ASSESSMENT OF FISH FARMING IN PLATEAU STATE, NORTH CENTRAL NIGERIA

Abstract

World leaders are making concerted effort to tackle the menace of food insecurity brought about by upsurge in human population, climate change and displacement of farming communities due to civil unrest in some part of the world. This study was undertaken to assess the current status of fish farming in Plateau State and suggest possible ways of ameliorating any observed challenges for increased fish production. The study evaluated the challenges affecting fish farming in the study area.

Structured interview schedule questionnaire were used in sourcing information from nine (9) local government areas in the state. Ninety (90) fish farmers were randomly selected from the nine (9) local governments areas each drawn from the three Agricultural zones of the State. Data obtained were analysed using descriptive statistics.

The findings revealed that majority of the fish farmers 70% were males and between the ages of 21-30 years.

The study also revealed that the major constraints affecting increased level of output in the study area were high cost of inputs (feeds), poor marketing channels, inadequate finance, inadequate access to credit facilities, and poor extension services.

Fish farming in the study area is however, profitable as majority of the farmers made a gross profit margin of above # 501,000.00 per annum.

The study recommends that fish hatcheries and feed mill should be established in the study area and that single digit credit facilities should be granted to interested fish farmers. Also extension services with respect to fish farming should be increased in the study area. A good quality fish market should also be established in the study area to assist the farmers in marketing their produce in order to optimise profit.

Key words: Fish farming, Constraints, Plateau State

1.0 Introduction

Feeding an expected global population of nine (9) billion by 2050 is a daunting challenge that is engaging researchers, technical experts, and leaders the world over (World Bank, 2013)[16]. A relatively unappreciated, yet promising, fact is that fish can play a major role in satisfying the palates of the world's growing middle income group while also meeting the food security needs of the poorest.

Fish is often referred to as the "rich food of the poor people" as it offers the best and cheapest source of good quality protein, macronutrients like vitamin A, Iron, Zinc, Calcium, Selenium and essential fatty acids, providing important balanced diet to the predominantly carbohydrate based diet of many poor people especially in developing countries such as Nigeria (Oluwatoyin *et al.,* (2010) [14]. In addition, fish is usually high in unsaturated fatty acids, particularly long-chain omega-3 fatty acids. It also provides health benefits in protection against cardiovascular diseases and assists in the development of the brain and nervous system in the foetus and infants.

Comment [RA1]: Delete

Fish demand is intensifying as world's population soars. The total fish demand for Nigeria based on the 2014 population estimate of 180 million was 3.32 million Metric tons (Mt). The domestic fish production from Aquaculture, Artisanal and Industrial fisheries for 2014 was 1.123 million Mt. Also in 2014, fisheries contributed 0.48% to the Agriculture GDP and contribution of Agriculture to GDP (2014) was 20.24%. The fisheries segment of agriculture delivered a growth rate of 5.9% year-on-year in 2015 and at the end of 2016 local fish production witnessed a significant boost in growing by 0.8%. Data from the Central Bank of Nigeria (CBN) showed that artisanal production accounted for around 76.8% of the 1.04 million tons of fish produced in 2015. (Eromosele, 2017) [5].

Comment [RA2]: From where came these data

Only about 50% of demand for fish is currently being met by local supply. The fisheries sector is estimated to contribute 3.5% of Nigeria's GDP, and provides direct and indirect employment to over six million people (Agu *et al.*, 2018) [2].

Fish is one of the vital sectors that are being explored as it is the best and cheapest source of animal protein for human consumption.

Comment [RA3]: Can fish be a sector?

Fish farming otherwise known as aquaculture, is the production of fish under a controlled environment by manipulating some stages of their life cycle to ensure maximum yield. It is an important source of food, income generation, employment and recreation for people around the world.

Fish in their natural environment are prone to attack by diseases, predators and other undesirable conditions such as pollutions and aquatic weeds infestation.

Also, over the recent decades the natural water bodies such as rivers, swamps, streams, lakes and seas had been over exploited by fisher folks without any deliberate attempt for replacement of aquatic resources especially in the developing countries.

There are also great concerns by consumers about the health implications of fish from the open waters due to the current rate of environmental pollutions from industries since the industrial revolutions. It is therefore commendable the current attention given to the development and growth of aquaculture globally.

This study was conducted to suggest ways of improving aquaculture production in order to bridge the gap between the supply and demand for fish and fish products in the study area.

2. Area of Study

This study was carried out in plateau State of Nigeria. The State is bounded on the South by Nassarawa and Taraba States, on the North by Bauchi and Kaduna States, on the East by Taraba and Bauchi States and on the west by Kaduna State.

Plateau State is located in Nigeria's middle belt. With an area of 26,899 square kilometres, the State has an estimated population of about four million people. It is located between latitude 08°24'N and longitude 008°32' and 010°38' east. The state is named after the picturesque Jos Plateau, a mountainous area in the north of the state with captivating rock formations. It is composed of 17 Local Government Areas (Fig1).

Plateau State which is known for its huge deposit of solid minerals is endowed with several mining paddocks which could be utilized for fish production. The State is divided into three Agricultural zones as shown in Table1 according to the Agricultural zoning system of the Plateau Agricultural Development Programmes (PADP). The three zones are made up of 17 Local Government Areas.

Comment [RA4]: Fish farming is not aquaculture but an aspect of aquaculture.
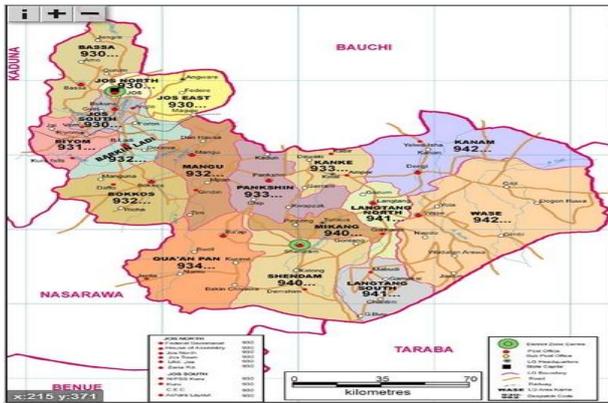
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Fig1: Map of Plateau State Showing the 17 Local Government Areas

   Source: State Ministry of Information, Jos.

Table1: Agricultural zones with their Local Government Areas

Zones	Local Government Areas
I	Northern: Jos North, Jos south, Barkin Ladi, Bassa, Riyom, Jos East
II	Central: Mangu, Bokkos, Pankshin, Kanke, Kanam
III	Southern: Lantang South, Lantang North, Quanpam, Wase, Mikang, Shendam

Source: PADP (2015)

3.1 Sampling Techniques

This study was carried out using structured questionnaires on various aspects of fish farming such as socio-demographic characteristics of the farmer and constraints in fish farming. Nine (9) Local Government Areas were randomly selected and ten fish farmers were randomly selected in each of the Nine (9) Local Government Areas. The study was carried out from October to November, 2017.

3.2 Analytical techniques

To satisfy the objectives of the study, descriptive analysis such as frequency and percentage were employed for the analysis.

Comment [RA6]: Include s

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Results and Discussion

Socio-Economic Characteristics of Fish Farmers

The information with respect to the socio-economic characteristics of the fish farmers in the study area is presented in table 2. The results indicate that a great number of the male folks (70%) are involved in fish farming, while a few females (30%) participated in Aquaculture meaning that the males dominate the aquaculture sector in the study area. This observation is in tandem with the report of (Ideba et al (2013) [9] who reported that fish farming is dominated by the male population in Cross River State, Nigeria. Olaoye et al., (2013)[13] also reported that the males dominated the aquaculture sector in Oyo State, Nigeria.

The result also indicates majority of the fish farmers (43.33%) in the study area are within the age bracket of that 41-50 years (table 2). This implies that most of the farmers still have the ability to practice fish farming, as this age bracket is a productive one, as such there is hope for increase in fish production in the state. This observation is in agreement with Sadiq and Kolo (2015)[15] who reported high youth participation in fish farming in Minna, Niger State , Nigeria.

The marital status of the respondent in the study area indicates that majority (64.44%) were married, 31.11% were single and 4.44% were widowed (table2). It then means that the married men are more interested in fish farming possibly because they have access to family labour. Also the singles in the study area that practice fish farming are very few. This is in agreement with Ibemere & Ezeano, (2014) [8] who reported married people participated more in fish farming in River State, Nigeria more than the singles. The result is also an indication that the singles who in most cases are youth are not aware of the huge economic potentials of fish farming, hence the neglect.

The household size indicated that majority of respondents in the study area (44.44%) had a household size of 1-5 persons, while 41.11% had a household size of 41 11%. The implication of this is that labour required for fish farm operation is cheap and easily available, as such labour is not a challenge in the study area.

All the respondents are learned and highly educated as 11.11% of them had attended secondary school education and 88.89% of them had attended tertiary education. This means that fish farming is a highly technical enterprise that requires learned farmers. And since majority of the respondents are literate innovation can be easily adopted. This is in agreement with Ajana, (1995) [3] Ibemere & Ezeano, (2014) [8] in their report for Ogun and River States of Nigeria respectively.

Comment [RA8]: Aquaculture or Fish farming

The primary occupation of the respondents revealed that majority (33.33%) of the fish farmers in the study area were fish farmer/businessmen, 28.89% were full time fish farmers, 27.78% were fish farmer/civil servant, while 10% were retired civil servant.

The study also shows that the business of fish farming can be operated as a part-time business. This is in disagreement with Ibemere & Ezeano,(2014)[8] who reported that majority of fish farmers in River State are full time fish farmer and in agreement with Ifejika and Ayanda (2005) [10] who reported that fish farming is majorly practiced in Niger State, Nigeria on part time basis. Also Ideba et al., (2010) [9] reported that 79% of fish farmers in his study areas were not full time fish farmers. It is also an indication that fish farming is practiced in riverine areas of the country more than the areas with less water bodies both lentic and lotic, since River State is a riverine area.

Table 2: Demographic/ Socio-economic characteristics of fish farmers (n=90)

Parameters	Frequency	Percentage
Age of respondent (years)		
21-30	21	23.33
31-40	23	25.56
41-50	39	43.33
50 and above	7	7.78
Total	90	100
Sex of respondents		
Male	63	70
Female	27	30
Total	9	100
Marital status of respondents (%)		
Single	28	31.11
Married	58	64.44
Widow	4	4.44
Total	90	100

Household size (person)

1-5	40	44.44
6-10	37	41.11
11-15	9	10.00
16-20	4	4.44
Total	90	100

Educational level

First school leaving certificate	0	0
JSSCE	0	0
SSCE	10	11.11
OND/NCE	37	41.11
HND/B.Sc.	33	36.67
M.Sc.	10	11.11
Ph.D.	0	0
Total	90	100

Primary occupation of respondents

Fulltime farming	26	28.89
Farming/ Business	30	33.33
Farmer/ civil servant	25	27.78
Retired civil servant/ Farmer	9	10.00
Total	90	100

Source: Field Survey, 2017

The farming experiences revealed that majority (36.67%) of the fish farmers had 6-10 years' experience in fish farming activities, 30% had 1-5 years of experience, and 21.11% had 11-15 years' experience, while 12.22% had 16-20 years' experience respectively. This implies that most of the fish farmers in the study areas are experienced which would invariably leads to increase in output, adoption of innovation and passing of information/innovation to intending fish farmers. This is in agreement with Akinrotimi et al., (2010) [4] in their study of brackish water aquaculture status in River State.

Table3: Fish Farming experience (years) (n=90)

Parameters	Frequency	Percentage
1-5	27	30.00
6-10	33	36.67
11-15	19	21.11
16-20	11	12.22
Total	90	100.00

Land ownership revealed that majority of the fish farmers (53.33%) in the study area inherited their land making them the rightful owners of the land, 33.33% of them purchased their land, 11.11% rented the land used for fish farming, and 2.22% of them were share croppers. The implication of this is that land does not constitute a challenge in the business of fish farming in the study area.

Table4: Land ownership (n=90)

Parameters	Frequency	Percentage
Inherited	48	53.33
Leased/ Rent	10	11.11
Share cropping	2	2.22
Purchased	30	33.33
Total	90	100.00

Source: Field Survey, 2017

Fish farmers in the study area preferred monoculture to polyculture system. This could be attributed to poor market value as well as acceptability of Tilapia species compared to Catfish/*Clarias* spp. Majority (62.66%) of the fish farmers practiced monoculture of the African catfish (*Clarias gariepinus*) as compared to 37.78% for Tilapia species. This is in agreement with Olaoye et al., (2013) [13] who reported similar trend in Oyo State, Nigeria. Ideba et al., (2013) [9] also reported that 61% of the total fish farmers in Cross River State, Nigeria, culture African catfish (*Clarias gariepinus*) as compare to other fish species.

Table 5: Fish farming technique/practice based number of species stocked in the same pond (n=90)

Parameters	Frequency	Percentage

Monoculture	56	62.22
Polyculture	34	37.78
Total	90	100.00

Source: Field Survey, 2017

System of fish farming practice

The result of the system of fish farming as presented in Table 6 showed that majority (46.67%) of the fish farmers reared their fish in concrete fish pond, 31.11% used earthen ponds, 16.67% used plastic tanks, and 5.56% used cage culture facility. This implies that fish farmers in the study area are buoyant economically since they can afford concrete pond as well as plastic/collapsible ponds which are a recent innovation in Nigeria. Ibemere & Ezeano, (2014) [8] reported similar trends in Ogun and River States of Nigeria respectively.

Table 6: System of fish farming practice (n=90)

System of fish farming practice	Frequency	percentage
Earthen Pond	28	31.11
Plastic tanks	15	16.67
Concrete	42	46.67
Cage culture	5	5.56
Total	90	100

Source: Field Survey, 2017

Sources for information for fish farmers

Regarding source of information on fish farming practices, majority (45.56%) of the respondents source their information from friends/fellow farmers, 20% from extension agents, 13.33% from workshops, 11.11% from the mass media, 6.67% from the internet and 3.33% from literature. This shows that the literacy level of the fish farmers is very high.

Table 7: Sources for information for fish farmers (n=90)

Sources for information for fish farmers	Frequency	Percentage
Extension agents	28	31.11
Friends/fellow farmers	31	34.44
Mass media	10	11.11
Literature	3	33.33
Internet	6	6.67
Workshops	12	13.33
Total	90	100.00

Source: Field Survey, 2017.

Sources of water supply

Majority of the farmers (20%) sourced their water from well, 17.78% from stream, 13.33% used rainwater, 11.11% borehole and 4.44% river. This could be attributed to inadequate extension services as the best source of water for fish farming is wells or borehole.

Table8: Sources of water supply (n=90)

Sources of water supply	Frequency	Percentage
Rain water	12	13.33
Stream	16	17.78
Borehole	10	11.11
Well	18	20.00
River	4	4.44
Total	90	100.00

Source: Field Survey, 2017

Types/species of fingerlings cultured

Table9 showed that majority of the fish farmers (60%) use *Clarias* species as their fingerlings, 24.44% used Tilapia spp., 11.11 used common carp, while 4.44% used *Heterobranchus spp*, respectively. This result compares favourably with Adewuyi et al., (2010) [1] who reported that the most common breeds of fingerlings cultured by fish farmers Ogun State were Claris, Heteroclarias and Tilapia.

The high premium placed on the culture of *Clarias* species could be attributed to its wide acceptability, hardness and tolerance to wide environmental conditions.

Table9: Types/species of fingerlings cultured (n=90)

Types/species of fingerlings used	Frequency	Percentage
Clarias/Catfish	54	60.00
Heterobrancus	4	4.44
Common carp	10	11.11
Tilapia	22	24.44
Total	90	100.00

Source: Field Survey, 2017.

Sources of fingerlings (fish seeds)

The results obtained in Table10 showed that majority (44.44%) of the respondents obtained their fingerlings from private farms located outside the state, 20% from the wild, 18.89% from Panyam fish farm/Government fish hatchery, 18% from the wild and 5.6% from personal hatchery. These findings showed that the fish farmers have a serious challenge in sourcing for their fish seed which will subsequently increase the cost of production with attendant negative impact on profit margin.

Table10: Sources of fingerlings (n=90)

Sources of fingerlings	Frequency	Percentage
Personal hatchery	5	5.56
Government hatchery/Panyam fish farm	17	18.89
Private hatchery	40	44.44
Wild	18	20.00
Total	90	100.00

Source: field Survey, 2017.

Annual income from sales of fish

The results of the annual income of the fish farmers in the study area is presented in table11.The result revealed that majority (30%) of the fish farmers earned above N501, 000.00 per annum, 24.44% earned N100,000.00 per annum, 18.89% earned between N100,000.00-N200,000.00 per annum, 14.44% earned N200,000.00-N300,000.00 per annum,

6.67% earned N401,000.00-N500,000.00 per annum, while 5.56% earned N301,000.00-N301,000.00- N400,000.00. This is an indication that fish farming is very lucrative in the study area. This result is in agreement with the report of Ibemere & Ezeano, (2014) [8] as well as Okeke and Chukwuone, (2012) [11]. Olaoye,et al., (2013) [13] also reported that fish farming is a very profitable venture in Oyo State, Nigeria.

Table11: Annual income from sales of fish (n=90)

Parameters	frequency	percentage
# 100,000.00	22	24.44
# 100,000.00- # 200,000.00	17	18.89
# 201,000.00- # 300,000.00	13	14.44
# 301,000.00-# 400,000.00	5	5.56
# 401,000.00-# 500,000.00	6	6.67
Above # 501,000.00	27	30.00
Total	90	100.00

Source: Field Survey, 2017.

Constraints in Fish farming

Results of the factors affecting fish production in the study area is as presented in table12. Aquaculture, which is the fastest growing subsector, is however faced with several challenges. The result showed that, majority of the farmers (26.67%) reported that high cost of feed is their major challenge; this is closely followed by poor extension services (22.22%), poor marketing (20%) and poor finance (16.67%).

Other constraints to fish production in the study area include: Disease and poaching (7.78%), inadequate supply of fish feed (1.11%), higher price of input (1.11%), cannibalism (1.11%), while land acquisition was 0.00%. These findings showed that virtually all the factors evaluated impeded fish production in the study area except land. However, the most important factors that affect fish production in the study area most are; high cost of feed, poor extension services and poor marketing.

This is in agreement with Ononji and Osayi, (2016) [12] who reported that the aquaculture sector in Edo State, Nigeria is still small scale and is currently confronted with the problems of high cost of feeds, inadequate funds and poor water supply. Sadiq and Kolo (2015) [15] also

reported that paucity of capital and high costs of feeds were some of the major challenges faced by fish farmers in Minna, Niger State Nigeria.

Table12: Constraints in Fish farming (n=90)

Constraints	frequency	Percentage
Inadequate infrastructure	0	0.00
Inadequate supply of fish feed	1	1.11
Irregular electricity supply	0	0.00
Poor finance	15	16.67
Poor hatchery facilities	0	0.00
High cost of feed	24	26.67
Land acquisition	0	0.00
High price of input	1	1.11
Disease and poaching	7	7.78
Poor extension services	20	22.22
Poor marketing/Price	18	20.00
Cannibalism	1	1.11
Total	90	100.00

Source: Field Survey, 2017.

Conclusion

There is an increase in fish farming activities in Plateau State and the potential of increased fish production is yet to be tapped, due to several factors hindering its rapid expansion. It is therefore incumbent on policy makers and stake holders in the fisheries and aquaculture industry in and outside the state such as the farmers, research agencies, and extension agents, cooperative society to take urgent and proactive measures needed to enhance fish production in the state.

Recommendations

Based on the findings from this study, the following recommendations are advanced:

The state Government should create an enabling environment for the sustainable growth and development of fish production in the State thus:

i.   Build a functional fish hatchery in each Agricultural zones

ii.   Create a good quality fish market in each of the Agricultural zone

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Comment [RA10]: Why 0?

Comment [RA11]: What is your recommendation?

Comment [RA12]: The work had no data on previous status and compare with current data. How do you know there is an increase?

Comment [RA13]: Just 1.11% in your table, what will be profit from government

Comment [RA14]: How?

iii. Train and mandate the village extension agent (VEAS) for the transmission of aquaculture innovation to the Rural fish farmers

iv. Provide single digit interest loan and credit facilities for fish farmers in the study area.

v. The State Agricultural Development Agencies should be empowered to train fish farmers and even those interested in the business on a regular basis with respect to innovations. Farmers need access to information on fish farming technologies packages. This is informed by farmers to get informed on the latest technology.

vi. Fish farmers should be encouraged to form both production and marketing corporative societies to ensure better productivity and quality sales.

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