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DETERMINANTS OF SUSTAINABILITY OF RURAL COMMUNITY BASED WATER PROJECTS IN NAROK COUNTY, KENYA

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Abstract

Purpose: The purpose of this study was to determine the factors influencing sustainability of rural community based water projects in Narok County, Kenya.

Methodology: The study employed descriptive survey with a target population of 163 and sample size of 85 respondents selected randomly from 15 community based water facilities. The study used closed ended questionnaires. Pilot study results were used to test reliability and validity of the instruments found. Data was analyzed using descriptive statistics and inferential analysis by use of Statistical Package for Social Sciences (SPSS) version 21 and presented using frequency distribution, percentages, mean, standard deviation and Pearson Product Moment Coefficients (PPMC).

Results: The correlation results revealed that community participation and project management practices have a positive and significant relationship with sustainability among rural community based water projects while technology use and post implementation support had a low relationship with sustainability of rural community based water projects.

Unique contribution to theory, practice and policy: The community members should be adequately involved in identification, planning, implementation and close out phases of water projects. There should be regular participatory meetings with stakeholders, empowerment workshops for community members, trainings for water management committees, joint meetings on establishing mechanisms for protection of water facilities and conflict resolution.

Keywords: *Community participation, project management practices, technology, post implementation support, sustainability.*

1.0 INTRODUCTION

1.1 Background of the Study

According to World Bank Group report (2016), globally, in year 2015, there are estimated 663 million people without access to improved sources of water. The highest number being from the Sub-Saharan Africa with 319 million people and South Asia with 134 million people. According to United Nations Children Education Fund (UNICEF)/World Health Organization (WHO) progress report (2015) on sanitation and drinking water, globally, about 660 million people still do not have access to improved drinking-water sources, and over 2.4 billion people do not have access to improved sanitation.

The importance of water projects sustainability is further emphasized in the global Sustainable Development Goals (SDGs) number 6 aimed to ensure availability and sustainable management of water and sanitation for all. Bridging the gap in access to improved water and sanitation is a core concern of the 2030 Agenda for Sustainable Development Goals. The SDGs, as part of the 2030 Agenda for sustainable development, target 6.1calls for universal and equitable access to safe and affordable drinking-water and Target 6.4 substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of fresh water to address water scarcity and substantially reduce the number of people suffering from water scarcity (WHO Report, 2017).

Study by Habtamu (2012) established that in Africa, most water projects decline in performance shortly after external support is withdrawn. The study recommended that a further study be done on factors that influence sustainability of such projects in other rural parts of other countries in Africa in order to bring a generalization of the findings. Another study on rural water supply sustainability in Mozambique found that among all communities visited, lack of community involvement and financial support was compromising rural water supply sustainability as most did not have any savings or collected monthly contributions for operation and maintenance (Jansz, 2011). Study by Gatari, Mbabazi & Jaya (2016) in Ruanda found out that community participation, project financing, project management practices and community training influences sustainability of water projects. Also it revealed that 35 percent of the Ruanda population collects water from unsafe sources, including unprotected springs or shallow wells, water pans, rivers and stream.

According to the WHO/UNICEF Joint Monitoring Programme (JMP) Report (2012), only 52 per cent of the population living in rural Kenya had access to improved drinking water sources as compared to 82 per cent of the urban population in 2010. The National Water Policy (NWP) report (2012) put rural coverage at below 50 per cent and attributed this to low coverage to the type of water point sources.

In Arid and Semi-Arid Lands (ASALs) of Kenya failure rate for water projects after hand over is extremely high. Some of these projects have gone to full implementation but without much benefit to the communities, others proved to be unsustainable while some prematurely terminated.

Ochelle (2012) did a research on factors influencing sustainability of community water projects in Mulala division, Makueni County and found that community members do not participate in

development of water projects during the initiation phase, leading to failure before execution phase. Similarly, Boru (2012) did a study on determinants of community ownership of water projects in Central Division, Isiolo County. He found that community involvement, technology choice, distance, governance structures and training influences the level of community ownership of water projects. Further, study carried in Nyando sub-county by Odie (2012) found a significant relationship between community contribution and sustainability of community managed water projects.

1.2 Statement of the Problem

For many years in Kenya, various Government Agencies, Non-Governmental Organizations (NGOs) and donors have been investing large sums of money every year for construction of community water projects. According to KNBS economic survey (2016), the water sector's approved development budget by Government of Kenya rose from Kshs 37 Billion in 2015/2016 Financial Year to Kshs 48 Billion in 2016/2017 Financial Year. This points an increase in expenditure on water projects in Kenya. However, the majority of the parts of the country still face shortage of water and malfunctions of water facilities.

