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The Use of Fishing Gears and Role of Beach Management Units in the Nyando Wetland

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Abstract

There has been a decrease in total fish production especially in Kisumu East, Nyando and Nyakach districts and consequently a decline in socio-economic benefits derived from the lake and the Nyando River wetlands. The department of fisheries introduced BMUs in 2004 in an effort to deal with the problem. The study focuses on the use of fishing gear and role of beach management units in the Nyando wetland in the three districts; Kisumu East, Nyando and Nyakach districts, in the Nyando River Wetlands. The study was conducted in 5 landing beaches four with BMUs and one beach without a BMU. Primary data was collected using Focus group discussions, key informants' interviews, field observations and a household survey. Secondary data were gathered from government reports and various other sources. Descriptive statistics were used to understand the socio-economic characteristics of fisher folks who utilize the Nyando River Wetlands. Overall family size mean was 6 members and 63% of the respondents were male, while the age of the respondents varied from16 years to 75 years, with a mean of 40 years. The study found that beach leadership is dominated by men who prefer using gill nets and long lines. Reasons given for the preference of gill net and long line include cost, assessment of risk and income received from the fishery. Fishers use illegal gears because of lack of enough resources, their availability and high cost of legal gears. The role BMU played in the last one year (2009-2010) includes enforcement of fisheries rules, improved sanitation, and also resolving disputes. It was also found that 79% of fishers use legal fishing gill nets while 21% do not, thus BMU's helps in ensuring compliance to fisheries regulations on the use of legal fishing gears. A Cobb-Douglas production function was used to establish the factors that influence fish catch. The results show that household age, household size, household income, level of education, boat ownership, presence of employees, experience of the fisher and presence of BMU are positively correlated with fish catch. Fish catch is also negatively correlated with the sex of the household head, age of boat, method of propulsion, non-income level and the type of household. The study recommends promotion of community participation in management, carry out a socio-economic survey and also provision of credit to improve quality of the fishery.

Key Words: Wetlands, Fisheries, Fisheries Management, Fishing Community

Introduction

Most of the world fisheries today is either overexploited or in a state of full exploitation because of greater fishing effort and increased competition between fishers, vessels or nations over the resource. National governments, development agencies, development practitioners and scholars around the world are working hard on how best to manage the fisheries resources without compromising the biological, economic and social objectives for the benefit of present and future generations (Onyango *et al*, 2003).

BMUs are organizations at the grassroots level introduced in the early 2000 as an important avenue for mobilizing communities for the purposes of integrating environment and natural resources issues into development planning, for development purposes. They were to provide experienced and stable community groups that are able to link with, and engage in, broader annual development planning cycles and processes. In Kenya, the co-management regime has been implemented through the establishment of Beach Management Units (BMUs). A BMU is a community-based organization which is legally accepted as a representative of a fishing community regarding fisheries resource utilization and management.

In the NRW 4 BMUs were formed and they work in collaboration with the relevant government authorities concerned with fisheries management. The primary goal of this partnership is the management of resources where the government has entered into an agreement with the BMUs on protection and sustainable utilization of the fish resources.

The co-management approach is one of the management tools in fisheries which has received much attention with the belief that it leads to efficient fisheries management by involving fishing communities in the decision-making process and management of their resources.

Materials and Methods

This chapter covers the methodology and procedures that were followed in carrying out the field work for the purpose of collecting data. The various methods that were used in data collection include participatory observation, interview schedule, focus group discussions and questionnaire. The chapter also gives the data sampling procedures, both qualitative and quantitative data collection.

Research Design

This study was conducted through structured questionnaire. An inventory visit was made of all the landing beaches in the study area. Key informant Interviews were conducted by choosing the respondents using purposive sampling, and focus group discussions which were taken to be the BMU committee members at every beach was also used. The questionnaire was pre-tested to allow correction to be done on questions that were not framed in the right manner and also to ensure it solicited reliable, valid and accurate data.

