

External Financial Sources and Its Influence on Sustainability of Fish Farming in Matungulu Sub-County, Machakos County

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Abstract: Kenya is endowed with numerous aquatic resources with aquaculture potential. However, the ever increasing population is not in tandem with the rate of job creation hence slow economic growth and development. Farmers in suitable areas are turning into fish farming as a way of producing high quality food either for their families or for the market, and as a way of earning extra income. Sustainability of pond fish farming is in line with Millennium Development Goal number 1 which calls for reduction of poverty in the world by 50 percent by the year 2015 and also in the government's agenda for National Development. The study sought to examine the influence of capacity building on sustainability of fish farming projects in Matungulu Sub-County. The target population of the study was fish farmers and Fisheries' officials in Matungulu Sub-County. The study employed a descriptive survey design. Data was collected using questionnaires and analyzed using the Statistical Package for Social Sciences. The study established that for the project beneficiaries who had employed fish farm attendants, 69.1 per cent said external sources greatly influence sustainability of fish farming. More disaggregation showed that 67.9 per cent thought external sources greatly influences sustainability of fish farming. The study further found that 61.8 per cent of the respondents who owned land also thought external sources influence sustainability of fish farming to a great extent. The study concluded that sustainability of pond fish farming in Matungulu Sub-County is greatly influenced by financial stability of project beneficiaries and not land availability.

Keywords: Aquaculture production, Sustainability, Financial sources, Pond fish farming

1. Introduction

1.1 Background to the Study

The establishment of subsistence aquaculture has been heralded as a means of achieving economical and social sustainability as it is seen to augment farm livelihoods by supplementing household subsistence needs and improving cash income, a study on perception towards subsistence aquaculture in Tabasco, Mexico, USA by [4] reveals.

In china, [42] state of world fisheries, there has been an increase in the world per capita fish consumption owing to substantial increase in fish production. China's share in the world fish production has grown from 7 percent in 1961 to 35 percent in 2010. This substantial growth has been driven by growing domestic income and increase in diversity of fish available. [25] indicates that poverty and food security are common conditions among minority communities in Vietnam's remote northern upland regions. This is because gender roles and division of labor among these communities have been defined and structured over the years, with the task of fishing being a domain and responsibility of men. Women have had very little if any involvement particularly in areas that require decisions about which technology to use, what investment to make or how revenues could be increased.

Fisheries and aquaculture has grown substantially in the last three decades with an average rate of 3.6 per cent per year since 1980. It is estimated that in 2008, 44.9 million people were directly engaged, full time or more frequently part time, in capture fisheries and at least 12 per cent of those were women [10]. On average each job holder provided for three dependants or family members. Thus, the primary and

secondary sector support the livelihood of a total of about 540 million people or 8.0 percent of the world population.

In other studies conducted by [2], the authors sought to provide a framework for examining fish linkages to food and nutritional securities by highlighting the key role of pond fish farming in the developing countries. Example taken from Asian countries showed that there was steady growth to employment, income and consumption. [6] reported that an estimated 840 million people lack adequate access to food and about 25 percent of these are in sub Saharan Africa. As population grows and puts more pressure on natural resources, more people will probably become food insecure, lacking access to sufficient amount of safe and nutritious food for normal growth development and an active healthy life [40].

In Africa, more than 10 million people rely on fisheries as a vital entrepreneurial activity. Over 2.5 million fishers make business opportunities available for many processors, traders, and micro enterprises in relevant industries. To most of them the fishing industry is a good avenue for income generating activity. Of Africa's 800 million people, over 200 million are regular fish eaters. To them fish is an essential aspect of their nutrition, accounting on average for 22 percent of their animal protein intake reaching up to 70 percent in some countries [1]. Africa is an area of the world where chronic poverty and malnutrition continues to be widespread. [32], state that in Africa, there is strong evidence of high increase in poverty levels among fish workers.

In Malawi a study by [9] on the impact of integrated aquaculture on small scale farms found out that the income of households owning fish ponds was 1.5 times higher than

that of households without fish ponds. [9] also observed that through employment and income generation from aquaculture and subsequent higher purchasing power, fish farming households often manage to improve their diets through increased food security.

[30] argues that majority 68 percent of fish farmers in Nigeria are in the age bracket of 41-50 years of age, while 22.5 percent are in the age bracket of 31-50 years, indicating that few young and old people are involved in fish farming. From the same research, fish farming in Nigeria is dominated by those with tertiary education. This is because fish farming requires a lot of technical and scientific knowledge to be successfully undertaken. [16] indicate that aquaculture can provide an important contribution to household financial stability. In Tanzania, between 65 to 90 percent of fish production is sold compared to only 15 percent agricultural produce in same community. Financial stability gives access to other benefits such as education, health services, clothing and other foodstuffs.