The country continues to face serious challenges related to water. Although the Ministry of Water make effort to have water accessible to all citizens, many people are yet to be connected with clean and piped water and in some localities people travel for long distances to fetch water (UNICEF, 2012). Moreover most serious issue is that many people have continued to die from water borne diseases and the government using a lot of money for drugs and medical facilities (UNICEF, 2012). This can be reduced by ensuring that water projects are sustainable throughout. According to Tifow (2013) despite much effort by various institutions to supply water projects to rural parts, majority of water projects fail within three years after development. This study therefore sought to find out determinants of sustainability of rural community based water projects in order to suggest what can be done to solve the problem and reduce losses of lives.

According to Kenya County Fact Sheets report (2013) by Commission of Revenue Allocation (CRA) in collaboration with KNBS ranked Narok County last position, 47 out of 47 counties in access to improved water services with only 33% of the population can accesses improved water services. This shows a serious problem on water improvement and sustainability in Narok County.

Further, an assessment was carried out by Regional Development Authority, Ewaso Ngiro South Development Authority (ENSDA) (2016) on the status of community water projects implemented in Narok County and found out that community water projects implemented between the years 2014-2016 were performing poorly in terms of maintenance, functionality and reliability of water supply. The findings showed that out of 120community water projects implemented, only 40% were functional while 60% had failed shortly2 years after hand over to community. The report further indicated that majority of the parts, where these projects were constructed, are still faced with shortage of water and poor sanitation. The study also discovered that the level of community participation during project site identification, planning, decision making and management was low due to lack of community awareness, lack of management skills and adequate finance for operation and maintenance of the water facilities.

In addition, KNBS survey report (2016) indicated that only20% of residents in Narok County used improved sources of water, while the rest of the residents (80%) who are mainly in rural parts used unimproved sources of water. The study also revealed that the shortage of water and access low quality water was caused by malfunctioning and poor operations of majority of water projects in the County. Furthermore, lack of sustainability is seen as a major obstacle to the attainment of other developments and improvement of living standards of people in the rural parts of Narok County. This has further implication to economic development in the country. Therefore, this study aimed to address the gap by establishing the factors which influence sustainability of Rural Community Based Water Projects (RCBWP) in Narok County, Kenya.

1.3 Objectives of the Study

i. To examine the extent to which community participation affects sustainability of rural community based water projects in Narok County, Kenya.
ii. To assess the extent to which project management practices influence sustainability of rural community based water projects in Narok County, Kenya.
iii. To determine how technology influence sustainability of rural community based water projects in Narok County, Kenya.
iv. To establish the extent to which post implementation support affects sustainability of rural community based water projects in Narok County, Kenya.

2.0 LITERATURE REVIEW

2.1 Resource Dependence Theory

Resource Dependence Theory is based upon on how the external resources of organizations affect the behaviour of an organization. The theory is based upon the following tenets: organizations are dependent on resources, these resources ultimately originate from the environment of organizations, the environment to a considerable extent contains other organizations, the resources one organization needs are thus often in the hands of other organizations, resources are a basis of power, legally independent organizations can therefore be dependent on each other (Pfeffer & Salancik 1978).The Resource Based Theory makes emphasis on need to share and contribute resources for purposes of achieving a common goal. This is related to the study's independent variable on Community Participation where community members participate inform of making contributions such as land, labour, materials and money. According to this theory for project to survive they depend on resources to achieve sustainability. These is relates to one of the independent variables of this study, community participation and dependent variable, sustainability of rural community based water projects

2.2 Empirical Review

2.2.1 Community Participation

A study done by Ochelle (2012) on factors influencing sustainability of community water projects in Mulala Division, Makueni County concluded that community participation during conception, design, implementation, operation and maintenance of water projects influences sustainability of communal water projects. Community participation ensures that projects

designed borrow from opinions of end users. This factor influences community ownership of water projects. Attention should be given to the community involvement in all the stages of projects implementation (Gicheru, 2012). Projects will fail if the community participation approach in project management is not adopted. According to Oakley and Marsden (2007) stakeholders' support brings together individuals, families, or communities who assume responsibility for their own welfare and develop a capacity to contribute to their own. In the context of development, community participation refers to an active process whereby beneficiaries influence the direction and execution of development projects rather than merely receive a share of project benefits. This is in agreement with Mulwa (2010) that people's participation improve understanding of the role of the several stakeholders involved and the limitation of technical and financial resources that exist to address the problems of the poor. Community project ownership is the process where the community participates fully in community based projects, accepts and owns the outcome of a project at the end and beyond the project period.