Study Area

The Nyando River Wetlands spans an area of 10 km wide and 30 km long as it spreads along the undulating beach from of the Winam Gulf of Lake Victoria, Kenya. Additional waters to the wetlands come from the seasonal Asawo, Nyatini, Ombeyi and Awach. The Nyando River Wetland in Nyando and Kisumu districts lies in the Kano/Nyakach floodplains and the mouth of river Nyando and covers approximately 40 km^2.

Administratively the project area covers and Kisumu East, Nyakach and Nyando Districts in Nyanza province. The main economic activities in the wetland are: fishing, subsistence and commercial crop production and livestock production. The main crops grown include: Sugarcane, sorghum, maize, rice, arrow roots, beans, sweet potatoes and horticultural crops. The livestock kept in the wetland surrounding by riparian communities include: indigenous breeds of cows, goats, sheep and poultry. Trade in items made from wetland products (papyrus) is very popular. Wetland horticulture is also an important source of income for women. The 3 districts cover an area of 931 sq. km which includes 365 sq km of water.

Target Population

The study targeted fishermen and fishmongers (all beach fish operators both male and female) who are either member and/or are aware of the operational activities of BMUs within the four beaches in the three Districts. This population also included officials or committee members of

the units. The total target population was 700 participants of which 650 were fishermen, fishmongers and 50 BMUs committee members. This population was targeted because it directly operates within the BMUs environment. The clients would prove the reality of the existence of BMUs activities and their relevancies to fish catch in these beaches.

Sample Size and Sampling Procedure

All beaches within the study area; Nyamware, Ogenya, Singida, Wasare and Kusa were sampled. A list of all fisher folks (boat owners, Gear owners, Traders and fishermen) was compiled with the help of BMU secretary in their respective Beach Management Units. The lists were screened for double entry and the final list formed the population (sampling frame) for each Beach Management Unit. Then sampling of individual household was done in the Beach Management Units offices by the researcher. Using a table of random numbers, a sample of 62, 53, 10, 15, and 10 fisher folks were selected from the list of BMU members from Nyamware, Kusa, Singida, Ogenya and Wasare respectively depending on the number of registered BMU members.

Data Collection Instruments

Primary data was collected through the use of both structured and semi-structured questionnaires. The study used the following research instruments in data collection. They included questionnaire interviews for household survey, interview schedules for key informants, check list for focus group discussions and, participatory observation. The primary data collected include data on fish catch per year, type of gears used, size of boat, age of boat, education level, age of fishers, gender, household size and Fish output. Others included data on health status, savings, expenditure and financial status of the respondents.

Secondary data was obtained by reviewing a number of relevant documents with a view to gathering information about the current fisheries situation, BMU introduction and the amount of fish caught in the district per year in terms of quantity and quality. These documents consisted of relevant books, journal articles, theses, dissertations, research reports, government reports and institutional records among others.

Data Analysis

Data captured from the interview schedule and questionnaires forms were examined before being summarized and classified into categories. The data was organized, presented, analyzed and interpreted using descriptive methods of data analysis. Frequency tables, charts, percentages, and chi square in analyzing the Likert scaled data. From the analysis of data, the hypotheses were tested to determine whether they can be accepted or not.

The data was then presented using frequency tables and analyzed using regression analysis (SPSS), excel and inferential statistics (mean, standard deviation). In the fisheries under study, output is heterogeneous not only because it is composed of different fish species, but also because fish caught are of different sizes and, thus, quality.

Fishermen vary in the catch they land because of one or more differences in experience, education level, age, income and also technological efficiency.

To compare the catches in beaches with BMUs and those without BMUs, fish catch is taken to be a function of socio-economic characteristics of the fisher and effort variables. A Cobb–Douglas (CD) production function was used for this study. The formulation is given as follows:

FISH CATCH = f (HHAGE, HHEDU, HHS, HHYRSFIS, HHINC, NONFISHNIC, DEP, NOCREW, LENGBOAT, AGEBOAT, GEARTPE, PROPULMEANS, OPERAMODE, BMU)

