.9282
Ability to meet O & M costs	Kinyathena	Munyu	-.59043*	.14387	.000	-.9632	-.2176
		Kamunyaka	.30612*	.11310	.037	.0131	.5992
		Juja Farm	.24362	.12471	.209	-.0795	.5668
	Munyu	Kinyathena	.59043*	.14387	.000	.2176	.9632
		Kamunyaka	.89655*	.13453	.000	.5479	1.2452
		Juja Farm	.83405*	.14443	.000	.4598	1.2083
	Kamunyaka	Kinyathena	-.30612*	.11310	.037	-.5992	-.0131
		Munyu	-.89655*	.13453	.000	-1.2452	-.5479
		Juja Farm	-.06250	.11381	.947	-.3574	.2324
	Juja Farm	Kinyathena	-.24362	.12471	.209	-.5668	.0795
		Munyu	-.83405*	.14443	.000	-1.2083	-.4598
		Kamunyaka	.06250	.11381	.947	-.2324	.3574
Motivation/ incentives	Kinyathena	Munyu	-1.40535*	.14480	.000	-1.7806	-1.0301
		Kamunyaka	-.04468	.11383	.979	-.3396	.2503
		Juja Farm	-.29974	.12551	.083	-.6250	.0255
	Munyu	Kinyathena	1.40535*	.14480	.000	1.0301	1.7806
		Kamunyaka	1.36067*	.13540	.000	1.0098	1.7115
		Juja Farm	1.10560*	.14536	.000	.7289	1.4823
	Kamunyaka	Kinyathena	.04468	.11383	.979	-.2503	.3396
		Munyu	-1.36067*	.13540	.000	-1.7115	-1.0098
		Juja Farm	-.25507	.11454	.120	-.5519	.0417
	Juja Farm	Kinyathena	.29974	.12551	.083	-.0255	.6250
		Munyu	-1.10560*	.14536	.000	-1.4823	-.7289
		Kamunyaka	.25507	.11454	.120	-.0417	.5519
<b>*The mean difference is significant at the 0.05 level.</b>							

#### 4.6.4 The variations in impact of community participation in rural water management

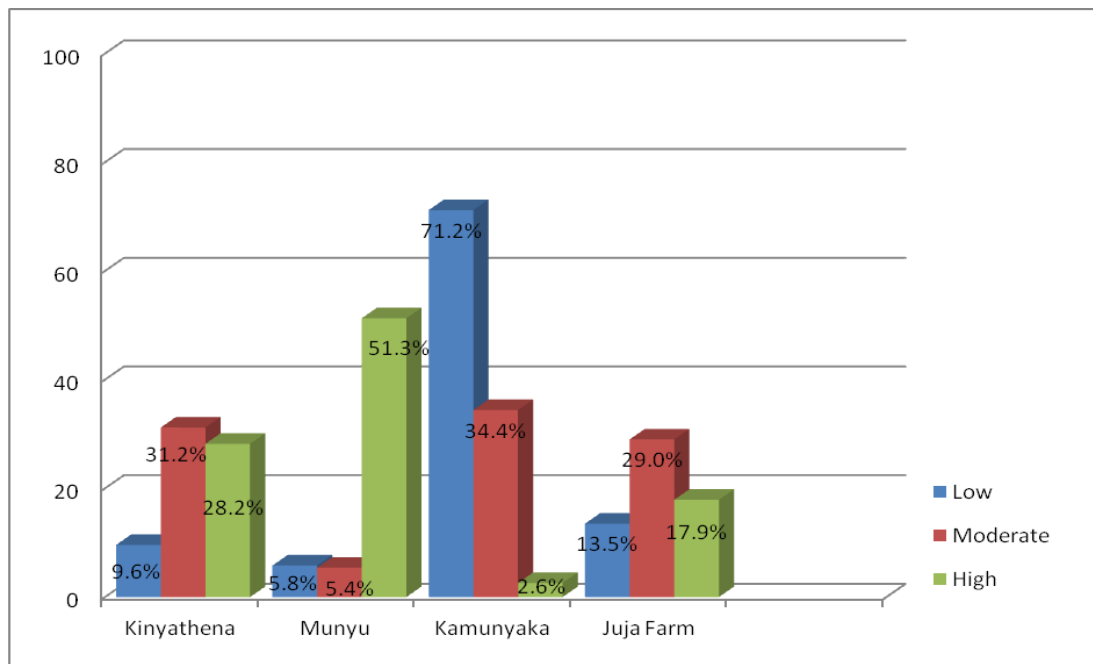
The variations in impact of community participation in rural water management was addressed in terms of constant access to water, use of proper farming methods and use of soil conservation measures. The level of impact was categorized into low, moderate and high levels. The ANOVA test results of variations in impact of community participation were as follows; constant access to adequate water ( $F=17.77$ ,  $p= 0.000$ ,  $p <0.05$ ), use of proper farming methods ( $F=8.52$ ,  $p= 0.000$ ,  $p <0.05$ ) and use of soil conservation measures ( $F=8.10$ ,  $p= 0.000$ ,  $p <0.05$ ) (**Table 5.8**).

