European Journal of Business and Management
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online)
Vol.6, No.12, 2014

Assessment of Establishment and Management of Organic Fish Farming in Kenya: A Case Study of Kiambu District

Dr. Emmanuel Awuor, Charles Thuo Karugu
Dean of faculty, School of Management and Leadership, The Management University of Africa
PO BOX 29677 – 00100, Nairobi, Kenya..
Email: eawuor@mua.ac.ke; ckarugu@yahoo.com

Abstract
Aquaculture is an important farming activity practised in Kenya. Kenya is the largest consumer of fish and fish products in East Africa. Fish is considered one of the healthiest sources of protein and thus increasingly the growth of fish will enhance the availability and subsequent consumption of this very important type of food. The research adopted a descriptive design in its methodology. The study population comprised of 124 fish farmers and 10 staff from the Kenya Organic Agriculture Network Offices and the Ministry of fishery. The data was analysed using statistical tools which included: frequency, percentages, means and standard deviations. The study concluded that due to the perishable nature of fish, farmers need to be trained to minimise losses before the fish gets to the market. The government should construct fish cooling and processing plants in these areas to preserve the products. Installation of fish pellet production machines for ready fish production is important. Policies should also be designed to enable the strengthening of organic produce, and the dissemination of organic technologies among the small scale producers.
Keywords: Fish farming, Organic farming, Aquaculture

1.0 Introduction

Aquaculture is an important animal farming activity, and the husbandry practices used, and the associated welfare issues are becoming increasingly focused on by policy makers, scientists and consumers. In the European Union minimum standards for the protection of animals bred for farming purposes including fish has been laid down in an EU Council Directive from 1998. In 2005 the Council of Europe adopted a recommendation on the welfare of farmed fish and in 2008 the World Organization for Animal Health adopted guiding principles for fish welfare; also the industry has adopted various measures to safeguard fish welfare (EFSA, 2009).

Major driving forces behind the promotion of fish welfare in the EU are also demands from retailers and consumers. In the UK for instance it is thus common place for supermarket chains to conduct their own farm audits which thus place an increasing pressure on farmers to demonstrate that fish welfare is being safeguarded. Supermarket chains' concern with fish welfare, of course, ultimately reflects consumers' growing concern over the ethics of modern livestock production in general (Wyban, 2007). It is therefore important to recognize consumers' concern over animal welfare; in addition studies seems to indicate that consumers appear to use animal welfare as an indicator of product attributes such as food safety, food quality, and the healthiness of the food product, and in this manner equating good animal welfare standards with good food standards, (Joker and Christensen, 2009).

One of the greatest problems confronting millions of people in developing countries in Africa today is lack of adequate protein intake both in quality to feed the nations ever-growing population. This inadequacy results in problem of malnutrition. The resultant effect of serious deficiency in the amount of protein intake is that people's health is adversely affected; particularly the mental capability, working productivity and eventually, the overall national economic growth (Okoruwa and Olakanmi, 1999). Fish farming is the growing of fish in ponds, allows feeding, breeding, growing, and harvesting the fish in cultured environment (James, 1989). Meanwhile, the place of fish in the domestic food basket and industrial needs of people cannot be over-emphasized. Also, Kenya is believed to be the largest consumer of fish and fish products in East Africa, reflecting its population size, economic status and dietary habits of the populace (Hebicha, Gamal and Green, 1994). It has also been observed that one of the most serious constraints of agriculture growth in Kenya is the inefficient use of productive resources and that considerable growth can be achieved by simply improving the level of efficiency in resource use and policy issues. Therefore, fish being one of the water resources is being targeted as a way of improving the protein intake of the African populace as well as improving the economic base of the country (World Bank, 2000).

According to Kenya Organic Agriculture Network (KOAN, 2010) the Bridges Organic and Health restaurant is the only place in Kenya where almost all the foods served there is considered organic (Kagai, 2005). This is because all their suppliers grow their raw materials organically. The fish that are produced under natural conditions according to the organic agricultural principles, not exposed to any protective additives or genetic modification, fed with baits prepared with completely natural materials and certificated by a control agency are

called “organic fish”.
Organic aquaculture is the production process every stage of which is controlled and certificated by the control and/or certification agency according to the articles of regulation related to the organic agriculture, with such aims as supplying organic raw materials for the industries getting their raw materials from agriculture, from fish grown with organic agriculture method in seas, domestic waters, pools, net cages, barrages, lakes, ponds, fish traps and farms, aquatic plants, sponge, mollusk, crustacean, mammals and the products generated from them and with other sportive, medical and scientific purposes (Hebicha, Gamal, and Green, 1994).
Organic products have richer and more beneficial attributes and term of food valve. Organic fish production is a model of production which supplies animal’s lease with low stock density and attaches importance to human health without wing any chemicals, pesticides or the products modified genetically. Although this alternative production model used in many developed and developing countries in the world constitutes only 0.01% of the world’s aquaculture production, demand for this production has caused an increase both in the production quantity and the diversity of types released to the market.