According to [33], fish farm sizes in Kenya range between 1 and 2 hectares. Those with farm sizes less than 1 hectare are regarded as small scale fish farmers. Those with farm sizes more than 4 hectares are those with some good number of years of experience and have gradually expanded their farms sizes as they make profit. [33] argues that demand for fish and fish products increases as population increases. This put pressure to already stressed aquatic ecosystem hence need for governments to introduce fish farming in nontraditional fish farming areas. Pond fish farming began in the 1920's initially using tilapia species and later including the common carp and the African catfish. In the 1960's rural fish farming was popularized by the Kenya Government through the 'Eat more fish campaign' as a result of this effort, tilapia farming expanded rapidly with the construction of many small ponds especially in Central and Western Provinces [33].

The Fisheries Act, Cap 378, the Maritime Zones Act, Cap 371 and other subsidiary legislation such as the Exclusive Economic Zone regulations 1990 and the Fish Quality Assurance regulations 2000 are the main legal instruments governing the development, management, exploitation, utilization and conservation of fisheries in Kenya. The government policy for this sub sector has been to maximize production by proper utilization of available resources. The government has continuously promoted aquaculture as an alternative cheap source of protein and income [11]. Today, following the renovation of several government fish rearing facilities, the establishment of research programs to determine best practices for pond culture, and intensive training program for fisheries extension workers, there is renewed fish farming in Kenya. Farmers in suitable area are utilizing appropriate techniques and good management resulting in high yields and good income [37].

The fisheries sector in Kenya consists of three major sub-sectors namely inland fisheries, marine fisheries and aquaculture. Aquaculture has remained at subsistence level since independence in 1963, but has recently been boosted when the government listed fish farming as one of the key activities in the Economic stimulus programme [19]. The government hopes that this programme will provide

employment, provide income to farmers as well as to provide a source of protein to many Kenyans. The decline of fish stock in the country over the past decade has rekindled efforts geared towards revamping the sector. And in what is seen as a paradigm shift from over reliance on fresh water fish, the government is now implementing an elaborate programme under the Economic Stimulus Programme (ESP), which aims at increasing aquaculture productivity and raising the income of farmers and other stake holders. Fish farming program under ESP currently has 13,444 fish ponds already constructed. The programme was poised to boost fish production in the country to 7560 MT from the current 4250 MT [7].

1.2 Statement of the Problem

The Kenya Government in the financial year 2009/2010 under the ESP introduced commercial fish farming in 140 political constituencies [36]. Each constituency benefitted with 200 fish ponds, 15 kilograms of fertilizer and 1,000 fingerlings. In the second phase of the exercise 2011/2012 financial year, 20 additional constituencies were brought on board adding an extra 100 fish ponds for the 140 constituencies and 300 fish ponds for the new constituencies making a total of 50,000 ponds with an estimated cost value of 15 million US dollars. The success of this new Government initiative brought about renewed strength in pond fish farming in Matungulu Sub-County.

The Government under the Economic stimulus program, allocated money for the set up of fish ponds in various constituencies and small processing plants that would serve as nerve centers for aquaculture, value addition and marketing at the constituency level. However this did not go as planned and the fish ponds are faced with a number of problems including water draining out while those fish ponds with water have no fingerlings. Other fish ponds are dry or overgrown with weeds. To the best of my knowledge no study has been conducted to ascertain the projects sustainability of this new government initiative.

Matungulu Sub-County is particularly characterized by high level of poverty with poverty index currently standing at 40.38 [20] and despite the Government's effort in providing food security and employment, fish farming has not been fully adopted as a means of addressing food security. Out of the 300 fish ponds constructed, only 100 ponds are viable projects. Many farmers have neglected their ponds citing challenges from project planning to implementation. The MOFD has already constructed 300 ponds but most of the ponds are not fitted with liners since majority of the farmers were not able to afford. Other farmers have reported challenges in pond management and marketing of fish products.

Despite all these challenges fish farmers in Matungulu are increasing their production in order to satisfy the demand in the sub-County. This will depend on the extent to which factors that influence sustainability of fish farming in the area are identified and documented so as to achieve sustainable fish farming. What is not known is the extent to which selected factors influence the sustainability of fish farming, a gap this study intends to fill.

1.3 Objective of the Study

The objective of this study was to establish influence of external financial sources on sustainability of fish farming projects in Matungulu Sub-County, Machakos County.

2. Literature Review

2.1 Overview of the Pond Fish Farming in Matungulu Sub-County

Pond fish farming in Matungulu was rolled out under the ESP, an initiative of the Government of Kenya, to expand economic opportunities in rural areas for employment creation. The programme aimed at improving nutrition and creating employment and income opportunities. The Government through the Ministry of Fisheries Development was in-charge of constructing pond and training young people on fish harvesting, marketing, fish farming and fish business practices. The implementing agency was the MOFD while the fish farmers were to be the co-implementers. For one to qualify for funding the following requirements were to be met; be unemployed Kenyan, fish farmers, women and public institutions; have land falling within the identified potential areas; and be willing to construct a pond not measuring less than 300m².

Labor for pond construction was sourced from the youth within the constituency while the Government was required to supply fingerings and stocking of ponds. However, harvesting, post harvest handling and marketing of fish was left to the fish farmers under the guidance of competent aquaculture extension officers [5], [17].