**Table 5.8 ANOVA Results on the variations in impact of community participation**

		Sum Squares	of Df	Mean Square	F	Sig.
Constant access to adequate water	Between Groups	69.145	3	23.048	17.768	.000
	Within Groups	254.250	196	1.297		
	Total	323.395	199			
Use of proper farming methods	Between Groups	42.048	3	14.016	8.522	.000
	Within Groups	322.347	196	1.645		
	Total	364.395	199			
Use of soil conservation measures	Between Groups	44.030	3	14.677	8.096	.000
	Within Groups	355.325	196	1.813		
	Total	399.355	199			

These results show that the impact of community participation in rural water management varies significantly among the selected water projects in terms of constant access to adequate water, use of proper farming methods and use of soil conservation measures.

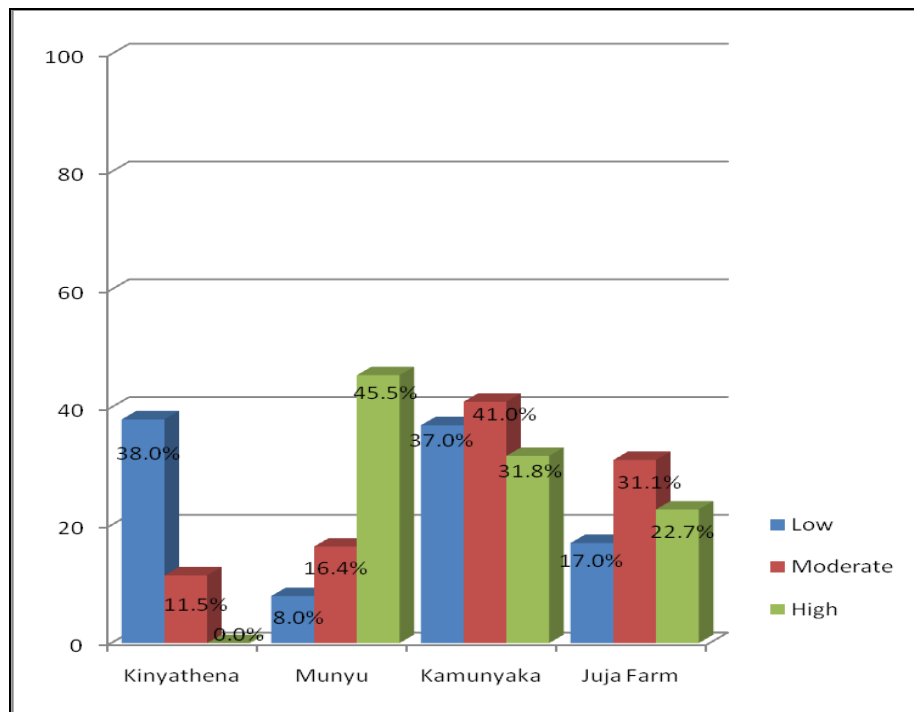
From the study, 51% of the respondents in Munyu, 28.2% in Kinyathena, 17.9% in Juja Farm and 2.6% in Kamunyaka community water projects felt that community participation has a high impact as far as constant access to water is concerned. Meanwhile, 71.2% of the respondents in Kamunyaka, 13.5% in Juja Farm, 9.6% in Kinyathena and 5.8% in Munyu said the impact is low, while 34.4%, 29%, 31.2% and 5.4% of the respondents in these community water projects respectively felt that the impact is moderate (**Figure 5.4**).



**Figure 5.4 Variations in constant access to adequate water**

These findings show that Munyu is better than the other projects in terms of constant access to water while Kamunyaka has the lowest impact. This could be attributed to the fact that Munyu community water project is better than the other project in terms of the level of community participation, leadership and available opportunities.

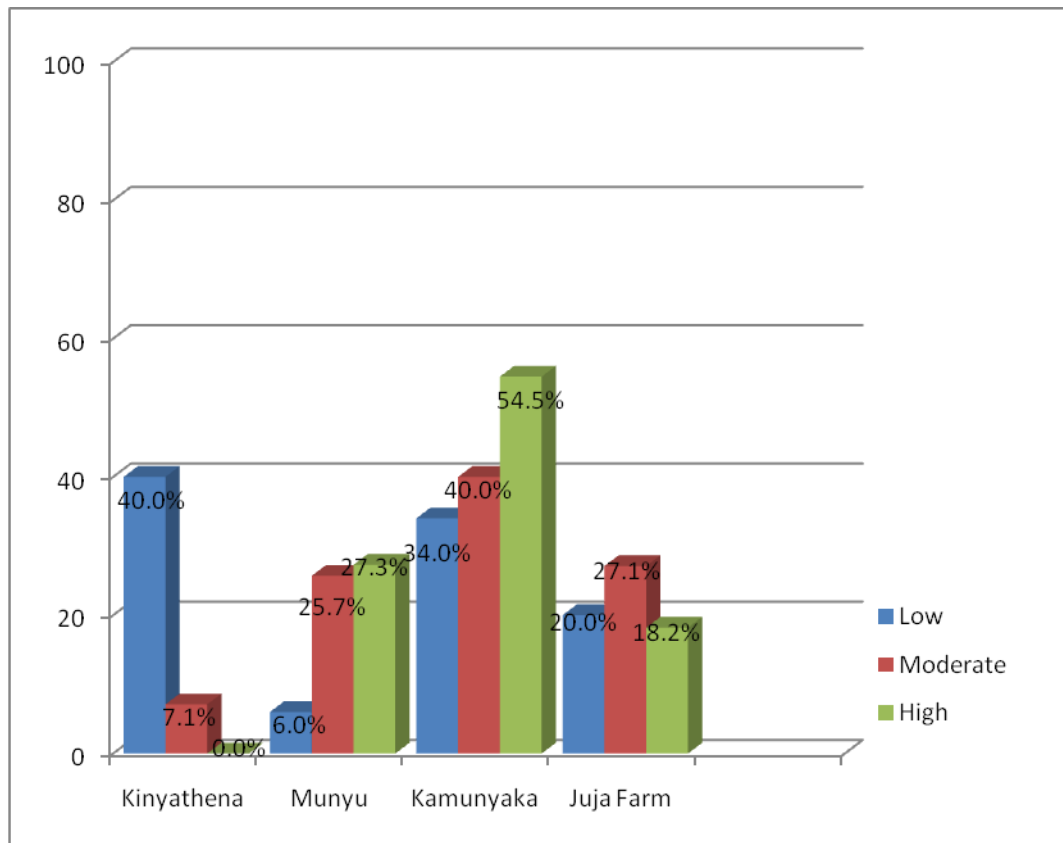
As far as the use of proper farming methods is concerned, the community members at Munyu community water project said there is a high impact of 45.5%, followed by Kamunyaka (31.8%) and Juja Farm (22.7%). However, there is no high impact of community participation in Kinyathena on the use of proper farming methods. From the results, Kinyathena community water project has a low impact of 38% followed by Kamunyaka, Juja Farm and Munyu water projects with 37%, 17% and 8% respectively. Another 41% of the respondents in Kamunyaka, 31.1% at Juja Farm, 16.4% at Munyu and 11.5% at Kinyathena community water projects felt that the impact is moderate (**Figure 5.5**).