2.0 Literature review

2.1 Organic Fish Farming

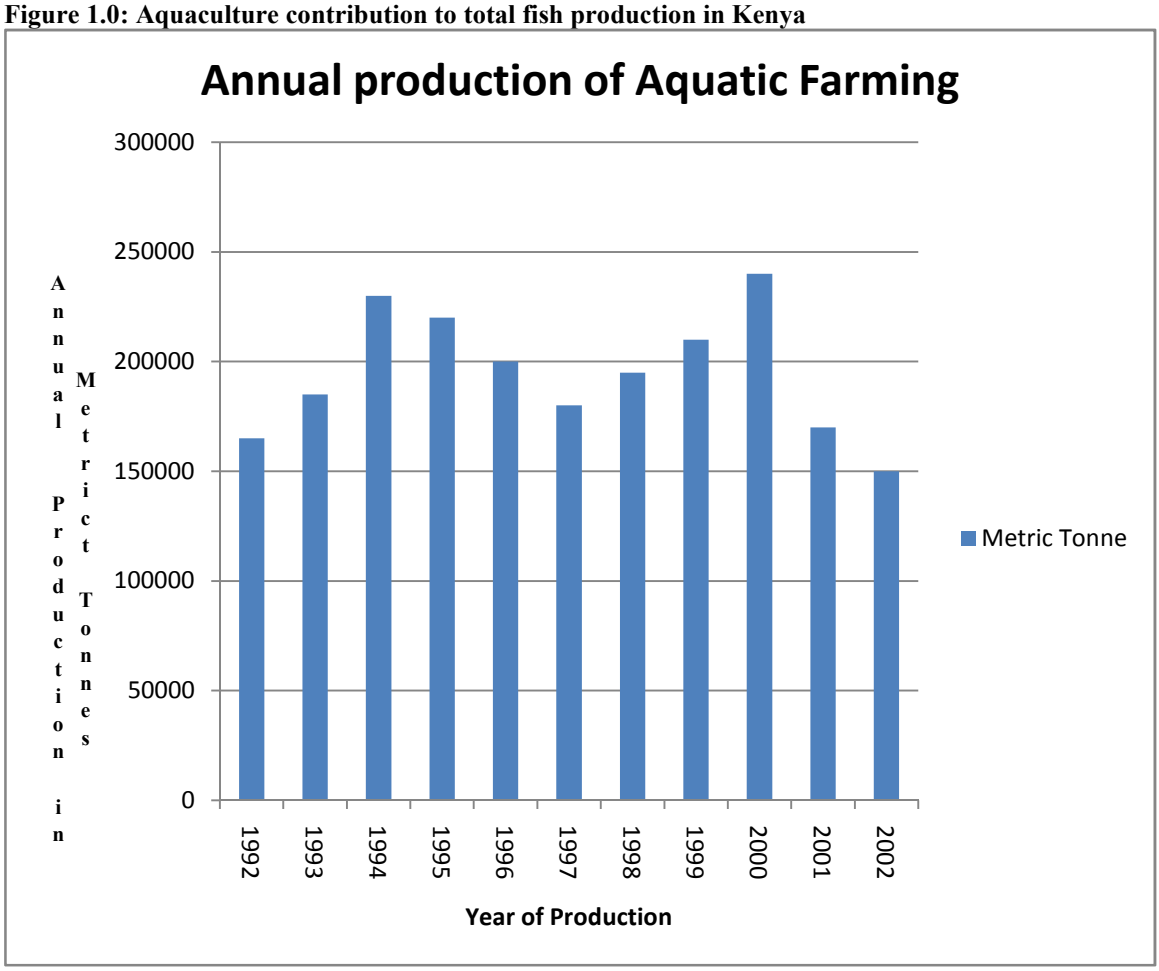
The relevance and need for an eco-friendly alternative farming system arose from the ill effects of the chemical farming practices adopted worldwide during the second half of the last century. The methods of farming evolved and adopted by our forefathers for centuries were
less injurious to the environment. People began to think of various alternative farming systems based on the protection of environment which in turn would increase the welfare of the humankind by various ways like clean and healthy foods, an ecology which is conducive to the survival of all the living and non-living things, low use of the non-renewable energy sources (Campell, Obuya and Spoo,1995). Many systems of farming came out of the efforts of many experts and laymen. However, organic farming is considered to be the best among all of them because of its scientific approach and wider acceptance all over the world (Kagai, 2005).
In recent years, organic aquaculture has been gaining considerable importance. Many farmers have begun shifting from traditional method to organic cultivation as means of producing safe foodstuff and respecting environment. The concept of sustainable farming has caught increasing momentum in developing nations during recent years. Organic farming favours lower input costs, conserve nonrenewable resources, high value markets and boost farm income, besides improving quality of the product. Organic fish farming system rely on practices such as cultural and biological disease management and virtually prohibit utilization of synthetic chemicals in fish production.
In recent years, worldwide increasing attention has been given on organic foodstuffs including fish. European Union (EU) directives suggest that fish captured or harvested from the wild cannot be labeled as “organic”. It should be produced in under specific conditions (Alderman *et al*., 1998). The organic fish farming is a holistic management system, which promotes and enhances agro-ecosystem health including biodiversity, biological cycle and soil biological activity (Bjorklund *et al*., 1990). Organic production systems are based on specific and precise standard of production, which aim at achieving optimal agro-ecosystem, and which are socially, ecologically and economically sustainable.

2.2 Aquaculture in Kenya

Aquaculture entails growing (farming) of fish and other aquatic organisms in control environment. The farmed fish or organisms are deemed to be of commercial value. Aquaculture is the only viable alternative source of fish especially at this time when the natural stocks of fish are declining. Kenya has great potentials for aquaculture growth because it is endowed with climatic diversity, natural features and other resources that favour the culture of a wide variety of aquaculture species. However, though not yet quantified, only a small portion of these resources are utilized (Campell, 1995).
Aquaculture in Kenya can be categorized into three broad divisions. These are warm fresh water aquaculture dominated by the production of various species of tilapia and the African catfish (Clarias gariepinus) mainly under semi intensive systems using earthen ponds and cold fresh water aquaculture involving the production of rainbow trout under intensive systems using raceways and tanks and finally marine water aquaculture which is underdeveloped. The Tilapine species constitute about 90% of aquaculture production in Kenya. Polyculture of the Tilapines with the African catfish is under mixed sex culture systems (GoK, 2005).
The production of the Tilapines and the African catfish is characterized by low pond productivity mainly due to poor seeds and employment of low pond management practices. The result has been stagnation of National aquaculture production over the past decades. The annual average total production of fish in the country is estimated at 180,000 metric tons (mt) valued at 6.7 million Kenya shillings (Ksh) to the fishermen with a retail value of Ksh 25 billion (Wakwabi *et al.* 2003). The commercially important fish species of Lake Victoria are *Lates niloticus* (Nile perch), *Rastrineobola argentea* (dagaa) and *Oreochromis* species (tilapia). These species account for 58%, 30% and 10% respectively of the total weight of fish landed. Besides Lake Victoria, the other

sources of fish in the country are the fresh-water lakes, dams and rivers located in various parts of the country, most of which drain into Lake Victoria (Abila 2003). Aquaculture accounts for less than 1% of the total production, with tilapia, trout and catfish being the main farmed fish species.