2.2 Influence of Financial Access on Sustaining Fish Farming Projects

[12] study on antipoverty program found out that citizens were well involved in the program due to material gains accruing from the projects. [39] argues that the poor and marginalized felt stigmatized and rarely interacted with others in community projects. Lack of capital has been identified in many studies as a major constraint in sustaining community projects. [22] found out that lack of affordable credit was a major impediment to intensify modern farming methods and technology. [8] did a study on improving project implementation in agricultural sector in South Africa and delimited his variables to resistance to change, financial sources, capacity development and competition from off-farm activities, from the study, it was established that financial stability is a key issue on sustainability of fish farming projects hence there is need to generate more knowledge.

According to [38] sustainability of food based projects in agriculture are influenced by physical access to land, insecure land ownership, limited use of fertilizers and weak support services of research and development. In Kenya, The fish farming projects were aimed at improving nutrition and creating 120,000 employment and income generating opportunities. Over 40,000 fish ponds have been constructed in 140 constituencies at an estimated cost of K.shs. 1.12 billion according to Finance Ministry in 2009. The youth

within the benefiting constituencies provided labor whilst the construction of fish ponds and supply of fingerings and nutrition feeds was provided for by the Government, ESP Package page 10. Lack of information and cost of commercially produced feeds and employment of low pond management practices has resulted in stagnation of fish farming leading to household food insecurity and low contributions to livelihoods in Kenya [19].

The occupation of different members of a household will affect their income and the availability of labor for agricultural activities. The type of occupation will also determine available savings that can be invested in agricultural activities. However, this will depend on farmer's priorities as some farmers may prefer to invest their money in some non- agricultural activities. [26] concluded that the daily income of the community members was significantly associated with sustainability of projects. [31] found out that most women engaged in farm activities as men went for off-farm work. They concluded that for greater success and sustainability, efforts to promote fish farming should therefore mostly target women. This study established the influence of financial stability on sustainability of fish farming projects.

[14], Stated that among the most recurring problems faced by fish farmers was lack of capital to run fish farming projects. Several reports indicated that low funding from both the Government and the private sector together with lack of continuous flow generally affected the daily activities of the projects. [38] in his study pointed out that, while lack of capital was a major setback in most food based programs; a lot of resources were held up in unproductive assets or even misappropriated by the management.

There have not been adequate studies on sustainability of fish farming projects for sustainable food security in Matungulu Sub-County and therefore a knowledge gap on the extent to which selected factors influence sustainability of fish farming project exists, thus the need for this study. The researcher also wished to establish whether the financial stability of the farmer, with reference to sources of income and frequency of the income has an influence towards sustaining the fish farming project.

[42] state of world fisheries and aquaculture indicate that while men are key decision makers in food based projects, women are the main stay of small-scale agriculture. They provide farm labor force and day to day family subsistence yet they encounter more difficulties than men in gaining access to resources such as land, credit and productivity-enhancing inputs.

According to [23] participation of women and youth throughout the project life cycle is very important for effective implementation and sustainability of food based projects. The report advocates for women's capacity building, provision of credit, technology development as well as integrating gender of across age in implementing and sustaining the food based projects.

[18] found that in Zimbabwe, age distribution had a key role in determining labor distribution and those household with

more members adopted fish farming projects introduced by the government as a means of improving food security within the community. The same report established that education had a role to play in encouraging innovation, optimism and tolerance in food related projects. [28] in his research conducted in Taita District, Wundanyi location found out that most of the farm workers were women aged between 35 and 60 years, closely followed by women of advanced age group. Some men over 60 years also assisted in the farming equally. [35] explains that women make a major contribution to economic production of their communities and that there cannot be societal transformation without their involvement, support and leadership in development process. Most of the studies reviewed have discovered the significance of involving women and youth in development processes.

Youth represent 30 percent of Kenya's population and their unemployment is twice the country's average. Almost one third of Kenyans are between 15 and 29 years and that the total reached 11 million people in 2006 compared to 8.5 million in 1999 [34]. Youth in Kenya face serious challenges including high rates of unemployment and underemployment. The government through the ESP fish farming projects, targets this potential energy from the youth, this will consequently improve the living standards of majority of Kenyans hence enabling the government's economic growth for the achievement of millennium development goals and Vision 2030 [34].

Lack of education and low level of literacy make access to information difficult and commonly undermine the confidence and skills needed to enter public life whether at village, community, local or national level [15]. Ideally, education should contribute to economic development, equalize opportunities between social classes, reduce disparities in the distribution of income and prepare the labor force for a modern economy [3]. Provision of adequate education levels will enhance capacity to service actively in community projects [4]. Education levels as brought to light by [41] is key to project implementation. Giving education to young mothers in United Kingdom resulted in their participation in community projects leading to self confidence and self esteem. [24] in a study conducted in Senegal, established that non-formal education had a key role in promoting sustainability of community projects.

[22], in his study in Kiambu, Kenya, established that the education level of households heads was an important factor influencing what development projects people would initiate collectively, which new farming technologies would be adopted and what farming enterprises to undertake. Education has a tremendous influence on food security status. [29] explains that sustainability of food security projects is associated with level of education of the project beneficiaries. Illiteracy level in the rural areas of Vihiga District leads to poor implementation and sustainability of the agricultural programmes by the donors and also by the government.

