

Factors Enhancing Land Use Development and Management for Rehabilitated Namasanda Dam in Bungoma County, Kenya

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Abstract: The study investigated factors enhancing land use development and management for rehabilitated Namasanda small dam in Kanduyi Sub County of Bungoma County. This research investigation showed that the general utilization of the dam water by the community for growing crops was less than 40% which was low compared to over 40% used by the community for other social economic activities like livestock keeping and fish farming. In this study, the community's capacity in terms of knowledge, material, monetary, organizational etc; and the community's skill in terms of training, experience etc. in dam development and management were interrogated to determine how these factors influence land use from the rehabilitated dam. The social economic benefits that are derived from dam rehabilitation like livestock keeping, fish farming, water for cleaning/washing etc. were also interrogated to determine how they contribute to the social economy of the community resulting from the rehabilitation activities of the dam. Other factors including Government regulations, politics, funding, subsidies etc. were also studied to determine their influence on land use and the social economy of the community around Namasanda dam. The study adopted descriptive research survey. The sampling procedure was by simple random sampling approach and the data collection method involved use of questionnaires, interview schedules, observations, taking of photographs and document analysis. The data collected was cross tabulated with land use activities and were measured as low for land use below 0.25acres, moderate for land use between 0.25 to 0.5 acres and high for land use of between 0.5 to 1.0 acres or greater. The social economic activities derived from the dam activities together with strength and the management capacity of the community were measured as less than 40% for low, 41 – 70% for moderate and over 70% for high utilization. Information on literature review in this study was gathered from books, periodicals, internet and other relevant documents. The findings showed that 90.5% of the community indicated that increasing their capacity through training improved their skills for enhancing land use and other social economic activities. The community also indicated that funding and incentives were necessary for improved land use activities; and that modes of dam rehabilitation measures contributed to enhancing food security and the social economic activities derived from the dam after rehabilitation. The study concluded that building capacity of the community, providing them with funding and incentives contributed significantly to improved land use activities and corresponding social economical benefits that enhance food security from rehabilitation activities of small dams. This study therefore recommends that rehabilitation of small dams should include strengthening the capacity of the community, providing them with incentives and involving them fully in all the project phases. This will enhance land use activities and the accompanying social economic benefits that are derived from dam rehabilitation activities.

Keywords: Factors Enhancing Land, Dam Rehabilitation Activities.

1. INTRODUCTION

1.1 Background of the Study:

Land use is the human use of land. Land use involves the management and modification of natural environment or wilderness into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed woods (FAO, 1997). Land use practices vary considerably across the world. According to Stefan *et al* (2014), land use and land management practices have a major impact on natural resources including water, soil, nutrients, plants

and animals. Stefan *et al* (2014) added that in colonial America, few regulations existed to control the use of land due to the seemingly endless amounts of it; however, today, federal, state, and local governments regulate growth and development through statutory laws in America Stefan *et al* (2014). In many tropical, subtropical and Mediterranean climates, dry season agriculture and the pre-rainy season establishment of food and cash crops cannot be undertaken without large quantities of water (Tim Evans 2010). Tim Stevens (2010) reported that to rely upon stream flow at a time when temperatures and evaporation are often at a peak can be unrealistic and risky. He added that in such a situation, it may become essential for a dam to be constructed on a river or stream to allow for off-season storage of vital water supplies. Although primarily for irrigation, such structures can be used, either separately or combined, for fish farming, livestock, domestic water purposes, groundwater recharge, flood amelioration and conservation storage (Tim Stevens, 2010). In his findings on the study on dam design and construction, reservoirs and balancing lakes, F. Lempérière (2013) reported that over one-third of dams worldwide are multipurpose. He further noted that a key characteristic of well designed dams is their longevity; some operating dams are over one thousand years old and the great majority of dams built in the nineteenth century are still operating fully today. Using water from such dams during the dry spell for irrigated agriculture can enhance land use for agriculture productivity.

According to F. Lempérière (2013) irrigation water taken from dams in the year 2000 produced food for about 15 percent of the world's population (almost one billion people). He added that it is estimated that during the first half of the twenty-first century, the population of Asia, Africa, and South America will increase by almost three billion people, and many further large dams may be built to provide food for them because in most of these countries, rivers are fully dry for half of the year (Lempérière, 2013).

Dams and reservoirs have played a key role in economic development, serving a variety of purpose, including electricity generation, domestic water, tourism, fish farming, flood control, and irrigation. However large dams have been a subject of growing international debate and controversy (Lemperiere, 2013).

In Kenya, land use is governed by the constitution and other Acts of Parliament. Given that 84% of Kenya is either arid or semi-arid lands (ASAL) and in light of recurrent droughts, floods and prolonged dry spells, the country cannot rely solely on rain-fed agriculture (Proposed Irrigation Bill, 2015). The availability of sufficient water resources to support agricultural productivity is under continuous and increasing pressure from other social and economic demands. The Proposed Irrigation (Bill 2015) states that the current total water storage capacity is equivalent to 5.3 m³ per capita per year which is among the lowest water storage rates in the world and equivalent to only 3 months' use. Hence, this calls for well-targeted actions in the rehabilitation and management of watersheds including soil and water conservation in the farmlands in order to increase the water resource base at which point water harvesting and storage will be sustained for use especially in irrigation, being the biggest water user consuming on average over 70 % of all that is used (Proposed Irrigation Bill, 2015). The Water Master Plan 2012 records that the opportunities for growth through irrigation, drainage and agricultural water storage are immense in Kenya. The country has an irrigation potential of 1,341,900 ha based on available water resources and improvement in irrigation water use efficiency of which approximately 161,840 ha of irrigation have been developed (Water Master Plan, 2012). The rate of irrigation development in the country has been low, with an increase of new irrigated area, which is equivalent to an annual growth rate of less than one per cent.

The Bungoma County integrated development plan (BCIDP) 2014 indicates that Bungoma County is generally an agriculture based economy. Enhancing land use through rehabilitation of dams will boost food security (BCIDP, 2014). According to Bungoma County agricultural sector plan of 2014, out of Bungoma's 3,032.4km² surface area, a total of 2,880.78 km² accounting for 95% of all land is arable (BCASP, 2014). Although the County is endowed with fertile soils, adequate rain and an elaborate network of permanent rivers and streams, the sector plan adds that during the dry spell especially from November to early March, there is need for supplementary irrigated agriculture. Since the available water in the sources is not adequate, there is need for water storage for irrigation and other uses (BCASP, 2014).

Development of a dam for use by community requires their full participation in all the phases of the project cycle (Deepti 2000). In his study, Deepti (2000) recorded that mechanisms such as meetings, community surveys, focus group discussion, training, and capacity-building exercises facilitated active community involvement. Also, information sharing and dissemination should be ensured through community notices and updates on project rules, roles, and responsibilities. Such data sharing also induced transparency in the project's activities (Deepti et al, 2000).

According to Kenya's Strategy for Revitalizing Agriculture (SRA) Policy paper (2004 – 2014), proper utilization of land will enhance the Government's objectives for self sufficiency in food production. It will also enhance poverty eradication which is an important theme of the National Poverty Eradication Programme (NPEP 1999-2015). This will lead to

improved income generation which was the rationale behind the implementation of the Economic Recovery Strategy for Wealth and Employment Creation (ERS 2003-2007) whose successes led to the development of the Kenya Vision 2030. Enhancing land use through rehabilitation of community dams especially for irrigated agriculture, fish farming and livestock production will boost food production and hence enhance food security. Most of the community dams in Kenya were built in the colonial days and are not being utilized as per the required purpose due to negligence, ignorance, siltation of the dam and other damages. In this report, 50 community members registered as members of Namasanda dam community based organization (CBO) that is mandated to manage the activities of the dam were studied to find out how the aspects of rehabilitation of the dam will enhance land use and other economic activities.