**Figure 5.5 Variations in the use of proper farming methods**

Relatively, the community in Munyu community water project is doing better than the other projects in the use of proper farming methods than the community in the other water projects.

According to the study, 54.5% of the respondents at Kamunyaka, 23.3% at Munyu and 18.2% at Juja Farm community water projects felt that the impact of community participation on the use of soil conservation measures is high. However, there is no high impact on the use of soil conservation measures in Kinyathena as far the community is concerned. Another 40% of the respondents at Kinyathena, 34% at Kamunyaka, 20% at Juja Farm and 6% at Munyu community water projects felt the impact was low while 7.1%, 40%, 27.1% and 25.7% of the respondents in these projects respectively felt it was moderate (**Figure 5.6**).



**Figure 5.6 Variations in the use of soil conservation measures**

These results indicate that the community at Kamunyaka water project is doing relatively better on the use of soil conservation measures than the community in the other water projects.

Results from multiple comparisons on the level of impact show that Munyu community water project is leading in terms of constant access to adequate water, use of proper farming methods and soil conservation measures followed by Juja Farm (**Table 5.9**). The level of impact of community participation in Kinyathena community water project is the lowest in the use of proper farming methods and soil conservation measures while Kamunyaka community water project is the lowest in terms of constant access to water.

Comparisons of Kinyathena, Munyu, and Kamunyaka show significant differences in the level of access to water. There is also significant difference between Munyu and the other projects and also between Kamunyaka and the rest. However, there is no significant difference between Kinyathena and Juja Farm community water projects. While the results indicate a significant difference between Kinyathena and the other projects in the use of proper farming methods, there is no significant difference among Kamunyaka, Munyu and Juja Farm community water projects.

There is also significant difference between Kinyathena and the other projects on the use of soil conservation measures. However, there is no significant difference among Munyu, Kamunyaka and Juja Farm community water projects.

**Table 5.9 Multiple comparisons in the level of impact of community participation in the sub-catchment**

Dependent Variable	(I) Name of water project	(J) Name of water project	Mean	Std. Error	Sig.	95% Confidence Interval	
			Difference (I-J)			Lower Bound	Upper Bound
Constant access to adequate water	Kinyathena	Munyu	-.78466*	.26684	.019	-1.4761	-.0932
		Kamunyaka	.88776*	.20977	.000	.3442	1.4313
		Juja	-.09141	.23130	.979	-.6907	.5079
	Munyu	Kinyathena	.78466*	.26684	.019	.0932	1.4761
		Kamunyaka	1.67241*	.24952	.000	1.0259	2.3190
		Juja	.69325	.26787	.050	-.0009	1.3874
	Kamunyaka	Kinyathena	-.88776*	.20977	.000	-1.4313	-.3442
		Munyu	-1.67241*	.24952	.000	-2.3190	-1.0259
		Juja	-.97917*	.21108	.000	-1.5261	-.4322
	Juja	Kinyathena	.09141	.23130	.979	-.5079	.6907
		Munyu	-.69325	.26787	.050	-1.3874	.0009
		Kamunyaka	.97917*	.21108	.000	.4322	1.5261
Use of proper farming methods	Kinyathena	Munyu	-1.21323*	.30046	.000	-1.9918	-.4347
		Kamunyaka	-.75703*	.23620	.009	-1.3691	-.1450
		Juja	-1.16582*	.26044	.000	-1.8407	-.4910
	Munyu	Kinyathena	1.21323*	.30046	.000	.4347	1.9918
		Kamunyaka	.45620	.28096	.368	-.2718	1.1842
		Juja	.04741	.30162	.999	-.7341	.8290
	Kamunyaka	Kinyathena	.75703*	.23620	.009	.1450	1.3691
		Munyu	-.45620	.28096	.368	-1.1842	.2718
		Juja	-.40878	.23767	.316	-1.0246	.2071
	Juja	Kinyathena	1.16582*	.26044	.000	.4910	1.8407
		Munyu	-.04741	.30162	.999	-.8290	.7341