[26] while studying factors influencing sustainability of foreign aid projects in Imenti North found out that where members had primary education, the donor funded projects

were about 58 times more likely to succeed compared to where the community had no education.

2.3 Theoretical framework

Several theories were established to be related to the study. These included theory of community development, theory of decentralization and Citizen Participation theory. The citizen participation theory was found more applicable compared to other related theories. Hence the citizen participation theory was specifically used to guide the study.

2.3.1 Citizen Participation Theory

Citizen participation theory states that participation is a desired and necessary part of all community development activities. Citizen participation is the process that can meaningfully tie programs to people by enhancing ownership. Citizen participation is a process that provides individuals with an opportunity to influence public decision and has long been a component of the democratic decision making process. The Kenyan government has borrowed much of this theory with an aim of eradicating hunger and poverty through involving the community in project implementation and sustainability. Through the fish farming projects the government aimed at improving development and food security status in Matungulu Sub-County community by actively involving the community in the implementation and sustainability of fish farming projects thus enhancing community ownership of the programme for sustainable food security.

The theory is again applicable to this study on factors that influence sustainability of fish farming projects in Matungulu Sub-County, because according to Millennium Development Goal Number 1, there is universal need to reduce poverty level by 50 percent before 2015. In Kenya, fish projects under the Economic stimulus programme are expected to provide income to fish farmers as well as create employment, thus contributing towards poverty reduction and good nutrition for its citizens.

3. Research Methodology

3.1 Research Design

This study employed a descriptive survey design, a design used in preliminary and exploratory studies to allow researchers gather information, summarize, present, and interpret for the purpose of clarification. The design enabled the researcher to conduct research among fish farmers and government officials in order to find out factors influencing the sustainability of fish farming projects in Matungulu Sub-County.

3.2 Target Population

Matungulu Sub-County has a total population about 300 fish farmers, the major economic activity being subsistence farming, MOFD Matungulu. The unit of analysis in this study was fish farming projects in Matungulu Sub-County. The target population for this study was 305, comprising of 300 fish farmers and 5 extension officers.

3.3 Sample Size and Sampling Procedure

Simple random sampling technique was used to select the respondents. In addition the information from the fish project officers was purposively sampled. This technique allowed the researcher to use respondents who had the required information with respect to objectives of the study [27]. [21] sample size table is universally accredited and provides a reasonable sample size depending on the size of the population on the study [21]. Therefore, out of the population of 305 target population, the sample size was 165 fish farmers and 3 MOFD Matungulu Sub County officials.

3.4 Research Instruments

This study employed individual fish farmer’s questionnaire and officials in fisheries department questionnaire, for data collection. This is because the questionnaire offered a considerable advantage in administration and provided an even stimulus to large numbers of people simultaneously. A questionnaire also provided the investigator with a convenient way of data collection, giving respondents’ freedom to answer the closed ended questions without fear or favor; and also made independent suggestions in the open ended questions. The questionnaire, being anonymous assisted in producing more candid answers than it could have been possible in an interview set up [13].

3.5 Data Analysis Techniques

The raw data obtained from the study was organized and converted into numerical codes representing variables. The organized and well coded data was then analyzed through descriptive statistics. Qualitative data was analyzed thematically to complement and substantiate the quantitative data analysis. The quantitative data was analyzed and presented using percentages and frequency distribution tables. Calculations were computed using the statistical package for social sciences (SPSS).

4. Data Analysis and Interpretation of Findings

4.1 External Financial Sources in Relation to Gender

Table 4.1 Extent of External Financial Sources in Relation to Gender

	Great extent	Low extent	No extent	Total
Males	95 (57.6%)	12 (7.3%)	2 (1.2%)	109 (66.1%)
Females	48 (29.1%)	6 (3.6%)	2 (1.2%)	56 (33.9%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

Disaggregation of the respondents by gender revealed that males were the majority, 109 (66.1 per cent) while females comprised 56 (33.9 per cent). The males who greatly thought external sources influenced sustainability of fish farming comprised 95 (57.6 per cent) of all the respondents while the females with that perception of great influence represented 48 (29.1 per cent) of the total. Similarly, the respondents who said external sources had low influence on sustainability were 12 (7.3 per cent) and six (3.6 per cent) males and females respectively. An equal proportion of two (1.2 per cent) for both male and females noted that there was no influence of external sources on fish farming

sustainability. The study findings pointed to the fact that external sources greatly influenced sustainability of fish farming in Matungulu sub-County. This indicated that pond fish farming is not financially self sustainable without reliance on other external sources of finance. The study findings also concur with observations made by the WORLD BANK (2007), which stated that in Kenya men were the key decision makers in farming while women played a bigger role towards sustaining food based community projects.

