1. Influence of social-economic factors, gender and the Fish Farming Enterprise and Productivity Project on fish farming practices in Kenya

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Abstract

Fish contribute 7 billion shillings to the Kenyan economy annually and fish processing, value addition and marketing provide excellent opportunities for the development of Public-Private partnerships. Government intervention in fish farming in Kenya started in 1921 when the colonial government introduced trout, common carp and black bass into the country. Despite many government initiatives, fish farming has not been fully integrated with other farming systems and its contribution to the national economy is small. A study was done to characterize fish farming practices in Mwea Division of Kirinyaga County, in Kenya. Specific objectives of the study were to evaluate how social-economic and gender factors influenced fish production, and to explore the preliminary influence of the Fish Farming Enterprise and Productivity Program (FFEPP) on fish farming practices and production in Mwea Division.

Over 80% of fish farmers in the division were recruited and funded through the FFEPP. Gender had a significant influence on fish management practices. Farmers funded through the FFEPP had larger ponds and stocked and harvested more fish than self-funded farmers while the latter group fertilized and drained their ponds more frequently. They also took less time to harvest (7.6 compared to 9.2 months) and harvested heavier fish (0.5 kg) than farmers under the FFEPP (0.27 kg). Most of the fish harvested were sold on the farm to neighbours, friends and family. All the extension officers sampled had at least a diploma and all of them indicated that they walked to meet farmers. The findings of this study are useful to policy makers, Ministry of Fisheries Development, Researchers and other stake-holders in Agriculture and Development.

Key words: *catfish, Economic Stimulus Programme, fish production, fish marketing, pond fertilization, Tilapia*

Introduction

Ninety five percent of fish landings in Kenya are from fresh water lakes, 3% from marine sources, and 1% from aquaculture (Ministry of Fisheries Development, 2006). Lake Victoria produces over 90% of all fish consumed and exported from Kenya, while Lake Turkana produces 6% of the fish. Other lakes and rivers contribute 2% of the national fish production (Odada et al 2004).

Lake Victoria is currently experiencing numerous challenges such as invasion by water hyacinth, loss of biodiversity, eutrophication and pollution among others (Johnson 2009). Fish catches from the lake and other fresh water lakes have declined.

Recently, the government identified fish farming as one of the sectors to benefit from the Fish Farming Enterprise and Productivity Program (FFEPP) and allocated more than three billion Kenya shillings for the sector between 2008 – 2011 financial years (MOFD 2011). The program was implemented in two phases funded by the Government of Kenya. Phase One of the project was funded under the Economic Stimulus Programme, while the second phase was funded under the Economic Recovery, Poverty Alleviation and Regional Development Programme (ERPARDP) ((MOFD 2010). The main aims of the project were to increase fish production, enhance food security, improve livelihoods of farmers, and provide employment for the youth (Uhuru 2010). In Phase 1 of the project, 1.12 billion Kenya shillings were allocated for the construction of 28,000 fish ponds in 140 constituencies (Uhuru 2009). In the second phase of the project, 2.72 billion shillings were allocated for construction of additional 200 fish ponds in 20 other constituencies, construction of 3 shallow wells in each constituency, purchase of pond liners, fingerlings and fish feeds which were to be given to farmers and construction of 80 mini fish processing and storage facilities (Uhuru 2010).

The success of this new government initiative depends on the extent to which factors that led to past failures in aquaculture projects are identified and mitigation measures put in place.

The overall objective of this study was to characterize the main social-economic and gender factors that influence fish farming in Kenya and to assess the preliminary influence of the fish farming enterprise and productivity program on fish production in Kirinyaga County in Kenya.

Materials and Methods

Study area

The work was done at Mwea Irrigation scheme in Kirinyaga County in Kenya. The scheme covers an area of 12,140 ha. Approximately 50% of the area is under irrigated rice and farmers live in 36 villages in the scheme with an average land holding of 1.6 ha. per family. Kirinyaga County has 1,376 fish farmers (MOFD 2010) with 1400 active fish ponds covering a total area of 342, 633 hectares, while Mwea Division had approximately of 250 fish farmers (MOFD 2012)

who were recruited under the Fish farming enterprise and productivity program. The study targeted farmers who owned or managed at least one fish pond.