		Kamunyaka	.40878	.23767	.316	-.2071	1.0246
Use of soil conservation measures	Kinyathena	Munyu	-1.28712*	.31545	.000	-2.1045	-.4697
		Kamunyaka	-.94043*	.24798	.001	-1.5830	-.2979
		Juja Farm	-1.10034*	.27343	.000	-1.8089	-.3918
	Munyu	Kinyathena	1.28712*	.31545	.000	.4697	2.1045
		Kamunyaka	.34669	.29498	.643	-.4177	1.1110
		Juja Farm	.18678	.31667	.935	-.6338	1.0073
	Kamunyaka	Kinyathena	.94043*	.24798	.001	.2979	1.5830
		Munyu	-.34669	.29498	.643	-1.1110	.4177
		Juja Farm	-.15991	.24953	.919	-.8065	.4867
	Juja Farm	Kinyathena	1.10034*	.27343	.000	.3918	1.8089
		Munyu	-.18678	.31667	.935	-1.0073	.6338
		Kamunyaka	.15991	.24953	.919	-.4867	.8065
<b>*The mean difference is significant at the 0.05 level.</b>							

This study therefore indicates that significant variations exist among the selected community water projects in terms of the level of community participation, leadership categories, level of available opportunities and the level of impact of community participation in rural water management. This study therefore supports Chogul (2000) findings who in her study on participation in the housing sector in developing countries found that where initiatives existed in a community to improve living conditions, led to different results depending on the confidence in the ability of the community to contribute to its own development.

Results from Participatory Rural Appraisal enabled the community in the selected community water projects to share, enhance and analyze their knowledge of life conditions, plan and act on issues affecting their participation in rural water management. It involved transect walk observation and innovation assessment which involved scoring and ranking their different actions in rural water management. Participatory Rural Appraisal was used simultaneously with SWOT Analysis.

Results from SWOT Analysis indicate that the community in the sub-catchment has a number of strengths, weaknesses, opportunities and threats in their participation in rural water management as shown in **Table 6.0**. The key for the SWOT matrix is shown in **Table 6.1**.

**Table 6.0 SWOT Analysis**

<b>EXOGENOUS FACTORS</b>	<b>OPPORTUNITIES (O)</b>  O <sub>1</sub> , O <sub>2</sub> , O <sub>3</sub> , O <sub>4</sub>	<b>THREATS (T)</b>  T <sub>1</sub> , T <sub>2</sub> , T <sub>3</sub> , T <sub>4</sub>
<b>ENDOGENOUS FACTORS</b>		
<b>STRENGTHS (S)</b>  S <sub>1</sub> , S <sub>2</sub> , S <sub>3</sub> , S <sub>4</sub> , S <sub>5</sub> , S <sub>6</sub> , S <sub>7</sub> , S <sub>8</sub> , S <sub>9</sub> , S <sub>10</sub> , S <sub>11</sub> , S <sub>12</sub> , S <sub>13</sub> , S <sub>14</sub> , S <sub>15</sub> , S <sub>16</sub> , S <sub>17</sub> , S <sub>18</sub> , S <sub>19</sub>	Maximize strengths (S <sub>1</sub> , S <sub>2</sub> , S <sub>3</sub> , S <sub>4</sub> , S <sub>5</sub> , S <sub>6</sub> , S <sub>7</sub> , S <sub>8</sub> , S <sub>9</sub> , S <sub>10</sub> , S <sub>11</sub> , S <sub>12</sub> , S <sub>13</sub> , S <sub>14</sub> , S <sub>15</sub> , S <sub>16</sub> , S <sub>17</sub> , S <sub>18</sub> , S <sub>19</sub> ) to exploit and manage the available opportunities (O <sub>1</sub> , O <sub>2</sub> , O <sub>3</sub> , O <sub>4</sub> )	Maximize strengths (S <sub>1</sub> , S <sub>2</sub> , S <sub>3</sub> , S <sub>4</sub> , S <sub>5</sub> , S <sub>6</sub> , S <sub>7</sub> , S <sub>8</sub> , S <sub>9</sub> , S <sub>10</sub> , S <sub>11</sub> , S <sub>12</sub> , S <sub>13</sub> , S <sub>14</sub> , S <sub>15</sub> , S <sub>16</sub> , S <sub>17</sub> , S <sub>18</sub> , S <sub>19</sub> ) to manage threats (T <sub>1</sub> , T <sub>2</sub> , T <sub>3</sub> , T <sub>4</sub> )
<b>WEAKNESSES (W)</b>  W <sub>1</sub> , W <sub>2</sub> , W <sub>3</sub> , W <sub>4</sub> , W <sub>5</sub> , W <sub>6</sub> , W <sub>7</sub> , W <sub>8</sub> , W <sub>9</sub> , W <sub>10</sub> , W <sub>11</sub> , W <sub>12</sub> , W <sub>13</sub> , W <sub>14</sub> , W <sub>15</sub> , W <sub>16</sub> , W <sub>17</sub> , W <sub>18</sub> , W <sub>19</sub> ,	Minimize the existing weaknesses (W <sub>1</sub> , W <sub>2</sub> , W <sub>3</sub> , W <sub>4</sub> , W <sub>5</sub> , W <sub>6</sub> , W <sub>7</sub> , W <sub>8</sub> , W <sub>9</sub> , W <sub>10</sub> , W <sub>11</sub> , W <sub>12</sub> , W <sub>13</sub> , W <sub>14</sub> , W <sub>15</sub> , W <sub>16</sub> , W <sub>17</sub> , W <sub>18</sub> , W <sub>19</sub> ) to get opportunities (O <sub>1</sub> , O <sub>2</sub> , O <sub>3</sub> , O <sub>4</sub> )	Foster strategic actions for community participation in rural water management to minimize weaknesses (W <sub>1</sub> , W <sub>2</sub> , W <sub>3</sub> , W <sub>4</sub> , W <sub>5</sub> , W <sub>6</sub> , W <sub>7</sub> , W <sub>8</sub> , W <sub>9</sub> , W <sub>10</sub> , W <sub>11</sub> , W <sub>12</sub> , W <sub>13</sub> , W <sub>14</sub> , W <sub>15</sub> , W <sub>16</sub> , W <sub>17</sub> , W <sub>18</sub> , W <sub>19</sub> ) and mitigate threats (T <sub>1</sub> , T <sub>2</sub> , T <sub>3</sub> , T <sub>4</sub> ) .