Figure 1.0: Aquaculture contribution to total fish production in Kenya



(Source, FAO 2002)

The species largely utilized for pond culture are *Oreochromis niloticus* and the African catfish *(Clarias gariepinus)*. Culture of other exotic fish species for aquaculture includes the largemouth bass *(Micropterus salmoides),* trout *(Salmo trutta* and *Salmo gairdneri*) for river and lake stocking and *Oreochromis spirulus niger* (Balarin 2005). In the past, a number of development agencies have aided projects on aquaculture research and development in the country. A most notable recent example is the World Bank Programme, through the Lake Victoria Environment Management Project (World Bank, 2006).

2.3 Fish Industry structure in Kenya

There are 17 industrial fish processing companies in Kenya all of which are export oriented and can be classified as either land based establishments or water-based freezer vessels. These companies mainly produce frozen and chilled fish for export to European and other non-European markets. These companies deal in different fish species including Nile Perch, prawns, lobsters, octopus, cuttlefish and squids. The companies have varying installed and utilized capacities.

A total of four fish processing companies have been established within the last five years namely Fish Processors (2000) Ltd, Samaki (2000) Ltd, Banner Distributors Ltd and Crustaceans Processors. The 17 industrial fish processors in Kenya have an installed capacity of 437 Metric tonnes per day of which only 213.4 metric tonnes per day is utilised. The sector is regulated and controlled by the Fisheries Department, which falls under the Ministry of Livestock & Fisheries.

Table 1.0: List of Companies, Capacities Utilized, and Location

Name of the company	Location	Fish species	Installed Capacity Per Day/Metric tonnes	Utilized Capacity Per Day
W.E Tilley (M) Ltd	Nairobi	Nile perch Ltd	60	35
East African Seafoods Ltd	Kisumu	Nile Perch	40	22
AfroMeat Ltd	Kisumu	Nile Perch	30	5
Prinsal Enterprises	Migori	Nile Perch	30	20
Peche Foods	Kisumu	Nile Perch	15	7
Capital Fish (K) Ltd	Homabay	Nile Perch	50	20
Fish Processors (2000) Ltd	Kisumu	Nile Perch	25	7
Samaki (2000) Ltd	Nairobi	Nile Perch	25	7
Wananchi Marine Products Ltd	Mombasa	Tuna	100	70
TransAfrica Fisheries Ltd	Mombasa	Octopus, Lobsters, Cuttlefish,Squids	29	22
Sea Harvest Kenya Limited	Mombasa	Octopus,Lobsters, Cuttlefish,Squids	5	3
*Banner Distribution Ltd	Malindi	Lobsters	10	1
Crustacean Processors	Mombasa	Lobsters	0.5	0.2
M.V Alpha Manyara	Mombasa	Prawns	2	0.3
M.V Alpha Serengeti	Mombasa	Prawns	2	0.3
M.V Alpha Amboseli	Mombasa	Prawns	2	0.3
M.V. Venture II	Mombasa	Prawns	2	0.3

Source: Department of fisheries Ministry of Livestock & Fisheries Development, 2010

2.4 Sustainable Organic Fish Feed

Fish feed is one of the most important factors in aquaculture production. It is widely anticipated that global aquaculture expansion will encounter an inevitable future shortfall of non-renewable resources such as fishmeal and fish oil, necessitating the exploration of alternative strategies for fish feeds (Balarin, 2005). The principles of organic aquaculture encourage the development of feeds that do not deplete global fish stocks. Fish discard and cut-offs may be potential alternative ingredients, but this conflicts with the Danish environmental regulations because of their high phosphorus content. Intuitively, partial substitution of fishmeal and fish oil by sustainable organic plant protein and oil sources seems a good alternative, since fish feed (including organic) contains more than 60 % fishmeal on a fat-free basis (Technical Report ,2001).

2.5 Health status in organic production

Organic management practices achieve a high level of disease resistance and prevention of infection. Principally, some precautions for the fish not to be sick should be taken. All management techniques, especially when influencing production levels and speed of growth maintain the good health and welfare of the living organisms. To maintain this, the stock intensity should be low, regular health checks should be made: dead fish should be immediately removed from the pool and stressing factors should be lowered to the minimum level. The choice of the species resistant to diseases and subspecies should be considered. The species whose races are in danger can be preferred [Bio Suisse 2001, IFOAM 2000].

In case of disease, it is proper to use natural treatment methods (homeopathic method). Synthetic chemical medicines, antibiotics are not allowed. If any medicine is given in 3 months line before the sale of the product, any kind of fish meat, roes, aquatic creatures or products obtained from them cannot be sold as organic (Egna, and Boyd, 1997).

Health status and disease susceptibility may also be affected if an altered feed composition (for example, the replacement of fishmeal with vegetable sources) is insufficient with regard to essential nutrients like amino acids and vitamins or may harm the digestive tract of the fish. This latter consideration is of particular relevance because the production of organic rainbow trout allows the usage of only one antibiotic treatment in a full production cycle. That is, between the time the fish enter the farm at approximately 25 g and until slaughter. This requires attention to husbandry practices that improve fish welfare and prevent diseases. In particular, prophylactic measures such as vaccination may be important in organic production. The impact of organic feed recipes on product quality will be investigated to ensure that organic fish are of high quality. This will comprise objective sensory and biochemical analyses of the flesh to obtain an overall picture of their eating quality (Balarin, 2005).

2.6 Constraints Facing Organic Fish Farming

2.6.1 Policy Framework

Promotion of organic agriculture both for export and domestic consumption, the requirements of food security for millions of the poor, national self-sufficiency in food production, product and input supplies, etc. are vital issues which will have to be dealt with in an appropriate agriculture policy of developing countries. These are serious issues the solution for which hard and consistent efforts along with a national consensus will be essential to go forward. Formulation of an appropriate agriculture policy taking care of these complexities is essential to promote organic agriculture in a big way (Zonneveld, 2003).

