

# **DETERMINANTS OF PERFORMANCE OF IRRIGATION PROJECTS: CASE OF NTHAWA IRRIGATION PROJECT OF MBEERE NORTH SUB- COUNTY, EMBU COUNTY, KENYA**

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©2017

**International Academic Journal of Information Sciences and Project  
Management (IAJISPM) | ISSN 2519-7711**

**Received:** 19<sup>th</sup> August 2017

**Accepted:** 23<sup>rd</sup> August 2017

Full Length Research

**Available Online at:**

[http://www.iajournals.org/articles/iajispm\\_v2\\_i1\\_447\\_463.pdf](http://www.iajournals.org/articles/iajispm_v2_i1_447_463.pdf)

**Citation:** Miruri, R. K. & Wanjohi, J. M. (2017). Determinants of performance of irrigation projects: Case of Nthawa irrigation project of Mbeere North Sub-county, Embu County, Kenya. *International Academic Journal of Information Sciences and Project Management*, 2(1), 447-463

## ABSTRACT

Water Irrigation has become one of the vital income generating activities on land, in that it enhances food security, creates employment opportunities, improves nutritional status of a nation and brings about good health in a particular society. The purpose of this study was to establish the determinants of performance of irrigation projects a case of Nthawa irrigation project of Mbeere North Sub-county of Embu county Kenya. The study sought to determine the effect of management of the project, community participation, resources adequacy, technology and availability of sizable land for irrigation on performance of irrigation projects in Mbeere North Sub-county, Embu county Kenya. The target population for this study comprised the 500 registered members in Nthawa Irrigation Project of Mbeere North Sub-County, Embu County. In addition, 19 key informants comprising 9 executive management committee members from the project and 10 Ministry of Water and Irrigation officials made up of 2 technical officers from the District Irrigation Office and 8 Water Resource Management Authority (WRMA) regional officials. For this study, the sample size was 130 respondents. On the Executive committee members and officials, the researcher did not sample since the target population was small, hence the study

employed a census method that is by capturing the entire population of Executive Committee Members and Ministry of Water and Irrigation Officials. The primary data was collected using self-administered questionnaires made up of both open ended and closed ended questions. The data collected was analyzed using Statistical Package for Social Sciences (SPSS Version 21.0). All the questionnaires received were referenced and items in the questionnaire were coded to facilitate data entry. After data cleaning, the data was presented in form of tables showing frequencies, percentages, mean score and standard deviation. From the results, it was observed that management of the projects, resource adequacy, and technology used, community participation and availability of sizable land for irrigation all positively and greatly affect the performance of public irrigation projects in Kenya. It is thus recommended that full participation of members in irrigation project development should be encouraged to enhance capacity to perceive their own needs and members' managed irrigation projects should encourage a maximum number of people to participate at various stages of project development.

**Key Words:** *performance, irrigation projects, Nthawa irrigation project, Mbeere North Sub-county, Embu County, Kenya*

## INTRODUCTION

Ensuring adequate and access to nutritious food for the growing population has a major concern globally. Global efforts aimed at ensuring food sufficiency by increasing staple food production have adopted irrigated farming as one of the main strategies. According to Valipour (2015), irrigation has a role to reduce poverty in the world through improvement of production, enhancement of employment opportunities and stabilization of income and

consumption using access to reliable water, and finally by its role in nutritional status, health, societal equity and environment.

Irrigation has historically had a large positive impact on poverty reduction and livelihoods, in both urban and rural areas, producing relatively cheap food for everyone and providing employment opportunities for the landless poor (Hussain, 2005).

The emerging and developing countries are faced with the challenge in meeting the sustainable Development Goal of food security. This challenge can be overcome by increasing production in their own regions, combined with increased import of food, where possible. Irrigation was expected to play an important role in the agriculture of the developing countries. Presently, its production was estimated at 20 percent of the arable land (30 percent of harvested area because of its cropping intensities) to contribute 40 percent of total crop production approximately 60 percent of cereal production. This is expected to increase to 47 percent by 2030. In principle, by that year the developing countries would be exploiting for agriculture some 60 percent of their total potential for irrigation. Naturally, the harvested area under irrigation will increase by more (33 percent), following fuller exploitation of the potential offered by controlled water use for multiple cropping.