1.1.1 Dam rehabilitation measures for enhancing land use:

Erik Nissen-Petersen (2006) posits that dam rehabilitation involve the technical aspects undertaken to restore the dilapidated dam to its original design and purpose. In many parts of the world, dam rehabilitation has been carried out by Government agencies, Non-Governmental organizations (NGOs) or private entities in collaboration with the local communities (Erik 2006). Large and medium dams have also been rehabilitated in Kenya and all over the world. Erik (2006) in his studies documented that before proceeding with any water project, however small, it is important to first determine whether it is feasible. This not only involves determining its technical and economic viability, but also its environmental and social impacts. It is important that these can be shown to be generally positive. Other considerations include the quality, quantity, source of water and the project cost. Erik (2006) further added that the dam rehabilitation process undergoes through the project cycle of initiation, planning and design, implementation and completion stages.

The initiation stage involves project identification, community mobilization and sensitization. The planning stage includes activities to be carried out, the time frame and analyzing the project cost and scope. The implementation stage involves the actual tangible works like construction of structures and excavation of materials. Finally, the completion stage involves the completion of the implementation activities and pulling out the construction equipment and the labour force from the site. Before a completed project is handed over to the community it is important to build the capacity of the community to handle all the processes and challenges that may arise (Erik, 2006). Rehabilitation of dam includes activities like soil excavations, soil compactions, construction of water draw off systems, cattle drinking troughs, toilets, bathrooms and community water points for sanitation.

1.2 Statement of the Problem:

Most parts of the world are experiencing food insecurity. Enhancing land use through rehabilitation of community dams especially for irrigated agriculture, fish farming and livestock production is one of the measures that can boost food production and enhance food security. Most of the community dams in Kenya were built in the colonial days and are not being utilized as per the required purpose due to negligence, ignorance, siltation of the dam and other damages. The main purpose of building these dams was to store water to be used in dry season to enhance food security through irrigated agriculture, fish and livestock farming. However this has not been achieved due to lack of proper management of the dams by the relevant community organizations. This study therefore intended to find out the capacity of the community organization in management and utilization of the rehabilitated dams for enhancing land use. Proper utilization of the dam will lead to enhancing food security through irrigated agriculture, fish farming and livestock keeping. It will also improve sanitation because of the sanitation facilities that are incorporated during dam construction like construction of the toilets, bathrooms, cattle drinking troughs and community water points.

1.3 Research Objectives:

1.3.1 Overall objective:

The overall objective of the study was to establish factors that enhance land use development and management for rehabilitated Namasanda community dam in Kanduyi constituency, Bungoma County.

1.3.2 Specific objectives:

The study was guided by the following specific objectives:

- 1) To describe the strength and status of the community organizations relevant to the rehabilitation of the small dams for enhancing land use and social economic benefits.
- 2) To establish the modes of rehabilitation measures that affects the rehabilitation of a small dam for enhancing land use and social economic benefits.
- 3) To develop/evaluate options for enhancing the development and management of a small dam for productivity.

1.4 Research Questions:

This study was guided by the following research questions:

- 1) What capacity (knowledge, organizational and material/monetary) does the community organization around Namasanda dam have to enhance land use and social economic benefits from the rehabilitated dam?
- 2) How do the modes of dam rehabilitation measures (construction activities, auxiliary works etc.) affect community participation in development of small dams for enhancing land use and social economic benefits?
- 3) What are the feasible options (e.g. incentives, subsidies, stakeholder involvement etc.) that are available to enhance community participation in the development of the small dams for enhancing land use and social economic benefits?

1.5 Justification of the Study:

This study aimed at contributing to the interventions and measures that are needed to enhance prudent utilization of land from dam rehabilitation activities. Most of the dams constructed in Bungoma County and elsewhere in the Country were done during colonial days and most of them have silted up or require substantial repairs to restore them to their original designed purpose. The committees formed to manage the dam activities are either redundant or have fizzled out altogether. Enhancing capacity building of the committees will improve their management skills and hence lead to proper land use and other economic activities of the dam. Some of the reasons for the weak management committees are lack of training/skills, inadequate funds and lack of access to credit. If most of these constraints are addressed, it is hoped that the land use development and management of small dams for enhancing land use will significantly improve.

Rehabilitation of community dams for agricultural productivity will enhance food security through irrigated agriculture, fish farming and livestock production. According to the Kenya Government's draft Irrigation Policy (2015), irrigated agriculture can boost food productivity four times as compared to rain fed agriculture. Enhancing land use through irrigated agriculture using the stored waters from the rehabilitated dams will be vital to achieve such an increase. Such development cannot be achieved without the support and involvement of the local communities (Draft Irrigation Policy, 2015).

The findings of this study are significant to project planners and implementers in developing strategies and methodologies for overcoming some of the challenges in the development and management of land through dam rehabilitation that lead to enhancing food security.

1.6 Scope of the Study:

This study covered Namasanda dam which is located in Namasanda ward of Kanduyi Sub-county, Bungoma County. It involved the population of the dam numbering 50 members.

1.7 Limitations and Delimitations of the Study:

It was the assumption of this study that the community around Namasanda dam would be willing to participate and freely respond to questions asked; and that the weather conditions during the entire field exercise would be conducive for easy movement in the area. The study also assumed that the list of the members of the scheme and any other materials used to identify the group members was accurately captured in the bona fide members' register. The membership register was used to ensure that only registered members formed the target population of the study so that mobility of community members in and out of the area would not distort bona fide membership of the group. Limitation to accurate data collection could occur if sampling was done using a defective membership register. To ensure that accurate data was collected, liaison with relevant dam management committee members and government officers was enhanced. Data was collected only during the dry season in order to avoid interference of the weather conditions in data collection.

2. LITERATURE REVIEW

2.1 Introduction:

This chapter aims to discuss most of the relevant past work that has been done by other researchers in the field of enhancing land use management, development and dam rehabilitation activities. The chapter also discusses the theories associated with the objectives of the study. The chapter finally highlights the variables that have been conceptualized in the study and the conceptual framework.

2.2 Theoretical Review:

Uma Sekeran (2010) posit that a theoretical framework is a conceptual model of how one theorizes or makes logical sense of the relationships among the several factors that have been identified as important to the problem. The theory flows logically from the documentation of previous research in the problem area by identifying the theories related to the study. This study was guided by the system theory and resource based view theory. The analysis of the theories linked the theories to the study and brought out the research gaps.

2.2.1 Resource based view theory:

According to Krippendorff (2014) the resource-based view (RBV) has since become one of the dominant contemporary approaches to the analysis of sustained competitive advantage. A central premise of the resource-based view is that firms compete on the basis of their resources and capabilities. Srivastava, Franklin, & Martinette (2013) found out that most resource-based view researchers choose to “look within the enterprise and down to the factor market conditions that the enterprise must contend with, to search for some possible causes of sustainable competitive advantages” holding constant all external environmental factors. The dam community based organization has to compete with other community based organization in order to be successful in the market. The committee must have adequate capacity in terms of skills, monetary and material in order to have a competitive advantage.