2.2.2 Project Management Practices

Mulwa (2013) conducted a similar study to investigate the factors which influence sustainability of water supply projects in Machakos District of Machakos County. The study targeted a population of 250 beneficiaries of five water projects. One of the study objectives was to ascertain the influence of project management practices on sustainability of water supply projects. The findings indicated that community management ensures ownership and security of the project hence it is an important factor for sustainability of the projects. It should therefore be well captured in developments of the area involving water projects.

Tafara (2013) conducted a study on factors influencing sustainability of rural community based water projects in Mtito Andei, Kibwezi Sub-county, Kenya. The study found out that the project management practices affects sustainability of the rural community based water projects and indicated the project management practices to be technical expertise, management of resources, monitoring and evaluation system, knowledge of business, leadership, estimating project schedule and budget, ascertaining and managing risks and experience. Project monitoring as one of management practices is to assure work is carried out as planned and efficiently. Monitoring and evaluation should be carried out with the participation of the beneficiaries, giving them the opportunity to decide on the criteria of success. Evaluations should be used as a management tool to identify any deficiencies and to establish a course of action to remedy problems.

Ochelle (2012) sought to establish factors influencing sustainability of community water projects in Mulala Division, Makueni County. The findings showed that there is need to reinforce clear goals, objectives and monitoring and evaluation plans in water projects management. The study discovered that a number of water projects in the community were non-functional because their implementation were poorly done. To ensure that projects serves community over time, the study recommended that close monitoring and supervision by technical staff and trained community members should be part of the implementation process. Similar study was conducted by Gatari, Mbabazi and Jaya (2016) to establish the influence of project management practices on the sustainability of the water projects in Muhanga District, Rwanda, concluded that project

management practices like project monitoring and evaluation, establishing skilled project team and ensuring effective communication structures ensure the water projects are sustainable.

2.2.3 Post Implementation Support

According to Gebrehiwot (2006) post implementation involves providing good maintenance and operation of machines, replacements of worn out parts, training of training of caretakers and operators and formation of management committee the water project. It also includes providing services regularly or even once a year by technician to ensure that the machines or equipment is functional throughout. Post implementation factors are technical support, institutional and financial management, training and willingness to sustain the water project.

According to Gatari, Mbabazi and Jaya (2016) training of community members after project implementation especially those responsible for operation and maintenance of water projects has significant influence on sustainability of water projects. Trained operators are more efficient while operating the water structures thus minimizes breakdowns during maintenance or operation. In cases of breakdowns, availability of trained community members on maintenance ensures that maintenance are done more promptly and cheaply as opposed to when community members have to depend on hired skilled labor.

According to Binder (2008) management of community rural water supply systems on operation and maintenance will not be successful, if financing resources are not available and frequent supports are not provided. Budgeting sufficient funding for rural water supply systems is an important issue for sustainability and proper maintenance but not only one. Binder (2008) further argues that increasing the budget allocation for rural water supply systems is very important, but that is not the only thing to meet the challenges of achieving the project goals. If there is willingness in the community to provide valued resources in the exchange for services then these community members value the service. The demand for supply of water will facilitate the management of the water supply system and enhance the rate of sustainability of the water supply system (Gizachew, 2005).

2.2.4 Technology

Ababa (2013) conducted a study to establish the factors influencing sustainability of rural community based water projects in Mtito Andei, Kibwezi County, Kenya. The study used cross section of people involving those who have been involved in the development of the projects, management, as well as those with expert information or data about the selected community based water projects. The study established that challenges affecting constant supply of water to the households were due to lack of information management systems, automated systems, appropriate tools and equipment, lack of skills in technology and availability of spare parts . The study also established that sustainability of rural water supply system depends on factors controlled by the project like; training, technology, cost of the project and construction quality.

Tifow (2013) carried out similar study to investigate factors influencing sustainability of UNICEF supported community based and managed water supplies in Kisumu and Siaya Counties. At least 94% of the respondents agreed that technology influenced the sustainability of UNICEF supported community managed rural water supplies at least to a moderate degree. The

findings indicated that where the respondents rated the use of technology highly, the water supply project was equally rated to be more sustainable compared to where use of technology was lowly rated. The findings of Tifow (2013) concur with that of Ababa (2013) that technology use is key to sustainability of community based water projects. According to Hopkins and Brynjolfsson (2010) performance gap exists between companies that embrace technology and those that resist it. Community projects that embrace technology exhibits better performance and sustainability than those that does not.

