FACTORS INFLUENCING SMALL SCALE FARMERS' PARTICIPATION IN MANAGEMENT OF GEM RAE IRRIGATION SCHEME IN NYANDO SUB-COUNTY, KISUMU COUNTY, KENYA

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ABSTRACT

Though its significance has been recognized in many previous studies, the desired levels of small scale farmers' participation have not been achieved and the low levels have continued to undermine the expected performance and sustainability of the small scale irrigation schemes. The purpose of this research study was to determine the factors influencing small scale farmers' participation in the management of Gem Rae Irrigation Scheme in Nyando Sub-County, Kisumu County, Kenya. The four objectives that the study sought achieve were: to establish the influence of Irrigation Water Users Association (IWUA) rules; to determine the influence of knowledge and skills in irrigation; to ascertain the influence of reliability of irrigation water and to assess the influence of economic benefits from irrigated agriculture on the small scale farmers' participation in the management of irrigation schemes. The cross-sectional study research design was used in the study. The target population in the study was the entire 480 farmers of Gem Rae Irrigation Scheme. The sampling procedure used used to get a sample of 144 respondents, that represented 30% of the target population, was simple random. The primary data was collected from the sampled respondents using researcher-administered questionnaires. The reliability analysis using the test re-test technique showed a coefficient of stability of 0.933 which was an excellent reliability. The data analysis of was conducted using descriptive statistics. The study found out that the farmers were disposed to participate in management of the scheme. The study equally established through descriptive statistics that the four factors; irrigation water users association rules, knowledge and skills in irrigation, reliability of irrigation water, and economic benefits from irrigated agriculture greatly influenced the small scale farmers' participation in the management of Gem Rae Irrigation Scheme by differing levels. The study concluded that the four factors greatly influenced small scale farmers' participation in the management of Gem Rae Irrigation Scheme and that there were variations in the extent of the influences of each factor. The study recommends development and implementation of strategies that enhance economic benefits from irrigated agriculture to the farmers in order to increase and sustain their participation in the management of the scheme, assurance of reliability of irrigation water, participatory development and formalization of IWUA rules to intensify the participation of farmers in the scheme management and tailor-made trainings and sensitization to address knowledge and skills gap in irrigation amongst farmers. The study suggested areas for further research that included research on the same subject in other parts of Kenya and comparative study of the farmers' participation in the management of small scale irrigation schemes fully funded by governments and others co-funded jointly by governments and beneficiary farmers.

Key Words: *small scale farmers', participation, management, Gem Rae irrigation scheme, Nyando Sub-County, Kisumu County, Kenya*

INTRODUCTION

Agriculture remains one of the important sectors with enormous contribution to socio-economic well-being of the world's population. In the African continent, the livelihoods of more than 60 percent of its population and 80 percent of its poor depend on the lowly productive agricultural sector. The low productivity of the African agricultural sector is attributed to the unreliable rainfall resulting in lower produce and the unpredictable weather conditions have worsened the case, subjecting the small scale farmers to adverse impacts of climate fluctuations (Todaro, 2012). The low performance of agricultural sector has continued to threaten the livelihoods of the majority of the population and created dangerous levels of food insecurity and poverty crisis (Ashley and Maxwell, 2011).

Irrigation is one of the strategic options that has been adopted in mitigating the water scarcity and dependence on rainfall for agricultural production. Over the years, the empirical experience has shown that irrigation increases yield of most crops by between 100 and 400 per cent (FAO, 2009). Irrigation has been taken as a remedy for inadequate food supplies, a cover against erratic rainfall situations, enhanced employment opportunities and secure incomes and promotion of cropping intensification and diversification. Given the importance of the irrigation, many governments have availed huge resources in establishing new schemes as well as repairing the existing ones to boost the socio-economic contribution of the agricultural sector (Todaro, 2012). Several governments have commenced the process of devolving the management roles in the schemes from government entities to beneficiary farmers. The devolution of management has been carried out through policies of irrigation management transfer (IMT) and participatory irrigation management (PIM) (Gomo, Mudhara and Senzanje, 2014). The IMT has been promoted by governments as a way of saving costs, improving maintenance of irrigation infrastructure and services, propagating self-dependence and increasing irrigation returns (Hassan, 2011). The introduction of PIM, with benefits of regular payments for water use, equitable water delivery, reduced government financial burden, enhanced durability of irrigation facilities, decrease in wasteful use of water, is gaining considerable significance in irrigation management (Tanaka and Sato, 2005).

However, the execution of IMT policy in a number of countries has encountered major setbacks. Fujiie, Hayami and Kikuchi (2005) observed that service provision from of state irrigation systems worsened after the state entities reduced their operation and maintenance activities since the farmers could not fund the operation and maintenance costs from their incomes from irrigated farming. In South Africa, the over-reliance on government's support by small scale irrigation farmers, coupled with ineffective farmers' organizations, inadequate extension services, low levels of farmers' participation, poor maintenance strategies and under performance are recurring challenges affecting the farmers who have been tasked with management of schemes previously financed by government (Mnkeni, Chiduza, Modi, Stevens, Monde, Van der Stoep, and Dladla , 2010; Fanadzo, 2012).