4.2 Extent of External Financial Sources in Relation to Age

Table 4.2: Extent of External Financial Sources in Relation to Age

	Great extent	Low extent	No extent	Total
30 years and below	16 (9.7%)	2 (1.2%)	0 (.0%)	18 (10.9%)
31 to 40 years	31 (18.8%)	8 (4.8%)	1 (.6%)	40 (24.2%)
41 to 50 years	35 (21.2%)	5 (3.0%)	0 (.0%)	40 (24.2%)
51 to 60 years	37 (22.4%)	3 (1.8%)	1 (.6%)	41 (24.8%)
above 60 years	24 (14.5%)	0 (.0%)	2 (1.2%)	26 (15.8%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

Majority of the fish farmers were in the age bracket of 51-60 years old, while those aged above 50 years were 40.6 per cent and those aged 30 years and below were only 10.9 per cent. This implied that the youths represented a small proportion of all the fish farmers. Hence, similar to the findings in a study by [30] in Nigeria, where majority of the fish farmers were in the age bracket of 41-50 years of age, few young people are involved in fish farming compared to old people.

The respondents who were aged 30 years and below, and thought external sources, greatly influences sustainability of fish farming were 16 representing 9.7 per cent of all the respondents. Those aged 31 to 40 years with that perception of great influence were 31 representing 18.8 per cent of the total. The respondents with the perception of great influence and aged 41 to 50 years were 35 representing 21.2 per cent of the total. In addition, those aged 51 to 60 years and perceived external sources to have great influence to sustainability were 37 representing 22.4 per cent. The respondents aged above 60 years and thought external sources, had great influence on sustainability of fish farming were 24 representing 14.5 per cent of all the respondents. The study is in agreement with the findings of [28] in Taita Taveta County which established that most of the farm workers were aged between 35 and 60 years.

4.3 Extent of External Financial Sources in Relation to Marital Status

Table 4.3: Extent of External Financial Sources in Relation to Marital Status

	Great extent	Low extent	No extent	Total
Single	7 (4.3%)	2 (1.2%)	0 (.0%)	9 (5.5%)
Married	127 (77.4%)	15 (9.1%)	2 (1.2%)	144 (87.8%)
Widowed	8 (4.9%)	1 (.6%)	2 (1.2%)	11 (6.7%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

Marital status of the respondents unveiled that most of them 144 (87.8 per cent) were married, 11 (6.7 per cent) were widowed while singles represented nine (5.5 per cent). The respondents who were single and thought external sources, greatly influenced sustainability of fish farming were seven representing 4.3 per cent of all the respondents. Those who were married with that perception of great influence were 127 representing 77.4 per cent of the total. The respondents with the perception of great influence and widowed were eight representing 4.9 per cent of the total. In addition, respondents who were single and thought external sources, had low influence on sustainability of fish farming were only two representing 1.2 per cent of all the respondents. Those who were married with that perception of low influence were 15 representing 9.1 per cent of the total. The respondent with the perception of low influence and widowed was only one representing 0.6 per cent of the total. Only two respondents, who were either married or widowed thought external sources, had no influence on sustainability of fish farming. The study showed that married families are prominent in the society and with many members to provide for and thus the need to embrace fish farming for food security, nutrition and earn extra income for the families.

4.4 Extent of External Financial Sources in Relation to Level of Education

Table 4.4: Extent of External Financial Sources in Relation to Level of Education

	Great extent	Low extent	No extent	Total
Primary	5 (3.0%)	2 (1.2%)	1 (.6%)	8 (4.8%)
Secondary	35 (21.2%)	6 (3.6%)	0 (.0%)	41 (24.8%)
College	72 (43.6%)	9 (5.5%)	3 (1.8%)	84 (50.9%)
University	31 (18.8%)	1 (.6%)	0 (.0%)	32 (19.4%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

Majority of the fish farmers had attained college education which was in line with the findings by [30], where fish farming in Nigeria was established to be dominated by those with tertiary education. This is because fish farming requires a lot of technical and scientific knowledge to be successfully undertaken. All the respondents interviewed were involved in fish farming projects.

The respondents who had attained primary level of education and also thought external sources, greatly influences sustainability of fish farming were only five representing 3.0 per cent of all the respondents. Those who had attained secondary education with that perception of great influence were 35 representing 21.2 per cent of the total. The respondents with the perception of great influence and had attained college education were 72 representing 43.6 per cent of the total. In addition, those who had attained university level of education and perceived external sources to have great influence to sustainability were 31 representing 18.8 per cent. The respondents who had attained primary level of education and thought external sources, had low influence on sustainability of fish farming were only two representing 1.2 per cent of all the respondents. Those who had attained secondary education with that perception of low influence were only six representing 3.6 per cent of the total. The respondents with the perception of low influence and had attained college education were nine representing 5.5

per cent of the total. In addition, those who had attained university level of education and perceived external sources to have low influence to sustainability was only one representing 0.6 per cent. Only one respondent, who had attained primary level of education thought external sources, had no influence on sustainability of fish farming. Similarly, only three respondents perceived external sources had no influence and had attained college education.

The study correlates with that of [22] in Kiambu, which established that the educational level of household heads was an important factor influencing what development projects people would initiate and also that of [29], who found out that sustainability of food security projects was associated with level of education of project beneficiaries.