Until recently, irrigated agriculture was almost exclusively supported by the state in most African countries. However, government-managed (large- and small-scale) schemes have generally performed far below expectations and most of the time, initial capital costs have not been recouped and the financial returns have not been able to cover operation and maintenance (O&M) costs. Meanwhile, privately developed and managed (small-scale) irrigation schemes in most of the Sub Saharan African countries show that there is business potential for private entrepreneur involvement in irrigation. Groups of farmers or water users' associations (WUAs) running parts of irrigation schemes for which responsibility was transferred to them by government, can also be considered as operating private irrigation schemes. Recent developments have shown the increasingly important role of these new operators. However, for private operators to function efficiently a clear institutional framework is required – in many parts of Sub Saharan Africa, this framework is not in place.

Despite several investments, development of irrigation projects in Sub-Saharan Africa has been slow, except for a few countries in northern Africa, Madagascar and South Africa. Out of a total arable land of about 874 million hectares (ha), the current area under managed water and land development totals 12.6 million ha, or 3.7 % of the surface area of Sub Saharan Africa. In spite of this potential, and the demand for more dependable sources of water, the development of irrigation has not picked up. Furthermore, existing irrigation farms operate at sub-optimal levels.

Over the last ten years Kenya's population has exponentially grown from 28.7 million to 38.6 million in 2009. Therefore the country was required to make strategies for food supply to match this population growth. Although agriculture was the backbone of the economy accounting to about 25% of the country's GDP, the scope for increasing production through expansion of arable agricultural land is severely constrained by over-reliance on rain-fed agriculture (GoK, 2015). Currently, only 114,600 hectares (20% of total irrigation potential)

have been put under irrigation in the whole country, categorized into three types: large private commercial farms (40%), government-managed schemes (18%), and smallholder individual and group schemes (42%) (Government of Kenya, 2010). In general, irrigation in Kenya accounts for only 1.8 per cent of total land area under agricultural production, but it was approximated to be directly providing 18 per cent, contributing 3 per cent to Kenya's GDP (Government of Kenya, 2010).

As reported in the agriculture sector development strategy (ASDS) of 2009 to 2020, irrigation holds the promise for the Kenyan future, given the unexploited 9.2 million hectares in Arid and Semi-Arid Lands (ASALs). Less than one per cent of the land in medium and high rainfall areas is under irrigation. To sustain food production, the government has invested on rehabilitation and expansion of irrigation, with the aim of bridging the gap of 1.085 million hectares by the year 2030 (Government of Kenya, 2012). Despite these efforts, food insecurity in Kenya still remains a challenge, since public irrigation schemes realizes only 40 per cent of the target production levels compared to private operated irrigation schemes. In Kenya, it is estimated that Kshs. 8 billion is invested annually in developing irrigation projects; however most of these Projects hardly serve their intended purpose because they cease to function or operate below capacity as soon as the financing agencies and development partners pull out.

## **STATEMENT OF THE PROBLEM**

Recently, emphasis has been on the importance of sustaining and improving the performance of existing irrigation schemes in parallel with area expansion and development of new irrigation. In Kenya, like in many other African countries, irrigation expansion has been hindered by poor performance of the existing public irrigation schemes. In addition, the performance of public irrigation scheme was way off the mark realizing only 40% of the target production levels and 28% of the expected revenues. Paradoxically, there are successful irrigation undertakings especially among the private commercial large-scale agricultural irrigated farms such as Delamare, Delmonte and Kakuzi. Continuous funding of irrigation projects followed by their collapse soon after donors pull out in Kenya such as Bura irrigation scheme, Kibwezi irrigation scheme and Ciambaraga irrigation project is an issue of great concern both locally and internationally. This was due to lack of proper operation and maintenance of these projects and mismanagement of water at field level due to lack of comprehensive community and or beneficiary involvement. Regardless of the motivation behind a project undertaking, most countries and organizations have realized that projects are strongly linked to an organization's effectiveness and success in the long run. There are different frameworks for assessing project success and a question remains on how project success can be best defined. In Kenya, close to 25 percent of the population experiences food insecurity, with close to 1 percent of the population being severely food insecure. There are still close to 2 million people who rely on relief food in Kenya. The agriculture sector development strategy of 2009 to 2020 reports that irrigation is the promise for the Kenyan future. There are close to 9.2 million unexploited hectares in Arid and Semi-Arid Lands (ASALs). Less than one per cent of the land in medium and high rainfall areas is under irrigation. To sustain food production, the government has invested on rehabilitation and expansion of irrigation, with the aim of bridging the gap of 1.085 million hectares by the year