3.0 RESEARCH METHODOLOGY

The study employed descriptive survey with a target population of 163 and sample size of 85 respondents selected randomly from 15 community based water facilities. The study used closed ended questionnaires. Pilot study results were used to test reliability and validity of the instruments found. Data was analysed using descriptive statistics and inferential analysis by use of Statistical Package for Social Sciences (SPSS) version 21 and presented using frequency distribution, percentages, mean, standard deviation and Pearson Product Moment Coefficients (PPMC).

4.0 RESEARCH FINDING AND DISCUSSIONS

4.1 Community Participation

4.1.1 Level of Community Participation

The findings of the study revealed that community members participated during project identification to a very great extent 37.5%, while others participated to great extent 13.7%, moderate extent 7.5%, minimal extent 23.8 and 17.5 % not at all. From the findings it was also revealed that a significant percentage 17.5% of respondents did not participate at all during the project identification stage.

The finding of the study also showed that majority of community members participated during project planning and design to a minimal extent 30.0%, those who did not participate at all were 26.2%, moderate extent 21.3%, great extent 12.5% and very great extent 10.0%.This result clearly indicates that more than half of the respondents did not participate during project planning and design. The findings of the study further revealed that community members participation during project decision making was 18.7% very great extent, 21.3% great extent, 13.7% moderate extent, 23.8% minimal extent and 22.5% not at all.

The findings of the study also revealed that majority of respondents 28.8% did not participate in implementation of water project at all. A slight percentage of respondents 10.0% participated at very great extent during project implementation while 20.0% great extent and 16.2% moderate extent. The findings of the study further indicate that majority of community members participated in making contributions at minimal extent 31.3% while those who participated at a very great extent were 12.5%, great extent 23.7%, moderate 17.5% and 15.0% not at all. Finally, the findings of the study revealed that community members participation in sharing cost for

operations and maintenance of their water projects was 10.0% very great extent,21.3% great extent, 22.5% moderate extent, 28.7% minimal extent and 17.5% not at all.

According to the findings majority of the respondents indicated to have participated to a very great extent only during water project identification and initiation as indicated by a mean 2.70 and standard deviation 1.586. According to the findings of the study, it was also found that community members participated at a minimal extent during water project planning, design, decision making, implementation , making contributions and sharing costs for operation and maintenance as shown by standard deviation above 3.10.

4.1.2 Influence of Community Participation

The findings revealed that community participation through project identification influence sustainability of water project to very great extent 62.5%, 3.5% great extent and 2.5% moderate extent. Regarding the influence of community participation during waster project planning and design the response was 48.7% very great extent, 45.0% great extent and 6.3% moderate extent. The findings also revealed that community teamwork influence sustainability of RCBWPs to a very great extent 56.3%, 33.7% great extent, 7.5% moderate extent and 2.5% minimal extent.

The findings also revealed that community participation through decision making influence sustainability to a very great extent 55.0%, 37.5% great extent and 7.5% moderate extent. The findings with regard to the extent to which community participation in meetings influence water project sustainability, the response was 47.5% very great extent, 41.3% great extent, 8.7% moderate extent and 2.5% minimal extent. The findings of the study further revealed that community participation in making contributions e.g. land, free labour, materials and finance influence water sustainability was done at very great extent 55.0%, 38.7% great extent, 3.8% moderate extent and 2.5% minimal extent. Finally the findings of the study showed that community members sharing of costs for operation and maintenance of their water project influences sustainability at 40.0% very great extent, 46.3% great extent, 7.5% moderate extent and 6.3% minimal extent.

According to the findings, majority of the respondents scored very great extent (above 55%) in all the aspects of community participation. This implies that community participation had a very great influence on sustainability of water projects.

4.1.3 Responses on Community Participation statement

The findings showed majority of respondents 63.7% strongly agreed that involvement of community during water project identification contribute to appropriate water project to be implemented. Those who agreed were 28.8%, neutral 5.0%, 2.5 disagreed while none strongly disagreed.