4.5 Extent of External Financial Sources in Relation to Type and Size of Family

Table 4.5 Extent of External Financial Sources in Relation to Type and Size of Family

	Great extent	Low extent	No extent	Total
Female headed	13 (7.9%)	2 (1.2%)	1 (.6%)	16 (9.7%)
Male headed	130 (78.8%)	16 (9.7%)	3 (1.8%)	149 (90.3%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)
1-5	117 (70.9%)	17 (10.3%)	3 (1.8%)	137 (83.0%)
6-10	26 (15.8%)	1 (.6%)	1 (.6%)	28 (17.0%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

The respondents whose families were female headed and also thought external sources, greatly influences sustainability of fish farming were 13 representing 7.9 per cent of all the respondents. Those who came from male headed families with that perception of great influence were 130 representing 78.8 per cent of the total. The respondents with the perception of low influence and came from female headed families were only two representing 1.2 per cent of the total. In addition, those who came from male headed families and perceived external sources to have low influence to sustainability were 16 representing 9.7 per cent. Similarly, only one respondent said that external sources had no influence on sustainability and came from female headed family. Only three respondents representing 1.8 per cent came from male headed families and also noted that, there was no influence of external sources on fish farming sustainability.

The respondents whose families had 1-5 individuals and also thought external sources, greatly influences sustainability of fish farming were 117 representing 70.9 per cent of all the respondents. Those who came from families with 6-10 individuals with that perception of great influence were 26 representing 15.8 per cent of the total. The respondents with the perception of low influence and came from families with household size of 1-5 were 17 representing 10.3 per cent of the total. In addition, those who came from 6-10 sized families and perceived external sources to have low influence to sustainability was only one representing 0.6 per cent. Similarly, only three respondents said that external sources had no influence on sustainability and came from families with household size of 1-5. Only one respondent representing 0.6 per cent came from families with 6-10 household size and also noted that, there was no influence of

external sources on fish farming sustainability. From the study most fish farmer’s families were of size 1-5 indicating their involvement into fish was as a result of effort to generate more income to meet household needs.

4.6 Extent of External Financial Sources in Relation to Ways of Raising Initial Capital

Table 4.6: Extent of External Financial Sources in Relation to Ways of Raising Initial Capital

	Great extent	Low extent	No extent	Total
Own money	26 (17.1%)	5 (3.3%)	2 (1.3%)	33 (21.7%)
Bank loan	29 (19.1%)	3 (2.0%)	1 (.7%)	33 (21.7%)
Cooperative society loan	82 (53.9%)	3 (2.0%)	1 (.7%)	86 (56.6%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

The respondents raised their money for starting fish farming through different ways. However out of the 165 respondents interviewed 152 (92.12 per cent) provided their different sources of initial capital. The sources include loans from cooperatives which were provided by 86 (56.6 per cent) respondents. Starting capital from own money and bank loan were equivalent 33 (21.7 per cent) each. Thus majority of the fish farmers sourced their starting capital from cooperative society loans. The respondents who raised their own money to start fish farming and also thought external sources, greatly influenced sustainability of fish farming were 26 representing 17.1 per cent of all the respondents. Those who raised their money to start fish farming by bank loan with that perception of great influence were 29 and represented 19.1 per cent of the total. The respondents who got a cooperative society loan with the perception of great influence were 82 representing 53.9 per cent of the total. In addition, those raised their own money and perceived external sources to have low influence to sustainability were five representing 3.3 per cent. Similarly, the respondents who said external sources had low influence on sustainability and got a bank loan to raise their startup capital were three representing 2.0 per cent. An equal number raised their money through a cooperative society loan. Only two respondents representing 1.3 per cent raised their own money and also noted that, there was no influence of external sources on fish farming sustainability. Similarly, only one respondent with this perception raised their startup capital through either a bank loan or cooperative society loan. The research findings agree with Lei (2003), whose finding concluded that success of agricultural technologies for sustainable food security depends on availability of farm land which also acts as a collateral and there for influences peoples access to financial services.

4.7 Extent of External Financial Sources in Relation to Fish Farming as the Main Source of Income

Table 4.7 Extent of External Financial Sources in Relation to Fish Farming as the Main Source of Income

	Great extent	Low extent	No extent	Total
Yes	8 (4.8%)	4 (2.4%)	0 (.0%)	12 (7.3%)
No	135 (81.8%)	14 (8.5%)	4 (2.4%)	153 (92.7%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

The main source of income according to 12 (7.3 per cent) of the respondents was fish farming. Majority 153 (92.7 per cent) reported that they had other main sources of income including business, employment, crop production and livestock keeping. Some of the animals kept consisted of dairy and poultry farming. The crops produced comprised of coffee, cereals, vegetable and fruits farming.

The respondents who said that fish farming is their main source of income and also thought external sources, greatly influences sustainability of fish farming were eight representing 4.8 per cent of all the respondents. Those who said that fish farming wasn’t their main source of income with that perception of great influence were 135 and represented 81.8 per cent of the total. In addition, those who said that fish farming wasn’t their main source of income and perceived external sources to have low influence to sustainability of fish farming were four representing 2.4 per cent. Similarly, the respondents who said external sources had low influence on sustainability were 14 representing 8.5 per cent, of those who said that fish farming wasn’t their main source of income. Only four respondents representing 2.4 per cent felt that fish farming wasn’t their main source of income and also noted that, there were no influences of external sources on fish farming sustainability.

