



Management Arts

Elixir Mgmt. Arts 56 (2013) 13387-13394

Elixir
ISSN: 2229-712X

Socio economic characteristics and practices of fish farmers in western Kenya

Shitote Zacharia, Wakhungu Jacob, China Samuel, Likuyani K.H, Okoth Patrick, Maina J and Wakaanya A
Masinde Muliro University of Science and Technology; Centre for Disaster Management and Humanitarian Assistance, P. O Box 190
Kakamega.

ARTICLE INFO

Article history:

Received: 12 January 2013;

Received in revised form:

5 March 2013;

Accepted: 6 March 2013;

Keywords

Fish farming,
Food security,
Livelihoods,
Socio economic.

ABSTRACT

This study examined the impact of fish farming on household food security and livelihoods for fish farming and non fish farming households in Siaya County. Currently fish farming remains under developed in Western Kenya where pond productivity is low and not rising, despite the effort of several players. Further, capture fish in Lake Victoria and rivers has subsequently declined. These scenarios called for the need to examine the production systems and their current performances. The objective of the study was to determine the socio-economic characteristics of fish farmers and their fish farming practices. A cross sectional survey research design was adopted for the study. Stratified random sampling was used to select fish farming and non fish farming households. Key informants were selected through purposive sampling method. Data gathering was through multiple methods; where primary and secondary data were collected. Data analysis made use of descriptive statistics, where numerical and non-numerical summary of data were used. Chi-Square was used to test the independence between variables. Findings were; fish farming in the study area is economically rewarding and profitable. It is capable of creating employment, increasing income and improving the livelihoods of the people. Fish farming in the area is male dominated, however, women are used to manage the ponds and there is less participation of youth in fish farming. Females and youths need to be encouraged to participate in fish farming in the area as a means of increasing their income and improve their standard of living. The main production level is semi-intensive where mixed sexed tilapia production system provides seed for subsequent restocking. Most of the fish farms are privately owned by individuals who have little access to finance. Therefore, government participation in fish farming should be encouraged to boost the quantity of fish available for consumption. Fish farmers should be organized into formidable groups such as self help and cooperative to realize economies of scale in the purchase of inputs and sale of their fish.

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Introduction

Currently, fish farming remains underdeveloped in Western Kenya (Munialo, 2011). Small- scale fish farming is characterized by low investment, poor management and low yields. However, the impact of the fish farming to local household food security and livelihoods is significant (Shitote et al; 2012). The sector currently provides direct employment to over 200, 000 Kenyans and indirectly supports over one million people (Gitonga and Achoki 2004). In 1970, only 5 per cent of the fish eaten came from farms, today over 40 % of the fish eaten is farmed. It is predicted that by 2048 all species of sea fish will have collapsed forcing us to rely almost exclusively on farmed fish (FAO, 2011). Fish farming has the potential to contribute significantly to the country's gross domestic product if the sector is accorded the necessary facilitation in line with the country's policy documents on poverty alleviation and wealth creation. More than 90% of the annual national fish production in Kenya comes from the capture fishery, especially Lake Victoria, which is facing over-exploitation (Okeyo-Owuor 1999). In order to reduce pressure on capture fishery and ensure consistent availability of fish for both domestic and export markets, there is urgent need to promote a viable fish farming sub sector.

Fish farming development is credited with stimulating the development of rural communities in which they are located. It is recognised for the provision of important livelihood opportunities for the rural poor by improving the local household food security and livelihoods (Kundu, 2010). Fish farming has the potential to significantly contribute to poverty alleviation through income generation, creation of jobs, and enhanced food security (FAO 2006).

Ridler and Hishamunda (2001) identified several economic factors that are important in fish farming development. They include availability and affordability of fingerlings and feeds, availability of land and security of tenure, skill of labour and wage rates, cost and competing use of water, finance, transport and marketing of the products. Kundu (2010) recognized that social factors such as gender, age, education level and household characteristics play an important role in sustainable fish farming. Understanding these factors, therefore, is important in policy formulation in fish farming sub sector as it allows refining management strategies to reflect the needs and aspirations of the people. Siaya County is endowed with several fish farming resources the potential for growth and expansion is high given the many favourable physical endowments of the region. Ample rainfall, a well distributed network of rivers, streams, dams, satellite lakes, and wetlands as well as suitable climate

characterize the region. Despite the effort of several players in the region; GOK, Dominion farms, FAO and individuals this potential has not been realized.

Methods and Materials

The data reported here were collected to identify socio-economic factors critical to impact of fish farming to household food security and livelihoods. This study was conducted in the six districts ; Alego Usonga, Gem, Bondo, Ugunja, Ugenya and Rarieda of Siaya County Western Kenya .Given the nature and complexity of this problem, a cross sectional survey design that focuses on the individual fish farmers as the unit of analysis was employed. This method is capable of describing the existing perception, attitude, behaviour or values of individuals within a household (Mugenda and Mugenda, 1999). The sampled population in each district was stratified into two categories, fish farmers and non-fish farmers. From each district a systematic random sampling approach was used to select the respondents. This sampling technique was used to avoid conscious or unconscious bias in the selection of sampled households and ensured that the selected sample was representative of the population. In total 384 respondents were selected of which 192 (50%) were fish fish farmers and 192 (50%) non-fish farmers. A large sample was required to produce salient characteristics of the population to an acceptable degree and also reduce sampling errors (Mugenda and Mugenda, 1999). The instruments used for data collection were questionnaire, interview guides, observations check list, focused group discussions interview guides and secondary information sources. A structured questionnaire was prepared and given to fisheries experts to check content validity. After incorporating experts’ comments, it was pre-tested, and then a final version incorporating the pre-test results was produced. All questionnaires were administered through face-to-face contact by the researcher and research assistants. In three districts FGDs meetings were conducted covering various topics such as ranking of different characteristics and why farmers are doing what they are doing. Data analysis was conducted with the Statistical Package for Social Sciences (SPSS-Version 17) computer programme. Only significant variables were considered to have influence fish farming.

Results and Discussions

Socio-Economic Characteristics of Respondents

The study sought to find out the background information of the respondents, their gender, ages, marital status, level of educational, years of fish farming, occupation, average household income and size of household.

Gender

Majority of the fish farmers were male (71.9%) while the female were 28.1% Figure 1. This is an indication that males participate more in fish farming than females. This is an agreement with the findings by USAID (2009) on the challenges facing women in Burkina Faso which established that women were constrained in terms of access to land, control of production, decision making on use of assets (e.g. livestock) and control over household income. In general, income earned from profitable activities (e.g., cotton farming) was managed by men. A Chi Square test conducted on the respondents distribution of gender indicated that there was a highly significant ($p < 0.01$) variation ($\chi^2_{1,0.01} = 133.01$) in the distribution of gender

among respondents. However, it emerged from the FGDs that women who were wives of fish farming households were used

to manage their ponds with fish farmers and other stakeholders admitting that ponds that were doing very well were being managed by women. This was attributed to the fact that most women stayed at home and were, therefore, more keen in managing their ponds as compared to men who were away most of the time. Although women’s economic power was limited in the household, some agencies have found that doing food security projects with women’s groups can change the dynamic and expand women’s control over the generation and expenditure of resources (USAID, 2009). Nearly 90% of women who work outside the home decide how to spend their income; this statistic varies little by socio-demographic group (USAID, 2009)

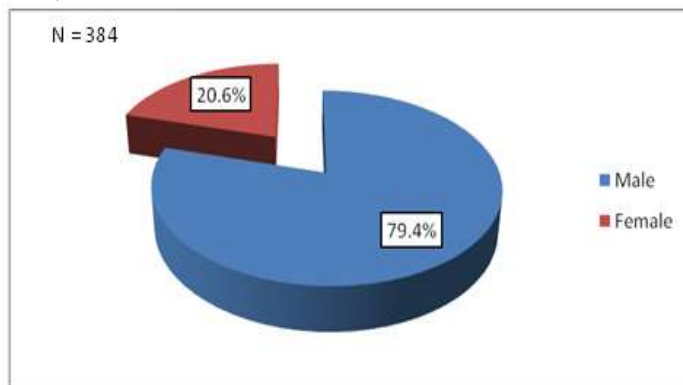


Figure 1 Respondents distribution of Gender in sampled household in Siaya County, Kenya

Age

Table 1 presents the age brackets of the fish farmers in Siaya County. Fish farmers in the age bracket 20 years and below were 11.5%, those in the age bracket of 21-30 years were 15.6%, those in the age bracket of 31-40 years were represented by 24.5%, those in the age bracket of 41-50 were 28.1% while 20.3% were over 50 years. The majority of fish farmers were above 20 years representing the population which has settled down and fully invested in fish farming. This age bracket has dependants hence the need to invest so as to support their families. Those above 40 years can closely monitor the fish ponds unlike other young people who are mostly committed in their educational endeavors as well as seeking for jobs.

Table 1: Age distribution of fish farmers in Siaya County, Kenya

Age	Frequency	Percentage
20 and Below	22	11.5
21-30	30	15.6
31-40	48	24.5
41-50	52	28.1
Over 50	39	20.3
Total	192	100.0

A Chi Square test conducted on the fish farmers’ age distribution indicated that there was a highly significant

$$\chi^2_{4,0.01} = 33.839$$

($p < 0.01$) variation () in the distribution of age. From FGDs it was established that most young people were not active in fish farming as most of them were alcoholics and drug abusers, with most of them becoming touts. According to USAID (2009), adolescents have the least decision making influence of all. The key informants explained that those funded through economic stimulus were adults who owned or were accessible to land; which explains as to why most youth are not

involved in fish farming. It also emerged from the FGDs, fish farming activities were carried out through groups, however, most youths do not belong to groups especially the women groups. These explain the fact that there are few youths under twenty years old involved in fish farming in Siaya County.

Marital Status

As per marital status for fish farmers majority (79.4%) were married, 6.3% were single, 12.2% were widowed and 2.1% were separated Figure 2.

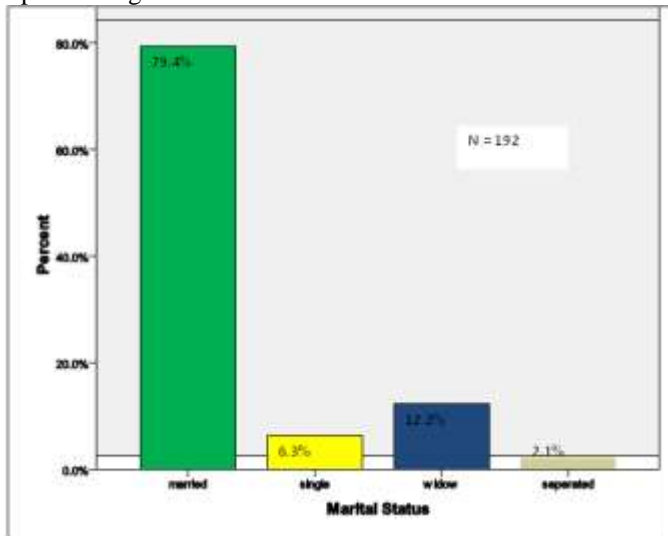


Figure 2: Marital status of Fish Farmers in Siaya County, Kenya

Majority of fish farmers were married people with marital responsibilities. From FGDs, it emerged that most fish farmers in the County were polygamous. A fact attributed to money gained from fish farming that could support more than one wife. It was also established through FGDs family responsibilities forced most non fish farmers to venture into fish farming as a way of raising income to support their families. In Tanzania, Wetengere (2009), found out that, sex, age, formal education, marital status, religious beliefs, extension education, land size, income, family size, risk and profitability are important for the adoption of fish farming to supplement family responsibilities.

Educational Level of Respondents

Figure 3 presents the educational status of fish farmers in the County. Results were 61.7% of fish farmers had primary education, 26.0% had secondary education while 12.3% had tertiary education. An indication that fish farming is practised mainly by people with primary level of education in the County. This may be due to lack of other formal employment or other income generating activities. Only a few fish farmers have tertiary level of education.

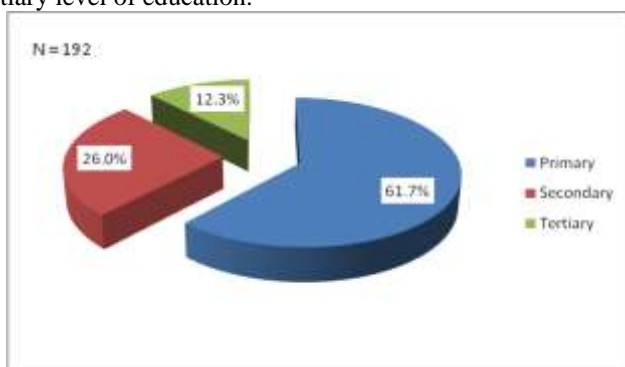


Figure 3: Educational Level of fish farmers in Siaya County, Kenya

FGD results as well as key informant interviews indicated that those who had attained tertiary levels of education had commitment to formal employment hence no time to carry out fish farming living fish farming to the rural poor smallholders. These finding are similar to those found in Bangladesh where two thirds of total fish supplies in Bangladesh is from poor smallholder fish farmers (Practical Action, 2010). However, according to OECD (2010) a focus on poor smallholders in Africa has had limited impacts on food security and poverty. Therefore, more coherent approach to fish farming and development are needed.

Duration of fish farming

Duration and experience in fish farming is critical to fish farming, length of stay to establish experience and exposure to fish farming are shown in Figure 4. Majority (66.1%) of the respondents had been practising fish farming for 1-5 years, 23.4% had been practising fish farming for less than a year, 5.7% had been practising fish farming for 6-10 years while 4.7% had been practising fish farming for more than 10 years. An indication most of fish farmers had been in the practice for few years leading to less experience in fish farming as a majority were formly involved in capture fisheries from the lake.

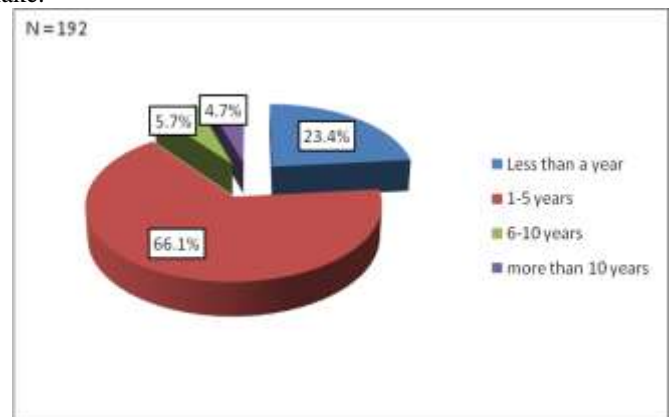


Figure 4: Duration of respondents in fish farming in Siaya County, Kenya

A Chi square test carried out to establish if there were any differences in the distribution of fish farming experience among fish farmers indicated that there was a highly significant

$$\chi^2_{3,0.01} = 380.833$$

($p < 0.01$) variation (). Information obtained from FGD indicated that most of the areas of Siaya County, especially those close to the lake had just been recently introduced to fish farming. Initially, they had been mainly engaged in fishing from the lakes and rivers (Ricdardson, 2010). To help alleviate poverty and provide food in the country, the government of Kenya launched the Economic Stimulus Programme for fish farming in 2009. This project contributes to the country's economy through employment creation, food production, generation of income and foreign exchange earnings (GOK, 2010). This is the project that has seen the establishment of many fish ponds in the area.

Occupation

When the fish farmers' occupation was considered the survey results showed that majority were involved in fish Figure 5. A Chi square test carried out to establish if there were any variations in the occupations of fish farmers indicated that there

was a highly significant ($p < 0.01$) variation ($\chi^2_{3,0.01} = 380.833$) in the distribution of occupations.

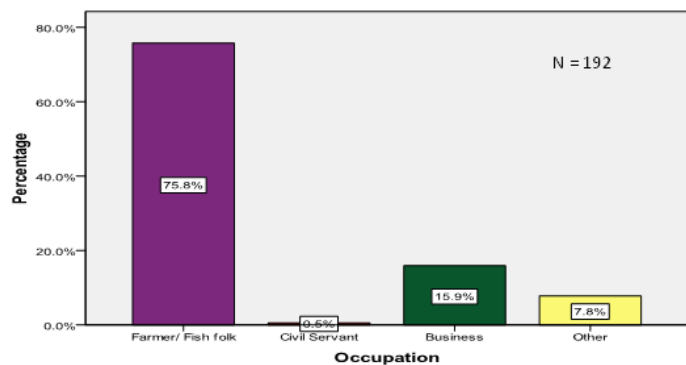


Figure 5: Distribution of respondents' occupation among fishermen in Siaya County, Kenya

Results in Figure 5 indicate that 75.8% practising fish farming were peasant farmers, 15.5% were in business, 0.5% were civil servants while 7.8% were engaged in other occupations. These proportion included teachers, nurses/doctors, bursars/ accounts clerks and bankers. These results indicate that majority of the respondents were mainly engaged in fish farming, which was the main focus of this study. However, the results point out that a considerable number of people are carrying out fish farming despite being engaged in other occupations. It emerged from the FGDs some people had started fish farming to benefit from free government economic stimulus grant; fish pond, fingerlings and feeds were provided under this project this scenario explains as to why all professions are involved in fish farming. However, DFOs who were key informants explained the project targeted the less fortunate in the society but who owned or were accessible to land and water this contributed to lower number of professionals in fish farming.

Household Income

This factor shows the accrued benefits from fish farming to fish farmers in Siaya County. The average household monthly income earned from fish farming was less than 10,000 per month Figure 6.

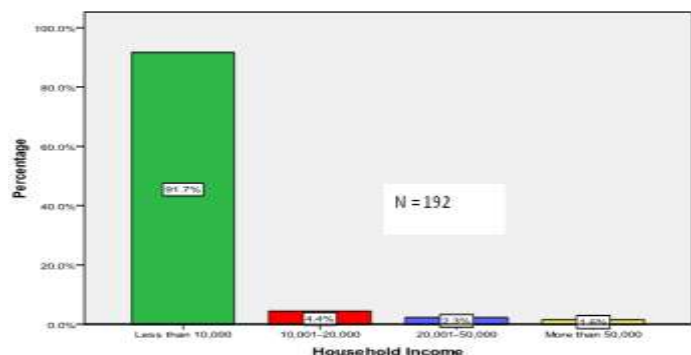


Figure 6: Distribution of fish farmers' household income in Siaya County, Kenya

A Chi square test carried out on income levels indicated that there was a highly significant ($p < 0.01$) variation ($\chi^2_{3,0.01} = 910.896$) in the distribution of farmers' income. Majority 91.7% of farmers earned less than Ksh. 10,000 per month, 4.4% earned between Ksh. 10,001- 20,000 per month, 2.3% earned between Ksh. 20,001- 30,000 and 1.6% earned

more than 50,000.. This is far much below the expected output from fish farming hence an indicator that fish farmers in the area face many challenges. FGD findings were that, some households harvested fish from their ponds prematurely to meet their food needs, a practice that reduced the number of fish and income at harvest time. More so those under economic stimulus project stole from their own ponds since it was perceived the fish belonged to the government and would be harvested to pay the grant. These perceptions contributed to poor pond management practices as fish farmers were reluctant to care for the "government's" fish. This explains low rates of pond productivity leading to reduced income from fish farmers under economic stimulus in Siaya County. Those who owned ponds privately as an enterprise complained of high costs of inputs; feeds and fingerlings, which subsequently reduced their income. Others were unable to feed their fish adequately resulting in small fish at harvest time that attracted low prices.

The findings are similar to those established in Thailand where, farmers living on low incomes have been reluctant to raise fish as a formal farm enterprise because of high feed costs and low survival rates of fingerlings (ACIAR, 2010). Australian Centre for International Agricultural Research (ACIAR), (2010) impact assessment report confirms that there were significant food security and poverty alleviation benefits for the farm households that operate a fish-farming enterprise. Income gains varied according to the amount of fish retained for home use.

Size of Household

The household size indicates fish farmers' food security status and their livelihoods as well as their labour demands on the farm Figure 7

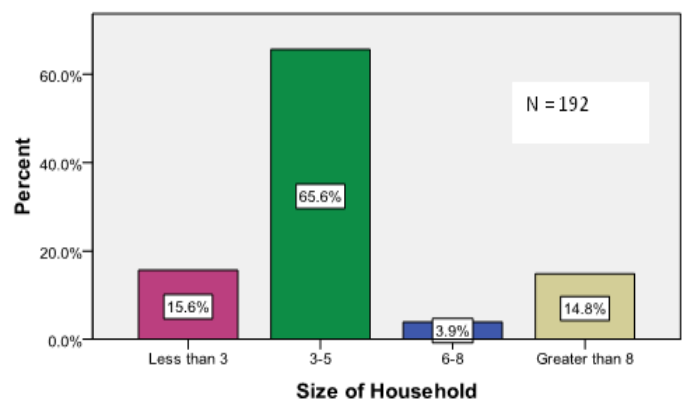


Figure 7: Sizes of households for fish farmers in Siaya County, Kenya

A Chi square test was carried out to establish differences in the farmers household sizes showed significant variation ($\chi^2_{3,0.01} = 351.188$)

($p < 0.01$). According to Table 7, (65.6%) had 3-5 children, 15.6% had less than 3 children, 14.8% had more than 8 children and 3.9% had between 6-8 children. The results imply that a large proportion of fish farmers (84.3%) had more than 3 children with 14% having more than 8 children. These showed that family planning has not yet been fully embraced by fish farmers in the area. Furthermore, FGD and Key informants' interviews revealed that most men in Siaya County were polygamous as a result of benefits gained from fish farming that provided extra income to support large families.

Availability of Fish Market and Marketing

On the issue of the market, fish farmers agreed they ready market for fish in the county. The results are in agreement with those of a study on fish farming in China which pointed out that there was a very high demand for fish confirming the view that fish farming is really the only way to meet the gap between supply and growing demand for fish to eat in developing countries (Malcolm, 2010). However, from the FGDs, it emerged that most of the residents preferred fish from Lake Victoria as compared to that from fish ponds or Lake Kanyaboli. This makes fish from fish ponds to lack market especially when fishing activities are very active in Lake Victoria. Nonetheless, Key informants comprising of the DFOs and Beach Management Committee (BMC) chairmen, said, the future provides a big market for fish farming since there is a big decline of fish capture from the lake due overfishing, siltation and pollution. On average fish capture is 5-10 kg per boat a night in Lake Victoria which is not sustainable as the catch was to be distributed to families of about 5 fishermen and boat owner since payment is in terms of fish, little or nothing is left for sale. The finding are supported by Brummett (2010), who notes fish farming success is due to; strong markets, access to quality seed, feeds, credit and transport and a focus on profits.

Marketing channels employed by fish farmers were also determined Figure 9. Most 81.4% fish farmer had ready market where fish was locally sold either at the farm gate or local market.

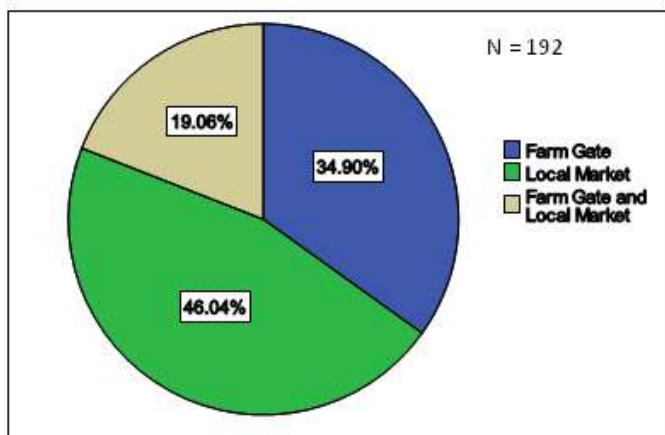


Figure 9: Marketing Channels employed by fish farmers in Siaya County, Kenya

Chi square test carried out to determine variation in responses showed a significant ($p < 0.01$) variation in the responses ($\chi^2_{2,0.01} = 46.274$).

The results indicate that 34.1% sold their fish at the farm gate, 47.3% at the local market while 18.5% through both the farm gate and at the local market.

Asked about the challenges faced in the marketing of fish, farmers cited lack of modern storage facilities and low prices as the main constraints. The lack of storage facilities would force farmers to sometimes sell their fish to middlemen at a low price. In addition there are no fish processing facilities in the area, which would provide a constant and stable market for the fish. Small sized fish harvested never sold well and ended up going bad causing farmers to incur heavy losses. Brummett (2010) found out that growth of fish farming in top ten producing countries was attributed to Small and Medium Enterprises (SMES), where conditions for success were; a wide range of

producers, strong markets, access to seed, feed, credit and transport and a focus on profits.

Credit Facilities

Credit is essential in any enterprise start up most 87% of if fish farmers never benefited from credit facilities in Siaya county Figure 10.

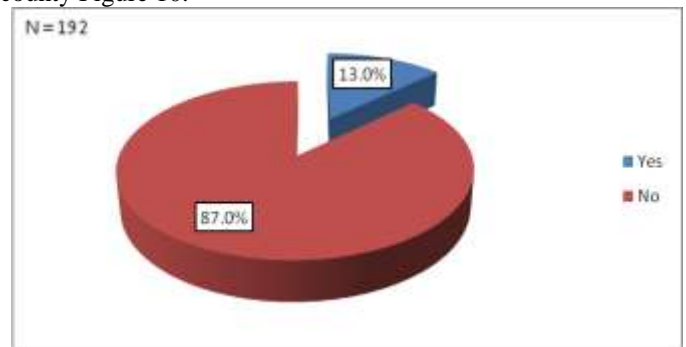


Figure 10: Distribution of responses of fish farmers on benefit from credit facilities in Siaya County, Kenya

Chi square test carried out on the responses indicated a highly significant ($p < 0.01$) variation ($\chi^2_{1,0.01} = 210.04$).

Figure 10 only 13% of respondents had benefited from credit facilities while majority (87.0%) had not obtained any loans. Further interrogation from FGDs revealed that most fish farmers in Siaya County were operating under the Economic Stimulus Programme which funded pond construction, seed as well as provision of free feeds. Other fish farmers especially in Gem and Alego were beneficiaries of Millennium Villages International project and were provided with fingerlings and feeds, besides the extension services. Other smaller NGOs and CBOs offered various support services to the fish farming households in Siaya. According to OECD (2010) the roles of development agencies should be to understand costs and benefits from different types of fish farming development. It should consider entire value chain by locating specific economic, social, political realities in implementation and invest in training and capacity building.

Extension Services

The results show that the government through fisheries Development was the main extension agent Figure 11.

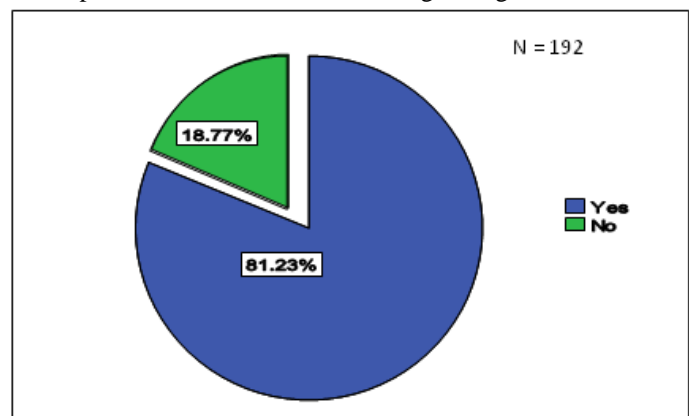


Figure 11: Distribution of fish farmer's responses on availability of Extension Services in Siaya County, Kenya

Chi square test carried out on the 'yes' and 'no' responses indicated that there was a highly significant ($p < 0.01$) variation in the responses ($\chi^2_{1,0.05} = 154.80$).

Majority (79.2%) said that extension services were available, 16.9% said that there

were no extension services while the rest (3.9%) were not sure whether extension services existed or not. Those who benefited from extension services were asked to indicate the frequency for services received Figure 12.

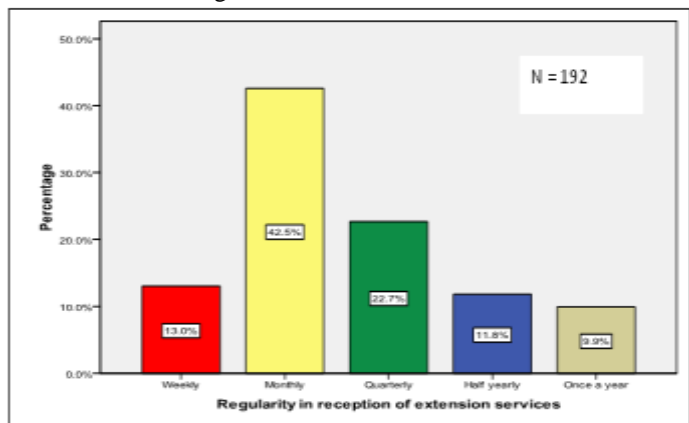


Figure 12: Distribution of fish farmers responses on regularity in reception of extension services in Siaya County, Kenya

Chi square test carried out on the responses indicate a significant ($p < 0.01$) variation in the $\chi^2_{4,0.01} = 117.91$.

responses(Frequency of services received were 13.0% weekly, 42.5% monthly and 22.7% four times a year, 11.8% received it twice a year while 9.9% received it once a year. It emerged that areas close to roads and market centres were commonly visited by the extension officer as compared to those in the interior which were not easily accessible. Also another significant feature was that fish farmers in project area under millennium Villages project received frequent extension services, while those close to Dominion fish farm never. According to ACIAR (2010) in Thailand, some fish farmers retained their entire fish harvest for home use then ceased production. This suggested that they were unaware of the need to sell a portion of each harvest to finance future output. Therefore, extension projects aimed at poor farmers should include, in addition to technical training, financial advice on enterprise performance.

Size of fish ponds

A study of pond size showed that majority of fish farmers (75.6%) had ponds that were less than 300 m²; few (24.4%) had ponds that were more than 300 m². According to Key informants during FGDs the recommended pond size by the government should be at least 300m² for economical production Table 2.

Table 2: Distribution of size of fish ponds in Siaya County, Kenya.

Pond Size (m ²)	Frequency	Percent
0-100	61	31.8
101-200	47	24.5
201-300	37	19.3
301-400	35	18.2
401-500	4	2.1
Over 500	8	4.1
Total	192	100.0

Chi square test carried out on the responses indicated a highly significant ($p < 0.01$) variation in the $\chi^2_{4,0.01} = 117.91$.

responses(The results show that 31.8% had 1-100 m², 24.5% had 101-200 m², 19.3% had 201-300 m²,

18.2% had 301-400 m², 2.1% had 401-500 m² while 4.1% had over 500 m².

When fish farmers were asked to indicate the number of ponds that they owned Figure 13. The results were majority (82.3%) of respondents had less than 5 ponds, 10.8% had 6-10 ponds, 16.4% had 11-15 ponds while only 0.6% had more than 15 ponds.

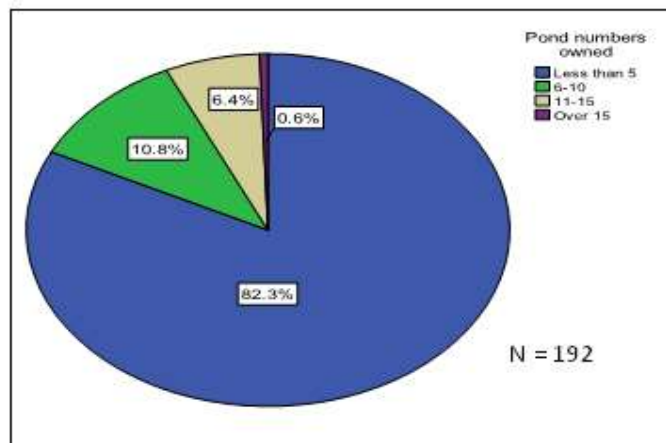


Figure 13: Number of fish ponds owned by fish farmers in Siaya County, Kenya

Chi square test carried out on the results indicated a highly significant ($p < 0.01$) variation in the $\chi^2_{2,0.01} = 658.55$.

responses(It was then established from FGDs that majority of respondents whose ponds were privately owned had only one acre of land implying that size of land determined the number of ponds owned. Interactions with the fisheries officers who were key informants revealed that a pond size of 300m² and above was considered viable as per government’s recommendations. There were cases where fish farmers had several ponds less than 300m² each these were not cost effective. Key informants were of the opinion that pond size and not number of ponds was critical in fish farming. In Bangladesh two thirds of total fish supplies is from poor smallholders as compared to capture fisheries. This is mostly attributed to; pond area where land and water quality are important in increasing productivity (Practical Action, 2010).The findings are in agreement with FAO (2011) it notes that until the mid 1990s, fish farming in Kenya followed a pattern similar to that observed in many African countries. This was characterized by small ponds, subsistence-level management, and very low levels of production.

Ownership of fish pond

Ponds constructed in the County were specifically for fish farming, the results Figure 14 indicate most of the ponds (95.8%) were privately owned while few (4.2%) were group owned.

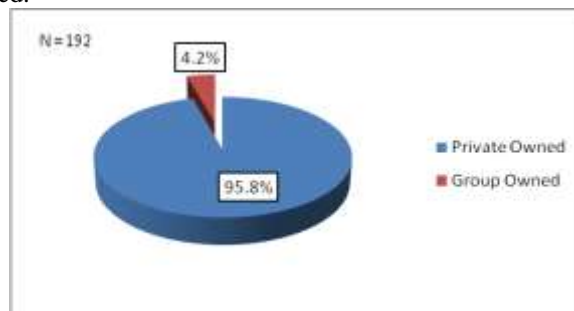


Figure 14: Ownership of fish ponds by fish farmers in Siaya County, Kenya

Chi square test carried out on the results indicated a highly significant ($p < 0.01$) variation in the responses ($\chi^2_{1,0.01} = 322.67$)

Indicating that majority of fish ponds were owned by individual fish farmers. FGD findings, supports the above results, it was observed, lack of corporation was prevalent in groups leading to pond neglect and low production as fish were left to fend for themselves in poorly managed ponds. Key respondents, asserted, there was a misconception by farmers under economic stimulus project that ponds on their farms belonged to the government and therefore refused responsibility of ownership. Fish were neglected and never fed adequately.

Production Level

Examination of the production level employed by fish farmers showed majority employed semi intensive system few extensive while non practiced intensive system in the county.

FGDs revealed most farmers preferred semi intensive method with mixed sex tilapia because the method was cost effective, easier to produce their own fingerlings and supplementary water feeds were available. Other reasons were that mixed sex tilapia production system provided the seed for subsequent stocking, since most farmers were unwilling to purchase a new stock of fingerlings due to high cost. This practice is not supported by GOK, (2010) who explain that; polyculture of tilapia with African catfish, mixed sex culture system of farming, has resulted in low pond productivity.

Stakeholders in fish farming

Apart from being their own sponsors, majority of respondents were receiving support from external sources, asked to name major stakeholders in fish farming results were as in Figure 15.

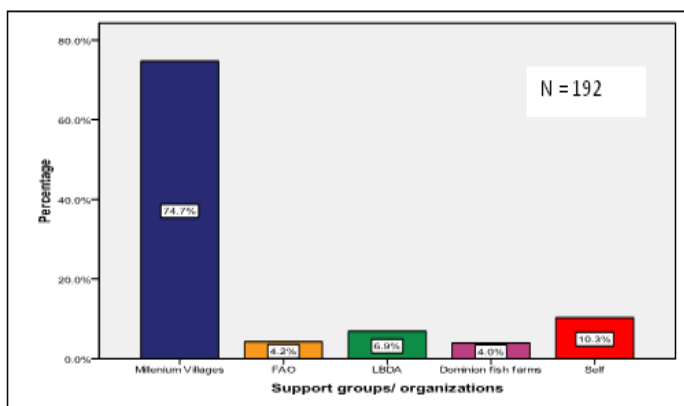


Figure 15: Stakeholders in fish farming in Siaya County, Kenya

The leading stakeholder was Millennium Villages (74.7%) followed by personal sponsorship (10.3%), Lake Basin Development Authority (6.9%), Dominion fish farm (4%) and FAO (4.2%). Key informants clarified that FAO was only working with a maximum of 14 fish farmers in the County on best management practices of fish farming, this explains their low rating. These were impact farmers whose performance would be replicated throughout the County. On the other hand Dominion is a private enterprise and was concentrating on its activities with less support to the community.

As for the type of support received from the various stakeholders fish farmers stated as below

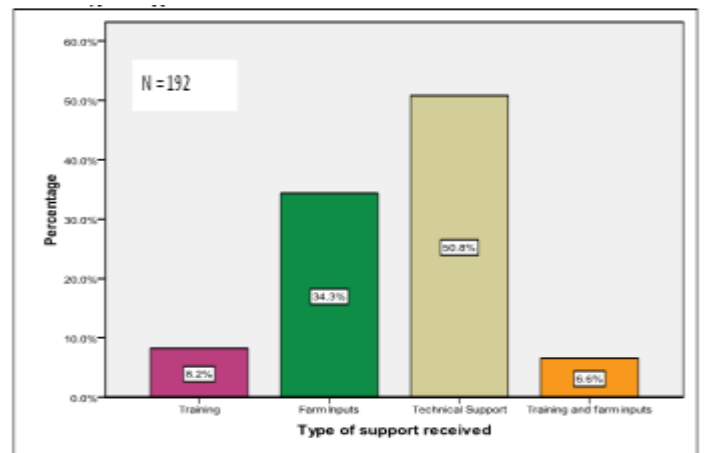


Figure 16: Type of support received from stakeholders in Siaya County, Kenya

Chi square test carried out on the results indicated a highly significant ($p < 0.01$) variation in the responses ($\chi^2_{3,0.01} = 505.12$).

The study then sought to establish whether there were differences in the results from questionnaires and FGDs conducted in Siaya and Yala. The rankings are given in Table 3. A Spearman Rank Order Correlation (r) was calculated to ascertain if there were differences or similarities in the stakeholder ranks in Siaya and Yala. The probable error (P.E._r) of the correlation was also obtained. The following are the results:

$r = 0.66 \pm 0.23$; P.E._r = 0.16

Table 3: Stakeholders' rankings in order of their contribution in Siaya County, Kenya

Stakeholder	Siaya Questionnaire Ranking	Yala Questionnaire Ranking
Millennium Villages	1	2
Self	3	5
LBDA	2	1
Government (ESP)	4	3
FAO	5	6
Dominion	6	4

The value of r is not significant ($p > 0.05$). Therefore, the two rankings were varied from each other. The differences in the rankings were due to the fact that residents in Yala benefited regularly from Dominion farms in terms of fingerlings, feeds and rice. On the other hand, Siaya residents had a negative stereotyping about Dominion farms, claiming that the limitations were too many. Unlike stakeholders in Siaya County, in Bangladesh a 5 year, Smallholder USAID project (DSAP) benefited 68,400+ farmers to address food security where more than 8200 tonnes of food were produced. Benefits at household-level were; 1542- 3046 kg per ha produced, while fish income was \$1130 -\$2200 per ha giving a total farm income of 13% - 17%. This project enhanced fish consumption to 46 -58 g per person per day and mostly empowered women. Overall, two thirds of total fish supplies in Bangladesh is from poor smallholders as compared to capture fisheries. Unlike stakeholders in Siaya County who have impacted little on poor households.

Conclusion and Recommendations

Based on the Socio economic indicators, it can be concluded that fish farming in the study area is economically rewarding and profitable. It is capable of creating employment, increasing income and improving the livelihoods of the people.

Based on the findings of the study, fish farming in the area is male dominated, however, women were used to manage the ponds and there was less participation of youth in fish farming. Females and youths need to be encouraged to participate in fish farming in the area as a means of increasing their income and improve their standard of living. Further it was established that the main production level was semi-intensive where mixed sexed tilapia production system provided seed for subsequent restocking.

The ownership structure revealed that most of the fish farms were owned by individuals who had little access to finance. Therefore, government participation in fish farming should be encouraged in the area to boost the quantity of fish available for consumption. Fish farmers should be organized into formidable groups such as self help and cooperative to realize economies of scale in the purchase of inputs and sale of their fish.

The following recommendations are made: adequate training programme on fish farming should be organized for fish farmers in the study area for the dissemination of research findings to fill the gap created by poor fish farming management practices.

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