2.2.1.1 Aspect of community's knowledge, skills and experience in dam rehabilitation for enhancing land use:

The aspect of capacity of a community based organization in terms of knowledge, skills, and experience is a resource to that can be used to gain a competitive advantage over similar groups in the environment. In the past there has been overwhelming tendency to view capacity-building from the narrow perspective of training that merely concerns impartation of knowledge, skills and attitude change. These alone are inadequate for effective and sustainable community development (MWRM&D, 2003). In general, capacity building refers to long-term investment in people and their institutions to enable them to effectively and efficiently carry out specific activities to achieve specific development objectives (MWRM&D, 2003). Rehabilitation and management of dam activities require heavy infrastructure investment, technical knowledge and manpower for it to be viable. This calls for proper training which is a learning process in which specific knowledge is imparted to community in order to improve their skills and change of attitude. Training and extension was evolved from the previous transfer of technology model by the so called experts to more “participatory approach model” that involves both the researchers and extension agents working closely with the community (FAO 2001). According to Okoth (2011), formerly extension professionals and scientists identified problems and developed solutions, which were then transferred by extension officers to extend to the community. This approach suffered a setback from lack of adoption as the so called “experts” neglected cultural, socio-economic, practical constraints and also ignored community-developed solutions already in place (National Agriculture and Livestock Extension Programme, 2005). Okoth (2011) added that the contents of training package should consists of principles, methods and examples of solutions from which the community can pick practical solutions based on personal experiences (FAO 2001). This approach recognizes that communities have a wealth of knowledge borne out of practical solutions to problems being experienced. Such knowledge and experience is important during capacity building of the communities. According to Tim (2010), training local people in all aspects of dam repair and maintenance may need to be included in the construction programme. Where local participation is expected in the construction process any contracts awarded to private contractors should clearly define all contributions to be made by the community and the contractors asked to modify their work programmes and practices accordingly. This may lengthen the construction period and increase costs but may prove worthwhile in the long term in enhancing ownership, responsibilities and skills amongst the beneficiaries (Tim Evans 2010).

Regarding community organization's many roles and functions expected of them, the concept of capacity building should be looked at in a broader context to encompass building of social capital, improved access to production resources (capital), strengthening organizations' capacity to determine their own values and priorities, strengthening organization's capacity for decision making, attitude change and enhanced access to information and services (FAO), 2001). Building the capacity of Namasanda dam community based organization is important for improved management skill and enhanced development.

2.2.2 Systems theory:

The study was also guided by the systems theory of organizations developed by Ludwig Von Bertalanffy in the early 1950's. Systems theory emerged as part of intellectual thinking following the World War II. Systems theory takes into account the inter relationships of the several parts of a phenomena that must interact. County Governments as organizations exist as social units in the larger environment. It is therefore important that they must be managed like systems where their operations and programmes continually interact with the outside environment in terms of its inputs and thereafter its output in form of service delivery and proposal.

Systems theory provides that organizations such as County Governments are like other open systems which of necessity engage in various modes of exchange with the environment (Katz and Kahn, 1966). Systems theory emphasizes the considerations of the relationships between organizations and its environment as well as what goes on within organizations. In this study, the systems theory holds that, the mission of the project, the personnel engaged on a project, the communications process among all the stakeholders involved in a project and the participation of the community influences land use and the social economic activities. The interrelationships among parts of a system have to be recognized and understood by all people involved (Katz and Kahn).

2.2.2.1 The organization capacity of community based organizations in dam rehabilitation:

The organization capacity of a community based organization is important for enhancing land use activities and social economic benefits. The United Nations defines Community development as "a process where community members come together to take collective action and generate solutions to common problems." (UN, Community Development, 2015). The term has taken off widely in Anglophone countries i.e. the US, UK, Australia, Canada and New Zealand and other countries in the Commonwealth. It is also used in some countries in Eastern Europe with active community development associations in Hungary and Romania (UN, 2015). Approaches to community development are recognized internationally. These methods and approaches have been acknowledged as significant for local social, economic, cultural, environmental and political development by such organizations as the UN, WHO, World Bank, Council of Europe and EU (UN, 2015). Community development seeks to empower individuals and groups of people by providing them with the skills they need to effect change within their communities. According to Erik (2006), participation of community in any project is vital from initiation to completion. The first step in any development of a project involves community mobilization and sensitization (Erik, 2006). Mobilization of community takes a long period for the community to attain self - organizing status. This is a spiral process that poses more challenges as the group advances from one stage to another because of change of vision and objective (Erik, 2006).

The mobilization is a facilitative process of strengthening the organizational and management capacities of people in such a way that they become self-reliant in solving their own problems (MWRM&D, 2003). It connotes the organized action of the people towards the resolution of issues or acquisition of what they desire and what may benefit them. This, then, requires that people, as a group, must have proper ownership of actions and highly organized causes of action (MWRM&D, 2003). During community mobilization exercise the beneficiaries gain self-confidence to undertake their projects independent of outsiders, discover how to organize their group well and also discover how to make their decisions and plans (MWRM&D, 2003). In case of a small dam being constructed for a community, Erick 2006, added that the whole community must be involved in the location, design, construction and maintenance of the dam (Erik, 2006). The reasons according to Erik (2006) include:

- 1) Common ownership of the water source will help to ensure that it is operated and maintained properly. It will also increase the likelihood that any communal benefits are shared in a fair way.
- 2) Community members are more likely to support any future calls to assist in repair or maintenance work, such as removal of sediment from the reservoir.
- 3) Even where the construction of dams is for single households, the inclusion of the nearby community members will encourage householders to assist each other in the heavy and tiring construction work.
- 4) Potential issues or obstacles can be identified from the outset and appropriate action taken. This will help to avoid potential future problems.

5) Community members who will use a new dam should be involved in all aspects of planning and management in a participatory way. Important decisions such as the site of the dam should be taken at a village meeting. At such public meetings the community should be encouraged to elect a small committee to represent them and keep them informed (Erik, 2006).

2.2.3 Effects of modes of dam rehabilitation measures on enhancing community participation in land use activities:

Several factors affect land use development and management of small dams. These include dam location, Government regulations, politics, funding, community organization etc. According to Manatenge et al (2014), environmental studies may identify and quantify the impact of a dam, as well as proposing ways to mitigate this impact and to improve the project. However, determining the impact of a dam is often a subjective matter: creating a water reservoir, for instance, might be considered both as a welcome development or as a disaster; preventing flash floods might be regarded both as progress and as an unacceptable modification of an ecosystem. Indeed, some ecologists and environmentalists are systematically opposed to the construction of any large dam whatsoever (Manatenge et al 2014). The main direct environmental impacts of dam reservoirs are the inundation of areas and the modification of river flows (Manatenge et al, 2014). In this regard the National Environmental Management Authority (NEMA) has put in place requirement for acquisition of an environmental impact assessment report and environmental license before commencing development of any dam.

According to the Water Act (2002) the acquisition of water permit from Water Resources Management Authority is also a legal requirement before using water from a source so as to be apportioned the required amount of water to be extracted. This is in order to mitigate on possibility of users from the upstream side of a water body using excess water and denying other users especially from the downstream side and hence creating water use conflict (The Water Act, 2002).

It is also mandatory that all dam committees be registered with the appropriate Government department and be issued with a registration certificate before they can implement their activities as a group. Politics have in many cases interfered with location of dam projects to suit to preferences of the politicians. This has resulted in some dams being wrongly located.

2.2.4 Feasible options for enhancing land use development and management from the rehabilitated community dams:

Dam rehabilitation is an expensive undertaking which may not be undertaken by the community alone especially in Kenya and other developing countries. The community requires technical and monetary assistance to achieve this. Politics and Government policies continue to play a role in determining where a certain project can be located and the amount of funds to be allocated. Sometimes the project is wrongfully located due to these directives. Incentives, donor funding and private investment can be a good option as incentives for community participation in development of earth dams. One of the approaches used in Indonesia involved; simple fund channeling arrangements, enhancing the degree of beneficiary control over decision making, extending the scope and content of the health and hygiene component, and having a greater level of institutional focus (Deepti *et al*, 2000). Enhancing organization management can improve managerial skills of dam committees and enhance sustainable land use practices (Deepti *et al*, 2000).

