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Assessment of Farmed Fish Production Systems and Practices in Lagos State

Okunade, O.A.
Nigerian Institute for Oceanography and Marine Research, Victoria Island, Lagos

Corresponding Author E-mail:
olumideokunade@yahoo.ca

Abstract

Farmed fish culture practices in Lagos State were assessed for their operational efficiency and productivity among 85 respondents in the study area, 94.1% were within the productive age of 43-54years and mostly male (80%). Monoculture of African catfish predominate industry. Semi-intensive aquaculture was adopted with 63.5% using earthen ponds. Literate farmers dominated the aquaculture business with 69.4% having tertiary education. Only one farm has broodstock bank for commercial purpose together with grow-out production. Most fish farmers produced fishes for commercial purposes and harvesting is done 2-4 times annually with the fish weights of 250-750g per culture period of four months. Flood was the significant constraint in earthen ponds but lack of funds and poor market strategy negatively affected the industry. The performance in the industry could be enhanced if most species are brought into culture.

Keywords:
Fish production efficiency, culture management, fish farm productivity

Introduction

Global aquaculture production greatly increased at an average annual rate of 6.6% since 1995. In 2015, it reached 106 million tonnes with almost all aquatic animals (76.6 million tonnes) destined for human consumption. The positive trend indicates a significant role of aquaculture in contributing to food security, poverty alleviation and economic development of the poor (FAO, 2017). However, in Nigeria, despite being the largest fish consumer in Africa (Ozigbo *et, al.,* 2013) the local production of fish is yet to measure up with the demand for fish. Though the contribution of aquaculture to fisheries industry in Nigeria (2011-2015) was 69.81% (NBS, 2017); indicating growth in fish production through aquaculture activities as a result of gradual decline in supply of ocean fisheries associated with pressure on overfishing, habitat destruction and environmental pollutions (Adedeji *et al.,* 2011). However, this increase in fish production is yet to satisfy the rising rate of consumption because of the exceeding margin between fish demand and supply which has increased due to population explosion in recent years (Falaye and Jenyo-Oni, 2009).

Fish farming is the most common practice of aquaculture. It involves fish culture for subsistence and commercial purposes in different culture facilities such as earthen ponds, concrete tanks, plastics tanks, Tarpaulin vat and other enclosures. Presently, the most significant fish species cultured in Nigeria are Clariid catfishes and tilapias. However, if aquaculture is adequately developed and practiced, it can contribute to global food security and economic growth (FAO 2014); likewise contributing to improve the country's Gross Domestic Product (GDP) and reduce the rate of unemployment (Emmanuel *et al.,* 2014). The growth in aquaculture in the country will contribute to solving the increase in animal protein demand as population increases. It is conceivable that if more investors invest in aquaculture, the gap

between supply and demand for fish will reduce for the benefit of consumers, thereby having more products from aquaculture (Adeogun *et al.,* 2007). Moreover, the trend of aquaculture development and operations must be monitored and guided for good aquaculture practices. Hence, this study assessed the potentials, strengths, weaknesses, operational management pattern of farmers and challenges to ensure aquaculture sustenance in Lagos State.

Materials and Methods

The study was conducted in Lagos State, Nigeria. A total of 85 functional fish farms were assessed using simple random techniques. Data collection took place between March 2017 and May 2018. Fish farmers were identified with the assistance of the extension officers of Lagos State Agricultural Development Programme (LSADP) and the Fisheries Department of Lagos State Ministry of Agriculture and Natural Resources. The survey was conducted using structured questionnaire.

The data collected were grouped into socioeconomic characteristics and procedures of farm operational management. Data were analysed using descriptive statistics such as percentages and tests of differences between means and proportions.