Unfortunately, several small scale irrigation schemes cease to function soon after freeze of government support in their development and rehabilitation (Cousins, 2013). Fanadzo, Chiduza and Mnkeni (2010) pointed out that the underperformance of these small scale irrigation schemes has been occasioned several factors including absence of farmers' participation in the schemes' activities. In India, Aref (2011) found that there were various reasons why active participation is very hard to achieve including famer's lack of knowledge, confidence, capital and skills. The low levels of farmers' participation was observed to be caused by inadequate returns and insufficient capacity of farmers' organization. Also in India, Chandran and Chackacherry (2004) observed that famers' participation in irrigation projects was influenced by availability of irrigation water and location of the farmland on the canal. Farmers who are far from irrigation water experience water scarcity and that had a negative impact on the farmers' participation.

In a study carried out in Nigeria, Adekunle, Oladipo and Busari (2015) established that the participation of the farmers was attributable to: access to financial resources and existence and effectiveness of Water Users Association (WUA) and reliability of irrigation water. Bothoko and Oladele (2013) in their study concluded that the major determinants of farmers' participation in agricultural programmes were household size, effectiveness of rural development programme and availability of funds. In Ghana, Etwire, Dogbe, Wiredul, Maertey, Etwire, Robert and Wahaga (2013) found out that participation of farmers was influenced by financial resources and recommended that such financial resources were required to be availed to farmers whose major source of income was farming to ensure their participation in agricultural production and scheme management. There was also need for better markets for farm produce which would act as a motivation for farmers to participate in irrigated agriculture.

Despite the many development interventions from government and other financiers in the agricultural sector, management tasks have not been taken up by many small scale farmers in the developed projects. This state of affairs raise the following questions: In what situations are small scale farmers most likely to participate in management of irrigation schemes? Do factors that influence the farmers' participation in other contexts apply also to the context in this study and what are the extents of the influences? These are the questions that this study seeks to answer. It is argued that unless farmers achieve satisfaction from the irrigation schemes, there would be no motivation for them to participate in management of the schemes.

Gem Rae Irrigation Scheme

Under the Smallholder Rice Project (SRP), the European Economic Commission financed the establishment of four cluster schemes in Wach Kano delta that included Gem-Rae, Oyani-Nyachoda, Kopudo and Alara in 1985. The water serving the schemes comes from Awach Kano River. It was expected that 350 acres in Gem Rae scheme would be put under rice irrigation. The management activities in the scheme are currently in the hands of the farmers through their organization, Gem Rae Water Users Association. The management of the scheme was

transferred to the farmers by the Ministry of Agriculture from its inception in 1985. The scheme lies within larger Lake Victoria basin. The scheme receives 1250 mm of rainfall annually with April and November recording highest measurements. The scheme is in a flat region, part of Kano plains and is prone to frequent flood waters. The soil type is mainly black clay soil that is ideal for rice cropping. Due to the perennial flooding, the area was turned into rice irrigation scheme since this was the only economically viable undertaking (Gem Rae Irrigation Water Users Association, 2017).

The farms in the scheme are owned by farmers and of variable sizes. The farmers have formed their organization within the scheme charged with overall responsibility of managing the all aspects in the scheme. There are 480 active members of the farmers' organization. The farmers mainly produce basmati rice for sale to Uganda businesspeople since its fetches higher price than other brands. Presently, the scheme is faced with challenges of inadequate irrigation water to meet the demand of all farmers at any cropping season resulting in illegal water abstraction, frequent breakdown of water conveyance and distribution structures, lack of cooperation from all farmers in provision of labour for repairs and low prices for the rice produce. According to the scheme management, the current irrigated area is approximately 100 ha and the limiting factor was irrigation water, inadequate irrigation infrastructure to supply water to all farms and high cost of labour for irrigation activities. A further 50 ha is occupied by out growers on the fringe of the scheme making use of excess water from scheme (Gem Rae Irrigation Water Users Association, 2017).

STATEMENT OF THE PROBLEM

While many governments, financiers and donors are allocating huge financial and other resources in irrigation development in order to address the imminent food insecurity occasioned by declining agricultural productivity, the level of small scale farmers' participation in the management of communal irrigation schemes remains low with reasons for such low levels of participation varying from one locality to another. The multitude of benefits of farmers' participation in management with the main being increased productivity have been observed by many scholars such as (Aref, 2011). Save for Asia, Europe and partly southern Africa, there is no much literature on small scale farmers' participation in scheme management activities. In Tanzania, Hirschmann (2003) pointed out that beneficiary farmers' feel of belonging to the scheme influenced their participation. In a Kenyan context, a study undertaken in Gichugu, Kirinyaga County by Kahuro (2012) established the factors that influenced farmers' participation in schemes' management to include: farmers' commitment to IWUA, farmers' knowledge and skills, reliability of water supply, quality of extension services and competing economic activities. In spite of several studies having been undertaken on the subject of farmers' participation in the irrigation scheme management in other parts of the world, to my knowledge, these studies have not covered the determination of how the some factors influence the small scale farmers' participation in Gem Rae Irrigation Scheme in Nyando Sub-County, Kisumu