The regression equation is as shown below

$$\text{FISH CATCH} = ß_O + ß_1\text{HHAGE} + ß_2\text{HHEDU} + ß_3\text{HHS} + ß_4\text{HHYRSFIS} + ß_5\text{HHINC} +$$

$$ß_6NONFISHNIC + ß_7DEP + ß_8NOCREW + ß_9LENGBOAT + ß_{10}AGEBOAT + ß11GEARTPE + ß_{12} PROPULMEANS + ß_{13}OPERAMODE + ß_{14} BMU + U$$

The decision to supply effort is a function of household and fishery characteristics among others. A Cobb–Douglas supply function was used and given as:

$$EFFORT = f (AGE, EDUC, HHS, VALFISH, NONFISHNIC)$$

Since $ß_{14}$ is estimated to be large, positive and statistically significant, it can be concluded that the BMUs is important in contributing to fish catch. The C–D has been found to be appropriate by, for example, Comitini and Huang (1967) for the North Pacific halibut fishery and by rndal (1987) for the North Sea herring fishery.

Results and Discussions

Household Size

Household size ranges from a minimum of 2 to a maximum of 16 with a majority of fishers having between 3 and 7 children. Overall family size mean was 6 members. This implies that majority of the households had a family size of six people. This differs from the National household size which is about 5 members per household. These households were considered large, and with a large household, there will be higher subsistence requirements which are likely to force the household head to even use illegal fishing gears to cater for the high subsistence requirements of the family. A large household could also mean labour availability for farming, fishing and for off-farm activities. Large household sizes imply increased family demands, leading fisher folks to belong to the low income bracket (Ong'ng'a 2002).

Gender of the Household Head

A total of 150 fisher folks were interviewed during the survey in which over 63% were male. The number of men interviewed in Kisumu East, Nyando, and Nyakach districts were 70%, 90% and 55% of the respondents respectively. This shows that fishing and fisheries is a male dominated activity. Historically, fishing has been a male activity, while the women concentrated on agricultural and household activities. This is likely to be related to the physical requirements of fishing as well as with traditional beliefs that discourage women from fishing. Cultural barriers (boat ownership is limited to men in the olden days) restricted the entry of women to fishing. According to Luo tradition, fishing vessels are given ancestral names. It was argued that since women are married to clans, they were not conversant with ancestral names. Thus, when allowed to buy and own the fishing vessels, they may not be able to give appropriate names, a factor believed to influence the potential performance of boats. Active fishing on the lake is predominantly men's work (Medard *et al*., 2002). In Tungaraza's (1986) study, female respondents reported that most women did not join off-shore fishing because it required a lot of time, energy and that it was risky. In the same study, they reported that there are no taboos, religious or traditional beliefs that prohibit women from fishing.

Age of Household Head

The age of the fishers in the sampled beaches within the Nyando Wetlands ranges from a minimum of 16 years to a maximum of 75 years, with a mean of 40 years. Majority of the respondents were in their early fourties, (Table 3). Age is a very important determinant of entry into production sector, since young people are normally more innovative, risk takers and have low discount rates for the future (Mwakubo *et al*., 2007). Age is also a proxy for experience and represents an increase in human capital endowment that can be acquired over time. Older fishermen, while having more experience, have shorter planning periods and, thus, higher discount rates, which reduce the values of long-term benefits from conservation measures (Gould *et al*., 1989).

Level of Education of Fisher

A large proportion of respondents had low literacy level as shown in the figure below. The figure also shows that 7.3% of respondents had no formal education and they have to rely on their experience in fishing or advice by fisheries department officers or other fishermen. Over 87% were in the lowest categories of formal education, which is Upper primary, Lower Primary and no formal education. They need training and extension for they cannot read technical information. About 18% of the respondents had reached secondary Education.