The statement on whether involvement of community during planning and designing processes makes them have sense of ownership and authority over the project, 46.2% strongly agreed while 42.5% agreed, rest 10.0% neutral and 1.2 strongly disagreed. Findings on the statement whether community participation by making contributions enables the project get necessary resources and support for continuity, majority of the respondents 68.7% strongly agreed while 26.3% agreed, 3.8% neutral and 1.2% strongly disagreed. The statement on whether community participation in

the processes of implementation of the water project builds unity and sense of togetherness, the findings indicated that 58.7% strongly agreed, 40.0% agreed, 1.3% neutral.

The findings further indicated that majority 67.5% of respondents strongly agreed that sharing the costs of operation and maintenance amongst themselves ensures continuous availability of finance and support for their water project, 28.7% agreed and 3.8% were neutral. Finally on the statement whether community participation empowers the community members and the finding indicated that 56.2% strongly agreed, 37.5% agreed and 6.3 neutral.

From the findings it was established that community participation has benefits and highly influences sustainability of water projects as majority of the respondents were strongly in agreement (above 58.0%) with the statements. The findings also revealed that sharing of operation and maintenance costs to enables continuous financial support of water project was the most strongly agreed as shown with a Mean 4.64 and Standard Deviation 0.557. It was followed by statement that making contributions provides the project with necessary resources and support as shown by Mean 4.61 and Standard Deviation 0.684.

These findings agreed with the findings of study done by Boru (2012) on determinants of community ownership of water projects in Isiolo County, Kenya which indicated that community participation by making contributions in form of land, labour and materials and sharing costs for operation and maintenance towards water project greatly influence sustainability of the water project.

4.2 Project Management Practices

4.2.1 Level of Project Management Practices

From the findings of the study, majority of respondents 47. 4% reported that frequent monitoring and evaluation was practiced to minimal extent. Others indicated 31.3% moderate, 12.5% not at all, 5.0% very great extent and 3.8% great extent. Complying with approved budget was practiced to minimal extent 41.2%, moderate extent 40.0%, 8.8% great extent, not at all 7.5% and very great extent 2.5%. Majority of respondents 48.7% reported that good leadership styles were practiced to moderate extent. Other responses were 22.5% great extent, 12.5% very great extent, 10.0% minimal extent and 6.3% not at all.

On allocation of adequate funds for operation and maintenance majority of respondents 43.8% reported that it was practiced to minimal extent, moderate extent 22.4%, 17.5% not at all, 12.5% great extent and 3.8% very great extent. On whether they had skilled management committee in place majority of respondents 48.7% reported moderate extent. Adherence to work plan was practiced to minimal extent 42.5%, 30.0% not at all, 16.3% moderate extent, 7.5% great extent and 3.7% very great extent. Finally transparency and accountability was practiced to minimal extent 36.3%, 35% moderate, 13.8% great extent and 8.7% very great extent.

From the finding of the study it was established that RCBWPs applied project management practices to minimal extent. The most applied management practice was good leadership at moderate extent with a Mean 2.75 and Standard Deviation 1.013. It was followed by skilled management committee practiced at moderate extent with a Mean 2.88 and Standard deviation 0.998. From the findings it was further revealed that the least practiced was adherence to work

plans with a significant percentage of respondents 30.0% indicated not all practiced, Mean 3.88, Standard Deviation 1.048 and allocation of adequate funds with a Mean of 3.59, Standard deviation 1.040, also a significant number of respondents 17.5% indicated not at all practiced. This findings are in agreement with the findings of the study done by Gicheru (2012) which indicated that most of community water projects lacked monitoring and evaluation mechanisms.

4.2.2 Influence of Project Management Practices

From the findings more than half of the respondents 65% reported that conducting monitoring and evaluation influenced sustainability of RCBWPs to a very great extent while others felt that such influence was great 25.0%, moderate 7.5% and minimal 2.5%. On the influence of adherence to approved budget majority of respondents reported that it influenced sustainability to a great extent 48.7% while others felt it had influenced to very great extent 42.5% and moderate extent 8.8%. The findings of the study also revealed that good leadership influenced sustainability of RCBWPs to a very great extent 38.7% followed closely with great extent 35.0% while others reported moderate 17.5% and minimal extent 8.8%. Further findings revealed that allowing participatory planning and decision making in management of RCBWPs influenced sustainability to a very great extent 58.8% while others reported great extent 36.2%, moderate 5%. The findings of study also indicated that adequate allocation of funds for operation and maintenance had very great influence 60.0% on sustainability of rural community based projects.