**Table 6.1 Key for the SWOT Matrix**

<b>Strengths</b>	<b>Weaknesses</b>
S <sub>1</sub> Good leadership	W <sub>1</sub> Poor leadership
S <sub>2</sub> Availability of water resources	W <sub>2</sub> Unavailability of water resources
S <sub>3</sub> Ability to pay for water	W <sub>3</sub> Inability to pay for water
S <sub>4</sub> Capacity to manage rural water	W <sub>4</sub> Lack of capacity to manage rural water
S <sub>5</sub> Availability of the required technical skills	W <sub>5</sub> Unavailability of the required technical skills
S <sub>6</sub> Gender balance in leadership	W <sub>6</sub> Gender imbalance in leadership
S <sub>7</sub> Control over water resources	W <sub>7</sub> Lack of control over water resources
S <sub>8</sub> Community cohesion during project activities	W <sub>8</sub> Lack of community cohesion during project activities
S <sub>9</sub> Education and awareness	W <sub>9</sub> Lack of education and awareness
S <sub>10</sub> Ability to meet operation and maintenance	W <sub>10</sub> Inability to meet operation and maintenance
S <sub>11</sub> Conflict resolution mechanisms in place	W <sub>11</sub> Lack of conflict resolution mechanisms in place
S <sub>12</sub> Ability to implement project development plan	W <sub>12</sub> Inability to implement project development plan
S <sub>13</sub> Accountability of community resources	W <sub>13</sub> Unaccountability of community resources
S <sub>14</sub> Involving the community in planning and development issues of the project	W <sub>14</sub> Failure to involve the community in planning and development issues of the project
S <sub>15</sub> Good representation of all concerned groups	W <sub>15</sub> Poor representation of all concerned groups
S <sub>16</sub> Participation of the poor and marginalized groups	W <sub>16</sub> Lack of participation of the poor and marginalized groups
S <sub>17</sub> Motivation and incentives	
S <sub>18</sub> Catchment management strategies in place	
S <sub>19</sub> Access to benefits and costs	

	<p>W<sub>17</sub> Lack of motivation and incentives</p> <p>W<sub>18</sub> Lack of catchment management strategies in place</p> <p>W<sub>19</sub> Lack of access to benefits and costs</p>
<p><b>Threats</b></p> <p>T<sub>1</sub> Lack of external support</p> <p>T<sub>2</sub> Lack of motivation and incentives</p> <p>T<sub>3</sub> Group relating poorly with other local political bodies</p> <p>T<sub>4</sub> Poor relationship with local government, donor or NGO</p>	<p><b>Opportunities</b></p> <p>O<sub>1</sub> External support</p> <p>O<sub>2</sub> Motivation and incentives</p> <p>O<sub>3</sub> Group relating well with other local political bodies</p> <p>O<sub>4</sub> Good relationship with local government, donor or NGO</p>

The results indicate that for community participation in rural water management to lead to sustainable development and positive impact on the lives of the poor, the community needs to maximize on the strengths which include; good leadership, availability of water resources, ability to pay for water, capacity to manage rural water, availability of the required technical skills, gender balance in leadership, control over water resources, community cohesion during project activities, education and awareness, ability to meet operation and maintenance, having conflict resolution mechanisms in place, ability to implement project development plan, accountability of

community resources, involvement of the community in planning and development issues of the project, good representation of all concerned groups, participation of the poor and marginalized groups, motivation and incentives, having catchment management strategies in place and access to benefits and costs. This will enable the community to exploit and manage the available opportunities such as external support, motivation and incentives, good group relationship with other local political bodies and good relationship with local government, donor or NGO. It will also enable the community engaging in rural water management to manage threats such as lack of external support, lack of motivation and incentives, poor group relationship with other local political bodies, local government, donor or NGO.