The challenges confronting OA in the study location are policy, social-cultural, economic, and institutional in character. With regard to policy challenges, like most SSA countries, developing countries such as Kenya have no OA policy to guide decision-makers, farmers and development stakeholders. OA is not even mentioned in the existing agricultural policy documents such as the National Agricultural Research Policy and the Plan for the Modernization of Agriculture (PMA). To make matters worse, policy-makers have continued to draft and pass policies such as those encouraging the importation and use of cheap agro-chemicals and fertilizers (EAC, 2004). As such, organic farmers are tempted to introduce these cheap chemicals to their organic farms and this is likely to affect the future international demand for organic products from developing countries. Moreover, there is no marketing policy for organic agricultural products (Hogendoorn, 2007).

According to Janseen, (2000) organically grown crops virtually sell at the same price as the conventionally grown crops and in some cases even less. The Indoor Residual Spraying Policy for malaria control (DDT) has also been a very big constraint to OA because it poses a potential threat of chemicals drifting to organically managed farms and may ultimately affect the quality of organically grown crops and the health of consumers and community members.

The Government recognizes the constraints hindering aquaculture growth and development and realizes that the sub-sector can play an important role in poverty alleviation of rural populations. It could also play a key role in provision of protein food and reduction of fishing pressure in capture fisheries. During the preparation of the Poverty Reduction Strategy Paper, aquaculture development was identified as a core activity for funding through the Medium Term Expenditure Framework (MTEF) budgeting system. Following this development in addition to the reorganization of the government functions, aquaculture has been prioritized and is now one of the four core functions of the Department of Fisheries. Given the fisheries potential, Government has taken a keen interest and given aquaculture and fisheries in general the priority it deserves (GoK, 2005).

2.6.2 Availability of Financial Support

The developing countries like India have to design a plethora of national and regional standards in attune with those of the developed countries. The adoption and maintenance of such a regulatory framework and its implementation will be costly.

The cost of certification, a major component of which is the periodical inspections carried out by the certifying agencies, which have freedom to fix the timings, type and number of such inspections appears to be burdensome for the small and marginal farmers. Of course, the fees charged by the international agencies workings in India before the NPOP were prohibitive and that was a reason for the weak response to organic agriculture even among the large farms in the country. No financial support as being provided in advanced countries like Germany is available in India. Supports for the marketing of the organic products are also not forthcoming neither from the State nor from the Union governments. Even the financial assistance extended to the conventional farming methods are absent for the promotion of organic farming (Mbugua, 2002).

2.6.3 Low Yields

In many cases the farmers experience some loss in yields on discarding synthetic inputs on conversion of their farming method from conventional to organic. Restoration of full biological activity in terms of growth of beneficial insect populations, nitrogen fixation from legumes, pest suppression and fertility problems will take some time and the reduction in the yield rates is the result in the interregnum. It may also be possible that it will take years to make organic production possible on the farm (UNCTAD – UNEP, 2008).

Small and marginal farmers cannot take the risk of low yields for the initial 2-3 years on the conversion to organic farming. There are no schemes to compensate them during the gestation period. The price premiums on the organic products will not be much of help, as they will disappear once significant quantities of organic farm products are made available (FAO, 2002).

2.6.4 Inability to Meet the Export Demand

The demand for organic products is high in the advanced countries of the west like USA, European Union and Japan. It is reported that the US consumers are ready to pay a premium price of 60 to 100 per cent for the organic products. The upper classes in India are also following this trend as elsewhere. The market survey done by the International Trade Centre (ITC) during 2000 indicates that the demand for organic products is growing rapidly in many of the world markets while the supply is unable to match it (Othina, Angiela, Wekesa, and Odipo, 2003).

Kenya is known in the world organic market as a tea supplier and there is a good potential to export coffee, vegetables, sugar, herbs, spices and vanilla. In spite of the several initiatives to produce and export organic produces from the country, the aggregate production for export came to only about 14000 tonnes. This also includes the production of organic spices in about 1000 ha under certification. Some export houses like Good Value Marketing Ltd and Burmah Trading Corporation are also engaged in exporting of organic fruits, vegetables and coffee from India. The country could export almost 85 per cent of the production indicating that demand is not a constraint in the international markets for organic products (Okemwa and Getabu, 1996).

2.6.5 Lack of Awareness

It is a fact that many farmers in the country have only vague ideas about organic farming and its advantages as against the conventional farming methods. Use of bio-fertilizers and bio pesticides requires awareness and willingness on the part of the farming community. Knowledge about the availability and usefulness of supplementary nutrients to enrich the soil is also vital to increase productivity (Okemwa and Getabu,1996).

Farmers lack knowledge of compost making using the modern techniques and also its application. The maximum they do is making a pit and fill it with small quantities of wastes. Often the pit is flooded with rainwater and result is the top of the compost remains under composted the bottom becomes like a hard cake. Proper training to the farmers will be necessary to make vermi-compost on the modern lines. Attention on the application of composts/organic manure is also lacking. The organic matter is spread during the months when the right moisture level is absent on the soil. The whole manure turns into wastes in the process. The required operation is of course labour intensive and costly, but it is necessary to obtain the desired results (Veverica, Ngugi, Amadiva, and Bowman, 2001).

2.5.6 Institutional challenges

Include the fact that there are very few institutions in developing countries for instance Kenya that teaches OA methods. Moreover, they are not facilitated or supported by the government. The Ministry of Agriculture, Animal Industry and Fisheries pays very little attention to this important emerging sub-sector. Furthermore, there are no defined syllabuses on OA in institutions of higher education, which essentially teach and promote only conventional types of agricultural technologies. This practice has hampered the building of sufficient capacity for leveraging and institutionalizing OA in developing countries and SSA in general (Martinez-Cordero, and Lueng, 2004).

The IAASTD report of 2009 echoes similar arguments affecting agriculture in general. The report indicates that local, provincial and national governments, as well as agencies, departments and ministries devoted to agriculture, environment, education, health, trade and finance among others, constrain agricultural knowledge and science and technological initiatives that are crucial for designing policies effective in reaching integrated goals of productivity, environmental sustainability, social equity and inclusion.