The findings also revealed that 43.8 % of the respondents reported that skilled management committee influenced sustainability of rural community based water projects to very great extent, 41.2% great extent and 15% moderate. The findings of the study further revealed that adherence to maintenance and monitoring work plans influenced sustainability of community based water projects to very great extent 43.8%, 37.5 % great and 18.7% moderate.

Finally, the findings indicated that transparency and accountability in implementation of RCBWPs influenced sustainability to very great extent 47.5%, 32.5% great extent, 17.5% moderate extent and 2.5% minimal extent. The findings of the study are consistent with the findings of study done by Mamburi (2014) on factors influencing community ownership of water projects in Kinna Division Isiolo County, Kenya which revealed that application of project management practices in community owned water projects influence sustainability.

4.3 Technology

4.3.1 Technology used to pump water

The household respondents were requested to indicate the method used to pump water to storage tank. From the findings of the study, majority of the respondents (47.5%) indicated that they used generator to pump water from the point/source to storage tank, 31.3% used gravity where water is piped to their homes, 15% used hand pump to extract water from the borehole while 6.3% used solar power to pump water to storage tank for household use.

4.3.2 Influence of technology

In relation to influence of information management system, majority of respondents 50% reported that it influence to a very great extent. This indicates that the presence of proper

information management system in improves efficiency in management of the water projects. However, other respondents felt that it has great extent 30.0%, moderate extent 12.5%, minimal extent 5.0% and not at all 2.5% influence. Findings in relation to influence of automated bill system on sustainability of water projects, highest percentage of respondents 46% reported very great extent while others reported great extent 36.6%, moderate extent 7.5%, minimal extent 6.3% and not at all 3.8%.

On appropriateness of technology choice, the highest percentage of respondents (51.3%) indicated that it had influence on water project sustainability to a very great extent while others indicated great extent 32.5%, moderate extent 6.3%, minimal and not at all being same at 5%. In relation to method of water extraction, majority of respondents 67.5% indicated that it had very great influence on sustainability of water project while 16.3% indicated great extent, 8.8% moderate extent, 5.0% minimal extent and not at all 5.0%.

Findings in relation to affordability of technology, majority of respondents 43.8% indicated that it had a very great influence on sustainability of rural community based water project while others reported 35% great extent, 13.8% moderate extent, 7.5% minimal extent. In relation to availability of spare parts, majority of respondents 52.5% indicated that it influenced sustainability of RCBWPs projects to a very great extent while 40% indicated great extent, 5.0% indicated moderate extent and 2.5% minimal extent. The findings of this study concurred with findings of the study done by Ababa (2013) which indicated that use of technology by rural community water projects had great influence on sustainability of water projects.

4.3.3 Level of Technology use

According to the findings, majority of the respondents indicated that technology was used moderately 36.3% for storage and management of information while others felt that it was used to minimal extent 31.3%, great extent 21.3% and not at all 3.8%. The findings on the use of technology to send monthly bills to water users, majority of the respondents (38.8%) indicated that it was used to minimal extent while 32.5% indicated that it was used to moderate extent. The findings on the use of modern technology to extract water, majority of respondents (41.3%) indicated that it was used to a great extent, 26.3% indicated minimal use, 16.3% indicated moderate, use at very great extent were 7.5% while 8.8% indicated not used at all. According to the findings majority of the community based water projects use better ways of extracting water from water sources.

On the use of technology to pay bills, majority of the respondents (40%) indicated that it was not used at all while 28.7% of respondents indicated that it was used to minimal extent (20%). In relation to use of technology in communication, respondents indicated 28.8% did not use technology at all, 27.5% indicated that it was used to great extent, 18% indicated moderate extent, 15% indicated minimal and 10.0% very great extent.

From the findings on use technology, it is revealed that communication was used at moderate extent since majority of respondents indicated to have been practiced at some extent. On use of technology to purify water majority of respondents (42.5%) indicated that it was used to great extent while those who indicated very great extent were 20%, moderate extent were also 20%,

not at all 12.5% and minimal extent were 12.5%. Finally the study findings on use of technology in operation of water facility majority of respondents indicated 37.5% moderate use while great extent was 30%, 20% minimal extent and 6.3% very great extent.

According to the findings the most used form of technology by RCBWPs were purification of water which had a mean of 2.48, standard deviation 1.232 and water extraction method with a mean of 2.88 and standard 1.151. The least used technology was paying of bills which had a mean of 3.81, standard deviation 1.274. According to Hopkins and Brynjolfsson (2010) performance gap exists between projects that embrace technology and those that resist it. Community projects that embrace technology exhibits better performance and sustainability than those that doesn't.