The community should also minimize the existing weaknesses which include; poor leadership, unavailability of water resources, inability to pay for water, lack of capacity to manage rural water, unavailability of the required technical skills, gender imbalance in leadership, lack of control over water resources, lack of community cohesion during project activities, lack of education and awareness, inability to meet operation and maintenance, lack of conflict resolution mechanisms in place, inability to implement project development plan, unaccountability of community resources, failure to involve the community in planning and development issues of the project, poor representation of all concerned groups, lack of participation of the poor and marginalized groups, lack of motivation and incentives, lack of catchment management strategies in place and lack of access to benefits and costs to enable the community utilize the available opportunities.

## **CHAPTER FIVE**

### **5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

This chapter makes a summary of the findings and provides a conclusion of the research. It also gives recommendations that would help to improve community participation in rural water management in Ndarugu-Thiririka Sub-catchment.

#### **5.1 Summary of findings**

A total of 200 respondents from Ndarugu-Thiririka Sub-catchment were interviewed during the study cutting across Gatundu, Thika West and Thika East Districts according to proportion of their population as per 2009 census report. The interviewed respondents consisted of 118 males and 82 females. Their ages were evenly distributed in five age categories of which the age group between 31-40 years shown the highest level of community participation in rural water management. The study shows that 48.5% of the households in the sub-catchment have a household size of between 5-9 persons thus explaining the high population in the sub-catchment. It was also noted that 51% of the population has attained secondary education. Agriculture was identified to be the major income generating activity. The research also reveals that 81.5% of the population earns a monthly income less than 10,000 Kenya Shillings as of April and May 2012.

The monthly income of the community is the most significant socio-economic factor that constrains community participation in rural water management. Other factors that significantly constraint community participation in rural water management include age, lack of access to adequate water, poor or lack of communication and sharing of information regarding the project, lack of education and awareness relating to rural water management, lack of the required

technical skills, inability to pay for water tariffs, lack of ownership and lack of external support. However, the level of education and the income generating activity of the community are insignificant as far as community participation in rural water supply is concerned. Nevertheless, the study findings indicate that there is a significant relationship between community participation and education and awareness relating to rural water management.

Ndarugu-Thiririka Sub-catchment has a number of opportunities that are available to the community for rural water management. Highly available opportunities include good leadership, water resources availability, ability to pay for water, capacity to manage rural water and gender balance in leadership. External support, community cohesion during project activities, education and awareness and motivation and incentives are lowly available while control over water resources and ability to meet operation and maintenance costs are moderately available.

Community participation in the sub-catchment has impacted on the livelihood of the local community by providing constant access to adequate water for domestic, agricultural uses, construction, reducing time wastage and general development and also in catchment management. Overall, community participation has made moderate impacts on the livelihoods of the community in the sub-catchment. Furthermore, community participation has made moderate impact on constant access to adequate water and low impact on catchment management based on the use of proper farming methods and soil conservation measures.

There are significant variations among the selected community water projects in Ndarugu-Thiririka Sub-catchment based on the level of community participation, leadership characteristics, available opportunities and impact of community participation in rural water

management. Munyu community water project is leading in the level of community participation, leadership, available opportunities and impact of community participation in rural water management.

## **5.2 Conclusions**

Ndarugu-Thiririka Sub-catchment experiences a high population due to large household sizes. There is also a lot of emphasis on secondary and post-secondary education both for males and females. This is in line with the government's policy of increasing transition rates from primary to secondary and the fact that reduced time wastage when looking for water gives boys and girls a chance to go to school.

There is a general low level of community participation in Ndarugu-Thiririka Sub-catchment. Monthly income is the major socio-economic factor that significantly constrains community participation in Ndarugu-Thiririka Sub-catchment. However, it depends on other factors such as leadership and availability of opportunities to a community in rural water management. Findings indicate that communities with good leadership and high level of opportunities have high level of community participation even if their monthly income is low. This is evident in Kamunyaka community water project where there is high monthly income but the level of community participation is low. This is because the community leadership is poor and has low levels of available opportunities. On the other hand, while Munyu community water project has low monthly income, it has a high level of community participation. This is because its leadership is good and has high level of available opportunities to the community.

Both men and women actively participate in rural water management in the sub-catchment. The age of the members of community determines their level of participation in rural water management. This is shown by the fact that people in the age group of 31-40 years are highly participating in rural water management. Consequently, community participation is increasing between the ages of between 21-40 years and decreasing from the age of 41 years.

Furthermore, the level of available opportunities to the community in rural water management is generally low in the sub-catchment. The opportunities that the community feels are highly available to them are below average (<50%).

According to the study, community participation in rural water management in the sub-catchment has made moderate impact in terms of constant access to adequate water and low impact in terms of catchment management based on use of proper farming methods and soil conservation measures.

The study also reveals that significant variations exist among the four community water projects based on the level of community participation in rural water management, the level of available opportunities and level of impact on the livelihoods of the community. These variations explain the variations in the performance and sustainability of community water projects in the sub-catchment.

### **5.3 Recommendations**

This study recommends;

- i. The government, NGOs and donors to provide programmes for intensifying agricultural production, credit and rural financial support and to give adequate external support to communities engaging in rural water management.
- ii. The government to provide education and awareness, training and capacity building to communities in rural water management.
- iii. Communities to be sensitized on the strategies for maximum utilization of the available opportunities for rural water management.
- iv. The current initiatives to create Water Resource Users Association in the Sub-catchment need to be accomplished to actively engage the community in catchment management.