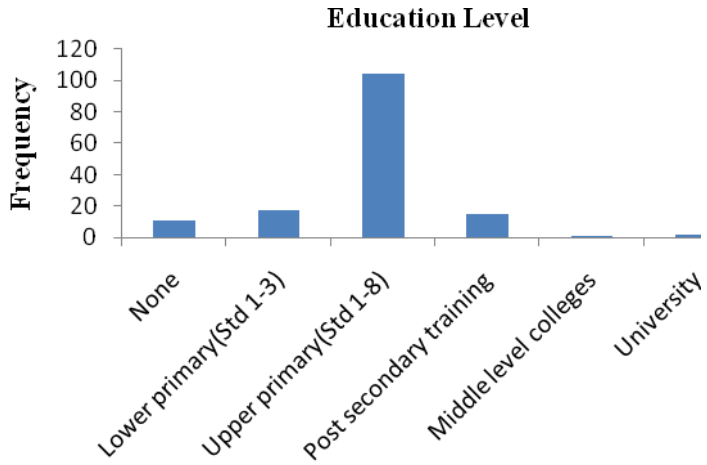

Figure 1. Education Level of Fisher Folks
Source: Field Survey, October-Dec. 2010

Because the education programmes have been an important component of government of Kenya's development policies, the level of literacy is relatively high. According to World Bank (2006), the literacy rate is 73.6% in Kenya, that is, literacy level of people aged 15 years and above. This has a great impact on fisheries development because fishermen's education level is known to influence fishing decision. It has been hypothesized that the educational level of the fishermen may determine how effective they are in terms of awareness of alternative opportunities, and it may also influence their fisheries management skills.

According to Ikiara (1999), a fisherman who has had some level of formal education is more likely to appreciate the importance of saving in order to acquire better fishing equipment, and to manage his fishing unit better than one who has not had any formal education. The level of education is also important in transfer of fisheries innovation and in making an informed decision.

Other Socio-Economic Characteristics

The survey also revealed that only 8 percent of sampled fisher folks had accessed credit for fishing activities. Access to credit eases liquidity constraint and this enables fishermen to be able to purchase external inputs (recommended nets, boats, sails). Low percentage of fishers who had accessed credit could be an indication of poor credit availability or hard conditions and terms of credit to the fishermen. Membership to an organization was reported by 93 percent of the sampled fisher folks.

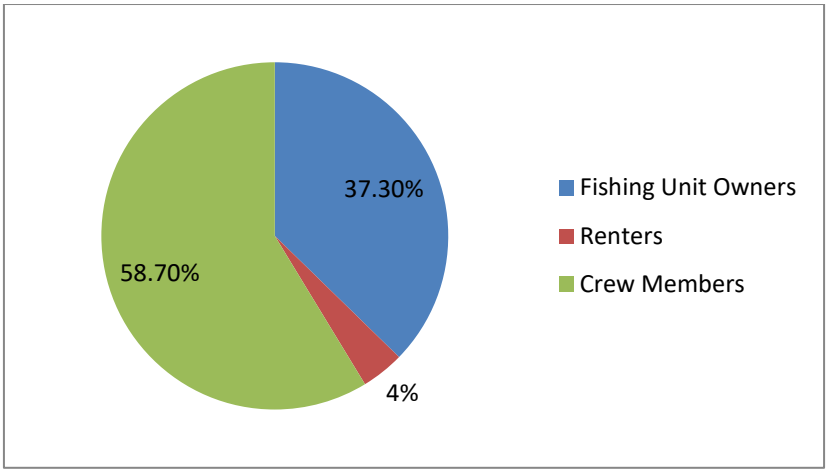

Figure 2. Categories of Fishers Interviewed

Governance in Beach Management Units

Characteristics of BMU Leaders

The BMUs are governed by chairpersons as provided for under the Law (GoK, 2003). Examination of the characteristic and background of the chairpersons and committee members revealed that the leadership of BMUs was dominated by men. The low representation of women on the BMU committees is hindering their effective participation and involvement in decision making and planning at the beach level.

The average age of a BMU chairperson was 40 years while the mean age of a BMU committee member was 37 years. This shows that although the fishing communities consist primarily of youthful people, the leadership is provided by mature people. The study also revealed that most BMU chairmen were boat owners, an indication that a qualification that one has to meet before being elected to be a BMU chairperson is boat ownership. It was also learnt that 44% of the committee members own fishing boats. Generally, the study revealed that boat owners, crews, fish traders, fish processors and boat and net repairers were all included in the BMU committees. The inclusion of women has actually contributed in motivating them to be actively involved in fisheries activities.