4.4 Post Implementation Support

4.4.1 Existence of Post Implementation Support

From the findings of the study, majority of respondents (45%) indicated that service and maintenance support were undertaken to minimal extent while others respondents indicated that was not done at all (37.5%), those who indicated moderate extent were 12.5%, great extent 5% and very great extent 5%. From the findings it implies that services and maintenance support were undertaken to a minimal extent on some water projects whereas in some water projects it was never done at all. On existence of guidance on operation and maintenance of water projects, majority of the respondents (42.5%) indicated that it was undertaken to moderate extent while others indicated that it was undertaken to minimal extent (23.8%), not at all (17.5%), great extent (10%) and very great (6.3%). The finding implies that guidance on operation and maintenance was done to minimal level in majority of rural community water projects. However, in some water community projects it was never done at all. With regard to community sensitization majority of respondents (50%) revealed that it was done to a moderate extent while others felt that it was done to a minimal extent (25%), great extent(11.3%), very great extent (8.8%) and not at all (5%).

From the results of the findings, it was revealed that community sensitization was done moderately to community water beneficiaries since it had highest percentage of respondents (50%) followed by minimal extent (25%).On whether periodic system review and check-up existed, majority of respondents indicated that it was done to a minimal extent (43.8%) while others indicated not at all (40%). Those who felt that it was done to moderate extent (12.5%), great extent (2.5%) and very great extent (1.3%). The findings above implies that community sensitization which had a mean of 3.06 and standard deviation of 0.959 was the most undertaken activity as post implementation support while periodic system review and check-up least existed or undertaken by RCBWPs with a mean of 4.19, standard deviation 0.843. It was followed by service and maintenance support with a mean of 4.13, standard deviation of 0.905. The findings are agreement the finding of study done by Ibrahim (2011) which indicated that the community members highly lack training and skills on how to manage their water projects and that community sensitization should be a key activity before project handover.

4.4.2 Influence of Post Implementation Support

The findings of the study revealed that majority of the respondents (65%) strongly agreed that maintenance support improves functionality of RCBWPs. Those respondents who agreed were 35%. The findings of the study also revealed that majority of the respondents (57.5%) strongly agreed that community sensitization improve the knowledge of the community members while 42.5% agreed. The findings of the study further revealed that respondents strongly agreed (72.5%) that guidance on operation and maintenance minimize faults and breakdowns of water facilities while 27.5% agreed. Finally, highest percentage of respondents 77.5% strongly agreed that system review and check-up make the water supply reliable while 22.5% agreed.

The implication of findings is that that post implementation support influence sustainability of rural community based water projects since majority of respondents strongly agreed. Majority of respondents strongly agreed on statement that system review and check-up make the water supply reliable, Mean 4.78 and standard deviation 0.420. The findings of the study are consistent with the findings of study done by Munyui (2015) which revealed that post implementation support had great influence on sustainability of rural community based water projects.

4.5 Ranking of factors influencing Sustainability of RCBWPs

The respondents were requested to rank the factors influencing sustainability of RCBWPs. From the findings, community participation had a mean of 1.49, Project management practices had a mean of 1.41, Technology use had a mean 1.35 and Post implementation support had a mean of 1.36. Majority of respondents ranked community participation highest.

4.6 Indicators of Sustainability of Rural Community Based Water Projects

According to the findings, functional water project throughout had a mean of 1.55, standard deviation 0.634, continuous support towards operation and maintenance of the water project had mean of 1.48, standard deviation 0.573, continuous reliable water supply had a mean of 1.51, standard deviation 0.616, efficiently managed water project had a mean of 1.40, standard deviation 0.587, empowered community that well manages water project had a mean of 1.43, standard deviation 0.546 and improved benefits to the community members had a mean of 1.46 and standard deviation of 0.57. From the findings, functional water project throughout was rated highest indicator of sustainability on RCBWPs by community members followed by having continuous reliable water supply.