### **5.4 Suggestions for further researches**

- i. An assessment of the impact of human activities on water quality in Ndarugu-Thiririka Sub-catchment.
- ii. Strategies for maximum utilization of the available opportunities for rural water management.

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## 6.0 APPENDICES

### APPENDEX 6.1 HEAD OF HOUSEHOLD QUESTIONNAIRES

#### INTRODUCTION

Good morning/afternoon? My name is **Ann Waithaka**. Am a student at **Kenyatta University** studying **MSc-Hydrology and Water Resources**. Currently, am conducting a study on **socio-economic factors constraining community participation in rural water management in Ndarugu-Thiririka Sub-catchment**. I would like to ask you some questions related to the study. The information given shall be kept strictly confidential and will be solely for research on finding solutions to common problems.

#### A: INTERVIEWEE/RESPONDENT INFORMATION

1. Respondent's a) Sex    Male     Female
- b) Age    18-20     21-30     31-40     41-50     50+
- c) Household size
- d) Level of education
- Non-formal     Lower primary     Upper primary
- Secondary     Post-secondary
- Others (Specify) \_\_\_\_\_
- e) Name of community water project \_\_\_\_\_
- f) Location/Sub location/District \_\_\_\_\_

2. How long have you lived here?

- Less than 5 years
- 5-10 years
- 11-15 years
- 16-20 years
- Over 20 years

**B: SOCIO- ECONOMIC STATUS OF THE COMMUNITY**

3. Which economic/income generating activities are you involved in?

- a) Agriculture
- b) Business
- c) Quarrying
- d) Formal employment
- e) Casual labour
- f) Others (Specify).....

4. What is your approximate monthly income in Kenya Shillings?

< 5,000  5,000-10,000  10,000-15,000  >20,000

**C: COMMUNITY PARTICIPATION IN RURAL WATER MANAGEMENT**

5. Please provide your own opinion about the level of your participation/involvement in rural water management in the following based on 5 point coding:

	<b>High</b>	<b>Substantial</b>	<b>Moderate</b>	<b>Marginal</b>	<b>Negligible</b>
<b>Helping to prepare development plan</b>					
<b>Providing funds to meet initial costs</b>					
<b>Helping in project implementation</b>					
<b>Providing support for operation and maintenance in form of money and unpaid labour</b>					
<b>Ability to use donor/community resources to build community capacity</b>					
<b>Making decisions concerning your project</b> <b>Attending project meetings</b>					

<b>Having control over the project</b>					
<b>Having a sense of ownership over the project</b>					

6. According to you, what is your opinion about the leadership of your water project on the following based on 5 point coding;

	<b>High</b>	<b>Substantial</b>	<b>Moderate</b>	<b>Marginal</b>	<b>Negligible</b>
<b>Gender balance</b>					
<b>Representation of the poor and marginalized</b>					
<b>Ability to solve water-related conflicts</b>					
<b>Relationship with local government, donors and NGOs</b>					
<b>Ability to implement project development plan</b>					
<b>Accountability of community resources</b>					
<b>Involving the community planning and development issues of the project</b>					
<b>Sharing of information concerning the project</b>					

7. Does the community have meeting(s) to decide and/or discuss issues affecting your water project? YES ( ) NO ( )

8. In the past year, how often did the community meet? Never ( ) Once ( ) Monthly ( )

Few times(<5) ( ) Many times (>5) ( )

9. How many times did you/member of your family attend project meetings? Never ( ) Once ( ) All meetings ( ) <5 times ( ) >5 times ( )

10. Did you or a family member;

A. Attend the meeting YES ( ) NO ( )

B. Speak in the meeting YES ( ) NO ( )

C. Disagree with the decision of the meeting YES ( ) NO ( )

11. What was the result of the meeting? Positive ( ) Negative ( )

12. Is there a committee to oversee the progress of the project during implementation and operation and maintenance? YES ( ) NO ( )

13. Who had the most important role in deciding the individuals in the committee?

14. Among the members of the committee, how many do you feel you can approach to solve a problem related with water supply?

None ( ) A few ( ) Some ( ) Most ( ) All ( )

15. Have you or any of you household members been asked to make contributions of time/labour, money or materials during construction or operation and maintenance?

YES ( ) NO ( )

16. How much money in Kenya shillings do you approximately contribute on monthly basis?

<500 ( ) 500-1000 ( ) >1000 ( )

17. Who decides how much contribution each household should makes?

18. How easy/ difficult is it for you and your household members to contribute?

Almost impossible ( ) Difficult ( ) Manageable ( ) Easy ( )

19. What happens to households that do not make contributions?

Nothing happens ( )

Pay a penalty (specify) ( )

Do not get water services ( )

Other (specify) ( )

#### **D. FACTORS CONSTRAINING COMMUNITY PARTICIPATION IN RURAL WATER MANAGEMENT**

20. Do you **agree**, **somehow agree**, **somehow disagree** or **disagree** with the statement that there are factors that hinder community participation in rural water management?

21. Please give your own opinion on the following factors which constrain community participation in rural water management based on 5 point coding:

	<b>High</b>	<b>Substantial</b>	<b>Moderate</b>	<b>Marginal</b>	<b>Negligible</b>
<b>Inability to meet Operation and maintenance costs</b>					
<b>Lack of access to adequate water</b>					
<b>Complexity of technology used in the project</b>					
<b>Poor/lack of communication and sharing of information regarding the project</b>					
<b>Lack of Education and awareness relating to rural water management</b>					
<b>Lack of the required technical skills in rural water management</b>					
<b>Unavailability of human resources (Qualified staff working in the project)</b>					
<b>Inability to pay water tariffs</b>					
<b>Availability of other sources of water</b>					
<b>Low Income</b>					
<b>Lack of ownership over the</b>					

<b>project</b>					
<b>Lack of motivation/incentives</b>					
<b>Lack of External support</b>					

22. According to you, are there other factors that hinder you from participating fully in community rural water management that need to be addressed? YES ( ) NO ( )

If YES, please give examples.

### **E. AVAILABLE OPPORTUNITIES FOR THE COMMUNITY IN RURAL WATER MANAGEMENT**

23. Do you **agree**, **Somehow agree**, **Somehow disagree**, **Disagree** with the statement that, this water project has improved the livelihoods of the local community? Please explain your answer.

24. Please provide your own assessment of the available opportunities for the community in rural water management based on 5 point coding:

	<b>High</b>	<b>Substantial</b>	<b>Moderate</b>	<b>Marginal</b>	<b>Negligible</b>
<b>Good leadership</b>					
<b>External support</b>					
<b>Access to water/water resources availability</b>					
<b>Ability to pay for water</b>					
<b>Capacity to manage rural water</b>					
<b>Availability of technical skills</b>					
<b>Gender balance in leadership</b>					
<b>Control over water resources</b>					
<b>Community cohesion during project activities</b>					
<b>Education and awareness</b>					
<b>Ability to meet Operation and Maintenance costs</b>					

<b>Motivation and incentives</b>					

25. According to you, are there other opportunities available to the community in rural water management? YES ( ) NO ( )

Please give examples

#### **F. IMPACT OF COMMUNITY PARTICIPATION IN WATER MANAGEMENT IN THE CATCHMENT**

26. Please provide your opinion on the impact of community participation in rural water management based on 5 point coding: **High, Substantial, Moderate, Marginal, Negligible.**

Constant access to adequate water ( )

Use of proper farming methods ( )

Use of soil conservation measures ( )

## APPENDIX 6.2 KEY INFORMANTS INTERVIEW GUIDE

### INTRODUCTION

Good morning/afternoon? My name is **Ann Waithaka**. Am a student at **Kenyatta University** studying **MSc.-Hydrology and Water Resources**. Currently, am conducting a study on socio-economic factors constraining community participation in rural water management in Ndarugu-Thiririka Sub- catchment. I would like to ask you some questions related to the study. The information given shall be kept strictly confidential and will be solely for research on finding solutions to common problems.

**Institution** \_\_\_\_\_

**Position/profession** \_\_\_\_\_

**Area** \_\_\_\_\_

1. Please give your own assessment on the level of community participation in rural water management based on the 5 point coding

**Very poor, poor, fair, good, very good,**

A. Project development initiatives

B. Decision making regarding the project

C. Control over water resources

D. Meeting operation and maintenance costs

E. Paying water bills

F. Catchment management initiatives

2. Is the water committee/board of this project active as planned? YES ( ) NO ( )

Please explain your answer.

3. According to you, which socio-economic factors hinder community participation in rural water management in the sub-catchment?

4. According to you, which opportunities are available to the community in rural water management?

5. According to you, is the community satisfied with community rural water projects? YES ( ) NO ( )

Please explain your answer.

6. Do you get/give any external support; financial, training, technical support from the local government, implementing agencies or other sources?

7. How can you rate the success of this water project? Very poor, poor, fair, good, very good

8. What do you think is the impact of community participation in rural water management in the sub-catchment?

9. According to you, is there something that needs to be done to improve the level of community participation in rural water management? YES ( ) NO ( )

If YES, please explain your answer.

**APPENDIX 6.3 FOCUS GROUP DISCUSSION GUIDE**

1. What can you say about the level of community participation on 5 point coding; **High, Substantial, Moderate, Marginal, Negligible**

A. Project development issues

B. Making decisions regarding the project

C. Control over water resources

D. Meeting operation and maintenance costs

E. Ability to pay for water bills

2. Are there socio-economic factors that hinder community participation in rural water management? YES ( ) NO ( )

If YES, please give examples.

3. Which opportunities are available for your community in rural water management?

4. Are you satisfied with water supply services from your community water project? YES ( ) NO ( )

Please explain your answer.

5. What are the impacts of community participation in rural water management?

**APPENDIX 6.4 PARTICIPATORY RURAL APPRAISAL GUIDE**

1. Which socio-economic factors constrain community participation in rural water management in your community water project?
2. What are the impacts of community participation in rural water management in terms of constant access to adequate water and catchment management?
3. What are the strengths, weaknesses, opportunities and threats of community participation in your community water project?

**APPENDIX 6.5 SWOT ANALYSIS TABLE**

<b>STRENGTHS</b>	<b>WEAKNESSES</b>	<b>OPPORTUNITIES</b>	<b>THREATS</b>