BMU Activities and Impacts

Different BMUs had been involved in a number of activities. These include enforcement of fisheries rules and regulations followed by improved sanitation and fish handling. BMUs have played an important role in improving sanitation at beaches, for example through constructing toilets, strengthening security at landing sites to ensure safety of their property e.g. by hiring of security guards at the beaches, increased income, constructing BMU office building and also buying furniture and many others.

Most fishers reported that they had been involved in different activities of the BMUS, which included general cleaning/sanitation activities either directly or by giving money to BMUs with a purpose of cleaning the beach, working together to fight illegal fishing by reporting those involved in illegal fishing, directly sending away those involved in destroying fish breeding grounds, attending BMU assembly meetings and contributing ideas and also participating in making development plans for the beaches. Those who had not been involved in BMU activities attributed it to the failure of BMU leaders to mobilize people for such activities.

BMUs perform a number of activities. The frequency with which they do these activities differs both by activity and by district. In Kisumu East, most respondents indicated that arresting offenders, resolving disputes and receiving visitors were done continuously by BMUs. On the other hand, operating savings and credit and fish marketing activities were hardly done. Similarly, in Nyando district most respondents indicated that resolving disputes and receiving visitors were done continuously. But, BMUs hardly operated savings and credit services, collected revenue, carried out fish marketing activities or planned their activities. In Nyakach district, most respondents indicated that BMUs continuously arrested offenders (20%), confiscated illegal gears (29%) and received visitors on the beach (42%). On the other hand, BMUs hardly operated savings and credit facilities or carried out fish marketing activities.

The problems faced by BMUs in carrying out their duties were diverse, including inadequate co-operation between BMU committee and the assembly, inadequate equipment to carry out work like boats, engines and fuel, conflict in roles with Marine Police and Fisheries staff, inadequate security during patrolling, lack of motivation in terms of pay for the work that they did, piracy and theft of fishing equipment, namely gear on the lake and being less empowered, BMUs are often undermined by Government authorities. This came out strongly during the focus group discussions when it was stated that the government officials would come and do patrol without consulting the BMU leadership as a working partner.

Fishing Gear

Crafts/ vessels/ boats in the NRW have evolved quite significantly from a single log, rafters, and dugout canoes all through to sesse canoe and parachute. Depending on beach to beach, same boat may be referred to by different names. The study revealed that the type of boat one owns dictates the type of fishing gear to be used by the fisherman.

In the study area, fishing techniques used include passive capture techniques and active capture techniques. Passive capture technique involves the capture of fish by entanglement or entrapment in devices that are not actively moved by man or machine. In the beaches surveyed, the passive fish capture techniques include gill nets, long lines and traps. Active fish capture techniques include beach seine and hand line. It was also revealed that the bottom type, water depth, transparency and current may affect the selective properties and type of gear applicable in any particular habitat. The study also revealed that most of the fishers use beach seine and gill nets in the beaches surveyed. Trap was found to be used mostly in Ogenya and Singida beaches.

Mesh Size Used by Respondents

Of those respondents (N=134) who used gill nets, about 65% used gill nets of mesh sizes 5-7'', 14% used 5 inches only and about 21% of the respondents used gill nets of mesh size less than 5'' which is illegal, and 31% targeted Nile perch 30% tilapia and 39% targeted both mud fish and cat fish.

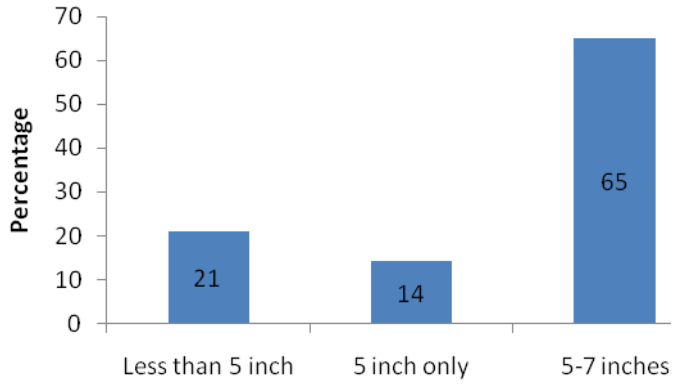

Figure 3. Mesh Sizes of Gill Nets Used

Seines

A seine is an active fishing system that traps fish by enclosing them with a long fence like wall of webbing. The top edge of the net is buoyed upwards by a series of plastics or cork floats and the bottom edge is weighed downwards by lead weights or chain. From the study, it was revealed that 49% of the respondents used seines in their fishing activity. From all the beaches surveyed, at least some respondents used seine. This is an indication that this is a common fishing method along the NRW. The reason it was preferred could be because it catches all types of fish species that could be in season.

Entrapment Devices

Aquatic animals enter an entrapment device by their own movement. They are captured because the entrance happens to stand in the exact path of their movement. Knowledge of migration, cover-seeking habits, escape reactions and diets of aquatic animals have influenced the design of entrapment devices used for various fish species. Entrapment devices used in fishery sampling are often small, portable versions of commercial fishing devices. It was revealed that most fishers within the NRW use osadhi (deep baskets/traps), sienyo, ounga and kira ((reeds, barricades and traps woven in hexagonal patterns) to catch fish.

Conclusions and Recommendations

Conclusions

The study shows that there are socio-economic benefits of BMUs and that BMUs play a very important role in enforcement of fish Catch methods and management of fishing facilities. BMUs have in the long run enhanced incomes of fishing communities. This has led to improvement of infrastructure such as landing facilities, fishing harbor facilities, communication and transport network among others. The first hypothesis was therefore rejected.

The study found that there is no significant change in the use of correct fishing gears by fishermen since Beach Management Units were introduced. Fishers in the NRW use non-selective gears since they provide fish that has a ready market among small-scale traders or household consumers. Most fishers prefer gill nets and long line.

The study found that there are significant differences in fish catch between beaches with and those without Beach Management Units. When fish catch in different beaches were compared, it was very clear that fish catch in Wasare was very low as compared to all other beaches. The third hypothesis was therefore rejected.

It was found that women play a very significant role in the management of BMUs. Fish trading is dominated by women and this sector has a high contribution in

strengthening and managing the BMUs, since the traders will always advice the fishermen on what qualities of fish to bring. The study therefore rejected the fourth hypothesis.

Boat ownership, fishing income & experience of fisher are positively related to fish catch.Age, non-fishing income and education are negatively related to fish catch. Boat ownership, Experience and fishing income were statistically significant and significantly increased fish catch in NRW. Increased use of improper fishing technology has resulted in increased scarcity and over-exploitation of fish stocks. Since the coefficient of BMU is positive and statistically significant, it can be concluded that BMUs are important in contributing to fish catch. When the factors that influence fishing effort are compared, show that household age, household size, fish catch, non-fishing income and fishing income have a significant effect on fishing effort. There is also a higher effort on beaches that are in Kisumu East District, compared to those in Nyando and Nyakach districts.

Recommendations

A number of recommendations are suggested in this study. First, the promotion of community participation in partnership arrangement in Lake Victoria should at least start from a hand on, applied research or pilot basis level on selected sites within Lake Victoria. Subsequently, the results of these experiments if successful can be applied to the whole lake, nationally and finally regionally. For the success of such pilot, various players such as research institutes, ministry of fisheries and development partners must closely work together in this process.

Second, a socio-economic survey needs to be carried out in all beaches along Lake Victoria to give the actual picture of the role played by BMUs on fisheries development. Such survey should include repeat visit to BMUs, questionnaires and reference to catch records at every BMU.

Third, provision of formal credit by the government to finance fishermen investment in the lake, as this has the potential to improving the quality of fishing gears used in the NRW.

Also, through extension education, fishermen need to be encouraged to undertake fish farming enterprise as a viable economic activity to the main lake fishing and agricultural enterprises. Studies done have shown that fish farming can increase fish production thus reducing overdependence on the lake for capture fishery.

Finally, since a BMU chairperson comes from the same area in which he/she works from, there always arise conflicts between the chair person and the gear owners and even relatives at a given BMU. It is therefore recommended that BMU chairpersons be transferred to work in different beaches away from their homes for effective management.

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