2.5.7 Lack of Farmers Training and Development

Lack of proper training has left farmers without proper management and monitoring skills, leading to deterioration of water quality and fish death from diseases.The smallholder experiences limited resources in terms of soil, water, capital and labour. It is a question of how he/she allocates and uses them to manage and maximize returns from a farm having mixed activities. Shibanda (1996), in his assessment of fish farming smallholder information needs, underscores the value of information as a commodity itself and the need to recognize it as an essential resource for the small farmer in taking proper decisions and improving farming practices. He further contends that a fish farmer is a risk-taker who needs to avoid and minimize risks through the provision of information that is timely, relevant, comprehensible and complete. As managers of their own smallholdings, Shibanda describes farmers as information seekers, with emphasis on such information being of quality and sufficient to influence final decisions. One notable constraint in the fish farmer's information needs is the prevalent indicator of illiteracy levels. Besides, they lack technical and scientific knowledge, including basic skills in general areas of farm management practices (Leroy, 1999).

Farmers' interest in fish ponds cannot be over-emphasized. What is clear is the fact that fish culture guarantees food security, is a cheap source of animal protein, earns extra income for the household, is a subsitute for captured ocean/lake but expensive fish, and provides challenging and innovative opportunities to the rural farmer. The most important thing is the fact that farming has become a business which must guarantee good returns to the practitioner. The practitioner (farmer) needs to be seen as a professional in practice and in the making (Tisdell, 2003).

2.5.8 Consumers' perception

Aquaculture is an important animal farming activity, and the husbandry practices used, and the associated welfare issues are becoming increasingly focused on by policy makers, scientists and consumers. In the European Union minimum standards for the protection of animals bred for farming purposes including fish has been laid down in an EU Council Directive from 1998. In 2005 the Council of Europe adopted a recommendation on the welfare of farmed fish and in 2008 the World Organization for Animal Health adopted guiding principles for fish welfare; also the industry has adopted various measures to safeguard fish welfare

(EFSA, 2009).

Major driving forces behind the promotion of fish welfare in the EU are also demands from retailers and consumers. In the UK for instance it is thus common place for supermarket chains to conduct their own farm audits which thus place an increasing pressure on farmers to demonstrate that fish welfare is being safeguarded. Supermarket chains' concern with fish welfare, of course, ultimately reflects consumers' growing concern over the ethics of modern livestock production in general (Cooke, 2001). It is therefore important to recognize consumers' concern over animal welfare; in addition studies seems to indicate that consumers appear to use animal welfare as an indicator of product attributes such as food safety, food quality, and the healthiness of the food product, and in this manner equating good animal welfare standards with good food standards, (Kjaernes *et al.*, 2007). This means that there need not be any conflict between good fish welfare and profitable farming practices as long as consumers are guaranteed good fish welfare and their belief in a link between good product quality and good fish welfare can be confirmed.

2.5.9 Political and Social Factors

Agriculture in developing countries is subject to political interventions with the objectives of dispensing favours for electoral benefits. Subsidies and other supports from both the Central and state governments, government controlled prices of fish inputs like chemical fertilizers, the public sector units' dominant role in the production of fertilizers, government support/floor prices for many agricultural products, supply of inputs like power and water either free of cost or at a subsidized rate, etc. are the tools often used to achieve political objectives (Lovshin, Da Silva, Carneiro-Sobrinho, and Melo, 1990). Any movement for the promotion of organic fish farming in Kenya will have to counter opposition from the sections who benefit from such policies in the conventional farming system. The political system in a democracy like India is likely to evade the formulation of policies, which affect the interests of the voting blocks unless there are more powerful counter forces demanding changes (Martinez-Cordero, and Lueng, 2004).

In the absence of alternative employment opportunities and other considerations, the organized workforce particularly in the public sector fertilizer, pesticide and seed industries is also likely to oppose moves on the part of the government to promote organic farming on a large scale.

2.5.10 Quality Standards for Bio manures

The need for fixing standards and quality parameters for bio-fertilizers and bio manures has arisen with the increasing popularity of organic farming in the country. There are a very large number of brands of organic manures, claiming the high levels of natural nutrients and essential elements. But most farmers are not aware of the pitfalls of using the commercially available bio manure products. While the concept of organic farming itself lays great stress on the manures produced on the farm and the farmers' household, many of the branded products available in the market may not be really organic (Mbugua, 2002).

Elements of chemicals slipping into the manures through faulty production methods could make the product not certifiable as organic. The process of composting which is a major activity to be carefully done is achieved usually by one of the two methods, vermi-composting or microbe composting. While the former is ideal for segregated waste material without foreign matter, microbe composting is suitable for large scale management of solid wastes, especially in cities and metres. Even though the farmers are using manure produced by different methods, proper parameters for bio manure are yet to be finalized (Mbugua, 2002).

Most farmers are still unaware of the difference between bio manure and bio-fertilizer, it is point out. While biomanure contains organic matter, which improves the soil quality, bio-fertilizers are nutritional additives separated from the organic material, which could be added to the soil, much like taking vitamin pills. Bio-fertilizers do nothing to enhance soil quality while the loss of soil quality has been the major problem faced by farmers these days.

3.0 Methodology

The research adopted descriptive research designs. The descriptive design refers to a set of methods and procedures that describe variables (Kothari, 2008). This research design involved gathering data that describe events and then organizes, tabulates, depicts, and describes the data. In this study the population of interest was the fish farmers who are growing fish on their farms and staff from the Kenya organic Agriculture Network and Ministry of fisheries Development. The study population comprised 124 fish farmers and 10 staff from Kenya Organic Agriculture Network and 5 staff from the Ministry of Fisheries Development making a total of 139 respondents. Primary data was collected using a questionnaire which was self-administered through drop and pick questionnaires to sampled fish farmers and staff from Kenya Organic Agriculture Network Officers and ministry of Fishery. The questionnaires were both open and close-ended questions. The collected data was well examined and checked for completeness and comprehensibility.

The data was then summarized, coded and tabulated. Data cleaning then was done and tabulated. The tabulated data was analyzed with the help of the Statistical Package for Social Sciences (SPSS 17.0) that has data handling and statistical analysis capability that can analyze data statistics and generate descriptive statistics

(Norusis, 2007). Data presentation was done by the use of pie charts, bar charts and graphs, percentages. For qualitative data, which was mainly gathered from open ended questions and interviews, a qualitative data checklist was developed. The checklist was clustered along main themes of the research to ease consolidation of information and interpretation and then analyzed through content analysis. Content analysis is the process of analyzing verbal or written communications in a systematic way to measure variables qualitatively .