4.8 Extent of External Financial Sources in Relation to Involvement in Fish Farming

Table 4.8 Extent of External Financial Sources in Relation to Involvement in Fish Farming

	Great extent	Low extent	No extent	Total
Run operation myself	4 (2.4%)	0 (.0%)	0 (.0%)	4 (2.4%)
My family assists	25 (15.2%)	10 (6.1%)	1 (.6%)	36 (21.8%)
I have employed fish farm attendants	114 (69.1%)	8 (4.8%)	3 (1.8%)	125 (75.8%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

About three quarters 125 (75.8 per cent) of the respondents said they have employed fish farm attendants, 36 (21.8 per cent) reported they are assisted by their families in carrying out the fish farming while only four (2.4 per cent) operate the project on their own. The respondents who had employed fish attendants were adding costs to the already constrained operating costs. However, this could have been due to the reason that the fish farmers were experimenting with fish farming before fully engaging in it. Hence, the possible reason for most of the fish farmers having their main source of income being other activities aside from fish farming.

The respondents who run the operation on their own and also thought external sources greatly influenced sustainability of fish farming comprised four (2.4 per cent) of all the respondents, while those who were assisted by the family with that perception of great influence represented 25 (15.2 per cent) of the total. In addition, those who had employed fish farm attendants and perceived external sources to greatly influence sustainability were 114 representing 69.1 per cent. Similarly, the respondents who

said external sources had low influence on sustainability were 10 and eight representing 6.1 per cent and 4.8 per cent respectively for those assisted by family and employed fish farm attendants respectively. Only one and three respondents representing 0.6 per cent and 1.8 per cent respectively were assisted by family and employed fish farm attendants and noted that, there was no influence of external sources on fish farming sustainability.

4.9 Extent of External Financial Sources in Relation to Fish Farmers' Income

Table 4.9: Extent of External Financial Sources in Relation to Fish Farmers' Income

		Great extent	Low extent	No extent	Total
Frequency of your income	Daily	4 (2.4%)	2 (1.2%)	4 (2.4%)	10 (6.1%)
	Weekly	1 (.6%)	0 (.0%)	0 (.0%)	1 (.6%)
	Monthly	74 (44.8%)	4 (2.4%)	0 (.0%)	78 (47.3%)
	Erratic	64 (38.8%)	12 (7.3%)	0 (.0%)	76 (46.1%)
Monthly income from fish farming	1001-5000	11 (6.7%)	0 (.0%)	1 (.6%)	12 (7.3%)
	5001-10000	102 (61.8%)	5 (3.0%)	0 (.0%)	107 (64.8%)
	Above 10000	30 (18.2%)	13 (7.9%)	3 (1.8%)	46 (27.9%)
Monthly income from other external sources	Below 1000	0 (.0%)	0 (.0%)	1 (.6%)	1 (.6%)
	1001-5000	1 (.6%)	2 (1.2%)	0 (.0%)	3 (1.8%)
	5001-10000	33 (20.0%)	3 (1.8%)	0 (.0%)	36 (21.8%)
	Above 10000	109 (66.1%)	13 (7.9%)	3 (1.8%)	125 (75.8%)
Total		143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

An analysis of the frequency of income from the fish farming revealed that 78 (47.3 per cent) had been done monthly while the income from 76 (46.1 per cent) of the respondents was erratic. Ten (6.1 per cent) of the respondents earned their income on daily basis and only one (0.6 per cent) realized the income weekly. The income generated per month from fish farming activities varied. Twelve (7.3 per cent) realized an income of Kshs. 1001-5000 every month, 107 (64.8 per cent) reported their monthly income from fish farming was Kshs. 5001-10000. The remaining 46 (27.9 per cent) of the respondents reported that their income each month was above Kshs. 10000.

In regards to the extent in which external sources of finance influence sustainability of fish farming, 143 (86.7 per cent) of the respondents said that the external sources of finance affects fish farming sustainability in a great extent. Moreover, 18 (10.9 per cent) noted that the influence is to a low extent while four (2.4 per cent) said that external sources does not influence sustainability of fish farming in Matungulu sub-County. A comparative analysis of the income from fish farming and other external sources clearly shows that external sources of income exceeds fish farming for most of the respondents, hence justifying the multi tasking nature of the fish farmers in income generation.

Moreover, the respondents reported external sources of finance contributes greatly to sustainability of fish farming.

The respondents interviewed were of the idea that the fish farmers' level of income influenced the sustainability of their projects. The fish projects officers said that financial access influences sustainability of fish farming projects. Similar findings emanated from studies by [22] who found out that lack of affordable credit was a major impediment and [8] in South Africa established that financial stability is a key issue on sustainability of fish farming projects.