4.7 Correlation Results

The PPMC analysis established a significant and positive relationship between community participation and sustainability of RCBWPs (r=0.724). The findings of the study also revealed that project management practices had a positive and significant effect on sustainability of RCBWPs (r=242). The correlation was significant at the 0.01 level. This indicates that sustainability of RCBWPs was associated with good Project Management Practices. The findings are consistent with those of Tafara (2013) which revealed that Project Management had a positive and significant influence on sustainability of rural community based water projects. The PPMC analysis revealed a weak relationship between Technology use and sustainability of RCBWPs. This indicates sustainability of rural community based water projects was not highly

associated with some forms of technology used. Even though some forms technology is desirable, the community may not have required them. There was a weak relationship between Post Implementation Support and sustainability of RCBWPs. However, the findings of the study revealed a positive correlation between Technology use and Post Implementation Support on sustainability of RCBWPs (r=250). The correlation was significant at the 0.05 level, indicating that technology has a positive and significant effect to post implementation support.

Table 1: Correlation Results

		Sustainability of RCBWPs	Community Participation	Project Management Practices	Technology use	Post Implementation Support
Sustainability of community water projects	Pearson Correlation (r)	1				
	Sig. (2-tailed)					
	N	80				
Community Participation	Pearson Correlation (r)	.724**	1			
	Sig. (2-tailed)	.000				
	N	80	80			
Project Management Practices	Pearson Correlation(r)	.242*	.210	1		
	Sig. (2-tailed)	.030	.062			
	N	80	80	80		
Technology use	Pearson Correlation (r)	.054	.050	-.054	1	
	Sig. (2-tailed)	.634	.658	.632		
	N	80	80	80	80	
Post Implementation Support	Pearson Correlation (r)	.066	.049	-.017	.250*	1
	Sig. (2-tailed)	.563	.669	.879	.026	

4.8. Regression Results

The study findings showed that Community Participation, Project Management Practices, Technology use and Post Implementation Support had a combined effect of 51% of the variation in RCBWP sustainability in Narok County. The coefficient of determination (R^2) explains the extent to which changes in the dependent variable can be explained by change in the independent variables that were studied. This is indicated by R square value of 0.510. This implies that 51% of the variations in sustainability RCBWP are explained by the four predictors; community participation, project management practices, technology use and post implementation support leaving 49% unexplained. Therefore, further studies should be done to establish the other factors (49%) affecting sustainability of RCBWPs in Narok County.

Table 2: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.731[a]	.535	.510	.45923

Analysis of Variance (ANOVA)

ANOVA test was conducted to test the significance of the relationship between the independentand dependent variables by predicting the power of the model with that of an intercept. Table 3 shows the summary of ANOVA results of the regression analysis between sustainability of RCBWPs and predictor variables. Probability value of 0.000 indicates that the regression relationship was highly significant in predicting the independent variable Community Participation, Project Management Practices, Technology use and Post Implementation Support and the dependent variable which was Sustainability of RCBWPs. The F calculated is 20.540 while F critical is 2.49. The F calculated is greater than the F critical (20.540 >2.49); this indicated that the overall model was statistically significant at 5% significance level.

Table 3: Analysis of Variance (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.170	4	4.543	21.540	.000
	Residual	15.817	75	.211		
	Total	33.988	79			

Multiple regression analysis was conducted as shown in Table 4 Substituting the values in the equation: $Y= \beta_0+ \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4 + \varepsilon$

$$\mathbf{Y= 0.109 +0.806X_1+ 0.088X_2+ 0.015X_3-+0.033X_4}$$

The effect of the Standard error of estimate **ε** is assumed to be negligible (**ε**=0)

Overall, there was a positive and significant relationship between all the independent variables and the dependent variable. Community participation had the highest influence on sustainability of RCBWPs. followed by project management practices then post implementation support while technology use showed least effect on water project sustainability.

Table 4: Regression coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.109	.223		.489	.626
Community participation	.806	.093	.702	8.688	.000
Project management practices	.088	.073	.097	1.196	.235
Technology use	.015	.073	.017	.206	.837
Post implementation support	.033	.094	.029	.356	.723

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study concluded that community participation had a significant influence on sustainability of rural community based water projects in Narok County. The study also concluded that project management practices had significant influence on sustainability of rural community based water projects. The study further concluded that technology use had weak influence on sustainability of community rural community based water projects. Finally, the study concluded that post implementation have influence on sustainability of rural community based project

5.2 Recommendation

The study recommended that periodic maintenance supports e.g. replacement of worn out parts for the boreholes, disilitation of water pans and dams should be done promptly in order to improve the functionality of water projects. The study also recommended that water beneficiaries and management should be sensitized to improve their knowledge on conservation and protection of water facilities from mismanagement and destructions. Also, the project implementers and donors should give adequate guidance and training to water operators and beneficiaries on how to operate and maintain water facilities before handing over to them

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