Sampling procedure and sample size

Stratified random sampling was used where farmers to participate in the study were drawn from the population of fish farmers in all locations of Mwea Division. A list of fish farmers was obtained from the District Fisheries Extension office and farmers who participated in the study were selected randomly from all the 6 locations of Mwea Division as follows: Nyangati (30), Thiba (39), Tebeere (13), Murinduko (11), Kangai (9) and Mutithi (15).

The number of farmers selected to participate in the study was guided by the number of fish farmers in the Division and the resources available for the survey. The minimum sample size was guided by a formula based on statistical theory (Yamane, 1967) which assumes a 95% confidence interval and a maximum variability of P = 0.05. A total of 121 farmers were selected with the co-operation of the District and Mwea Division Fisheries officers.

Data collection and analyses procedures

A semi structured questionnaire with both closed and open ended questions was used as the survey instrument. Global positioning system (GPS) co-ordinates were taken for each homestead included in the study to facilitate researchers to make a follow-up. Secondary data were collected using documents from the Ministry of Fisheries Development headquarters in Nairobi and Fisheries reports from the Kirinyaga District Fisheries office and Mwea Divisional Fisheries Development Extension office.

All the data were cleaned, edited, sorted and entered into the computer. Descriptive statistics consisting of frequencies, means and modes were computed for different data categories to facilitate comparisons. Data were analyzed using the Statistical Package for Social Sciences (SPSS version 16.0)

Results and discussion

Social-Economic factors that influence fish production in Kirinyaga County

Gender of respondents

The persons selected for the interview (respondents) had to be either the owners of the fish ponds, or took part in the management of the same. This condition was put in place to ensure that the respondents would have true information on pond management and other practices.

Majority of the respondents were men (Table 1). The explanation for this is that one of the conditions for participating in the FFEPP was that the farmer had to own land, and majority of registered land owners in Kenya are men. It was also noted in this study that over 90.3% of households sampled were headed by men.

Table 1: Socio-economic aspects of participating farmers

	Frequency	Percentage
Gender of respondent		
Female	31	25.6
Male	90	74.4
Age of respondents		
20 - 30	8.0	6.7
30 - 40	33	26.9
40 - 50	28	22.8
50 - 60	26	21.8
Over 60	26	21.8
Education		
Primary level (Grade 8)	47	38.7
Secondary level (Grade 12)	53	43.7
Post-secondary level	21	17.6

Age of the respondents

Fish farming is done by farmers across all age categories (Table 1), with majority of them below 50 years of age. This has important implications for adoption of new technologies. Wetengere (2009) stated that adoption of fish farming technologies in Eastern Tanzania was influenced by level of education of farmers, gender, age, education, income, religious beliefs and knowledge and skills of the farmer among others. In a study by Polson and Spencer (1991), age was positively correlated with adoption of fish farming technologies with younger farmers being more likely to try new technologies than older farmers, and harvesting more fish per year than the older farmers.

Education level of respondents

Majority of the respondents had attained a secondary school education while only a smaller number had post-secondary school training (Table 1). Studies by Kimenye (2001) showed that formal education was positively correlated to the probability to adopt farming technologies. A farmer with a higher level of formal education was more likely to adopt fish farming than one with less formal education. The author attributed this to the fact that much of the fish farming technologies were communicated to farmers through pamphlets, newsletters, trainings and seminars, which were conducted in the English language. A farmer with formal education was more likely to attend such training seminars and to read, comprehend and apply information packaged in English pamphlets, newsletters and other documents used to transfer technologies in fish farming.

Gender influences on fish management practices

There were differences between men and women farmers in relation to size of ponds, where men tended to have larger ponds than women (Table 2). There were also differences in frequency of fertilizing ponds and in the type of fertilizers used in fertilizing ponds. These gender disparities arose from the differences in the economic status of men and women, where women tend to have less access to land, capital and credit to increase pond sizes, improve management and purchase commercial fertilizers. In a study on gender inequality in Agricultural households in Kenya, Wagithi (2003) observed that women in Kenya are generally less educated than men, and those who work as hired labour in farms earn less than their male counter-parts.