4.10 Extent of External Financial Sources in Relation to Land Ownership

Table 4.10 Extent of External Financial Sources in Relation to Land Ownership

	Great extent	Low extent	No extent	Total
Family land	41 (24.8%)	11 (6.7%)	0 (.0%)	52 (31.5%)
Own land	102 (61.8%)	7 (4.2%)	4 (2.4%)	113 (68.5%)
Total	143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

The respondents who used family land and also thought external sources greatly influenced sustainability of fish farming comprised 41 (24.8 per cent) of all the respondents, while those who owned land with that perception of great influence represented 102 (61.8 per cent) of the total. Similarly, the respondents who said external sources had low influence on sustainability were 11 (6.7 per cent) and seven (4.2 per cent) respectively for those who on family land and own land. None of those who used family land noted that there was no influence of external sources on fish farming sustainability with only four (2.4 per cent) of those using own land giving the view of no influence.

4.11 Extent of External Financial Sources in Relation to Availability of Land

Table 4.11 Extent of External Financial Sources in Relation to Availability of Land

		Great extent	Low extent	No extent	Total
Adequacy of Land	Yes	140 (84.8%)	17 (10.3%)	4 (2.4%)	161 (97.6%)
	No	3 (1.8%)	1 (.6%)	0 (.0%)	4 (2.4%)
Total		143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)
Land acreage	1-5	63 (39.1%)	7 (4.3%)	2 (1.2%)	72 (44.7%)
	6-10	77 (47.8%)	9 (5.6%)	2 (1.2%)	88 (54.7%)
	Above 10	0 (.0%)	1 (.6%)	0 (.0%)	1 (.6%)
Total		143 (86.7%)	18 (10.9%)	4 (2.4%)	165 (100%)

A cross tabulation of the adequacy of land and acreage in relation to extent of external sources influence revealed that 84.8 per cent of the respondents who had adequate land, said external sources influenced sustainability of fish farming to a great extent. In addition, 47.8 per cent of the respondents who had land acreage between 6 to 10 notes that, external sources have a great influence to sustainability of fish farming.

5. Conclusions and Recommendations

5.1 Conclusions

Based on the findings of the study, it was concluded that Majority of the fish farmers were males. The study findings point to the fact that external sources greatly influence sustainability of fish farming in Matungulu sub-County. Similar to the findings in a study by [30] in Nigeria, the fish farmers aged above 50 years were 40.6 per cent and those aged 30 years and below were only 10.9 per cent. Most of the fish farmers 144 (87.8 per cent) were married and most of the families 149 (90.3 per cent) who practiced fish farming were male-headed. It was evident that most 137 (83.0 per cent) of the respondents composed of 1-5 members. This shows that majority of the fish farmers came from small households.

Most, 84 (50.9 per cent) of the fish farmers had attained college education which is in line with the findings by [30], were fish farming in Nigeria was established to be dominated by those with tertiary education. This is because fish farming requires a lot of technical and scientific knowledge to be successfully undertaken. The respondents raised their money for starting fish farming through different ways. The sources included loans from cooperatives which were provided by 86 (56.6 per cent) respondents. Starting capital from both own money and bank loan were equivalent 33 (21.7 per cent) each. Thus majority of the fish farmers sourced their starting capital from cooperative society loans. About three quarters 125 (75.8 per cent) of the respondents said they have employed fish farm attendants. The respondents who have employed fish attendants are adding costs to the already constrained operating costs.

The income generated per month from fish farming activities varied. Most, 107 (64.8 per cent) reported their monthly income from fish farming was Kshs 5001-10000 and 46 (27.9 per cent) of the respondents reported that their income each month was above Kshs. 10000. Information disclosed by 125 (75.8 per cent) of the respondents showed that income from external sources other than fish farming were above Kshs 10000 and 143 (86.7 per cent) of the respondents said that external sources of finance affects fish farming sustainability in a great extent.

One of the project officers elaborated that 'fish farming is a heavy investment and it requires someone to be able to raise enough capital so the level of income should be stable'. Another officer revealed that 'low income farmers face a lot of challenges as compared to the rich' and closely linked to that another officer shared the sentiments that 'farmers would wish to farm more after getting income'. The fish projects officers said that financial stability influences sustainability of fish farming projects. These were expressed through their opinions, in which according to one of the officers 'the project requires money to run and if you don't access finances it will fail'. Another added that 'farmers are able to provide feeds to the fish and manage the fish pond' and as such 'the number of ponds will depend on financial stability'

External sources of income exceed fish farming for most of the respondents, hence justifying the multi tasking nature of

the fish farmers in income generation. Moreover, the respondents reported external sources of finance contributes greatly to sustainability of fish farming.

5.2 Recommendations of the Study

Based on the findings of the study, the following recommendations were made;

- (i) A greater proportion of youths, specifically one-third representation in fish farming should be involved as a way of employment creation.
- (ii) Since majority of the fish farmers sourced their starting capital from cooperative society loans the government ought to provide some form of grant for farmers who want to engage in fish farming especially the youth and women.
- (iii) Given that about three quarters said they have employed fish farm attendants adding to already constrained operating costs, there is need for those engaging in pond fish farming to practice large scale pond fish farming, to maximize their income and take advantage of economies of scale.

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Author Profile



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