2030. Government and donors' policies in ensuring sustainable projects seem inadequate due to lack of community and beneficiary participation at various stages of project identification, feasibility studies, design and indeed implementation such as formation of Water Users Associations and Water Resource Users Associations. Several studies have been conducted on irrigation projects in Kenya. However, most of these studies did not focus on determinants of performance of irrigation projects in Embu County. Further, it is not clear what factors impact on the performance of public irrigation schemes in Kenya. Against this backdrop, this study sought to establish the determinants of performance of irrigation projects, a case of Nthawa Irrigation Project of Mbeere North Sub- County, Embu County, Kenya.

## **GENERAL OBJECTIVE**

The purpose of this study was to establish the factors that affect performance of irrigation projects, case of Nthawa Irrigation Project of MbeereNorth Sub- County, Embu County, Kenya.

## **SPECIFIC OBJECTIVES**

1. To examine the effect of management of the project on the performance of public irrigation projects in Kenya
2. To determine the effect of community participation on the performance of public irrigation projects in Kenya
3. To assess the effect of resources adequacy on the performance of public irrigation projects in Kenya
4. To evaluate the effect of technology used on the performance of public irrigation projects in Kenya
5. To find out how availability of sizable land for irrigation affect the performance of public irrigation projects in Kenya

## **THEORETICAL FRAMEWORK**

Theories are set of ideas that describe a social situation, and theories gives directives on what needs to be done to deal with a particular problem. This section discusses the theoretical foundation on which the study is anchored. The study would be grounded on the classical contingency theory which is supported by the public participation theory.

### **Classical Contingency Theory**

This study was underpinned in the Contingency Theory postulated by Pinto and Slevin (1987). An impression created by project management practitioners and underscored by the Project Management Body of Knowledge (PMBOK) is that project management knowledge is applicable to all sorts of industries and environments (Packendorff, 1995). Packendorff (1995) contends that such a view positions project management as a field of study which is held together by conceptions of process rationality in which differences in outcome and process are disregarded in favour of alleged similarities. This difference clearly does not only exist between industries but also within the same industry, in the case of projects. Indeed, the lack of agreement as to what factors affect project success as acknowledged by project

management researchers (Pinto & Slevin, 2011) has been blamed on the assumption by project management researchers that a universal theory of project management can be applied to all projects.

Classical contingency theory suggests that different external conditions to an organization require different organizational characteristics, and that the effectiveness of the organization is contingent upon the goodness of fit between structural and environmental variables (Shenhar, 2011). These classes of behavioral theories posit that there is no one best way to organize a corporation, to lead a company or to make decisions (Fiedler, 1964; Vroom and Yetton, 1973). Alluding to this, Shenhar (2011) posits that one size does not fit all, and talks of an organization concept project management. This falls in line with the philosophy of the project as a temporary organization and so on. The approach to poverty reduction in social fund-supported communities is a process of development-focused collaboration among various stakeholders.

The underlying theory posits that collaboration increases the productivity of resources and creates the necessary and sufficient conditions for community-driven development. Community-driven development represents a people-centered approach to social change, whereby local actors take the lead in conceptualizing projects and programs that address social and economic needs. Local actors are fully involved in implementing such projects and programs. Stakeholder involvement, therefore, is a key element of development-focused collaboration. A major hypothesis embedded in this stakeholder involvement theory is that the greater the collaboration, the greater the productivity of the resources and the more favorable the conditions for community-driven development (Zulu & Chileshe 2008).

Members of communities that received social fund assistance for projects attempted to deal with local-level poverty-related problems by following a four-stage process, that is, identifying problems and priorities, motivating and mobilizing, working together and creating an enabling environment. For each stage, codes at the three levels were identified, compared and contrasted, and collapsed to produce themes (World Bank, 2013). These overarching themes, therefore, do not reflect any a priori selection by the researcher.

### **Public Participation Theory**

It is until recently that, scholars and many researchers have concurred that project success concerns not only cost, time and quality, but also the satisfaction and effective management of all the stakeholders involved (Bourne & Walker, 2011). They further define stakeholders as those individuals or group of individuals who have a claim or interest in a project and its activities. The theory underscores the fact that the creation and the ongoing operations of each project/programme are as a result of several actors' activities, who are the stakeholders. The central idea therefore is that a programme/project's success is dependent on how well the organization manages the relationships with key groups such as customers, employees, suppliers, communities, financiers, and others that can affect the realization of the project objectives.

The social responsibility of the government owned Special Purpose Vehicle (SPV) therefore significantly increases and external relationships become crucial for the success of the project. In any government projects, stakeholder management is a decisive factor as well for a project's success or failure and therefore identification of stakeholders and their involvement should be part of the project's planning process (Bourne & Walker, 2011). Most projects/programme consist of individuals and groups with different interests and motivational incentives, hence this makes most of government projects/programmes.

## **RESEARCH GAPS**

The categories of the determinants of irrigation performance has been described by Malano and Burton (2011), Molden et al. (2008) in Molden et al. (2010) and it includes those factors such as management of the project, community participation, technology used, resources adequacy and availability of sizable land for irrigation. In Kenya, several studies have been conducted to in irrigation projects (Kibe et al., 2007; Owuor, 2006; Nyangito et al., 2003). However, the determinants of public irrigation schemes performance are not evident. One main challenge in Kenya though, is on how to properly advise and inform policy decisions, if there is little or no knowledge on how the existing public irrigation schemes perform. There is therefore a literature gap on the determinants of performance of irrigation projects in Kenya.

## **RESEARCH METHODOLOGY**

### **Research Design**

The study adopted a descriptive research design. A descriptive design is concerned with determining the frequency with which something occurs or the relationship between variables (Bryman & Bell, 2011). Thus, this approach is suitable for this study, since the study intends to collect comprehensive information through descriptions which were helpful for identifying variables. Bryman and Bell (2011) assert that a descriptive design seeks to get information that describes existing phenomena by asking questions relating to individual perceptions and attitudes.

### **Target population**

According to Sekaran and Bougie (2010), a population is the total collection of elements about which we wish to make inferences. The target population for this study composed of the 500 registered members in Nthawa Irrigation Project of Mbeere North Sub- County, Embu County. Additionally, 19 key informants comprising 9 executive management committee members from the project and 10 Ministry of Water and Irrigation officials made up of 2 technical officers from the District Irrigation Office and 8 Water Resource Management Authority (WRMA) regional officials were also targeted. The project executive management committee members were involved in the study because they were in a position of providing vital information on performance of irrigation projects as opposed to the general project members.

## **Sample Size**

The sample size is a subset of the population that is taken to be representatives of the entire population (Kumar, 2011). For this study, the sample size was 130 respondents (25% of target population). On the Executive committee members and officials, the researcher was not sample since the target population is small, hence the study employed a census method that is by capturing the entire population of Executive Committee Members and Ministry of Water and Irrigation Officials. The study therefore used a total sample size of 130 respondents

## **Sampling Procedures**

The study selected the respondents using stratified proportionate random sampling technique. Stratified random sampling is unbiased sampling method of grouping heterogeneous population into homogenous subsets then making a selection within the individual subset to ensure representativeness. The goal of stratified random sampling is to achieve the desired representation from various sub-groups in the population. In stratified random sampling subjects are selected in such a way that the existing sub-groups in the population are more or less represented in the sample (Kothari, 2004). The study used simple random sampling to pick the respondents in each stratum.

## **Research Instruments**

Primary data was obtained using self-administered questionnaires. The questionnaire was made up of both open ended and closed ended questions. The open ended questions were used so as to encourage the respondent to give an in-depth and felt response without feeling held back in illuminating of any information and the closed ended questions allow respondent to respond from limited options that had been stated. The questionnaires were used in an effort to conserve time and money as well as to facilitate an easier analysis as they are in immediate usable form. Part one of the questionnaire contained the demographic information of the respondents, some closed Yes/No questions sought to establish if the research variables determine performance of irrigation projects. The extent to which each of the research variable determine performance of irrigation projects were investigated using likert scale items that formed the third part of the questionnaire. The likert scale items had five categorization ranging from strongly agree (SA), agree (A), neither agree nor disagree (ND), disagree (D) and strongly disagree (SD). In order to measure the mean (M) and standard deviation (SD) from the likert scale items allotment of numerals were done as follows; SA=1, A=2, ND=3, D=4 and SD=5. The same allotment was accorded to the other likert scale items with the following categorization on the extent scale: Very great extent (5), great extent (4), average extent (3), small extent (2) and no extent (1).

## **Pilot Testing**

Pilot testing refers to putting of the research questions into test to a different study population but with similar characteristics as the study population to be studied (Kumar, 2005). Pilot testing of the research instruments were conducted using stakeholders in another irrigation project in the Embu County. 20 questionnaires were administered to the pilot survey respondents who were chosen at random. After one day the same participants were requested

to respond to the same questionnaires but without prior notification in order to ascertain any variation in responses of the first and the second test. This is very important in the research process because it assists in identification and correction of vague questions and unclear instructions. It is also a great opportunity to capture the important comments and suggestions from the participants. This helped to improve on the efficiency of the instrument. This process was repeated until the researcher is satisfied that the instrument does not have variations or vagueness.

**Validity of Research Instruments**

The study used content validity which draws an inference from test scores to a large domain of items similar to those on the test. Content validity is concerned with sample-population representativeness. Expert opinion was requested to comment on the representativeness and suitability of questions and give suggestions of corrections to be made to the structure of the research tools. This helped to improve the content validity of the data that was collected. Content validity was obtained by asking for the opinion of the supervisor, lecturers and other professionals on whether the questionnaire was adequate.

**Reliability of Research Instruments**

Reliability is concerned with the question of whether the results of a study are repeatable. The questionnaire was administered to a pilot group of 20 randomly selected respondents and their responses used to check the reliability of the tool. This comprises 10% of the sample size. A pilot study was carried out to determine how reliable the questionnaires were. Reliability analysis was subsequently done using Cronbach’s Alpha which measures the internal consistency by establishing if certain items within a scale measure the same construct. Bryman and Bell (2011) established the Alpha value threshold at 0.7, thus forming the study’s benchmark.

**Table 1: Reliability Analysis**

	Cronbach's Alpha	Decision
Management of Project	.708	Reliable
Community Participation	.807	Reliable
Resources Adequacy	.713	Reliable
Technology	.736	Reliable
Land	.787	Reliable

Cronbach Alpha was established for every objective which formed a scale. The community participation was the most reliable with an Alpha value of 0.807 while management of project was the least reliable with an Alpha value of 0.708. This illustrates that all the five variables were reliable as their reliability values exceeded the prescribed threshold of 0.7 (Bryman and Bell, 2011). This, therefore, depicts that the research instrument was reliable and therefore required no amendments.

### Data Collection Procedures

The researcher obtained an introduction letter from the university which was presented to each stakeholder so as to be allowed to collect the necessary data from the respondents. The drop and pick method was preferred for questionnaire administration so as to give respondents enough time to give well thought out responses. The researcher booked appointment with respondent at least two days before visiting to administer questionnaires. The researcher personally administered the research instruments to the respondents.

### Data Analysis Techniques

Data was analyzed using Statistical Package for Social Sciences (SPSS Version 21.0). All the questionnaires received were referenced and items in the questionnaire were coded to facilitate data entry. After data cleaning, which entailed checking for errors in entry, descriptive statistics such as frequencies, percentages, mean score and standard deviation were estimated for all the quantitative variables and information presented in form of tables. The qualitative data from the open-ended questions were analyzed using conceptual content analysis and presented in prose

## RESEARCH RESULTS

### Correlation Analysis

The results in Table 4.17 show the coefficient of determination of relationship between dependent variable and independent variables as well as coefficient of determination of relationship among the independent variables.

**Table 2: Correlation Analysis**

		Irrigation Project Performance	Management of the Project	Resources Adequacy	Technology used	Community Participation	Availability Of Sizable Land for Irrigation
Irrigation Project Performance	Pearson	1					
	Correlation Sig. (2-tailed)	0.000					
Management of the Project	Pearson	0.548	1				
	Correlation Sig. (2-tailed)	0.000	0.000				
Resources Adequacy	Pearson	0.521	0.475	1			
	Correlation Sig. (2-tailed)	0.000	0.000	0.000			
Technology used	Pearson	0.534	0.363	0.226	1		
	Correlation Sig. (2-tailed)	0.000	0.002	0.071	.		
	Pearson						

Community Participation	Correlation	0.541	0.333	0.337	0.324	1	
	Sig. (2-tailed) Pearson	0.000	0.005	0.015	0.003	-	-
Availability of Sizable Land Irrigation	Correlation	0.643	0.552	0.516	0.324	0.112	1
	Sig. (2-tailed)	0.005	0.016	0.018	0.001	-	-

The outcome showed that management of the project and irrigation project performance are correlated positively and significantly ( $r=0.548$ ,  $p=0.000$ ). The Table further indicated that resources adequacy and irrigation project performance are positively and significantly related ( $r=0.521$ ,  $p=0.000$ ). It was further established that, technology used and irrigation project performance were positively and significantly related ( $r=0.534$ ,  $p=0.000$ ). Similarly, results showed that community participation and irrigation project performance were positively and significantly related ( $r=0.541$ ,  $p=0.000$ ). Finally the results reveal that availability of sizable land for irrigation and irrigation project performance were positively and significantly related ( $r=0.643$ ,  $p=0.000$ ).

## DISCUSSION

Under this section, the findings summarized in the section of summary of the findings are linked to the literature in chapter two.

### Management of the Project

Under this the study sought the extent to which management of the project affect the performance of public irrigation projects in Kenya. The study showed that management of the project greatly affects the performance of public irrigation projects in Kenya. The findings also showed that the participants indicated that management of organization (resource mobilization, conflict resolution, communication and decision-making) greatly affects the performance of public irrigation projects in Kenya. This correlate with Ruigu(2009) who notes that some degree of control and discipline is required in an organized community such as Mwea and Ahero where the wellbeing of the tenants and of the schemes are dependent on the performance of a technically determined cycle of activities.

The participants also illustrated that water use management (acquisition, allocation, distribution and drainage) greatly affects the performance of public irrigation projects in Kenya. They also showed that leadership and capacity greatly affects the performance of public irrigation projects in Kenya. The participants again indicated that management of structures required for water control (design, construction, operation and maintenance) moderately affects the performance of public irrigation projects in Kenya. Finally the participants indicated that management set up/structure moderately affects the performance of public irrigation projects in Kenya. These concur with Woldeab (2013) who argued that although both the human and physical aspects interact in their irrigation domain, the management aspect of irrigation is often ignored while priorities are given to the construction of irrigation.

## **Resources Adequacy**

Further the study sought to examine the extent to which resources adequacy affect the performance of public irrigation projects in Kenya. The study indicated that resource adequacy affect the performance of public irrigation projects in Kenya greatly. Participants indicated that water supply adequacy and reliability and transport infrastructure greatly affect the performance of public irrigation projects in Kenya. They also showed that financial capital adequacy, ease of use and user acceptability and institutional capacity greatly affect the performance of public irrigation projects in Kenya. The participants further indicated that human capital lowly affect the performance of public irrigation projects in Kenya. This correlate with Shah et al. (2013) who when studying smallholder irrigation systems in sub-Saharan Africa, identified the following challenges: mismanagement, high cost of working capital, poor linkages to credit, input and output markets, institutional vacuum, land tenure issues, improper management transfers, damaged soils, expensive and ineffective mechanisation, poor farmer capacity and lack of farmer entrepreneurship development.

## **Technology used**

The participants were again were requested to indicate the extent to which technology used affect the performance of public irrigation projects in Kenya. The studyrevealed that technology used greatly affect the performance of public irrigation projects in Kenya. Participants indicated that availability and cost of spare parts affect the performance of public irrigation projects in Kenya greatly. They also indicated that cost affect the performance of public irrigation projects in Kenya greatly. This concurs with Narayan (2009) who suggested that beneficiary participation is the single most important factor contributing to project effectiveness.

Participants again indicated that and type of irrigation systems affect the performance of public irrigation projects in Kenya greatly. They also showed that appropriateness of technology affect the performance of public irrigation projects in Kenya greatly. Participants however indicated that and ease of use and user acceptability affect the performance of public irrigation projects in Kenya greatly, that ease of maintenance affect the performance of public irrigation projects in Kenya moderately and that engineering designs for the physical systems affect the performance of public irrigation projects in Kenya amoderately affect the performance of public irrigation projects in Kenya. These findings concur with Holtslag (2012) who argue that ease of operation and maintenance, user acceptability and cost must be considered jointly and if a water supply system in the irrigation project is not maintained it is because it is too complicated, not 'attractive' or too expensive.

## **Community Participation**

The study revealed that community participation greatly affects the performance of public irrigation projects in Kenya. Analysis of community participation aspects shows that, laying out a system of enforcement of the use restrictions greatly affect performance of public irrigation projects in Kenya. This is in line with Kumar (2002) who asserts that participation

is a key instrument in creating self-reliant and empowered communities, stimulating village-level mechanisms for collective action and decision-making.

It also revealed that involving the farmers in planning, operation, management and maintenance greatly affect performance of public irrigation projects in Kenya. This is similar to Smith (2008) who claims that stronger forms of participation, involving control over decisions, priorities, plans and implementation or the spontaneous, induced, or assisted formation of groups to achieve collective goals.

The study further showed that preparing and agreeing on rules of restrained access to the resource greatly affect performance of public irrigation projects in Kenya. Finally the study showed that financial, labour or other contributions moderately affect performance of public irrigation projects in Kenya. These rare similar to Garces -Restrepo et al. (2007) who noted that the underlying assumption was that greater participation by the farmers would induce a sense of ownership and responsibility, and hence improve resource use efficiency .Some governments in Sub-Saharan Africa handed over management of smallholder schemes to the farmers in the face of IMT.

### **Availability of Sizable Land for Irrigation**

Finally the study explored how the availability of sizable land for irrigation affects the performance of public irrigation projects in Kenya. The study showed that availability of sizable land for irrigation affects the performance of public irrigation projects in Kenya in a great extent as per the majority. These findings concur with Wade (2009) who argues that the degree of scattering of the holdings also affects the performance of irrigation schemes.

From the findings the participants indicated that scattering of the holdings greatly affects the performance of public irrigation projects in Kenya. The participants also showed that land tenure issues greatly affect the performance of public irrigation projects in Kenya. They also indicated that number of farmers also greatly affects the performance of public irrigation projects in Kenya. Again the participants revealed that area of the land under irrigation greatly affects the performance of public irrigation projects in Kenya while indicating that number of plot holders moderately affects the performance of public irrigation projects in Kenya. This agrees with Inocencio et al (2007) who found that in Sub Saharan Africa, small irrigation projects showed higher performance measured by yields, water distribution, and operations within the scheme, due to better management compared to bigger irrigation projects where as they did not benefit from scale economies.

### **CONCLUSIONS**

The study concluded that management of the project positively and greatly affects the performance of public irrigation projects in Kenya. The study deduced that water use management (acquisition, allocation, distribution and drainage) greatly affects the performance of public irrigation projects in Kenya. They also showed that leadership and capacity greatly affects the performance of public irrigation projects in Kenya. The study again deduced that management of structures required for water control (design, construction, operation and maintenance) moderately affects the performance of public irrigation projects

in Kenya. Finally the study deduced that management set up/structure moderately affects the performance of public irrigation projects in Kenya.

The study concluded that resource adequacy affect the performance of public irrigation projects in Kenya greatly and significantly. The study deduced that water supply adequacy and reliability and transport infrastructure greatly affect the performance of public irrigation projects in Kenya. They also showed that financial capital adequacy, ease of use and user acceptability and institutional capacity greatly affect the performance of public irrigation projects in Kenya. The study further deduced that human capital lowly affect the performance of public irrigation projects in Kenya.

The study concluded that technology used greatly and positively affect the performance of public irrigation projects in Kenya. The study deduced that availability and cost of spare parts affect the performance of public irrigation projects in Kenya greatly .The study again deduced that type of irrigation systems affect the performance of public irrigation projects in Kenya greatly. The study finally deduced that and ease of use and user acceptability affect the performance of public irrigation projects in Kenya greatly, that ease of maintenance affect the performance of public irrigation projects in Kenya moderately.

The study concluded that community participation greatly, positively and significantly affects the performance of public irrigation projects in Kenya. The study deduced that Analysis of that laying out a system of enforcement of the use restrictions greatly affect performance of public irrigation projects in Kenya. The study further deduced that preparing and agreeing on rules of restrained access to the resource greatly affect performance of public irrigation projects in Kenya. Finally the study deduced that financial, labour or other contributions moderately affect performance of public irrigation projects in Kenya.

Finally the study concluded that availability of sizable land for irrigation positively and significantly affects the performance of public irrigation projects in Kenya. The study deduced that that availability of sizable land for irrigation affects the performance of public irrigation projects in Kenya in a great extent as per the majority. The study also deduced that number of farmers also greatly affects the performance of public irrigation projects in Kenya. Again the participants revealed that area of the land under irrigation greatly affects the performance of public irrigation projects in Kenya while indicating that number of plot holders moderately affects the performance of public irrigation projects in Kenya.

## **RECOMMENDATIONS**

The study recommends that full participation of members in irrigation project development should be encouraged to enhance capacity to perceive their own needs. Through participation, local people identify their needs as well as the relevant goals of a program. The study recommends that project members need to participate in decision making and implementation activities, to help irrigation officials identify their needs, strategies to meet those needs and the necessary resources required to implement the various strategies.

1. The study also recommends that members' managed irrigation projects should encourage a maximum number of people to participate at various stages of project

development. Such involvement should give the participants full inclusion in designing, organizing, implementation activities and workshops in order to create consensus thus enhancing ownership.

2. The study recommends that the adoption of modern technology of irrigation such as drip and sprinkler irrigation system that increases water use efficiency. This will eventually improve the performance of the projects as well as enhancing the work efficiency.
3. The study further recommends that the study recommends that the management of the projects should adopt stringent measures which would arrest the cost related factors. This also should include less bureaucratic procedures and processes in disbursement of both material and financial resources required by contractors to implement irrigation projects.
4. The study recommends that the project management should strengthen the capacity of supervisory staff involved in irrigation projects. Supervision was found to have the least influence on completion of projects in the study. However, supervision would enhance the identification of trouble areas through spot checks of project implementation activities in order to reduce massive loss of resources and project non-completion.
5. The study recommends that the Ministry of Agriculture and policy makers should formulate policy on irrigation and technology that is supportive to the development and growth of small scale dry-land farming. The policy should provide incentives that promote small scale dry-land farming establishments. These would include access to the market, access to credit, transport and the general provision of the required infrastructural facilities that could help in enhancing sustainable irrigation of small scale dry-land farming in most of the arid and semi-arid lands.

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