

ORIGINAL ARTICLES

Constraint to Aquaculture Development in Nigeria and Way Forward

Adediji O.B. and Okocha R.C.

Veterinary Public Health and Preventive Medicine University of Ibadan, Nigeria.

ABSTRACT

Nigeria offers the largest market for fisheries products in Africa. Fish production from capture fisheries in spite of its being expensive and risky in the coastal line regions of Nigeria has been erratic and on the decline in recent years, resulting in increase in poverty and nutritional deficiency. Aquaculture production remains the best option to bridge the gap between the total fish demand and total domestic production in the face of high cost of production input and unstable government policy. This study enumerate the factors affecting aquaculture production in Nigeria with emphasis on fish seed, disease, education, production and management, feed and feeding, government policy, veterinary care and, breeding, infrastructure etc. and suggested way forward for profitable and sustainable aquaculture in the country.

Key words: Aquaculture, Problems, Nigeria.

Introduction

Aquaculture is the husbandry of aquatic food organisms. The need arose from the decrease in supply from ocean fisheries as a result of over-fishing, habitat destruction and pollution. One of the ways to bridge the gap between the reduced fish supply and increased world food fish demand is through aquaculture. Unlike Asia, Africa has little aquaculture tradition and has been affected by a number of external problems that have prevented proper management and development despite investment. Aquaculture has been demonstrated as a cheap source of protein (FAO, 1983). FAO (2002) reported that an estimated 840 million people lack adequate access to food; and about 25% of these are in sub-Saharan Africa. As the 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 and healthy life (Pretty, 1999). A number of countries in sub-Saharan Africa are characterised by low agricultural production, widespread economic stagnation, persistent political instability, increasing environmental damage, and severe poverty. Given this situation, it is therefore pertinent to provide the poor and hungry with a low cost and readily available strategy to increase food production using less land per caput, and less water without further damage to the environment (Pretty *et al.*, 2003). In Nigeria, aquaculture development has been driven by social and economic objectives, such as nutrition improvement in rural areas, generation of supplementary income, diversification of income activities, and the creation of employment. This is especially true in rural communities, where opportunities for economic activities are limited. Only in recent years has aquaculture been viewed as an activity likely to meet national shortfalls in fish supplies, thereby reducing fish imports. According to Ekunwe and Emokaro (2009) Statistics indicate that Nigeria is the largest African aquaculture producer, with production output of over 15,489 tonnes per annum, this is closely followed by Egypt with output of about 5,645 tonnes. Only five other countries: Zambia, Madagascar, Togo, Kenya and Sudan produce more than 1,000 tonnes each. Ekunwe, and Emokaro (2009) further showed that Nigeria imports about 560,000 tonnes of fish estimated at about \$400 million annually while annual domestic fish supply in Nigeria stands at about 400,000 tonnes. The fisheries sector accounts for about 2% of national G.D.P, 40% of the animal protein intake and a substantial proportion of employment, especially in the rural areas; the sector is a principal source of livelihood for over three million people in Nigeria.

Corresponding Author: Adediji O.B., Veterinary Public Health and Preventive Medicine University of Ibadan, Nigeria.

Short Statement of the Problem:

Fish farming or culture (an aspect of aquaculture) is an integral component of the overall agricultural production system in Nigeria. The major species cultured in Nigeria include tilapias, catfish and carp; however the African catfish *Clarias gariepinus* is the most farmed (Agbede *et al.*, 2003).

In spite of the great potentials of fish farming in Nigeria, Nigeria is still unable to bridge the gap in the short fall between total domestic fish production and the total domestic demand. In Nigeria, total domestic fish production is far less than the total domestic demand. According to Zango-Daura (2000), as cited by Rahji and Teslem Bada 2010 the country requires 750,000 tonnes of fish while domestic production amounted to 350,000 tonnes. Fish importation makes up the balance of 400,000 tonnes. Importation is thus often used to bridge the fish supply-demand gap (Rahji *et al.*; 2001). According to Zango-Daura (2000), Nigeria requires about 1.5 million tonnes of fish annually. This is what is needed to meet FAO's recommended minimum fish consumption rate of 12.5 Kilograms per head yearly to satisfy basic protein needs. For now, the unsatisfied demand will continue to be met through importation unless policy actions are geared towards improving domestic productions by providing solution to factors militating against aquaculture in the country which is discussed below.

Government Policy:

According to Fapohunda (2005) in Nigeria, a large number of farms have failed to attain profitability in one or more years because of major disruptions in the production process. It may be due to late delivery of supplies of fingerlings and other related services. Lack of adequate technology or technical information and expertise as regards hatchery propagation remains a bane of the venture. There are also financial risks, which the farmer must contend with; these are due to unstable government financial policies. A change of government or changes in government policies are risks to the utilization of capital by the farmer. Fish farmers require repeated loans in addition to loans for capital constructions and initial operational costs. These may be followed by short-term loans for annual supplies of seed, feed, new equipment or expansion. The risk to farmers in this regard emanated from the terms of credit and changes in the operational cost Afolabi & Fagbenro (199) investors must be informed about the meteorological conditions of the site and the climatic conditions of the locality, the chances of certain incidences such as flooding, high tides and incidences of drought. Efforts must be intensified at monitoring and patrolling farms regularly to check the menace of poachers and saboteurs.

Government should encourage fish farmers by evolving a number of non-fiscal incentives, which may include grants for development, government equity shareholding, government insurance, leasing of facilities and compensation schemes, and there may also be subsidies for construction, equipment, supplies, labour and price support. Credit on advantageous terms through quasi-government credit schemes, special loans with deferred repayment schedules and loan guarantees should be made available. Lending institutions must encourage farmers by ensuring that credit is available. Since various changes in government, which is a common feature in Nigeria, are risks to the utilization of capital by farmers, a stable polity must be ensured. Such stability will boost the development of the fish industry through a number of valuable roles e.g. market services (information, intelligence reports, promotions etc) and technical services (research and development, extension, training schemes etc). In order to ensure sustained and increased inflow of investment into Nigerian agriculture, agricultural policies must endure and even outlive the governments that formulated them. The practice of changing macroeconomic policies by successive federal governments is inimical to long-term investments in fish farming. The practice of contract arrangements between out growers and private companies needs to be strengthened, since it has been difficult to promote and enforce contract details between any of the tiers of government and small farmers.

Land:

Land is one of the most important resources readily available for production in developing countries. According to Adeogun et al, 2007 the mode of acquisition of land varies from one part of the country to other; outright purchase from individual owners or from government by issuance of a certificate of occupancy it could also be by traditional inheritance, family, communal/cooperation, squatter . Land is perhaps the most important production input. Ownership affects land use, farming systems, institutional structures, ecological conditions, adoption and use of technology, food production and self-sufficiency, and overall wellbeing of the rural and urban population. Poverty and resource misuse is linked because of the pattern of land distribution, which often favors the rich class. The rich have access to land, which is less prone to degradation or erosion. In addition, the rich class has the economic resources to invest in and improve the land. However, poor farmers continue

to till a marginal resource base despite increase in their number. Land use coupled with the effort of small farmers is the key instruments for achieving sustainable increases in yield and productivity.

However, insecurity of tenure, especially among small-scale farmers, has been known to act as a disincentive to the conservation of resources, including reforestation and soil conservation projects. This is so because farmers are not willing to make necessary investments for which they may be unable to reap future benefits. Of all social reforms, without it, resource conservation and hence food security and poverty elimination will not be met and sustained. The location of land determines how land is used and the type of fish culture adopted by fish farmers. Farmers, whose lands are located in swampy areas with plenty of water, simply excavate such lands into earthen ponds. On the other hand, farmers utilize any available empty space in their homes and build them into ponds. The main problem with respect to land for cultivation is land availability. Land availability for agricultural production in Nigeria involves a complexity of interacting variables such as population, land tenure system, level of technology and the stage of the country's development (Ojo and Afolabi, 2003). These variables, especially land tenure systems put serious limitations on the amount of land that is available for aquaculture. Ugwuba and Chukwuji 2010 in their study reported lack of land for pond establishment as one of the constrain to aquaculture in eastern part of Nigeria.

Resource policy planners have recently begun to recognize that many resource management systems embodied in the farming system that have persisted for years exemplify careful management of soil and water. In addition, such systems exemplify efficiency and a regenerative approach to agriculture development. The principles underlying local management systems can be utilized to develop new techniques that will preserve the land's capability and productivity even as population increases. One example is the continuous cultivation agro-forestry system of "alley cropping" which uses the local resource management principle of natural regeneration in a fallow. The method is a scientifically based but locally acceptable way of meeting the resources conservation needs of farmers in third world countries.

Water:

This is one of the most important resources used in fish farming. Without assured, adequate and good quality water supply, fish production would be made impossible. According to Onome and Ebinimi (2010), water is one of the most critical factors besides good feed/feeding in fish production. It is not constant, varies with the time of the day, season, weather condition, water source, soil type, temperature, stocking density, feeding rate and culture system. For a successful aquaculture venture, the dynamics and management of water quality in culture media must be taken into consideration. The major source of water for fish farmers in Nigeria includes: tap water from domestic water supply, water from streams/ rivers, well and boreholes. The greatest challenges encountered by fish farmers in Nigeria have to do with pollution from industrial activities, mining and the petroleum industries. Water pollution has become a global issue. Water is essential to all living organisms. It is needed for aquaculture production and also the organisms that it harbours (Olowosegun *et al*, 2005). Water serves as the medium for fish life processes. Without water fish cannot survive. Ugwuba and Chukwuji (2010) in their study reported that mortality of fish due to disease and water pollution constitute problems to aquaculture development in the country. Pollution of surface water has had severe impacts on fisheries production. Olowosegun *et al*, 2005 reported that in Nigeria, most of the fishing ground has been rendered unproductive by oil exploration, dredging of some water bodies and dumping of toxic industrial effluents. Fish kill have been reported to occur in the aquaculture industry due to crude oil pollution Patience *et al*, 2009. Also the level of yield in the industry has been reported to be affected by pollution according to Akanni and Akinwumi 2007. The rapid industrialization, coupled with technological advances in agriculture has introduced various pollutants into the aquatic ecosystems, which serves as the ultimate sink for most metals (Ogbeibu and Ezeunara, 2002).

Production and Management:

Many technical problems arise in the production of fish seed either in the pond or hatchery system. Principal among these are: the lack of and poor management of broodstock, especially feeding and handling; and the poor record keeping of all activities regarding induced spawning, care of eggs, fry, feeding, and general management of fingerlings (Atanda, 2006). The others factors that could affect production and management as indicated by Adedeji and Owoigbe (2005) in their studies on factors affecting catfish production and its public health implication includes the following: capital, cost of labour, security, marketing, storage, preservation, distribution and transportation of fish and fish products. For increase production and profitability all the factors listed most are taken care of.

Breeding:

The potential negative impacts of genetics related to brood stock management issues, such as inbreeding, genetic drift, introgressive hybridization, and unconscious selection, have been well established that many, if not the majority, of aquaculture stocks have been negatively impacted by poor genetic management (Mair, 2002). Availability of fish seed of the candidate species in adequate quantity is one of the most important factors for a sustainable and profitable fish farming, which involves a number of management practices in the maintenance of quality broodfish in adequate number. In the tropics, most aquaculture species can be grown year round, subject to suitable availability of water and demand for cultured fish is also largely year round, with seasonal troughs and peaks associated with the availability of fish from capture fisheries and cultural preferences. However, for the majority of species, spawning and seed supply is seasonal, thus multiple spawning species are often preferred for successful aquaculture (Mair, 2002). However, according to Agbede *et al*, (2003) there is a need to produce good quality seed, fingerlings and high quality broodstock at a good price in order to solve the problems encountered by fish farmers in Nigeria. Scarcity of quality seeds have been identified by Ugwuba and Chukwuji (2010) as one of the major problem encountered by fish farmers in Nigeria. Government should be willing to assist hatcheries by given subsidy to equipment and materials used in the industry. Nigerian aquaculture industry also needs to explore the potential of genetics and modern technologies in breeding this will enable the development of high quality fish seed. Atanda 2007 One aspect of the Nigerian seed industry which needs to be addressed is the standardization of fingerling size and pricing. Due to the absence of institutionalized quality control of practices, seed producers sell different sizes of fry and fingerlings to farmers, with neither standardization nor guarantee on the quality. While some hatcheries sell 1-2 cm fry as fingerlings, another farm may sell 5-6 cm fry for the same price. The market capitalizes on the ignorance and desperation of the buyers. The adverse effect of this is the heavy post-stocking mortalities which could discourage farmers from continuing the business. A good hatchery must always have a way of producing equal size of fingerlings of the same age. A good practice is to ensure that only fingerlings of uniform sizes are sold out as a batch to customers.

Feed and Feeding:

Fish like other animals have a requirement for essential nutrients in order to grow properly. In the wild, natural feeds are available and as the fish forage for these, they are able to meet their body needs. When fish is removed from its natural environment to an artificial one, enough food must be supplied in order to enable them grow. Artificial diets may be either complete or supplemental. Complete diet supply with all the ingredients (protein, carbohydrates, fats, vitamins and minerals) is necessary for the optimal growth and health of the fish. Supplemental diet do not contain a full complement of nutrients needed but are used to help fortify the naturally available diets. Riche and Garling (2003) reported that fish reared in intensive tank systems requires all nutrients in a complete pelleted diet since natural food is limited and fish cannot forage freely for natural foods. This has the advantage of high quality and consistency of diet. The quality of fish feeds and the hygienic levels of technological process employed during feed formulation determine the level of risk of microbial contamination aided by temperature. According to Zmyslowska (2000), storage conditions especially temperature and humidity are important factors affecting microbial quality of fish feeds. Improper storage temperature may prolong survival of the microorganism in fish feeds by enhancing their multiplication and production of toxic substances which may be injurious to fish. Good nutrition in fish production system is essential to economically produce healthy, high quality fish products. However the ever increasing cost of feed in Nigeria has greatly increase cost of fish production due to lack of raw materials which have to be imported and competition in the livestock industry for micro and macro nutrient and essential amino acids used in the production of fish feed.

Disease:

Diseases in aquaculture tend to spread relatively easily because of high density of stocking and intensity of feeding in limited water area, the proliferation of disease causing agents through the common water source between ponds, farms and the stocking of fish, fry, fingerlings and broodstock transported from other fish farms without adequate precaution. Agbede *et al*, 2003 and Nyaku *et al*, 2007 reported that disease problems could result in financial losses under extensive culture and the risk of complete loss of crop tends to be higher than in other agricultural activities.

In Nigeria the level of awareness of the impact of disease to aquaculture is lacking as revealed by numerous personal interactions and the report of Adeyemo *et al*, 2002; Adeyemo *et al*, 2003; Adedeji *et al*

2003; Adedeji and Owoigbe (2005) and Kolndadacha, *et al*, (2007). Parasitic diseases of fish are very common all over the world and are of particular importance in the tropics (Roberts and Janovy, 2000).

Fish is the most parasitized of all vertebrates (Arme and Wakey, 1970). The importance of parasitic infection on fish production has largely remained an issue of concern to fish farming industry. Some parasites have been discovered to have zoonotic potential in mammalian host including man thereby making them of public health importance (Ukoli, 1981).

However, in instances where hosts are overcrowded such as in aquaria and fish farms, parasitic diseases can spread very rapidly causing gross mortalities (Paperna, 1996).

In fish farming or aquaculture, some parasites may be highly pathogenic and contribute to high fish mortalities and economic loss, while in natural systems they may threaten the abundance and diversity of indigenous fish species (Mashego, 2001).

Clarias gariepinus is one of the most resistant and widely accepted and highly valued fish that could be cultivated in Nigeria, therefore the need for documented research on parasites which might constitute serious problems on this fish cannot be over emphasized (Anthony, 1982); Dankishiya and Zakari (2007).

Nwuba (1987) reported that out of 107 *Clarias lazera* observed only three were free from helminthes parasites infestation, and a single fish could have an average of about twelve helminthes parasites. Olurin and Somorin (2006) also reported helminthes infestation of the fishes from Owo in South Western Nigeria. A high level of management involving the maintenance of adequate hygiene practices, use of good water quality and disease resistant species and the employment of services of qualified aquatic/fish veterinarian will help prevent or reduce the incidence of diseases as highlighted by Agbede *et al* 2003 that lack of skilled and experience Aquatic Veterinarian with adequate knowledge of principle of disease prevention and control in the aquaculture industry is a major factor affecting fish culture in Nigeria. This has resulted from the non inclusion or little time allocated to the teaching of Fish and Wildlife Medicine to Veterinary student in the Veterinary curriculum in Nigerian Universities.

Veterinary Care and Availability of Drugs and Biological:

The rapid development of aquaculture in the last twenty years and the concomitant increase in fish and shell fish diseases have led to the increase in the use of veterinary drugs, biologicals and other chemicals in aquaculture industry. Akolisa and Okonji (2005) and Ihuahi and Omojowo(2005) reported huge economic losses and failures of aquaculture thus necessitating increased used of veterinary drugs, biological and chemicals to combat diseases in farmed fish.

The increased usage coupled with increase cost of these drugs, biological and chemicals and high cost of veterinary care have led to increase cost of production and reduction in profit. Abuse of veterinary drugs, biological and chemicals are other problems encounter in the industry. Lack of adequate knowledge about prevention, treatment and control of fish diseases which is also compounded by absence of diagnostic laboratory for fish diseases is another problem that have limited the growth of the industry in Nigeria. Government is encouraged to set up standard fish diseases investigation laboratories in all the state capital in Nigeria. This will assist the veterinarians in providing adequate service thereby increase productivity.

Marketing and Distribution:

This is an integral aspect of fish production because it is only when the fish gets to the final destination (consumers) that production can be complete. Marketing has been defined as all processes involved from the production of a commodity until it gets to the final consumer (Crammer *et al*. 2001). Apart from seasonality, scarcity and means of preservation which are the main problems of fresh fish marketing, transportation is also observed to be a major problem in fish marketing and distribution in Nigeria Adedeji and Owoigbe (2005). Most fresh fish sellers travelled by road and some of the roads are bush tracks while others are tarred but in a state of disrepair. This reduces the volume of traffic on the roads and raises the cost of transporting fish. The government should open up more roads and intensify efforts on the maintenance of existing road and also create a more enabling environment for more people to go into aquaculture so as to beat the seasonality of fresh fish supply due to inadequate and high cost of fish preservation/storage in Nigeria.

Education/extension Service:

(Edwards, 1998) emphasizes that most scientists focus on technical aspects of aquaculture, resulting in the impression that the major constraint facing aquaculture development is a shortage of technical knowledge, overshadowing the developmental and educational constraints. The most important constraint to aquaculture

development is dissemination of existing knowledge, whether derived from research or indigenous technical knowledge of farmers. The limited capacity of developing-country institutions in education, research and development compounds this fundamental failing. Research should follow farming systems research and extension methods in which inter-disciplinary teams work with farmers to evaluate and develop both production systems and extension methods that are appropriate to the local conditions of farmers and their resource base. Ajieh (2010) identified low level of adoption of fishery technology due to lack of extension service in Edo State as one of the factors that contributes to low productivity in the industry. In Nigeria the interaction between the extension agent and the farmers are poor due to level of education of most farmers (Adedeji and Owoigbe, 2005), most of the farms are located in places that are not easy assessable due to bad roads and lack of infrastructure. These have constituted a limiting factor to the growth of the industry. Agbede *et al* 2003 enumerated the importance of education in improving aquaculture in Nigeria and concluded that to improve the yield of fish production from aquaculture there is a need to improve the educational status of most of the farmers and those consulting for them. The Government should offer low-interest loans for continuous training of fish farmers, who should be mandated to train regularly to update their knowledge on new developments in the industry. These steps should result in enhanced fish production for viable and sustainable aquaculture development in Nigeria.

Others:

Other critical problems that servers as constrain to the growth of the aquaculture industry in the country according to Ugwuba and Chukwuji (2010) includes: poor storage facilities, high cost of labor, high cost of transportation, lack of capital and poaching by birds, reptiles and snakes

Conclusion:

Fish culture, an aspect of aquaculture, is vigorously being developed in Nigeria today, in order to bridge the gap between demand and supply. Food security, through a viable and sustainable aquaculture development, could be achieved if the factors militating against aquaculture in the country are strictly urgently addressed.

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