Table 2: Gender influence on fish management practices

Management practice	Male	Female	t-value	SEM
Size of pond (M^2)	308	281.4	0.05	13.4
Frequency of topping water (times /year)	2.41	2.38	0.88	0.22
Frequency of draining pond (times/year)	1.24	1.23	0.98	0.16
Number of fingerlings stocked	1002	922	0.35	84.92
Frequency of pond fertilization (number of times/production cycle)	2.01	1.68	0.035	0.15
Fertilizers used	1.64	1.33	0.086	0.18

1 = Animal manure while 2 = Commercial fertilizer

Extension methods preferred by farmers

Majority of the farmers preferred to be visited by Extension Agents, while a smaller number preferred organized training sessions (Table 3). Only a small percentage of farmers preferred field days, media and agricultural shows as the main methods used to train them on fish farming.

According to a study by Maina et al (2012), there were 18 Aquaculture Extension officers in Kirinyaga County, with 3 of them covering Mwea division which had approximately 250 fish farmers. Each of the extension officers made between 20 – 30 farm visits per month. The extension officers quoted poor transport facilitation, lack of in-service training and poor investment in aquaculture by farmers as the main challenges they faced in doing their work.

Table 3: Extension methods preferred by farmers

Method of extension	Frequency	Percentage
Visits by Extension Agents	61	52.2
Organized training sessions	41	35
Agricultural Shows	3	2.6
Field days	8	6.8
Radio/Media/Internet	4	3.4
Total	117	100.0

Fish species cultured

The number of respondents who answered this question were 111 out of 121 questionnaires administered, giving a 91.7% response rate. Majority of the respondents kept mixed sex tilapia in monoculture (Table 4), while a smaller number practiced polyculture of tilapia and catfish. Rearing catfish in monoculture was rare among farmers who told enumerators that catfish fingerlings were not readily available and the government had provided them with mixed sex tilapia fingerlings in the fish project.

Table 4: Fish species cultured

	Frequency	Percentage
Tilapia (monoculture)	67	55.4
Catfish	11	9.1
Tilapia and Catfish	33	27.7
Total	111	100

Keeping mixed sex tilapia in monoculture is a major challenge to increased fish production because of excessive breeding of mixed sex tilapia in ponds (Rakocy and McGinty, 1989). This results in competition for feed and oxygen and leads to production of small unmarketable fish.

Influence of the fish farming enterprise and productivity program on fish production

Most of the fish farmers in Mwea were funded by the government through the FFEPP program. All self funded farmers started fish farming before the start of FFEPP in 2009. The government, through the FFEPP gave money to selected fish farmers to construct fish ponds, purchase fish fingerlings and fish feeds for at least 6 months. Fish farming was one of the sectors selected to for funding through the Economic Stimulus Programme in Kenya. Majority of fish farmers got information to start fish farming through this government programme, while a small percentage got this information through neighbours, mass media and other means.

The main management practices compared between self funded farmers and farmers funded through the FFEPP are listed in Table 5 below. The average number of ponds per farm was 1.4 ponds for self funded farmers and 1.3 for the farmers funded through FFEPP. Farmers in the government fish project had significantly bigger ponds 300 m^2 than farmers who were self – funded. This was explained by the fact that through the project, government constructed ponds for farmers measuring 300 $m^{2.}$

Table 5: Source of funding and information to start fish farming

Source of funds to start aquaculture	Frequency	Percentage
FFEPP	71	59.7
Self- funded	16	13.5
Both	32	26.8
Total	119	100
Source of information to start aquaculture		
Recruited through FFEPP	88	72.7
Mass media	3	2.5
Neighbours	20	16.5
Others	2	1.65
Total	121	100

Influence of FFEPP on Fish management practices

Farmers in the FFEPP program had larger ponds than self funded farmers (Table 6). Through the government fish project, the government constructed ponds measuring 300 m^2 for farmers participating in the project and stocked the ponds with 1000 fingerlings. Self funded farmers fertilized their ponds more times per month than those under the government program and changed water in the pond more often. For FFEPP farmers, the production period was longer than self funded farmers which has implications on profitability and sustainability of the project.

Time taken to harvest determines the number of fish cycles that can be grown per year and hence affects farmers' profits.

Table 6: Influence of the FFEPP on pond fish management practices

Management practice	FFEPP Farmers	Self funded Farmers	*p*	SEM
Category of farmers (% of total)	86.5	13.5	-	-
Number of ponds	1.2	1.4	0.20	0.16
Sizes of ponds (m^2)	300	261	0.001	11.4
Fingerlings stocked	1061	655	0.000	98.6
Number of times pond fertilized/month	1.76	2.42	0.007	0.24
Number of times fish fed/day	1.67	1.73	0.598	0.14
Number of times pond is drained/year	1.06	1.70	0.001	0.15
Time (months) taken to harvest	9.20	7.6	0.096	0.94

Fish production and marketing aspects were evaluated among farmers who had harvested more than 100 fish in the most recent harvest (Table 7). The mean number of fish harvested per production cycle was higher for self funded farmers than for farmers under the government fish project and the average weight of fish was also higher. Farmers under the government fish project sold a higher proportion of the harvested fish than the other farmers and most of their fish was sold at the pond site, mostly to neighbours and friends. Self funded farmers consumed a higher proportion of the harvested fish at home and also sold their fish to markets and institutions away from their farms. It is probable that having been in fish farming for a longer period of time, they had established their markets beyond their neighbours. Most of farmers on the government fish project quoted lack of markets as a key challenge preventing them from up-scaling their enterprise.

Table 7: Influence of the FFEPP programme on fish production and marketing

Production/marketing Indicator	FFEPP farmers	Self Funded farmers
Mean number of fish produced/cycle/farmer/year	207	393
Average wt of fish harvested (kg)	0.26	0.50
Percentage of fish sold	85.8	81.8
Percentage of fish consumed at home	14.13	18.15
Proportion sold at farm-gate (%)	66.7	37.5
Proportion sold in other markets (%)	33.3	62.5
Price per fish (Ksh)	80	94

Ksh. refers to Kenya shillings. 1 US$ = 85 Ksh.

Discussion

In this study, a descriptive research design was used to study the main social-economic and gender factors that influenced fish production in Mwea Division of Kirinyaga County in Kenya.

The preliminary influences of the Fish Farming Enterprise and Productivity Program on fish management practices and fish production were also evaluated and documented. The FFEPP has created a lot of awareness on fish farming and most of the farmers farming fish are doing so under the project. Management practices, however, are still at a low level and production is low.

Some of the main challenges are the unavailability of catfish fingerlings and use of mixed sex tilapia in monoculture, and lack of well established fish markets. Mwea has favorable climate for tilapia farming with mean temperatures of 25– 26ºC and the slow growth of fish can only be attributed to use of mixed sex tilapia and poor pond management practices.

In Kenya, fish farming management practices have not been characterized and there is inadequate information on factors that influence fish production. The main goal of the FFEPP was to promote fish farming as a means of facilitating attainment of food and nutritional security, improve livelihoods and provide jobs particularly for the youth. The preliminary influence of this program on fish farming and production has not been documented and this study has provided some of the initial influences of the project on fish farming.

Conclusions

- The FFEPP has created a lot interest in fish farming even among communities that traditionally did not eat much fish. It has also increased the number of fish farmers with over 80% of the sampled farmers reporting that they were funded through this project.

- The method used to select farmers to participate in the project may have disadvantaged women as only 26% of women were found to be participating in the project, either as managers or owners of the pond. Further, there were gender differences in sizes of ponds and their management, which may require a gender responsive extension approach.

- Mixed sex culture of tilapia should be discouraged.

- The growth rates of fish were low and fish took too long (9.2 months) before harvest. This influences the number of fish production cycles per year and lowers profitability of the enterprise, which may make the project unsustainable.

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