4.0 Discussion of findings and results

4.1 Establishment and Management of Organic Farming in Kenya

4.1.1 The type of fish reared in fish farm

Table 2.0 The type of fish reared in fish farm

	Frequency		Percentages of yes
	Yes	No	
African catfish (Clarias gariepinus	45	20	69
Tilapine	53	12	82
Nile perch (Lates niloticus)	42	23	66
Dagaa (Rastrineobola argentea)	50	15	77
Oreochromis species	46	19	70

The study sought to know the type of fish reared in the respondent's fish farm. From the findings, Tilapine, Dagaa (Rastrineobola) and Oreochromis species were the type of fish reared in the respondent's fish farm as indicated by 82%, 77% and 70% of the respondents. Most 69% and 66% of the respondents indicated that African catfish (Clarias) and Nile perch (Lates) types of fish were reared in the firms

4.2 Extent of agreeing with statements on the benefit of organic fish farming in Kenya

Table 3.0: Extent of agreeing with statements on the benefit of organic fish farming in Kenya

Statement	Neutral	Agree	Strongly agree	N	Mean	Std deviation
Provision of health food	2	18	45	65	4.61	0.59
Improve economic status of farmers	5	8	52	65	4.44	0.50
Create employment	4	12	49	65	4.40	0.48
Increase protein intake	8	10	47	65	4.56	0.56
Increase food security in the country	10	13	42	65	4.53	0.55
Improve environment by reducing use of chemical	11	15	39	65	4.00	0.34
Enhance production of health safe food	7	20	36	65	4.67	0.63
Lower fish farming input costs	13	13	37	65	4.03	0.41

The table 4.5 indicates the response on the extent to which the respondents agreed on the given statements concerning the benefit of organic fish farming in Kenya. On the given responses, a five point likert scale was used to interpret the respondent's extent. Accorded to scale those issues that were strongly disagreed were awarded 1 while those which were strongly agreed on were awarded 5. Within the continuum are 2 for disagree, 3 for neutral and 4 for agree. Mean and standard deviation were used to analyze the data. According to the researcher, those factors with a mean close to 4.5 were rated as to a strongly agree while those with a mean close to 1.0 were rated to a strongly disagree or even not considered at all. On the same note the higher the standard deviation the higher the level of disagreement or dispersion among the respondents. From the finding, majority of the respondents strongly agreed that organic fish farming in Kenya, enhanced production of health safe food, enhanced the provision of health food, increased protein intake and increased food security in the country as indicated by a mean of 4.67, 4.61, 4.56 and 4.53 with standard deviation of 0.63, 0.59, 0.58 and 0.55. From the findings, most of the respondents agreed that organic fish farming in Kenya improves economic status of farmers, creates employment and lowers fish farming input costs as well as Improve environment by reducing use of chemical as indicated by a mean of 4.44, 4.40, 4.03 and 4.00 with standard deviation of 0.50, 0.48, 0.41 and 0.34

4.3 Management constraints facing organic fish farming in Kenya

Table 4.0: Factors affect organic fish farming in Kenya

	Moderate extent	Great extent	Very great extent	N	Mean	Standard deviation
Weak policy framework	4	12	49	65	4.57	0.67
Negative customer perception	3	20	42	65	4.85	0.83
Low of financial supports	5	21	39	65	4.56	0.47
Increase protein intake	8	20	37	65	4.49	0.48
Low production in fish farms	7	25	33	65	3.65	0.15
Limited market	1	21	43	65	4.61	0.70
Lack of awareness on existence of organic fish farming	6	17	42	65	4.45	0.47
Low skills and knowledge	5	8	52	65	3.74	0.20
Poor government support	4	12	49	65	3.80	0.38
Ineffective farmers training and development	8	10	47	65	4.46	0.56
Political influence	9	14	42	65	4.94	0.87
Drought	4	18	43	65	4.64	0.60
Low quality standard for bio manures	7	25	33	65	4.46	0.45
Inability to meet the export demand	1	21	43	65	4.76	0.70

This study sought to investigate the extent to which the given factors affect organic fish farming in Kenya. On the factors affect organic fish farming, a five point likert scale was used to interpret the respondent's response. As per the scale those factors which were not considered at all were awarded 1 while those which were considered to a very great extent were awarded 5. Within the continuum are 2 for low extent, 3 for moderate extent and 4 for great extent. Mean and standard deviation were used to analyze the data. According to the researcher those factors with a mean close to 4.0 were rated as to a very great extent while those with a mean close to 3.0 were rated to a low extent or even not considered at all. On the same note the higher the standard deviation the higher the level of disagreement or dispersion among the respondents. From the findings, majority of the respondents indicated that political influence, negative customer perception, inability to meet the export demand, drought, limited market, weak policy framework and low of financial supports affects organic fish farming in Kenya to a very great extent as indicated by a mean of 4.94, 4.85, 4.76, 4.64, 4.61, 4.57 and 4.56 with standard deviation of 0.87, 0.83, 0.70, 0.60, 0.70, 0.67 and 0.47. The study further found that increased protein intake, ineffective farmers training and development, low quality standard for bio manures and lack of awareness on existence of organic fish affects organic fish farming in Kenya to a great extent as indicated by a mean of 4.49, 4.46, 4.46, 4.45 and 4.44 with a standard deviation of 0.48, 0.56, 0.45 and 0.50. Most of the respondents indicated that poor government support, low skills and knowledge and low production in fish farms affects organic fish farming in Kenya to a moderate extent as indicated by a mean of 3.80, 3.74 and 3.65 with a standard deviation of 0.38, 0.20 and 0.15.

The study sought to know the effectiveness of the policies governing organic fish farming in Kenya. From the finding, majority 79% of the respondents indicated that policies governing organic fish farming in Kenya was effective to a very great extent while 21% of the respondents indicated that policies governing organic fish farming in Kenya was effective to a great extent.