Results and Discussion

Respondent characteristics

Table 1 shows that men primarily dominate fish production while the involvement of women dropped to 10.6 percent compared to 16.1percent reported by Adeogun *et al.,* (2007). About 94.1 percent of the respondents were still within the productive age bracket of 19 – 54years with the highest percentage recorded for age 43 – 54years. The implication is that young active youths embrace fish farming earlier in conformity to Egbufor *et al.* (2012) who reported the average age of 33years involvement in fish farming and Adeogun *et al.,* (2007), who reported the highest involvement of age bracket 45 – 54 years in fish farming. The 5.9% captured the retiree in fish farming with age bracket greater than 55years.

Married respondents accounted for 91.8% most of who engaged their spouse in emergency operations if the need arises while widow recorded the least with 1.2%. The educational level of the respondents showed that 69.4% had tertiary education being the highest followed by 29.4% secondary school holders, 1.2% primary school holders, therefore there was no respondent without formal education. The result agreed with the findings of Ifejika *et al.* (2013) with 82.8% of farmers found to be graduates of different tertiary institutions. The implication is that aquaculture practice can be well restructured for better output.

Table 1: Socio – economic characteristics of fish farmers

Background characteristics	Frequency	%
Gender of respondents		
Male	76	89.4
Female	9	10.6
Age distribution of respondents (yrs)		
19 – 30	1	1. 2
31 – 42	28	32.9
43 – 54	51	60
= 55	5	5.9
Marital status		
Single	6	7.1
Married	78	91.8
Widowed	1	1. 2
Educational status of respondents		
Primary School	1	1.2
Secondary School	25	29.4
Tertiary Institution	59	69.4
Farmer's Status		
Fish producer	71	83.5
Businessman/woman	8	9.4
Employee	2	2.4
Retiree	4	4.7
Years of experience (year)		
= 1	3	3.5
2 – 5	11	12.9
6 – 10	47	55.3
Above 10	24	28.2

Source: Field survey, 2017 -2018

Among the respondents, 83.5% were fish producers followed by 9.4% business men/women in fish production, while the least was an employee doubled as fish producer. Both fish producers (83.5%) and retirees (4.7%) are always in the farm involving in daily operations of the farm while others engaged the services of farm attendants. More than average of the total respondents had >5 years' consistent fish farming activities with 55.3% followed by those having >10 years' experience (28.2%) while 3.5% are new entrants in the system.

Table 2: Frequency distribution of fish farming management

	Frequency	Percentage
Source of water		
Borehole	53	62.4
Well	4	4.7
Stream/river	1	1.2
Spring	22	25.9
Borehole & Well water	3	3.5
Borehole & Spring water	2	2.4
Available culture facilities		
Earthen pond	23	27.1
Concrete tank	21	24.7
Plastic tank	2	2.4
Tarpaulin Vat	9	10.6
Plastic Vat	1	1.2
Wooden Vat	2	2.4
Collapsible	1	1.2
Earthen &Concrete	2	2.4
Earthen & Plastic	1	1.2
Earthen & Plastic & Wooden Vat	1	1.2
Earthen & Concrete & Plastic	2	2.4
Earthen & Concrete & Plastic & Wooden Vat	1	1.2
Earthen & Concrete & Plastic & Tapaulin	1	1.2
Earthen & Concrete & Plastic & Fibre	1	1.2
Concrete & Plastic Tank	9	10.6
Concrete & Tapaulin/Vat	4	4.7
Concrete & Collapsible & Wooden Vat	1	1.2
Concrete & Collapsible	2	2.4
Concrete & Plastic & Tapaulin/Vat	1	1.2
Farming interest		
Hatchery	18	21.2
Hatchery & Grow – out	18	21.2
Production of sub – adult	3	3.5
Sub – adult and Grow – out	14	16.5
Grow – out	31	36.5
Grow – out & Broodstock	1	1.2
Cultured fish species		
Clariid Catfish	67	78.8
Clariid Catfish & Tilapia	12	14.1
Clariid Catfish & Heteroclarias	1	1.2
Clariid Catfish & Tilapia & Gymnachus	1	1.2
Clariid Catfish & Tilapia & Heterobranchus	1	1.2
Clariid Catfish & Heterobranchus & Gymnachus	1	1.2
Clariid Catfish & Tilapia & Arowana	1	1.2
Clariid Catfish & Snairy	1	1.2

Level of involvement		
Intensive	31	36.5
Semi-intensive	54	63.5
Culture system		
Monoculture	67	78.8
Polyculture	17	20
Integrated	1	1.2
Production technique		
Stagnant water	18	21.2
Flow Through system	46	54.1
Semi – flow through	19	22.4
Stagnant & Flow through	2	2.4
Types of feed used		
Feeds & Animal offal	2	2.4
Floating	60	70.6
Sinking	6	7.1
Floating & Sinking	17	20
Source of formulated feed used		
Self produced	5	5.9
Commercially purchased	64	75.3
Both	16	18.8
Feeding pattern per day		
1 – 2 Times	54	63.5
3 – 4 Times	31	36.5
Culture periods per annum		
1	2	2.4
2 – 4	58	68. 2
5 – 10	17	20
Above 10	8	9.4
Average weight harvested		
Fingerlings	21	24.7
100-499g	11	12.9
500-999g	38	44.7
1000g and above	15	17.7
Record keeping of farming activities		
Input procurement	48	56.5
Stocking rate	60	70.6
Sorting	55	64.7
Feeding rate	50	58.8
Mortality	22	25.9
Sales	61	71.8
Disease/Infection	3	3.5
Water quality parameters	2	2.4

Source: Field survey, 2017-2018

Management practices in the study area

The result on fish species cultured (Table 2) showed that clariid catfish are mainly cultured by farmers 78.8 percent while the culture of both clariid catfish and tilapia was 14.1%. Thus the major fish species under culture is the Clariid catfish. The reasons may be attributed to the desirable qualities of clariid catfishes for culture which includes, acceptability, resistance to infection and disease, hardiness, higher market value, high growth and survival. This agreed with the finds of Emmanuel *et al.* (2014) and Atanda (2007) who reported the acceptability of Clariid catfishes (80%), and tilapias (14%) among other culturable fishes in Nigeria. Carp that was next to clariid catfish in culture decades ago (Adeogun *et al.,*2007) are not reared presently. However, a species, *Arowana* is being subjected to culture trial in one farm in the sample area of the state. The fish culture practices were made possible without difficulties with the provision of water through borehole and well mostly for enclosure different from earthen ponds. The borehole recorded the highest (62.4%) and indicated the culture practices upland and within the city. The spring principally served 22 earthen ponds (25.9%) while only 1 facility fed with stream/river water. The following percentage mean of the farmers who maintained adequate information of farm activities at the time of this survey were recorded thus; procurement/input (56.5 %), stocking rate (70.6 %), sorting (64.7 %), feeding rate (58.8%), mortality (25.9%), sales of fish (71.8%), disease/infection (3.5%) and water quality parameters (2.4%). More attention of the farmers was on stocking, sorting and sale and less concerned about the water quality measure and pathogenic data.

Intensity of culture

Table 2 shows that the most culture facilities used by farmers were earthen pond which accounted for 27.1% followed by concrete tank (24.7%). The earthen pond activities are peri – urban based which enable farmers to acquire more cheaper space compared to land use in the city. It was observed that tarpaulin vat (10.6%) has taken over the use of plastic tank (1.2%) in the study area being used in hatchery and growout activities. Series of culture facilities combinations were engaged by the farmers based on the target goals and fund availability. However, no farmer is currently on water recirculatory (WRS) and cage culture system during the period of this project.

The respondents who predominantly involved in hatchery were 21.2% which accounted for about 20% of the farmers' population in the study area (Table 2). The average annual production of fingerlings was 6,345,000 (Table 3). This implies that farmers may have access to fish seeds at the time of stocking. However, the farmers who engaged in production for commercial purposes of sub–adult or/and adult were 56.5%. Only one farm has broodstock bank for commercial purpose together with growout production, whereas no designated farm for broodstock bank in the study area for the source of gravid broodstock for regular assurance of fish seed propagations.

The information gathered during the survey showed that no farmer engaged in extensive farming irrespective of the number of functioning facilities and stocking density. Most of the farmers practiced semi-intensive farming (63.5%) which supports Adeogun *et. al.,* (2007), based on the cost of commercially formulated feeds. Intensive farming (36.5%) was practiced contrary to the report of Ideba *et al.* (2013) that 100% of farmers practiced intensive system in order to make profit. The farmers in semi-intensive practices fed at most twice per day while the least of thrice per day in intensive fish farming practices. Commercial feeds (75.3%) were used, majority of which were floating feeds (70.6%) whereas few farmers (5.9%) produced their own sinking feeds which was reported to be cheaper as well as meeting the nutritional requirement of their stock. Water renewal rate was 54.1% for flow through while there was no significant difference in the practice of stagnant water and semi-flow (Table 2) through water renewal (21.2% and 22.4%, respectively).

Table 3: Production capacity of *Clarias gariepinus* seeds in Lagos State

Culture facilities	Total number used	Total size of culture facilities (m^3)	Total number of fingerlings produced per annum
Concrete tanks	46	549.94	2,583,913
Tarpaulin vat	75	393.43	2,927,949
Plastic tanks	47	84.07	833,138
	168	1,023.54	6,345,000

Source: Field survey, 2017-2018

Table 4: Production capacity of table sized *Clarias gariepinus* in Lagos State

Culture Facilities	Total number	Total size of culture facilities in use	Total stocking density (m^3)	Actual tonnage per annum
Earthen ponds	155	33,954.5	1,036,520	552.66
Concrete tanks	144	5,587.9	703,900	311.18
Tarpaulin vat	14	588.5	64,800	21.63
Plastic tanks	11	32.7	22,000	10.25
	324	40,163.6	1,827,220	895.72

Source: Field survey, 2017 -2018

Most fish farmers in the study area ensured that they produced fishes for commercial purposes 2 – 4 times annually with the average weight of 250 – 750g per culture period of usually four months. About 17.7% of the farmers reared to 1kg and above (Table 2) thereby making the annual tonnage production of grow-out to 895.72 with earthen pond producing the highest (Table 4).

Constraints to Fish Farming

Aquaculture is not exempted from challenges associated with productions like any other agricultural enterprises. Some of the factors may militate against the development and growth of the industry. The most common limitation of the earthen pond is flood which usually destroy almost 85 – 90% stock in the rainy season in the study area whereas, lack of funds and credit facilities cut across all production cadres. The problem of technical know – how and lack of adequate information on aquaculture (Adeogun *et al.,* 2007) is gradually reducing due to more awareness and regular fish related trainings being organized by the Ministries and Agencies of Agriculture (Fisheries Departments) to farmers. Fish Farm Estate equally improves aquaculture growth through sharing of knowledge and ideas. The producers are majorly subjected to the limitation of being unable to sell their matured fish as planned due to uncontrolled market and pricing system contrary to Okonji *et al.,* (2016).

Conclusion

The aquaculture growth in Lagos State reflects the involvement of young and vibrant youth who are ready to utilize little resources to practice aquaculture at least on semi – intensive culture system. Monoculture of clariid catfish is still predominant which calls for attention to develop better culturable fish strain or maintain the quality of the accepted catfish. Women are expected to be involved and also contribute more to the development of the industry to bridge the gap of gender inequality in fish culture

productions. The government policy should accommodate absorption of high cost of feed which caters for about 75 - 80% production cost in fish farming. The marketing structure in the cities and suburbs should be friendly to receive the produce as incentives to fish farmers and build the confidence of farmers to be in business.

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