Charging of water fee for dam maintenance from those who use the water from the dam can boost cash in the community's account that can be used for maintenance of the dam infrastructure (MWRM&D, 2003). In most countries land and water rights are closely related, although water is often a public good, and therefore its use is associated with permits, concessions, and other tenure systems (Tim Evans 2010). Evans (2010) added that irrigated and rain fed land is the main source of livelihood for many rural populations; and that women have much less access to this essential asset than men. The distribution of water and land is a major determinant of poverty (Tim Evans, 2010). Hence gender issues in development and management of land use should be considered such that women are not marginalized.

Another option is the involvement of the County Administration in project activities at all phases. In the current governance system of devolution in Kenya, focus in participation in project implementation is shifting from the previous Provincial Administration to the new set up of County Administration. Hence involvement of County Administration is crucial for success of project implementation.

2.3 Conceptual Framework:

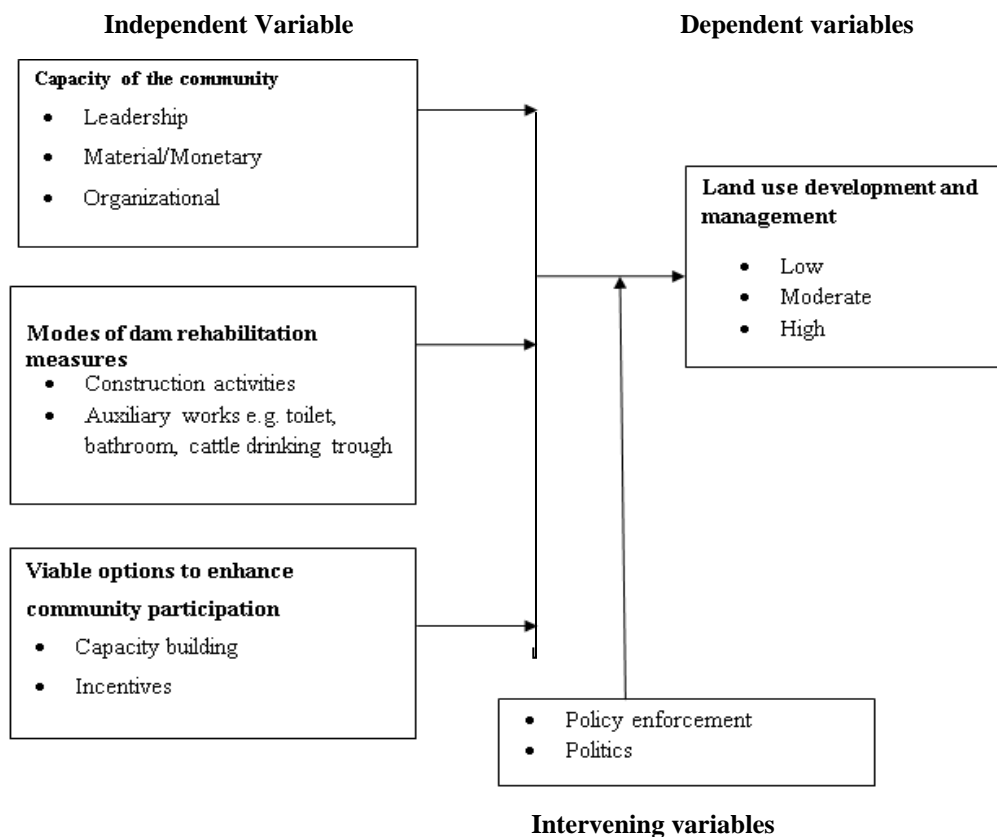


Figure 2.1: Conceptual framework

2.4 Summary:

In accordance with the resource base view theory, Namasanda dam community based organization has to compete with other community based organization in order to be successful in the market. The committee must have adequate capacity in terms of skills, monetary and material in order to have a competitive advantage. Considering Namasanda dam community organization based on the system theory, the organization has to have a clear mission of the project, competent personnel engaged on the management of activities and a clear communication process among all the stakeholders involved.

2.5 Research gaps:

The study focused on Namasanda community dam which is located in Bungoma County. These findings may differ for similar dams in different geographic characteristics. The research did not include effectiveness of water use and other resources owned by the community in the study. There is thus need for further research in these areas.

3. RESEARCH METHODOLOGY

3.1 Introduction:

This chapter discusses research design, target population, sampling method, data collection method, validity tests for instrument used and data analysis used for the study.

3.2 Research Design:

The research design used in this study was descriptive survey. According to Kothari C.R (2004), descriptive research survey is concerned with describing the characteristics of a particular individual or group. In this case, the researcher must be able to define clearly what he wants to measure and must find adequate methods for measuring it along with a clear cut definition of the population he wants to study (Kothari, 2004). Survey research is a self-report study which requires the collection of quantifiable information from the sample (Mugenda, 2003). Using this research design the members of Namasanda dam community were studied in order to determine characteristic occurrences in the population with respect

to the variables outlined in the study objectives. The design helps in the gathering of information from respondents on factors that enhance land use development and management for the rehabilitated Namasanda community dam in Kanduyi constituency, Bungoma County. In this study both qualitative and quantitative data collection techniques were used in the gathering of primary data in the field. Secondary data from community's organization records was also collected through document analysis.

3.3 Target Population:

Namasanda dam was registered under the former Bungoma County Council with land registration number as E.Bukusu/S.Kanduyi 1046 and has an area of 13 acres. The dam was built in 1952 and was managed by an elected committee. The committee was redundant until 2008 when a new committee was registered after being elected by group members. The registered members of the group are 50 members. These are registered members of the community around the dam who use the dam water as a group for various activities. The researcher targeted 44 members of the population based on the calculation from the random size table shown in Table 3.1.

3.4 Sampling Frame:

Namasanda dam is located about 7km along the Bungoma – Mumias road about 2km away from the tarmac road. It is in Namasanda ward, Kanduyi constituency in Bungoma County. The project is located in agro-ecological zone LM1 or marginal sugarcane zone with a long cropping season followed by a medium to short one with intermittent rains between. It lies between altitude 1,440m and 1,460m above sea level. The annual average rainfall ranges between 1,400 mm – 1,650 mm. The catchment area of the dam is 200 ha with a population of 620 persons. The study targeted a sample of 50 persons from the area who also happen to be registered members of Namasanda community based organization for the purpose of utilizing the dam water for various social economic activities.

3.5 Sample and Sampling Technique:

Sampling is the process of selecting a number of individuals for a study in such a way that the individuals selected represent the large group from which they were selected (Mugenda A and Mugenda O, 1999). The study used a sample size of 50 households calculated basing on the Krejiele and Morgan (1970) as cited by Okelo (2012) sample size table shown below. In this table, N = population and n = sample size. From the table, it can be explained that when a population has N members, the corresponding sample size to be selected will be n. Hence for the case of Namasanda dam the sample size from a population of 50 members can be got as follows;

The population (households) that use Namasanda dam was 50 (i.e. N=50). Hence from the table below the sample size n = 44. Therefore 44 questionnaires were administered from the list of the registered 50 members.

Table 3.4: Sample size Table

N - n	N - n	N - n	N - n	N - n
10 - 10	100 - 80	280 - 162	800 - 260	2800 - 338
15 - 14	110 - 86	290 - 165	850 - 265	3000 - 341
20 - 19	120 - 92	300 - 169	900 - 269	3500 - 346
25 - 24	130 - 97	320 - 175	950 - 274	4000 - 351
30 - 28	140 - 103	340 - 181	1000 - 278	4500 - 354
35 - 32	150 - 108	360 - 186	1100 - 285	5000 - 357
40 - 36	160 - 113	380 - 191	1200 - 291	6000 - 361
45 - 40	170 - 118	400 - 196	1300 - 297	7000 - 364
50 - 44	180 - 123	420 - 201	1400 - 302	8000 - 367
55 - 48	190 - 127	440 - 205	1500 - 306	9000 - 368
60 - 52	200 - 132	460 - 210	1600 - 310	10000 - 370
65 - 56	210 - 136	480 - 214	1700 - 313	15000 - 375
70 - 59	220 - 140	500 - 217	1800 - 317	20000 - 377
75 - 63	230 - 144	550 - 226	1900 - 320	30000 - 379
80 - 66	240 - 148	600 - 234	2000 - 322	40000 - 380
85 - 70	250 - 152	650 - 242	2200 - 327	50000 - 381
90 - 73	260 - 155	700 - 248	2400 - 331	75000 - 382
95 - 76	270 - 159	750 - 254	2600 - 335	100000 - 384

Source: Okelo, (2012)

3.6 Data collection instruments:

The study used questionnaires, interview schedules, observations and taking of photographs as instruments of data collection. The instruments contained open ended, closed ended and Likert scales where the respondents answered a series of statements by indicating the degree of agreement or disagreement by choosing one of the choices given.

3.7 Data collection procedure:

Data collection was done by administering of questionnaires by the research assistants through interviews of 44 members out of 50 group members under the supervision of the researcher. The data collection exercise took three continuous working days during which period all the three sets of instruments were administered. Data was collected from the dam committee leaders by the researcher through focused group discussions. Document analysis was undertaken on the organization's records by the researcher. Prior to collection of data, 3 research assistants were identified, recruited and trained on how to administer the questionnaires. The interview schedule, taking of photographs and the observation schedules were administered by the researcher. Ethical issues were observed by the researcher and all the research assistants involved in this study. The researcher was given a letter of permission from the Chief Officer Agriculture, Irrigation and Cooperatives, Bungoma County to interview the group. Data was collected from the study population through random sampling of the group members guided by the dam committee leaders and village elders.

3.8 Pilot Test:

Reliability is a measure of the degree to which a research instrument yields consistent data after repeated trials. It indicates precision of the data collection tool. The reliability of the instruments was enhanced by using test-retest method. The instruments were administered to 20 group members of Magemo dam in Webuye East sub county, Bungoma County which had also been rehabilitated to determine the consistency of the instruments.

3.9 Data Processing and analysis:

Data from the study was analyzed using both qualitative and quantitative methods of data analysis. Qualitative data analysis began with field editing of the data sheets to minimize errors by the research assistants. That was later followed by coding of the open ended data, entry, cleaning, transformation analysis and interpretation. Data was assigned codes for ease of identification purpose and then classified into categories during analysis. Descriptive statistics such as mean, median, mode, frequency and percentages were used to express extent of land use and other social economic activities as a result of rehabilitation of Namasanda dam. Mean scores of the respondents were worked out. The responses to the investigation were analyzed and presented in tables and charts. Secondary data and data from the focused group discussions were analyzed and interpreted using the following three steps: First data was organized in key thematic areas in line with the objectives of the study. Secondly data was summarized into daily briefs and finally the briefs were described and expanded to incorporate additional insights from observations made in the field by the researcher and from the dam committee documents through content analysis. The frequencies of data analysis were then represented in the form of tables and charts. The tabulated data was analyzed and the raw data subjected to statistical analysis.

4. RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction:

This chapter presents the research findings, data analysis, presentation, interpretation and discussion. It contains respondents return rate, general information of the respondents and their response to the questionnaire on factors enhancing land use development and management for rehabilitated Namasanda small dam.

4.2 Respondents Return Rates:

The total number of questionnaires administered was 44 and the response was 100%. This 100% response was achieved because the research assistants were guided by the dam committee members and village elders to reach the target respondents. However not all those who were interviewed responded to all the questions asked.

4.3 General information of the respondents:

The general information of the respondents included gender, age brackets, academic qualification, land tenure system, land sizes and use of the dam for various activities. This information was necessary in order to assist the researcher know the details of the population under study for comprehensive data analysis.

4.3.1 Distribution of Respondents by Gender:

The influence of gender on enhancing land use from the rehabilitated dam was analyzed in this study. The respondents were asked to indicate their gender. This was important because decision making in the household on land use activities has a relation to the gender of the head of the household. The results are presented in table 4.3.1 below.

Table 4.3.1 Distribution of the respondents by gender

Gender	Frequency	Percentage
Males	26	59%
Females	18	41%
Total	44	100%

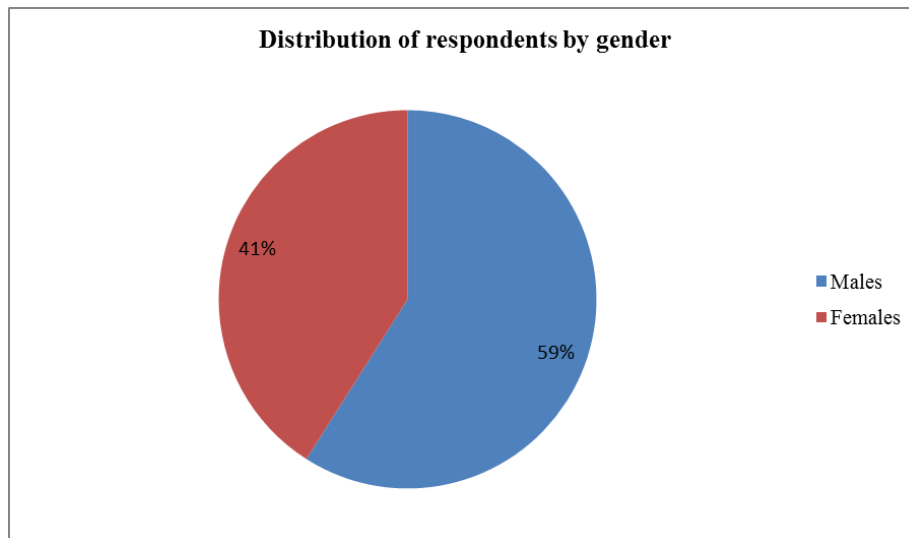


Figure 4.3.1 Distribution of respondents by gender

The findings from Table 4.3.1 and figure 4.3.1 indicated that that the majority 26(59%) of the respondents were males while 18(41%) were females. The results indicate that men are more readily available than women on issues concerning land use that involves dam rehabilitation and management. The results agree with the fact that men are the main decision makers of the households on land use activities and they participate in dam management issues than women.

4.3.2 Distribution of respondents by age:

The study interrogated the respondents on their age brackets so as to determine community contribution to land use, dam rehabilitation and management and other social economic activities in relation to their age. The age factor of the respondents was carried out by asking the group members to state the age ranges within which their ages fell. This was important because the age of the respondent was important in determining how effective group members were able to contribute their own labour towards land use and other social economic activities involving dam rehabilitation. Age of the respondent is also a determinant in the extent to which a group member has control and access to land and its use for various social economic activities. Table 4.3.2 and figure 4.3.2 below indicates their responses.

Table 4.3.2 Distribution of respondents by age

Age Bracket	Frequency	Percentage
Less than 25 years	4	9.1%
25 – 35 years	6	13.6%
35 - 45years	16	36.4%
More than 45 years	18	40.9%
Total	44	100%

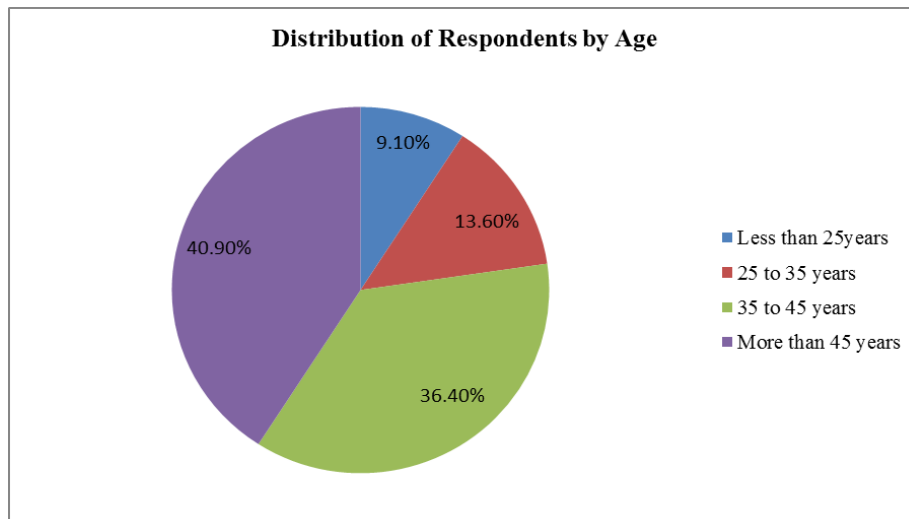


Figure 4.3.2 Distribution of respondents by age

The statistics shown in table 4.3.2 indicated that the majority of the respondent from the group members 18(40.9%) were more than 45 years old and 16(36.4%) were in the age brackets of 35 - 45 years and the rest were less than 35 years old. This indicated that majority of the group members were old compared to the minority 10(22.7%) who were youth with their age being less than 35 years. This shows that older group members control the management of the dam and related social economic activities compared to the relatively younger ones.

4.3.3 Distribution of respondents by academic qualification:

The study asked the respondents to state their highest level of education. This was necessary because the level of education enables a group member to understand and put into good practice measures for enhancing land use and other social economic activities through capacity building. Their responses are given in table 4.3.3.

Table 4.3.3 Distribution of respondents on academic qualification

Academic qualification	Frequency	Percentage
Primary	33	75%
Secondary	9	20%
Post-secondary	2	5%
Total	44	100%

The result indicated that the majority of the group members 33(75%) have attained primary level of education. This shows that most of the land use activities and other social economic activities derived from use of the dam are done by group members with lower education qualification. This is followed by those with secondary education 9(20%) and those with post-secondary education 2(5%) are least involved in land use activities.

4.3.4 Distribution of respondents by size of land for crop production:

The study sought to determine the area of land used for growing crops by the group members of the dam by asking them to state the area of land they cultivated using the water from the dam. This was important because the total area of land cultivated using water from the dam to grow crops compared to the potential of the land could be used to infer the level of land use for irrigated agriculture. Table 4.3.4 below gives the results of the respondents.

Table 4.3.4 Distribution of respondents by size of land cultivated for growing crops using water from the dam

Area of land used to grow crops using water from the dam	Frequency	Percentage
0 – 0.25 acres	12	27.3%
0.25 – 0.5 acres	7	15.9%
More than 0.5 acres	15	34.1%
None	10	22.7%
Total	44	100%

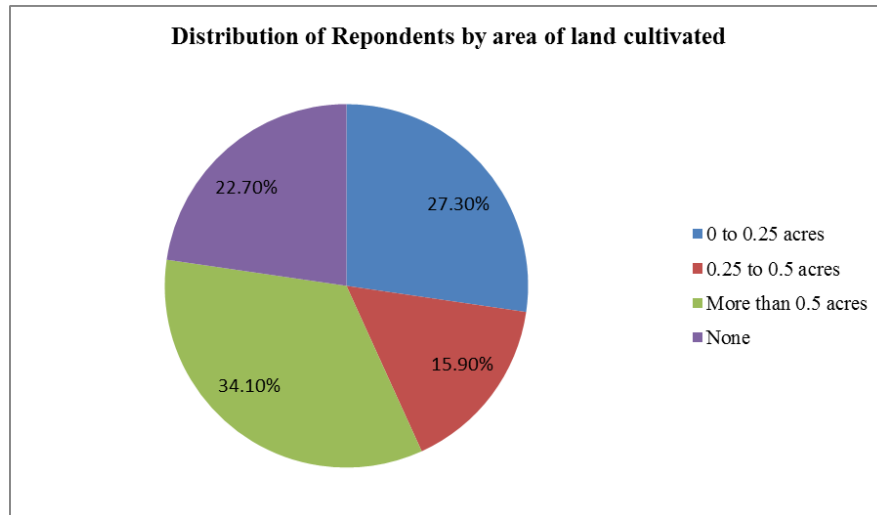


Figure 4.3.4 Distribution of repondents by size of land cultivated for crops using water from the dam

The results showed that majority of the group members 15(34.1%) cultivate more than 0.5 acres of land by using the water from the dam to grow crops. However, the average usage of the water to grow crops using water from the dam is less than 50%. This indicated that the community does not fully utilize the dam for growing their crops.

4.3.5 Distribution of respondents who use fish from the dam:

Fish farming contribute to food security when practiced in community dams. The study therefore sought to find out the contribution of fish farming as an economic enterprise for enhancing food security in Namasanda dam as part of land use activity. Table 4.3.5 and figure 4.3.5 shows the distribution of respondents who were asked whether they ever utilize fish from the dam.

Table 4.3.5 Distribution of respondents who utilize fish from the dam

Use of fish from the dam	Frequency	Percentage
Those who utilize fish from the dam	28	63.6%
Those who had not utilized fish from the dam	16	36.4%
Total	44	100%

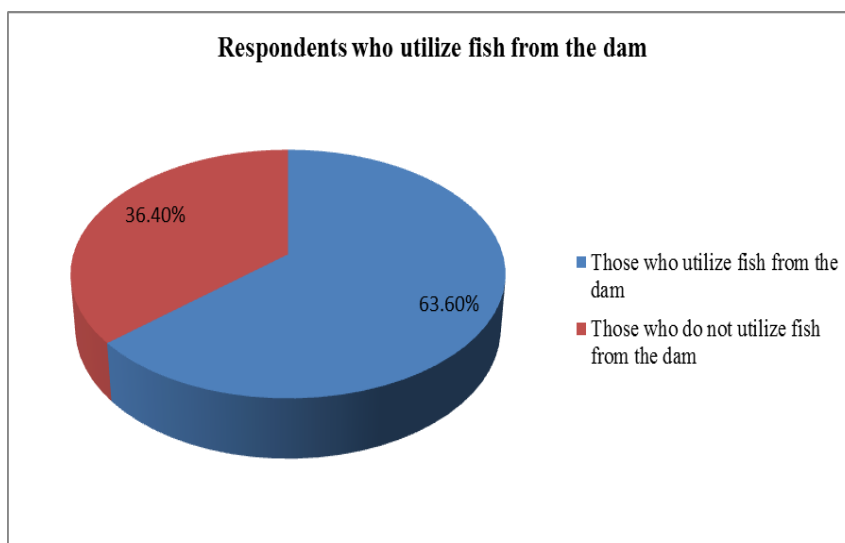


Figure 4.3.5 Distribution of respondents who utilize fish from the dam

From table 4.3.5 and figure 4.3.5, the result shows that majority of group members 28(63.6%) had utilized fish from the dam and 16(36.4%) of the group members did not utilize fish from the dam. This indicated that utilization of the rehabilitated dam for fish farming can enhance food security for the community.

4.3.6 Distribution of respondents on utilization of dam for various economic activities:

The aim of rehabilitating the dam was to enhance its usage for food security and other social economic activities. Some of the other activities included use of dam for cleaning/washing, use of the toilet and bathroom as represented in table 4.3.6.

Table 4.3.6 Distribution of respondents on utilization of Namasanda dam for various activities

Activity	Frequency of those who use	Frequency of those who do not use	Total	Percentage of usage
Use of fish from the dam	28	16	44	63.6%
Use of dam water for livestock	32	12	44	72.7%
Use of dam water for cleaning	26	8	34	76.5%
Using the toilet and bathroom that belong to the dam	33	10	43	76.7%

The results from table 4.3.6 show that Namasanda dam is important to the community as it is used for various social economic activities which included 63.6% for fish farming, 72.7% for livestock use, 76.5% for cleaning/ washing and 76.7% who use the toilet and bathroom that belong to the dam.

Table 4.3.7 Analysis of respondents on utilization of Namasanda dam for various social economic activities

Dam rehabilitation measures and utilization of the dam for various social economic activities	Extent of dam rehabilitation measures for enhancing land use					
	Low		Moderate		High	
	0 – 39%		40 – 70%		Over 70%	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Fish farming	0	0	28	63.6	0	0
Use for Livestock	0	0	0	0	25	72.7
Use of toilet and bathroom	0	0	0	0	33	76.7
Use of dam water for cleaning/washing	0	0	0	0	26	76.5

The analysis from table 4.3.6 indicated that the use of the dam for livestock and also the use of the toilet and bathroom after rehabilitating Namasanda dam is over 70% which is high. The results showed that the dam rehabilitation activities can enhance social and economic activities for the community.

4.3.7 Other benefits derived from the dam after rehabilitation:

The study also sought to know the other benefits the group derive from the dam after rehabilitation activities and they responded that the dam is used for the following activities; brick making, domestic use, local tourism, provision of water for nearby cattle dip and for learning by students. However these economic activities have not been utilized by the community due to their lack of capacity in terms of organizational, managerial and funds to exploit the existing opportunities.

4.4 How strength and status of the community organization influences development and management of community dams for enhancing land use:

The study interrogated the respondents on how the strength and status of the community organization influences development and management of small dams for enhancing land use and other social economic activities by asking them to answer questions asked on various dam development activities and management aspects of the dam committee. Table 4.4.1 gives the findings of these aspects.

Table 4.4.1 Analysis of influence of strength and status of the community organization on development and management of Namasanda dam for enhancing land use

Strength and status of the community organization for enhancing land use e.g. leadership, monetary, organizational	Influence of strength and status of community organization for enhancing land use					
	Low		Moderate		High	
	0 – 39%		40 – 70%		Over 70%	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Qualification of dam committee members to manage dam activities	0	0	23	52.3	0	0
Proper election of dam committee leaders	0	0	0	0	31	70.5
Management capacity of the dam committee leaders	0	0	23	52	0	0
Organizational skills of the management committee leaders	0	0	27	62.8	0	0
The capacity (funds and materials) to manage dam activities	0	0	28	63.6	0	0
The development of the dam has changed your land use activities	0	0	0	0	32	76.2
Impacts of rehabilitation activities on management of dam activities	0	0	0	0	28	73.7
None involvement of group members in management of dam activities	0	0	0	0	31	70.5

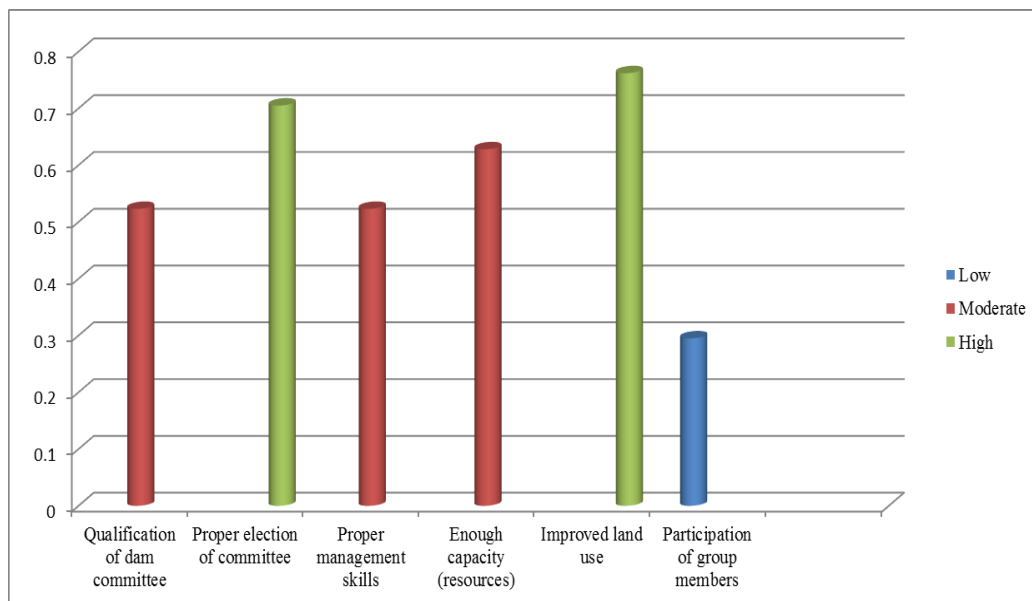


Figure 4.4.1 Analysis of influence of strength and status of the community organization on development and management of Namasanda dam for enhancing land use

The analysis from table 4.4.1 and figure 4.4.1 shows that the group indicated that the elected committee to manage dam activities were averagely qualified i.e. 52.3% to manage dam activities. Since it is the group members that elected the committee members, they had a certain level of confidence in their leaders. That is the reason 70.5% indicated that the dam committee members were properly elected. However, 62.8% of the group felt that the committee cannot manage the dam activities on their own. The group members indicated that the development of the dam had changed their land use and social economic activities. This is reflected by the 76.2% of the group members who responded in the affirmative. The group members also indicated that their registered group did not have enough capacity in terms of funds, materials etc. to adequately manage their activities.

4.5 How community’s skills, incentives and funding affect land use from the rehabilitated dam:

The study sought to determine how previous knowledge in dam rehabilitation and land use activities impacted on their management practices. This was important because previous skills on land use and management of small dam lead to improved subsequent land use and management techniques for improve social economic gain. The results are given in table 4.5.1 and figure 4.5.1 below.

Table 4.5.1 Influence community’s skills, incentives and funding on land use from rehabilitated dam

Viable options to enhance dam rehabilitation e.g. capacity building, incentives etc.	Influence of training, incentives and funding for enhancing land use					
	Low		Moderate		High	
	0 – 39%		40 – 70%		Over 70%	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Training of the group	0	0	0	0	38	90.5%
Incentives e.g. fertilizer, seeds etc.	0	0	18	40.9%	0	0
Funding e.g. from Government or donors	0	0	0	0	32	72.7%

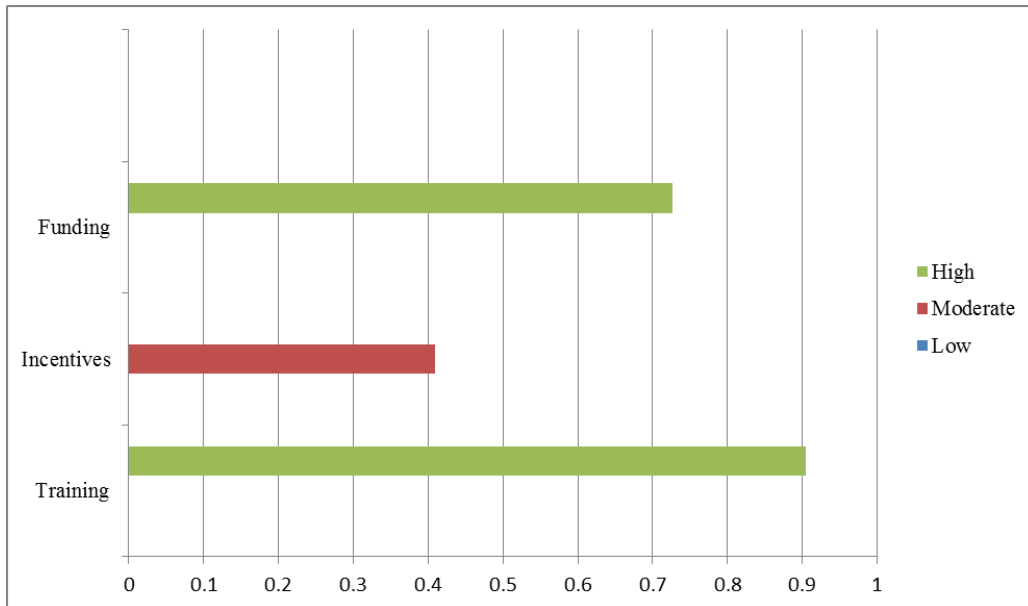


Figure 4.5.1 Influence of community’s skills, incentives and funding on land use from dam rehabilitation activities

The result from table 4.5.1 and figure 4.5.1 indicated that 90.5% of the respondent indicated that training was very important in enhancing land use and other social economic activities. They indicated that they had received the training mainly from the department of Irrigation, in Bungoma County. The members of the group were also asked whether they had ever received any subsidy from the Government and 40.9% indicated that they had received and 59.1% did not receive. This shows that most of the group members had not received subsidies from the Government or other donors. They were also asked to indicate which subsidy they had received and most indicated that they had received fertilizer. 72.7% of the group members indicated that the group had received funding from the Government and other donors. The main donor was GIZ – a German cooperation agency working in some parts of the country that assisted the group with soil conservation measures around the dam to prevent silting of the dam.

4.6 How Government regulations and politics affect dam rehabilitation activities for a small dam:

The study sought also to find out how Government regulations and politics affect dam rehabilitation activities for a small dam. These included interrogating the group on whether the community is involved in dam location, whether the government policies and politicians interfere with location of the site for dam construction. The results are given in table 4.6.1.

Table 4.6.1 Influence of Government policies and politics on dam rehabilitation

Influence of specific factors e.g. Government policies, politics etc. on dam rehabilitation	Influence of Government policies and politics for enhancing land use					
	Low		Moderate		High	
	0 – 39%		40 – 70%		Over 70%	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Community involvement in dam location	0	0	0	0	32	72.7%
Political interference	3	11.1%	0	0	0	0
Government influence in dam location	0	0	23	52.3%	0	0
Government regulations on dam location e.g. NEMA, WRMA etc.	0	0	25	62.5%	0	0

The result from table 4.6.1 indicated that 72.7% responded that the community was involved in dam rehabilitation activities, 11.1% indicated that politicians interfered with dam rehabilitation activities, 52.3% indicated that the Government influenced rehabilitation activities and 62.5% indicated that Government regulations influenced rehabilitation activities. The results are in agreement with Deepti 2000 who said that the development of a dam for use by community requires their full participation in all the phases of the project cycle. These results are in agreement with the fact that it is a Government mandatory requirement by any developer of a dam project to acquire an environmental license from National Environmental Management Authority and to also acquire a water permit from Water Resources Management Authority for water abstraction before the project is developed.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction:

This chapter presents the summary of the findings of this study. It also presents the conclusions and recommendations of this study. The findings, conclusions and recommendation focus on the main objective of factors enhancing land use development and management for rehabilitated Namasanda dam.

5.2 Summary of the Findings:

The findings on the first objective on how the strength and status of the community organization influences development and management of small dams for enhancing land use showed that 52.3% of the community indicated that the elected committee to manage Namasanda dam activities was fairly qualified to manage the dam activities. Since it is the group members that elected the committee members, they had a certain level of confidence in their leaders. That is the reason 70.5% indicated that the dam committee members were properly elected. However, 62.8% of the group felt that the committee could not manage the dam activities on their own. The group members further indicated that the development of the dam had changed their land use activities. This is reflected by the 76.2% of the group who responded in the affirmative. The group members also indicated that their registered group did not have enough capacity in terms of organizational, funds, materials etc. to adequately manage their activities.

The findings also showed that the general utilization of the dam water by the community for growing crops was less than 40% which was low compared to over 40% which is generally the average used by the community for other social economic activities they derived from the dam like livestock keeping and fish farming.

The findings on the second objective on the effect of community's skills, incentives and funding on land use from dam rehabilitation activities showed that 90.5% of the community indicated that training was very important in enhancing land use. They indicated that they had received the training mainly from the department of Irrigation, in Bungoma County. Furthermore, 40.9% of the community indicated that they had received subsidies from the government. This indicated that most of the group members had not received subsidies from the Government or any other donor. The main subsidy they said they had received was the fertilizer. 72.7% of the group members indicated that the group had received funding from the government and other donors. The main donor they cited was GIZ – a German cooperation agency working in some parts of the country including Bungoma County.

With regard to the third objective on the influence of dam rehabilitation measures and Government regulations on rehabilitation of small dam for enhancing land use, the findings showed that 72.7% responded that the community was involved in dam rehabilitation activities, 11.1% indicated that politicians interfered with dam rehabilitation activities, 52.3% indicated that the Government influenced site for dam location for rehabilitation activities and 62.5% indicated that Government regulations influenced rehabilitation activities of the dam. The findings also indicated that dam rehabilitation measures contributed to enhancing food security and social economic benefits like fish farming, livestock keeping, and use of dam for cleaning/washing, use of water for brick making and for construction activities.

5.3 Conclusions:

The study concludes that though the group had average trust in the management of dam activities by their elected leaders, the group did not have the capacity in terms of organizational, funds, materials etc. to manage the dam and other social economic activities on their own. The community of Namasanda had a general feeling that the dam rehabilitation activities had enabled them improve their land use and social economic activities. The study also concluded that enhancing capacity building through training of community and their leaders contributed significantly to improved land use activities and other social economic benefits that enhance food security. There is therefore need for frequent capacity building to communities in order to enhance land use activities. The dam rehabilitation activity measures contributed to enhancing of food security and other social economic activities which include irrigated agriculture, fish farming, livestock keeping, use of dam for cleaning/washing, use of dam water for brick making and use of dam water for construction activities. Hence, integrating other social economic measures in rehabilitation of the dams is important. Finally, it can also be concluded that providing incentives to organized community groups could lead to improved management of dam, land use and other social economic activities that lead to enhancing food security.

5.4 Recommendations:

The rehabilitation of Namasanda community dam can lead to improved land use and relevant social economical activities of the community around Namasanda dam and similar dam projects elsewhere. The following recommendations are important for enhancing land use by rehabilitation of Namasanda community dam and other similar dams:

- 1) The dam management committee members and group members should be trained on leadership, management skills and economic importance of the dam in order to build their management and land use skills for improved benefits that will enhance food security.
- 2) The registered group should be supported through monetary and material resources to enable them execute their activities effectively so as to improve their economic status.
- 3) Rehabilitation of dam activities should fully involve the project beneficiaries throughout the project cycle from the project initiation to completion. This will enhance their level of cooperation and participation to enhance the success of the project.
- 4) All dam rehabilitation activities should adhere to Government regulation including those involving environmental protection and water rights. This will enable the planned activities to be implemented accordingly without delays and probable legal bottlenecks.
- 5) The Government should increase the provision of incentives to communities involved with land use activities so as to enable them build their economic independence so as to enhance food security. The incentives may include provision of subsidized seeds, fertilizers, stocking of the dam with fish, provision of fishing gear, encouraging local tourism for the dam etc.
- 6) Adequate donor support and collaboration with other stakeholders should be encouraged so as to enable the communities to improve their capabilities in enhancing land use and other social economic activities from the rehabilitated dam.

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