The study sought to know the extent to which the respondents agreed with the given statement concerning influence of the policy framework on organic fish farming. From the findings, majority of the respondents strongly agreed that political interference with policy formulation that aims at improving organic fish farming affected the organic fish farming as indicated by a mean of 4.81 with standard deviation of 0.66. The study further found that most of the respondents agreed that formulation of weak policies and lack of willingness to create effective policies affected organic fish farming as indicated by a mean of 4.44 and 4.38 with standard deviation of 0.46 and 0.41.

4.4 Measures that can be taken to enhance organic fish production

The study requested the respondents to indicate the measures that can be taken to enhance organic fish production. From the findings, organic management practices, principally precautions for the fish heath,

maintenance of good fish heath through regular health check should be taken. Adopt management techniques, especially when influencing production levels and speed of growth. Ensure stock intensity are low, dead fish should be immediately removed from the pool and stressing factors should be lowered to the minimum level. The choice of the species resistant to diseases and subspecies should be considered. The species whose races are in danger can be preferred and In case of disease, it is proper to use natural treatment methods. This would enable the farming to achieve a high level of disease resistance and prevention of infection.

5.0 Conclusion and recommendations

5.1 Conclusion

The study concluded that due to the perishable nature of fish, farmers need to be trained to minimize losses before the fish gets to the market. The government should construct a fish cooling and processing plant to preserve the products. Installation of fish pellet production machines for ready fish food is important.

Pollution, destruction of sensitive coastal habitats, threats to aquatic biodiversity and significant socio-economic costs must be balanced against the substantial benefits. Aquaculture has great potential for food production and the alleviation of poverty for people living in coastal areas, many of who are among the poorest in the world. A balance between food security and the environmental costs of production must be attained

New technologies such as reticulating and offshore systems hold promise for lessening the impact of aquaculture on the surrounding environment, is an advantage of these expensive innovations. Aquaculture development must adapt to the needs and capacities of developing countries. Politically, food production will remain an overriding priority, and aquaculture will continue to grow. Models must be developed to clearly predict whether the socio-economic benefits of aquaculture are worth the environmental cost.

5.2 Recommendations

The government of Kenya (GoK) should formulate clear policies on organic agriculture. Such policies should identify mechanisms for protection of small scale producers because these are the ones facing more serious challenges compared to the large scale producers. The policies should also be designed to enable the strengthening of organic farmer associations and NGOs so that they will play a major role in the marketing of organic produce, and the dissemination of organic technologies among the small scale producers;

The GoK through Ministry of Agriculture, the Ministry of Fisheries, and Organic Agriculture sector stakeholders should revise the existing policies which have relevance in organic agriculture to ensure that they effectively consider the vision and mission of organic agriculture in Kenya; The GoK and OA sector stakeholders through consultations to formulate laws in favor of organic agriculture thereby enabling Kenya to comply with international regulations on organic fish farming. This will help the efforts around regional cooperation in standards development and implementation and establish easy entry to international markets National Organic Agriculture Movement in consultation with Agriculture sector ministries and parastatals like Kenya Bureau of Standards to establish a National Organic Committee (NOAC) with cross-cutting representation of government and all stakeholders in the sector. A key task for the NOAC would be to explore and spearhead the prospecting, development and eventual implementation of policies on organic fish farming.

References

IFOAM (2009*) Definition of Organic Agriculture* (Accessed 12th July 2012). Available from World Wide Web: e.ehttp://www.ifoam.org/

KOAN, 2009), *Kenya Organic Agriculture Network (2005 – 2009*, Accessed 14th July 2012) Available from World Wide Web: e.ehttp://www.koan.co.ke

Ministry of Fisheries Development. 2009 (online) (Accessed 19th July 2011). Available from World Wide Web: <http://www.fisheries.go.ke/fisheries sector>

Ministry of fisheries Development 2009 (online. (Accessed 19th July 2011). Available from World Wide Web: <http://www.fisheries.go.ke/fisheries sector/Kenya fish resources>

Saunders M, Lewis P & Thornhill A. (2009). *Research methods for business students*. Essex England 5th edition: Pearson Education Ltd.

UNCTAD – UNEP, (2008). Capacity-building Task Force on Trade, Environment and Development*. Organic Agriculture and Food Security in Africa.* UN New York and Geneva

Abila, R.O. (2003). 'Fish Trade and Food Security: Are They Reconcilable in Lake Victoria?' Report of the Expert Consultation on International Fish Trade and Food Security. Casablanca, Morocco, pp.27 - 30 January. 2003. *FAO Fisheries Report.* No. 708. Rome,

Bangkok, WWF and Network of Aquaculture Centres in Asia-Pacific. (Unpublished)

Balarin, J. D. (2005). National reviews for aquaculture development in Africa 7. Kenya.

– FAO Fisheries Circular N0. Pp. 770. 799

Brigham, E.F. and Houston, J.F. (2004). *Fundamentals of Financial Management*.10th ed.International Students Edition (ISE).pp.387- 421.

Campell, D; (1995). The impact of field day extension approach on the development of fish farming in selected areas of Western Kenya. TCP/KEN/4551 (T) Field Document N0 1. Kisumu, Kenya.

Campell, D; S. Obuya and M. Spoo. (1995). A simple method for small scale propagation of *Clarias gariepinus* in Western Kenya. TCP/KEN/4551 (T). Field Document N0 2. Kisumu, Kenya.

De Graaf, G. (1994). T*he Artificial Reproduction and Pond Rearing of The African Catfish Clarias gariepinus*. A manual/reader prepared for the training course given at Kisumu from 3-8-94 to 8-8-94 for fish farm managers and extension officers of the project for the development of small scale fish farming in the lake basin area (FAO/UNDP/BSF-KEN/86/027) (February 2005)

De Graaf, G. and Janssen, H. (1996). Artificial reproduction and pond rearing of African catfish *Claris gariepinus* in sub-saharan Africa – A handbook. *FAO Fisheries Technical Paper*. No.362. Rome, FAO. 1996. 73p.

Egna, H.S. and Boyd, C.E. (1997). *Dynamics of Pond Aquaculture*. CRC Press, FL,USA.

Norusis,M.J. (2007*) SPSS 15 Guide To Data Analysis*. Lodon: Prentice Hall.