County, Kenya and the extents of the influences. Following its establishment in 1985, the operations in the 350 acre Gem Rae Rice Irrigation Scheme stopped in 1997 because of El nino rainfall that caused the intake and main canal infrastructure to get clogged with heavy sediment from the higher areas of Nandi hills. The farmers to whom the management of the scheme was transferred to have not managed to put the entire scheme under production save for about 30 acres (Ong and Orego 2002). Threatened by hunger, few farmers have cleared small portions of the scheme and were using residual water to grow rice. Ong and Orego (2002) did not establish why the farmers had not fully unclogged the entire irrigation infrastructure to allow full usage of the scheme for irrigated farming and thus there exists a knowledge gap. It is this state of farmers' participation in the management of the scheme that necessitated the need to undertake the research study with the aim of determining how some factors influence the farmers' participation and thus fill the knowledge gap. There are many factors influencing farmer's participation that have been identified in other small scale irrigation schemes. However, the study was limited to the four factors that were investigated with respect to Gem Rae Irrigation Scheme to determine the extent of their influence on the farmers' participation in the scheme management.

PURPOSE OF THE STUDY

The purpose of the study was to determine the factors influencing small scale farmers' participation in the management of Gem Rae Irrigation Scheme in Nyando Sub-County, Kisumu County, Kenya.

OBJECTIVES OF THE STUDY

1. To establish how Irrigation Water Users Association rules influence small scale farmers' participation in the management of Gem Rae Irrigation Scheme in Nyando Sub- County, Kisumu County.
2. To determine how knowledge and skills in irrigation influences small scale farmers' participation in the management of Gem Rae Irrigation Scheme, Nyando Sub- County, Kisumu County.
3. To ascertain how reliability of irrigation water influences small scale farmers' participation in the management of Gem Rae Irrigation Scheme, Nyando Sub- County, Kisumu County.
4. To assess how economic benefits from irrigated agriculture influence small scale farmers' participation in the management of Gem Rae Irrigation Scheme, Nyando Sub-County, Kisumu County.

LITERATURE REVIEW

Small scale farmers' participation in management of irrigation schemes

During the last half century, irrigation has caused the farm produce to increase three fold. (FAO, 2011a). Nevertheless, progress in raising productivity has slowed in recent years (Bruinsma, 2009) and significant geographical disparities remain (FAO, 2011a). The continent of Asia (FAO 2011b). Here, the agricultural production increased rapidly from the 1960s due to the introduction of new technologies and subsequently driving economic growth and poverty reduction (Hazell, 2009). Population increase, reduced availability of arable land and reliable irrigation, subsistence farming to feed families (Joemat-Pettersson, 2009), technological advancement methods (Bembridge, 2000), have prompted the promotion as well as the trend of developing irrigation schemes only in small scale sizes.

A number of governments started Irrigation Management Transfer (IMT) in the early 1970s in order to manage the recurrent expenses and address the dissatisfaction with the underperformance of the schemes (Garces-Restrepo, Vermillion and Muñoz, 2007). The purpose of the IMT reform exercise was to secure better returns on investments in irrigation by means of devolving the control of the schemes to the beneficiary farmers (Perret, 2002). It was observed that more participation would instill a feel of ownership and responsibility and thus promote the efficient utilization of the communal resources Garces-Restrepo et al. (2007). The inclination towards increased involvement of beneficiary communities in the development of small scale irrigation schemes is attributed to the observations that showed the small scale ones to be more viable and sustainable than large scale schemes. The small scale schemes in Ghana and Ethiopia have had their managements transferred to the farmers' organizations with the farmers actually executing various management activities (Jonah and Dawda, 2004; Awulachew, Merrey, van Koopen, Kamara, de Vries, Frits and Boelee, 2005)

There are several remedies that have been put forward as remedies for addressing the management problems facing small scale irrigation schemes including farmers' participation. The devolution of management of common pool natural resources has gained momentum all over the world and small scale irrigation schemes are not exception. The realization of the commensurate returns in irrigation schemes is assured in circumstances where farmers orderly participate in the management of their schemes. Farmers have a direct incentive, and the means, to reduce costs besides enhancing the service provision: IWUAs can reduce labor costs by offering labour at lower wages than government agencies; local beneficiary farmers provide closer supervision of staff than distant government agency supervisors; damages and break downs are minimized since farmers feel of much shareholding in the irrigation infrastructure. The produce is expected to be improved due to faster water delivery and repairs, farmers' yields are higher (Kuper, Dionnet, Hammani, Bekkar, Garinand Bluemling, 2009).

In Kenya, the government, just as it is changing in other parts of the world, the irrigation development has adjusted to conform to the new paradigm of bottom up approach. The new paradigm approach according to the Government of Kenya's Ministry of Water and Irrigation (MWI), treats the beneficiary communities as the main players in any developmental initiative in which they submit their needs and priorities for irrigation project and are fully in charge of all the project phases from initiation to management. The bottom up approach is embedded in the government irrigation policy, presently draft form and which promotes the active involvement and participation of farmers and other relevant agencies in all project phases (MWI, 2003).

Irrigation Water Users Association rules and small scale farmers' participation in management of irrigation scheme

In participatory irrigation management (PIM), the farmers are expected to address the irrigation issues within the scheme through their farmers' organizations such as Irrigation Water Users Association (IWUA). According to the findings of the study by Shahroudi and Chizari (2007) in North East Iran, it was found that farmers' organizations were considerable social units that could facilitate improved farmers' active involvement in scheme management activities.

The extent to which IWUAs are able to carry out the management functions of enforcing water supply regulations, planning repair activities, collecting fees for water supply and financial resources management depends on a number of factors including: farmers' involvement as this increases the feel of shareholding and accountability among the members as shown by studies in Nepal, Indonesia, Pakistan and Philippines (Morales and Mongcopa, 2008); transparent and accountable leadership as leaders who lack integrity may not have the moral authority to demand compliance to rules and regulations from members; existence of by-laws that are developed by the IWUA rather than seen to have been imposed from external parties; appropriate legislation so that they are recognized as the legitimate users and managers of the irrigation systems thus promoting legitimacy and effectiveness (Gyasi, Engel, and Frohberg, 2006). Chandrasekaran, Umashankar, Duraiswaminathan and Jayakumar (2005) found out that many of the farmers expressed excitement and readiness to contribute labour and other resources in communal undertakings since IWUA rules were created with their participation. The farmers participated in various irrigation management activities on their own choice.

Mati, Hatibu, Phiri and Nyanoti (2007) in a set of studies asserted that community guidelines andregulations on agricultural water management exist by way of articles of association, by-laws and customary laws. The guidelines are majorly founded on indigenous knowledge and social values. The guidelines have increased the small scale famers' access to irrigation water through establishment of IWUAs for operation and maintenance. This arrangement has ensured equity of water distribution and prompt conflict resolution. Mati et al., (2007) recommended that the overall responsibility of agricultural water management should be left to farmers' organization

and governments only intervene to offer advisory services on registration in accordance with the rules.

The inability of IWUAs to execute payment regulations made it easier for farming community to abscond settling their water dues in irrigation schemes in Ghana (Jonah and Dawda, 2014). Also in South Africa, the management committee in an irrigation scheme experienced difficulties in denying the non-members the opportunity to draw water from the scheme (Muchara, Ortmnann and Mudhara, 2014).

Knowledge and skills in irrigation and small scale farmers' participation in management of irrigation scheme

Generally people will shy away from involvement in group activities when they have insufficient knowledge on the activities (Svubure, Ahlers, and van der Zaag, 2007). Knowledge and skills are important aspects of human capital that need to be enhanced as the technological environment changes to allow farmers intensify and diversify production. Extension service providers are relied upon to impart knowledge in irrigation water management methods which may involve new operation procedures and techniques, equipment and production methods. The study by Vilas and Goldey (2005) showed that the main constraints to participation in farmers' organizations are lack of technical advice from rural extension officers and other institutions responsible for providing technical advice.

In studies of IWUAs carried out in Turkey, Kiymaz, Ozekici and Hamdy (2007) demonstrated that lack of sufficient knowledge in irrigation issues like water saving, when and how much to irrigate and environment led to problems of efficient use of water in the fields by farmers. This could lead to low productivity of water and hence affect crop yields. Availability of water in abundance has been reported to encourage its execessive application by farmers (Machethe, Mollel, Ayisi, Mashatola, Amin and Vanasche (2004). Farmer training has been demonstrated to improve productivity and income levels in many countries (Fanadzo, 2012). Machethe et al., (2004) recommended practical training in water management and irrigation scheduling for both farmers and extension agents. Adekunle et al. (2015) in their study revealed the great extent of influence exerted by the farmers' inadequate knowledge on their participation in scheme management. Muchara et al. (2014) established that farmers who are knowledgable and skilled courtesy of trainings tend to take up management roles in their schemes.

In South Africa, the absence of knowledge and skills by majority of small scale farmers was worsened by non-existent field training (Bembridge, 2000). However, in instances where field training was offered, the trainings were largely inappropriate for the farming circumstances (Fanadzo, 2012). The inability of farmers in Zimbabwe to control and properly use the irrigation infrastructure was occasioned by inadequate knowledge (Mutambara and Munodawafa, 2014). According to Regner, Salman, Wolff and Al-Karablieh (2006), lack of necessary irrigation management training of farmers is one of the main problems in managing water successfully.

The lack of efficiency in managing the irrigated farms has resulted in poor yields (Makurira, Mul, Vyagusa, Uhlenbrook and Savenije, 2007). The passive farmers' involvement in the management of the irrigation scheme activities has led to the overreliance on the state agencies thus inhibiting the devolution of management of irrigation to the beneficiary farming communities. (Fanadzo, 2012). Sufficient knowledge and expertise allows utilization of available opportunities by local farmers (Snyder and Cullen (2014)) and encourages a participation which leads to empowerment of farmers and their farmer organizations (Levidow, Zaccaria, Maia, Vivas, Todorovic and Scardigno, 2014). In Zimbabwe, Nhundu,K., Mushunje, Zhou and Aghdasi, (2015) found out that the farmers' participation in management of irrigation scheme activities was more amongst those farmers who had acquired much education since they were aware of the good results of their participation.

Reliability of irrigation water and small scale farmers' participation in management of irrigation scheme

Management problems in small scale irrigation schemes are more pronounced in cases where the irrigation water is insufficient to cater for the needs of all farmers (Albinson and Perry, 2002). The scheme management failures in addressing water issues have frequently resulted in illegal abstraction coupled with destruction of water conveyance structures (Albinson and Perry 2002), thus affecting the irrigation performance. There is usually high water demand during the dry period when irrigation is at the peak and crops are fetching maximum returns. Water supply during this period is therefore critical. As Pazvakawambwa and van der Zaag (2001) observed after a study of Nyanyadzi smallholder scheme in Zimbambwe, the underperformance was the result of lack of constant supply of irrigation water.

It has been observed that the community's need for and reliance on a particular natural resources prompts the community to preserve the resource (Sserunkuuma, Ochom and Ainembabazi, 2009). The study by Muchara et al. (2014) indicated that farmers who lack steady water supplies were more likely to put in more efforts in participation to address their worse situation. The results indicated that the farmers were aware that their situation could be reversed by their involvement.

Economic benefits and small scale farmers' participation in management of irrigation scheme

People's participation in community activity is dictated by the economic benefits to be gained from the participation. Given that returns are derived from investments, people will generally invest where the expected returns are more than the investments (Svubure, et al., 2007). Secure food supplies coupled with additional monetary income from sale of farm produce are economic returns that accrue from irrigated agriculture (Mckay and Keremane, 2006). The people's choice

to engage in communal projects is dictated by the benefits that are likely to be obtained through their active participation (Ben-Ayed (2002).

Smallholder farmers participate in irrigation for two basic reasons; to improve their food security and generate income to meet their financial needs. In making the decision to concentrate their efforts in irrigation then they have to make comparisons with other available alternatives because irrigation is a labour intensive form of agriculture (Rijn, 2004). Apart from engaging in irrigation, smallholder farmers are faced with the following choices; engaging in rain-fed agriculture, livestock rearing, hiring out their labour, formal and informal employment, waiting for remittances from working relatives among others. Smallholder farmers are known to engage in almost all of these activities in varying intensities. It is not uncommon to find irrigation being carried out by some farmers on part time basis as they also divide their time between other income earning activities. The enthusiasm with which irrigation projects start and the seemingly successful take off period often turns to declining yields, diminishing returns, and growing indebtedness of farmers (Gichuki, Gichuki and Matsuoka, 2010). This partly explains the loss of interest by farmers, the diversification to other enterprises and the eventual failure of projects.

The results in Kpong Irrigation Scheme in Ghana showed that farmers who were satisfied with the benefits they obtained from the scheme participated more actively in the management process (Anaglo, Nasiru, Manteau, Amoah and Boateng, 2014). Muchara et al. (2014) in in their research study concluded that farmers' level of participation in irrigation management activities was directly proportional to the income received. These findings were consistent with studies by Maleza and Nishimura (2007) who indicated the returns obtained from irrigation activities caused motivation for farmers to participate more in activities in the irrigation schemes.

THEORETICAL FRAMEWORK

The concept of public participation has become a key ingredient in project implementation. The impacts of implementation of public participation on public policy and development programmes have been noted to be varying due to public perceptions and expectations (Hickey and Mohan 2004; Cooke and Kothari 2001). This research study was guided by two underlying theories, Arnstein Ladder of Participation and Theory of Collection Action, supporting participation of beneficiary community in the community based projects and in this case, the small scale farmers' participation in the management of irrigation scheme.

Arnstein's Ladder of Participation

Olson (1965) showed that the individual member's participation is the building block of the communal success. One of the theories of citizens' participation is the one advanced by Arnstein (1969). The significance of Arnstein's work recognizes that public participate in activities at various levels that range from manipulation, therapy of citizens, consultation, partnership and citizen control. The model is equally subdivided into main three extremes of citizens' power:

non-participation, tokenism and citizen power. The three forms comprise a ladder of eight rungs of citizens' participation. Non-participation includes forms of participation such as manipulation and therapy. These two forms are not regarded as genuine citizens' participation. Tokenism includes informing, placation and consultation, which provide minimal opportunity for citizens' participation. Lastly, citizen power involves partnership, delegation of power and control: citizens can try to reach a compromise, make tradeoffs and can have a stake in the decision-making process. Taylor (1998) terms the ladder as a lovely piece of conceptual analysis of public participation showing that participation can be take many forms and that there various degrees of participation.

The theory of Arnstein's Ladder of Citizens' Participation is relevant in the identification of extent of the small scale farmers' participation in the management of Gem Rae Irrigation Scheme. The theory facilitates understanding of the present status of farmers' involvement in the scheme management and explains the levels of the participation. By comparing the stages and rungs of Citizens' Participation on the Arnstein's Ladder with the activities undertaken by small scale farmers in Gem Rae Irrigation Scheme, it will be possible to understand the extent of farmers' participation.

Theory of Collection Action

The Theory of Collective Action (Olson, 1965), which has proved to be applicable to a broad range of social and economic situations, assumes that cooperation must be explained by the individual's cost-benefit calculus rather than that of the group because the group as a whole is not rational but can only consist of rational individuals. Groups often seek public goods that are available, once they have been generated, to everyone, including those who did not contribute to producing them. Because individuals potentially can receive the benefits of public goods without having contributed to their production, they have an incentive to let others pay for them. Ostrom (1990) stated that benefits obtained from communal undertakings are more when members combine their efforts as compared to the benefits when members work individually. Hardin (1968) pointed out that people are likely to overuse the naturally occurring resources for their own gain resulting in complete depletion of the resource and thus creating tragedy for all. However, Ostrom (2007) argued that rational behavior can be obtained at group or individual levels. He pointed out that either the group or individual may choose to act for the benefit of his own or the entire group depending on certain circumstances. The three assumptions are that members have good understanding of the returns to be obtained from their participation, the choices are made individually and at the same time by members and that there is no influence from outside the group to force consensus on the group (Ostrom, 2010).

This theory is relevant in this study of small scale farmers' participation in management of Gem Rae Irrigation Scheme since farmers in the scheme are expected to share and cooperate in the utilization of the scheme resources in order to obtain the maximum benefits. It is also expected

that farmers will be influenced by some factors to get involved in the management tasks in the scheme. However, the problems of damaged irrigation infrastructure, insufficient water can equally occur when the farmers do not actively participate to address them in the scheme. Thus the theory of collective action will facilitate a good understanding and analysis of the farmers' participation in the management tasks in the scheme.

RESEARCH METHODOLOGY

Research Design

Research design is a plan according to which research participants are obtained and how information is collected from them. In the research design the researcher describes what he/she is going to do with participants in order to be able to reach a conclusion about the research problem (Welman, Kruger, Mitchell, 2005). The study adopted cross-sectional survey research design. In a cross-sectional survey, the information gathered about the independent variable, Y and the dependent variable (s), X represents what is going at one instance in time (Olsen and St. George, 2004). The cross-sectional survey research design was chosen because of the nature of research questions that required data to be obtained from respondents at a single point in time.

Target Population

Population refers to a whole set of individuals, events or objects exhibiting same features (Mugenda and Mugenda, 1999). It is universal set of all subjects to which a researcher wishes to study and generate findings. The researcher selected the entire active membership of the Gem Rae Irrigation Scheme as the target population for this study. The target population was the entire 480 small scale farmers in Gem Rae Irrigation Scheme, Nyando, Kisumu County (Gem Rae Irrigation Water Users Association, 2017).

Sample Size and Sampling Procedure

A sample is a smaller group or sub-group obtained from the accessible population (Mugenda and Mugenda, 1999). This sub-group was carefully selected so as to be representative of the whole population with the relevant characteristics. Each member or case in the sample is referred to as subject, respondent or interviewee. Sampling is a procedure, process or technique of choosing a sub-group from a population to participate in the research study (Ogula, 2005). The respondents in this study were selected from the target population of farmers at Gem Rae Irrigation Scheme through simple random sampling since the population was homogenous. In order to comply with to Borg and Gall (2003), 144 farmers out of the target population of 480 farmers was selected as a sample. The sample was 30% of the target population and this was considered adequate for the research study. Simple random sampling was utilized in this study because the population was homogenous and procedure provided every farmer a chance to be part of the sample and the

degree of sampling error was equally low. First, the researcher visited Gem Rae Irrigation Scheme management who provided the list of 480 farmers in the scheme. The second stage was to assign numbers to the 480 farmers and lastly the 144 numbers were randomly picked to obtain a sample.

Data Collection Procedures

Data collection means the activity undertaken by the researcher to obtain particular details in order to arrive at some conclusion (Kombo and Tromp, 2006). The questionnaires were used to gather the primary date from the respondents. The University of Nairobi offered a letter of introduction to the researcher. The National Commission for Science, Technology and Innovation provide research permit that allowed the researcher to undertake the research in the area without hindrance. Equally at the scheme, the researcher sought permission from the scheme management before commencement of the data collection exercise. The research used the researcher-administered questionnaires to collect data from the sampled farmers. Six trained research assistants administered the questionnaires with close supervision from the researcher. The respondents were guided through the questionnaires and responses recorded by the research assistants.

Data Analysis Techniques

Data analysis refers to the computation of certain measures along with searching for patterns of relationship that exists among data-group (Kothari, 2004). The returned questionnaires were edited for accuracy, completeness and those with major discrepancies will be discarded. Accurate and completed questionnaires were numbered and coded. The data from respondents were organized thematically. Data was analyzed quantitatively through descriptive statistics. Microsoft Excel was used to compute descriptive statistics of frequency, percentages and statistical measures of central tendency of means and standard deviations.

RESEARCH RESULTS

The findings of the study are based on a cross-sectional survey conducted on sample of 144 respondents obtained from the whole population of 480 farmers in Gem Rae Irrigation Scheme. The researcher utilized the questionnaires to gather the primary date from the respondents. The respondents were farmers randomly selected from Gem Rae Irrigation Scheme.

The research findings showed that Irrigation Water Users Association (IWUA) rules influenced the small scale farmers' participation in the management of Gem Rae Irrigation Scheme. Majority of the respondents rated the influence of IWUA rules on their participation in the management of the scheme as great with average frequency of 67 (65.4%) of the respondents and mean of means of 3.813.

The study established that knowledge and skills in irrigation influenced the small scale farmers' participation in the management of Gem Rae Irrigation Scheme. Majority of the respondents rated the influence of knowledge and skills in irrigation on their participation in the management of the scheme as great with average frequency of 71 (69.1%) of the respondents and mean of means of 3.892.

The study findings showed that reliability of irrigation water influenced the small scale farmers' participation in the management of Gem Rae Irrigation Scheme. Majority of the respondents rated the influence of reliability of irrigation water on their participation in the management of the scheme as great with average frequency of 73 (71.8%) of the respondents and mean of means of 4.026.

The study found out that economic benefits from irrigated agriculture influenced the small scale farmers' participation in the management of Gem Rae Irrigation Scheme. Majority of the respondents rated the influence of economic benefits from irrigated agriculture on their participation in the management of the scheme as great with average frequency of 80 (78.2%) of the respondents and mean of means of 4.061.

The findings of the study revealed that the all the four factors of Irrigation Water Users Association (IWUA) rules, knowledge and skills in irrigation, reliability of irrigation and economic benefits from irrigated agriculture influenced the small scale farmers' participation in the management of Gem Rae Irrigation Scheme. From the results, economic benefits from irrigated agriculture was rated the as highest factor that influenced the small scale farmers' participation in the management of Gem Rae Irrigation Scheme followed by reliability of irrigation water, knowledge and skills in irrigation and Irrigation Water Users Association (IWUA) rules in that order.

DISCUSSION

Irrigation Water Users Association rules and the small scale farmers' participation in the management of Gem Rae Irrigation Scheme

This study found that Irrigation Water Users Association (IWUA) rules influenced the small scale farmer's participation in the management of Gem Rae Irrigation Scheme. The farmers had varied opinions regarding the extent of influence; the influence ranging from moderate influence to very great influence. All the farmers sampled in this study reported the influence of IWUA rules on their participation in the management of Gem Rae Irrigation Scheme. Indeed, the existence of IWUA rules suggested an assurance of orderly conduct of all members of the farming community and thus enhanced the farmers' willingness to identify with the scheme in the first instance and subsequently participate in the management of Gem Rae Irrigation Scheme. The farmers' participation in the management of the scheme was attributed to the IWUA rules that ensured fair and equal treatment of the farmers in the scheme. The IWUA rules secured the

farmers' cooperation with the scheme management and their participation in the scheme management activities since the management exercised their authority under the rules. The findings agree with those of Chandrasekaran et al., (2005) who found out that many of the farmers expressed excitement and readiness to contribute labour and other resources in communal undertakings since IWUA rules were created with their participation. However, beyond the relationship, this study has further established that Irrigation Water Users Association (IWUA) rules influenced small scale farmer's participation in the management of Gem Rae Irrigation Scheme by a great extent. The study results showed that farmers participated in various irrigation management activities in Gem Rae Scheme at varying degrees.

The requirement to abide by the IWUA rules by farmers was the likely prompt for the participation of majority of the small scale farmers in scheme management activities with the aim of achieving compliance as well as raising their concerns regarding the rules from within. The farmers who comply with the IWUA rules are likely to demand the same compliance from other farmers and usually such farmers register more participation in the scheme management to ensure the required compliance is achieved by entire membership. They are motivated to participate in management in order to ensure equal treatment to all farmers with regard to the IWUA rules. The findings of this study concur the findings of Shahroudi and Chizari (2007) who established that farmers' organizations were considerable social units that could facilitate improved farmers' active involvement in scheme management activities.

Knowledge and skills in irrigation on the small scale farmers' participation in the management of Gem Rae Irrigation Scheme

The findings of the research revealed that that knowledge and skills in irrigation influenced the small scale farmer's participation in the management of Gem Rae Irrigation Scheme by a moderate to a very great extent. Farmers who have knowledge and skills in irrigation are likely to be motivated by their knowledge and skills status to get involved in management roles and other activities in the scheme than those without the knowledge and skills in irrigation. Farmers who have the knowledge and skills in irrigation are most times compelled to apply them at any single opportunity and serve in different roles in the scheme. These findings were consistent with the findings by Aref (2011) that that lack of knowledge and skills was the reason for absence of active participation in Iran. Equally, Nhundu et al. (2015) found out that the farmers' participation in management of irrigation scheme activities was more amongst those farmers who had acquired much education since they were aware of the good results of their participation.

Though the populations in the studies were different, this study and that of Kahuro (2014) yielded the same result that knowledge and skills influenced the small scale farmer's participation in the scheme management activities. This study confirmed the earlier result obtained by Kahuro (2014) and this was attributed to the two studies being undertaken in the

Kenyan context, use of same random sampling method, data collection procedures of researcher administered questionnaires and data analysis techniques of descriptive analysis.

Reliability of irrigation water on the small scale farmers' participation in the management of Gem Rae Irrigation Scheme

The major attraction to engage in irrigation farming was inadequate rainfall and thus the influence of reliability of irrigation water on the farmers' participation in the management of the scheme was rated the highly by the farmers. The findings of the study revealed that the reliability of irrigation water for cropping was a major motivation for farmers' participated in the scheme activities. The findings of this study compare well with the findings of Chandran and Chackacherry (2004) that farmers' participation in irrigation projects was influenced by availability of irrigation water and that shortage had a negative impact on their participation. Additionally, in their study of schemes in Lower Niger River Basin in Nigeria, Adekule et al. (2015) established that farmers' participation was dependent on availability of water among other factors and the findings are in harmony with the findings of this study.

Though the studies of Chandran and Chackacherry (2004) and Adekule et al. (2015) yielded the same findings as those in this study, the findings did not establish the extent of the influence of reliability of irrigation on the small scale farmer's participation in the management Based on the results of the study, this study further established that the reliability of irrigation had great influence on the small scale farmer's participation in the management of Gem Rae Irrigation Scheme and this was attributed to the adverse and direct impact the reliability of irrigation water would likely have on the farming activities and returns.

Economic benefits from irrigated agriculture and the small scale farmers' participation in the management of Gem Rae Irrigation Scheme

The influence of economic benefits from irrigated agriculture on the small scale farmers' participation in the management of Gem Rae Irrigation Scheme as rated by the farmers was established to be the most dominant compared to the influence of other factors. Although the populations and regression models used were different, a comparison of the findings in this study with the work done by Muchara et al. (2014) can be made as well as a contrast. Muchara et al. (2004) assessed the determinants of the farmers' participation. The findings of Muchara et al. (2014) using the Tobit and Ordered Probit models showed that the farmers' degree of participation in irrigation management activities was directly proportional to the income received from their participation in irrigated agriculture. The findings on the relationship on relationship farmers' level of participation in irrigation management activities and income received are consistent with the findings in this study. However, Muchara et al. (2014) found out from their study that the significant determinant of farmers' participation was water scarcity while the findings in this study showed that dominant factor of farmers' participation was economic

benefits from irrigated agriculture. The differences in the dominant factor of farmers' participation from the studies would likely be attributed to the probable differences in socio-economic status and poverty levels of the sampled populations. Farmers with high poverty levels are more likely to rate the economic benefits higher than other factors such as reliability of water.

The study results suggested that if farmers obtain more economic benefits from irrigated agriculture, then they are inclined to participate in the scheme management activities. Farmers with higher economic benefits from irrigated agriculture are likely to get more involved in management activities of the scheme through commensurate contribution of resources such as finance and labour as their investments. The results are consistent with that from Etwire et al. (2013) which recommended that for active participation of farmers, the financial resources were required to be availed to farmers whose major source of income was farming to ensure their participation in agricultural production and scheme management.

CONCLUSIONS

1. According to the study findings, it was concluded that IWUA rules influences the small scale farmer's participation in the management of Gem Rae Irrigation Scheme. Thus it can be concluded from the study that IWUA rules influences the participation of small scale farmer's participation in the management of irrigation schemes.

2. From the findings of the study, the decision of small scale farmers to participate in the management of Gem Rae Irrigation Scheme was influenced by their knowledge and skills in irrigation. Thus, it is concluded that knowledge and skills in irrigation influences the small scale farmer's participation in the management of Gem Rae Irrigation Scheme.

3. The findings of the study led to the conclusion that the reliability of irrigation water influences the small scale farmer's participation in the management of Gem Rae Irrigation Scheme.

4. As per the findings of the study, a conclusion is made that economic benefits from irrigated agriculture influences small scale farmer's participation in the management of Gem Rae Irrigation Scheme.

RECOMMENDATIONS

1. The study recommends that the participatory establishment of Irrigation Water Users Association (IWUA) rules with active involvement of all farmers to secure the acceptance and ownership of the rules and ehnance their participation in the management of the scheme. The government requires to support IWUAs with proper legislation,

financing and technical capacity to enhance the development of the necessary by-laws and enforcement structures.

2. The study recommends that Gem Rae Irrigation Scheme and other similar schemes undertake enhanced farmers' sensitization and training on the irrigation to enhance their knowledge and skills in irrigation. It is recommended that the national service provider, National Irrigation Board and other stakeholders make efforts to execute capacity building programs for the community-managed irrigation schemes and thus improve their willingness and capacity to participate in management activities in the scheme.

3. Since irrigation farming is dependent on reliable irrigation water, whose absence or inadequacy would cause failure of crops and subsequent less returns or zero returns, it is recommended that the management of Gem Rae Irrigation Scheme undertakes activities that ensure access to reliable irrigation water by the small scale farmers to secure and sustain their participation in the management of the schemes.

4. The study recommends that Gem Rae Irrigation Scheme management secures reliable markets for the farmers' produce to ensure predictable and profitable returns that motivate the farmers to participate in the scheme management activities. The scheme management needs to search for strategic financial and marketing partners that will enable the farmers to finance and expand their irrigation farming and align their cropping patterns and schedules with the market needs in order to obtain commensurate economic returns from their investments in irrigated farming.

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