Anderson,T.W.(2003) *An Introduction to Multivariate Statistical Analysis*. New York: John Wiley

Soto, D., N. and Buena, F., (2004). Evaluation of salmon farming effects on marine systems in the inner seas of southern Chile: a large-scale mensurative experiment. *Journal of Applied Ichthyology* 20, pp.493–501.

Mugenda, O. M. And Mungenda, A. G. (2003), *Research Method Quantitative & Qualitative Approaches*: Nairobi Kenya: acts Press.

Kothari, C. (2008), *Research Methodology; Methods and Techniques*: New Delhi, New age International Publishers.

Cooper, D. R. & Schindler P. S. (2008). *International Edition: Business Research Methods*. (8th ed.); New Delhi; MacGraw-Hill.

East African Community (EAC), (2004). *The Vision and Strategy Framework for Management and Development of Lake Victoria Basin.* Retrienved on 23rd July 2012,on <www.eac.int >

FAO. (2002). FAO Yearbook of Fishery Statistics. *Capture production 2002.* Vol. 94/1. (February 2005)

Gichuki, J. (2003). *Ecosystem functioning in African tropical freshwater wetlands: Insights from stable isotopes and water quality analysis (Nyanza Gulf, Lake Victoria, Kenya)*. PhD Thesis, Brussels Belgium ,Free University of Brussels,

Government of Kenya , (2003). *Economic Recovery Strategy for Wealth and Employment Creation, 2003-2007*. Ministry of Planning and National Development. The shorter (popular) version.40p.

Hebicha, H.A; Gamal A.R. and Green, B.W. (1994). *Economic Analysis of Different Tilapia Pond Culture Systems in Egypt.* 12th Annual Technical Report 1994. PD/A

Hogendoorn, H. (2007). Controlled propagation of African catfish *Clarias Tazera* (C&V). I. Reproductive biology and field experiment. *Aquaculture*. 17(4):323–333.

Janseen, J. (2000). Hatchery management of the African Clariid Catfish *Clarias gariepinus* (Burechell, 1822). In Coche, A., Edwards, D (Eds), Selected aspects of warm water Fish Culture. FAO/UNDP, Rome.

Kagai, J.K .(2005). National plan for Development of Aquaculture in Kenya. – In*: FAO Aquaculture Planning in Africa,* ADCP/REP/75/1, pp. 61 -65.

Leroy, C. (2009).The Emergence of Aquaculture: Bridging the gap.*MTS Journal*.pp.34:1

Martinez-Cordero, F.J. and Lueng, P.S. (2004). Multicriteria decision making (MCDM) model for regional sustainable shrimp farming development in northwest Mexico. *Aquaculture Economics and Management*. 8 (N0.3 & 4): pp.179-192.

Macharia, S.K; Ngugi, C.C and Rasowo, J. (2002). Comparative study of hatching rates of African catfish (*Clarias gariepinus* Burchell 1882) eggs on different substrates. (December2004)

Mbugua, H. M. (2002). The Role of Fisheries Department in Aquaculture Development in Kenya. *Samaki News*. Department of Fisheries Kenya. Nairobi Vol 1 no. 1 June

Moehl, J. (2006). Development in Africa: Cote d'Ivore/Project ADB-West. In: *FAO Aquaculture Newsletter*, no. 21, pp. 27-28. FAO, Rome.

NaCSA. **(**2009). Sustainable shrimp culture through cluster farming approach. Finfish News,*National Fisheries Development Board*, Volume 1, Issue 1, April–July 2009, India

Omondi, J.G; Gichuri, W.M and Veverica, K. (2001). Apartial economic analysis for Nile tilapia *Oreochromis niloticus* L. and sharptoothed catfish *Clarias gariepinus* (Burchell 1882) polyculture in central Kenya. *Aquaculture Research*, 2001 (32), 693- 700.

Othina, A, N, Angiela, P.O., Wekesa, S.J and Odipo, J.O. (2003). Report on Lake Victoria (Kenya) fisheries catch assessment survey of August 2003. *Kenya Marine & Fisheries Research Institute Catch Assessment Survey Report,* August 2003.

Economic Survey (2004), by Central Bureau of Statistics Ministry of Planning and National Development.

Rahman, M, Varga, I. and Choudhury, S.N. (1992). *Manual on African Magur (Clarias gariepinus) Culture in Bangladesh*. Field Docuemnt. Institutional Strengthening in The Fisheries Sector. Department of

Fisheries, Government of Bangladesh,United Nations Development Programme and Food and Agriculture Organization of The United Nations.

Tisdell, C. (2003). *In Aquaculture, Farming Aquatic* Animals *and Plants*. Lucas, J.S and Southgate, P, C (Eds). Blackwell Publishing Ltd, Oxford OX4 "DQ, UK. ISBN 0-85238-22-7. Pp237-251.

Veverica, K.L; Ngugi, C; Amadiva, J. and Bowman J.R. (2001).*On-Farm Trials: Evaluation of Alternative Aquaculture Technologies by Local Farmers in Kenya.*19th Annual

Technical Report (2001)**.** *PD/A CRSP Office of International Research and Development*, Oregon State University, OR, USA, pp.121-129.

Wakwabi, E., Abila, R.O. and Mbithi, M.L. (2003). *'Kenya Fish Sub-sector: Fish Sector Development strategy for Kenya'*. Consultancy Report for the ITC/ UNCTAD/ WTO Joint Integrated Technical Assistance Program to Least Developed and Other African Countries. Kenya Department of Fisheries/ AFIPEK/ EPC. Nairobi. (Final draft). World Bank. 1996

Zonneveld, N. (2003). *Study of the Pre-conditions of Commercial Fish Farming on the Lake Victoria Basin,* Kisumu, Kenya –Lake Basin Development Authority (LBDA) Report, 130 pp.

Joker, L. and Christensen, B. **(**2009). *The seafood business and small-scale aquaculture farmers*. Rome, Danish Technology Institute and FAO. (Unpublished)

NACA**. (**2009). *Project report: small-scale shrimp producer environmental standard assessment.*

Waban, J. (2007). Thailand's shrimp revolution. *AQUA Culture AsiaPacific Magazine*, May–June.

World Bank, (2000). *World Development Indicators 2000 – CD Rom,* World Bank*,* Washington, D.C.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Recent conferences: http://www.iiste.org/conference/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar