NIGERIAN AGRICULTURAL JOURNAL
ISSN: 0300-368X
Volume 53 Number 1, April 2022 Pg. 260-266
Available online at: http://www.ajol.info/index.php/naj
https://www.naj.asn.org.ng

Assessment of Fish Farming Practices, Development and Constraints among Fish Farmers in Ibi Local Government Area, Taraba State, Nigeria

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Abstract
This study was carried out to determine the fish farming practices, development and constraints among fish farmers in Ibi Local Government Area (LGA), Taraba State, Nigeria. A sampling frame was drawn from the list of 740 fish farmers registered with the Department of Fisheries and Forestry, Ibi LGA, Taraba State. A multistage stratified design was used for selecting the respondents for the study. The first stage involved stratification of the Local Government into Districts (Sarkin Kudu, Dampar and Ibi). The second stage was selection based on the prevalence of fish farmers in the districts. The third stage involved random selection of 90, 69 and 63 (30%) fish farmers from each district to obtain a sample size of 222 respondents. Data from the study were collected through structured questionnaire and scheduled interview administered to the respondents. Data were analyzed using descriptive (frequency distribution and percentages) and inferential (non parametric test at coefficient of 0.116 and p-value of < 0.05) statistics. Results show that concrete tanks were mostly used by fish farmers (35.0%) and sourced fingerlings for stocking through personal hatchery (34.9%), practiced poly culture (58.90%) and monoculture techniques (56.50%). The culture system was predominantly intensive (90.0%), *Clarias spp* were cultured (68.9%) and fed on imported floating feed (72.0%). The major constraints to fish production are inadequate infrastructure, high cost of inputs, poor quality of fish seed and poor extension services on fish farming. The study recommends that the Government should grant import duty waiver on fish farming inputs and monitor the implementation so that the policy can benefit intending and existing fish farmers. Efforts should be intensified on different areas of fish farming development.

Keywords: Constraints, culture, fish farming, fish farmers, development

Introduction

Fish farming generates employment directly and indirectly in terms of people employed in the production of fishing output and other allied business, it also generates income for all categories of people involved in fish farming and thus contributes to the national income. When compared with livestock, it requires less space, time, money and has a higher feed conserving rate (Nwakuche *et al*., 2019). Fish farming is regarded as a key agricultural and food-producing sector throughout the world. The promoters argue, while depleted fish catches can be re-filled, that aquaculture can meet the food security needs of millions of people in developing countries who will benefit from relatively cheap protein (Hagar, 2014; Wally, 2016). The fish farming industry, which accounts for over 50% of global fish production, is the fastest-growing food-producing sector (FAO, 2017). About 424 aquatic species are cultivated globally, benefiting millions through the provision of nutrition, food security and sustainable lively-hood, and poverty reduction (Galappaththi *et al*., 2020). In Nigeria, farming 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 (Anthony and Richard, 2016). The contribution of aquaculture to fish supply in Nigeria is an indication of growth in fish production activities as a result of global decline in supply of ocean fisheries associated with pressure on fishing, habitat destruction and environmental pollutions (Adedeji *et al*., 2011). Omitogun and Orisasona (2018) reported that an estimated annual *per caput* fish consumption of 13.3kg in 2013, showed that fish represents an important dietary component and one of the few sources of animal protein available to 180 million Nigerians. Fish farming like any other area of agriculture is constrained by factors which hinder maximum productivity for meeting the protein demand and income generation of the populace. This study was carried out therefore, to determine the fish production practices and constraints to fish farming in the study area. Specifically, the objectives of the study are to: identify fish rearing facilities, fish farming systems in the study area and ascertain constraints encountered during fish production practices among the fish farmers.

Methodology

Ibi is one of the 16 LGAs in Taraba State. It covers the total land area of 2,672km^2 and extends between latitude 8^0, 19′ north of the equator and 9^0, 51$'$ east of the Greenwich meridian (Taraba State Government, 2015). The town is located at the south bank of the Benue River, opposite the influx of much smaller Shemankar river. Both the Taraba River and the Donga River flow into the Benue within the LGA. Ibi LGA has two distinct seasons; rainy season which extend from April - October, and the dry season which last for 5 months extending from November - March. The annual rainfall ranges between 1058mm and 1300mm with the temperature range of 28^{o}C – 39^{o}C. A sampling frame was drawn from the list of 740 fish farmers registered with the Department of Fisheries and Forestry of Ibi LGA, Taraba State. A multistage stratified design was used for selecting the respondents for the study. The first stage involved stratification of the Local Government into Districts (Sarkin Kudu, Dampar and Ibi). The second stage was selection of fish farmers in three districts stratified based on the prevalence of fish farmers in those districts. The third stage involved random selection of 90, 69 and 63 (30%) fish farmers from each district with a population size of Ibi district (300), Dampar district (230) and Sarkin- kudu (210) to obtain a sample size of 222 respondents. Data obtained from the study were collected through scheduled interview and structured questionnaire administered to the respondents. Data obtained were presented using descriptive statistics - frequency distribution and percentages, while constraints to fish production practices were measured with 5-point Likert-type scale of "very severe" (5), "severe" (4), "not severe" (3), "not a constraint" (2), and "undecided" (1) respectively. Kandell (non parametric) test was used to test the responses obtained as either "yes" or "no" on the level of fish farming development at Kandell coefficient of 0.116 and p-value of < 0.0.

Results and Discussion

Results in Table 1 indicate that about 58.11% of the respondents depended directly on either stream or river as their major water source for fish culture, only 23.87% used borehole, while 18.2% depend on deep well. The use of stream/river was due to the geographical location of the studied area. River/stream is the cheapest source of water for fish culture, the only challenge is that the quality should be tested and if need be could be treated after impounding the pond before stocking with fish. Source, quality and quantity of water available are most important factors to be considered when selecting a site for fish farming (Ayodele and Fregene, 2003). The quantity of water needed for commercial fish farming varies with the production method employed, type of aquaculture chosen, scale of operation, and species cultured. Aniebone *et al,* (2018) reported that poor water quality can affect the production, growth, or quality of fish products by contaminating their flavour or causing bioaccumulation due to high concentrations of certain elements or toxic substances. Fish farmer's personal hatcheries (34.90%), private/commercial hatcheries (31.50%) and Government owned farms (25%) were sources of fingerlings among the fish farmers as indicated in Fig. 2. Only 8.6% of the fish farmers obtained their fingerlings from the wild. This was an indication that some respondents have acquired the skill required for fish breeding. The fact is that the fingerlings produced by fish farmers are likely to be of high genetic quality in terms of early maturity, high feed conversion rate and resistant to diseases compared to those sourced from the wild (Bluwey *et al*., 2017). Government farms and some commercial hatcheries are equally dependable as fingerling sources. Jamabo *et al*. (2019) noted that success in intensive aquaculture depends on the quality of fish seeds since it determines the growth of the fish and to some extent, the proliferation of bacteria in the system.

Fish rearing facilities of the respondents

The result in Fig. 3 showed that 35% reared fish in concrete tanks, 31% in cages, while 5% reared fish in other facilities such as plastic and rubber tanks. The advantage of concrete tanks like any other receptacles is that it can be easily managed, although capital outlay is higher compared to earthen pond of same size. Nwachukwu and Onuegbu (2005) reported that most fish farmers in Nigeria operated small-scale farms ranging from homestead concrete ponds to small earthen ponds. Use of concrete tanks for fish culture is a new trend apart from the old method of earthen pond through soil excavation, land available can be maximized to the fullest. However, concrete tanks and other receptacles such as fibre tanks and tarpaulin require much water exchange especially flow through system where fresh water replenishes the water released through the outlet. Wally (2016) noted that small and medium scale fish farms have intensified their fish production from earthen ponds using new technologies such as the use of extruded feed, water circulation systems, and improved farm management practices. Fish farming techniques are presented in Figure 4. Many of the respondents (58.90%) practiced poly culture, and 56.50% practiced monoculture. Integrated fish farming system with crops was the least practiced (14.70%). Poly culture is a sure way of utilizing the nutrients in water efficiently because species cultured are bottom and surface feeders. Ecologists have long known that multiple species animal and plant communities are more stable and more efficient in the utilization and transfer of energy than single species systems. Caution with poly culture is that species to be cultured should be compactable for instance cat fish and Tilapia.

Culture systems practiced by the respondents

Figure 5 shows the culture systems used by the respondents; intensive culture system (90%), semi-intensive culture system (9%) and extensive culture system (1%). Majority (90%) agreed that intensive feeding can improve the quality and quantity of fish seed. This implies that with adequate feeding of brood stock, the quality of fish seed supply can be improved (Delgado *et al*., 2003). Much money is usually spent on purchase of feed in intensive system, because fish stocked depend mostly on supplementary feeding unlike in extensive where feeding rate is not high and production capacity is small compared to intensive system.

Type of fish species cultured by the farmers

The types of species cultured by the respondents are presented in Figure 6. *Clarias spp* was reported by 69.80% fish farmers; *Heterobranchus spp* 25.00% and *Tilapia spp* 5.2%. Based on the study area, *Clarias spp* command high market price because of greater demand, preferences, hardiness of the stock, fast growth, high feed conversion ratio and high survival rate under captivity. Experience has shown that consumers prefer catfish because it is not as bony as Tilapia. *Tilapia spp* cannot withstand wide range water quality variation; as a result most fish farmers hardly culture it, coupled with low demand and low market value. The only advantage is that they are herbivorous and prolific breeders which when raised with carnivorous species at required stocking density the fry can be fed on. Ogundiran *et al.* (2009) in a similar study reported that cat fish appears to be hardy, economical and generally accepted by people.

Types of feed used by the fish farmers

The types of feed used by the respondents are represented in Figure 7. Majority (72.0%) of the respondents used imported floating pelted feed, while 27.0% used locally produced sinking feed, and about less than 1% fed fish with maggot and agricultural waste. Floating pellet feeds are in high demand because when used, fish response can be monitored, and tendency of feed wastage can be reduced to the barest minimum, since uneaten feed will normally float on water.

Level of fish farming development in the study area

Table 4 shows the level of fish farming development in the study area. Fish farmers who were non members of cooperative society (66.40%) were significantly (α = 0.032) higher than members. Variation in member and non membership of fish farmers' association was statistically significant (α = 0.041). About 70% of the fish farmers used locally produced feeds (α = 0.020), and stocked improved fish seed of 98.70% (α = 0.013). Majority (98.70%) did not use an excavator for pond construction, statistically significant (α = 0.014) compared with respondents who used an excavator for pond construction. About 64.50% fish farmers did not have their farm site surveyed/planned before fish pond construction, 61.70% did not test crop and 68.10% did not fertilize their ponds before stocking (α = 0.043). Similarly, only 32.40% of the fish farmers limed their ponds, while 4.70% carried out water analysis before impounding was only done (α = 0.012). Pond water aerations were only practiced by 38.30% fish farmers (α = 0.024) and 46.80% indicated access to loans for farm expansions, in the variations between the responses, the development index 'sourcing loans for farm expansion' however recorded an indecisive result and not significant (α = 0.561). The findings implied that fish farming practices and development are influenced by fish farmer's membership of association through which they share, interact and learn fish farming practices that enhance development of their farms. It can also be pointed out that fish farming practices and development were not tied to loan sourcing among the respondents, implying that personal savings accounted for money sources used by the fish farmers.

Constraints encountered by Fish Farmers

Table 4 presents the constraints encountered by fish farmers in the study area. Respondents indicated 12 constraints as strong acceptance (SA) (65%), weak acceptance 6 (30%) while 1 (5%) indicated no response arising from the inferences made on the hypothesis test. Considering the mean ranking of the constraints, the most critical constraint fish farmers faced in the study area was poor quality of fish seed (13.33%), high cost of inputs (13.03%), poor extension services (12.80), high cost of management (12.71%) and theft (12.14%). These constraints are capable of hindering the expected high return from fish farming in the country. In a similar study Nwakuche *et al.* (2019) identified the major problem to fish farming as water shortages during dry season, lack of capital, disease and pest infestation and high cost of fish feed.

Conclusion

The study shows that the culture system was predominantly intensive, *Clarias spp* were cultured and fed on imported floating feed. The major constraints to fish production are inadequate infrastructure, high cost of inputs; poor quality of fish seed and poor extension services on fish farming. The study recommends the need for Government to grant import duty waiver on fish farming inputs and as well monitor the implementation so that the policy can benefit intending and existing fish farmers. More extension agents should be employed and well equipped to provide necessary training and other services needed by fish farmers. Fisheries Research Institutes and higher Institutions that offer Fisheries and Aquaculture should develop high quality strains of culture able fish species for effective fish production. Efforts should be intensified on different areas of fish farming development.

References

Adedeji, O.H., Ibeh, L. and Oyebanji, F.F. (2011). Sustainable management of mangrove coastal environments in the Niger Delta region of Nigeria: Role of remote sensing and GIS. Proceedings of the Environmental Management Conference, Federal University of

Agriculture, Abeokuta, Nigeria. Pp. 308-326.

Aniebone, V. O., Mohammed, R., Nwamba, E. E. and Abe, O. B. (2018). Assessment of groundwater quality at the Nigerian Institute for oceanography and marine research:Implication for production of aquaculture. *Global Journal of Geological Sciences,* 16 (1):19–23.

Anthony, O. and Richard, J. (2016). Contribution of aquaculture to poverty reduction and food security in Nigeria. *International Journal of Applied Microbiology and Biotechnology Research,* 4, 26–31.

Ayodele, I.A. and Fregene, B.T. 2003. Essentials of Investment in Fish Farming, Hope Publications, Ibadan, Nigeria. 38pp.

Bluwey, F.A., Taiwo, I.O., Okonji, V.A., Kumah, L.A., Ipinmoroti, M.O., Boateng, M.A. and Idoko, F.A. (2017). Introduction to Fisheries of West Africa, Published by Root & Associates Printing and Publishing House Benin city, Edo State.

Delgado, C.L., Wada, N., Rosegrant, M.W., Meyer, S. and Ahmed, M. (2003). Fish to 2020: Supply and Demand in Changing Global Markets, International Food Policy Research Institute. World Fish Center, Washington, D.C., Penang. 226pp.

FAO (2016). Aquaculture Summary: The state of World fisheries and aquaculture 2016: Contributing to food security and nutrition for all Food and Aquaculture Organization of the United Nations (UN FAO), Rome. 200pp.

Galappaththi, E.K., Stephanie T.I., Amanda A. H., Charlotte, J. A. and James, D. F. (2020). Climate change adaptation in aquaculture. *Reviews in Aquaculture,* 12(4): 2160 – 2176.

Hagar, D. H. S. (2014). Brief summary about aquaculture in Egypt. *Journal of Aquatic Marine Biology*, 1(1): 3.

Jamabo, N. A., Ukwe, I. O. K. and Amachree, D. (2019). Growth assessment and microbial flora presence in African catfish (Clarias gariepinus) larvae fed live and commercial feeds. *International Journal of Sciences*, 8(7):1–6.

Nwachukwu, I. and Onuegbu, R. (2005). Adoption of Aquaculture Technology by Fish Farmers In Imo State of Nigeria. *Journal of Technology Studies,* 57-60.

Nwakuche, E. I., Akinyoade, O. F., Akalonu, G. C., Oyelade, O. A. and Opowoye, I. O. (2019). Facing Fish Farming Business in Kwara State: A Case Study of Four Local Government Areas. *Continental Journal of Sustainable Development*, 10 (2): 27 – 34.

Ogundiran, M.A., Fawole O.O., Adewoye, S.O. and Ogundiran, T.A. (2009). Pathological lesions in the gills of *Clarias gariepinus* exposed to sublethal concentrations of soap and detergent effluents. *Journal of Cell Animal Biology*, 3(5):78-82.

Omitogun and Orisasona (2018). A Case Study on Application of Biotechnology to Tilapia and Catfish Production in Nigeria. In Fagbenro, O.A.; Ajani, E.K.; Magawata, I.; Shinkafi, B.A.; Ayoola, S.O. and Orisasona, O. (Eds.) *Proceedings of 1st Conference of Association of Nigerian Fisheries Scientists*. 'Science, Innovation and Aqua business: A Tripod for Sustainable Fisheries and Aquaculture Development in Nigeria'. Pp. 13 – 26.

Oruonye, E.D. (2014). An Assessment of the Trends of Climatic Variables in Taraba State Nigeria *Global Journal of Science Frontier Research: Environment & Earth* Science, 14 (4):1-14.

Wally, A. (2016). The state and development of aquaculture in Egypt Global Agriculture Information Network 1–14. Wasini, D.

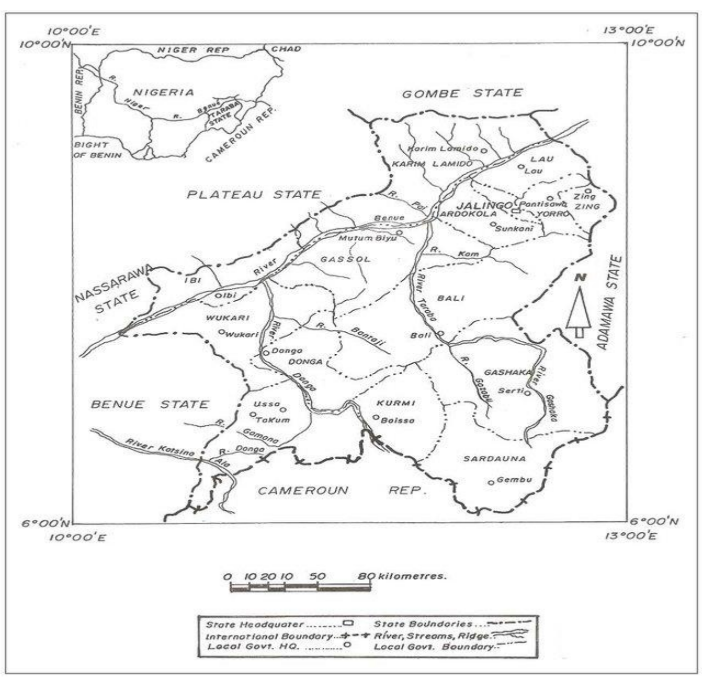

Figure 1: The study area
Source: Oruonye (2014)

Table 1: Sources of water for fish culture

Sources of water	Frequency	Percentage
River/Stream	129	58.11
Bore hole	53	23.87
Deep well	40	18.02
Total	222	100

Source: Field survey, 2018

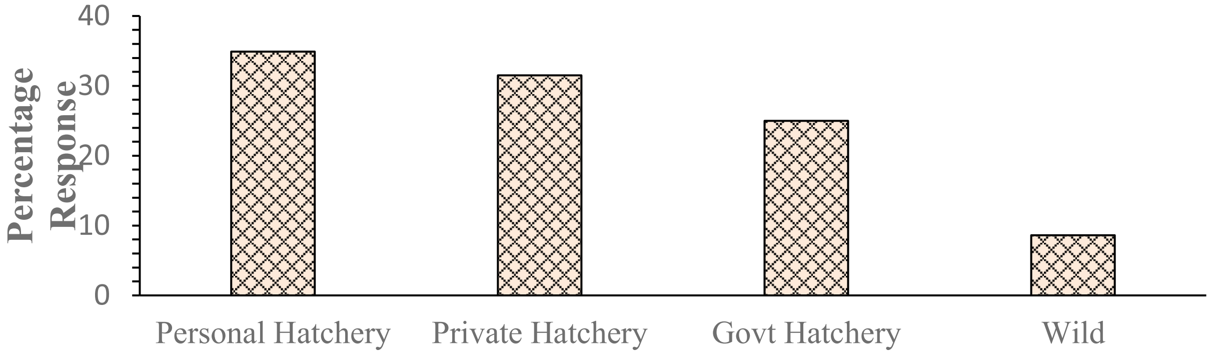

Figure 2: Sources of Fingerlings

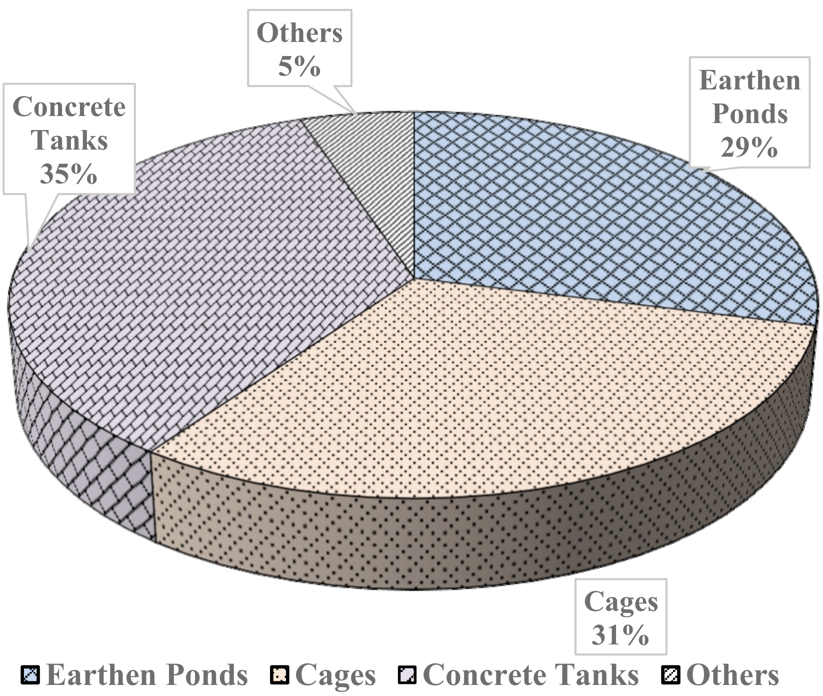

Figure 3: Fish rearing facilities used by the respondents

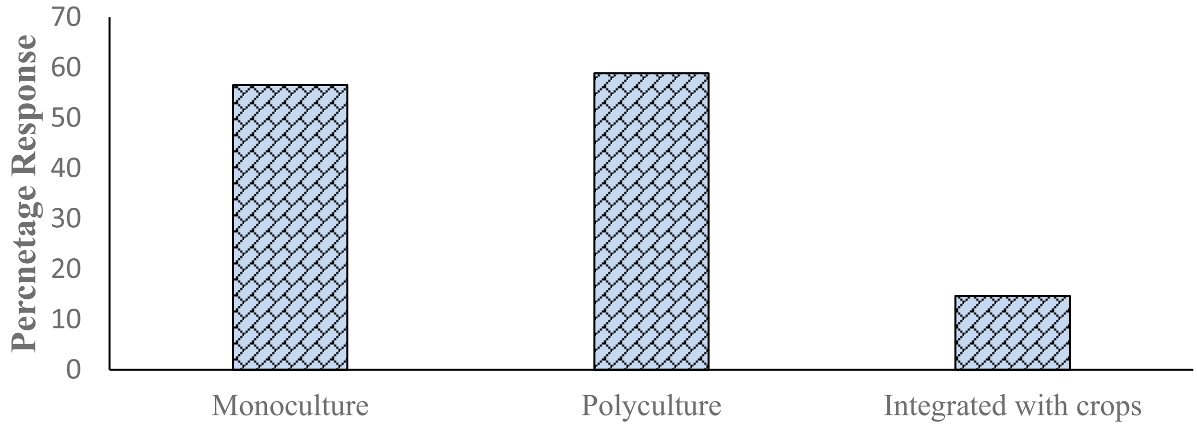

Figure 4: Fish Farming Techniques

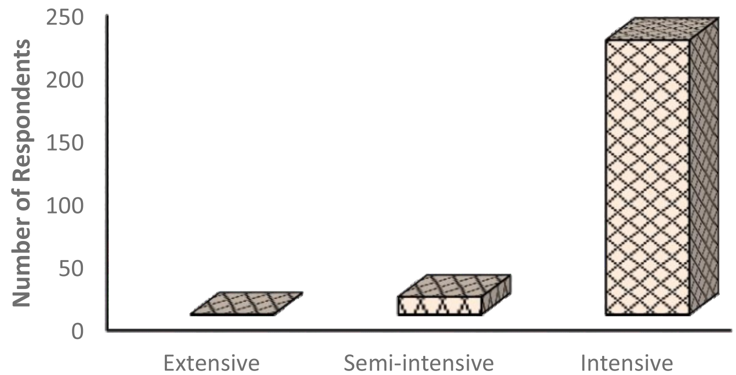

Figure 5: Culture Systems

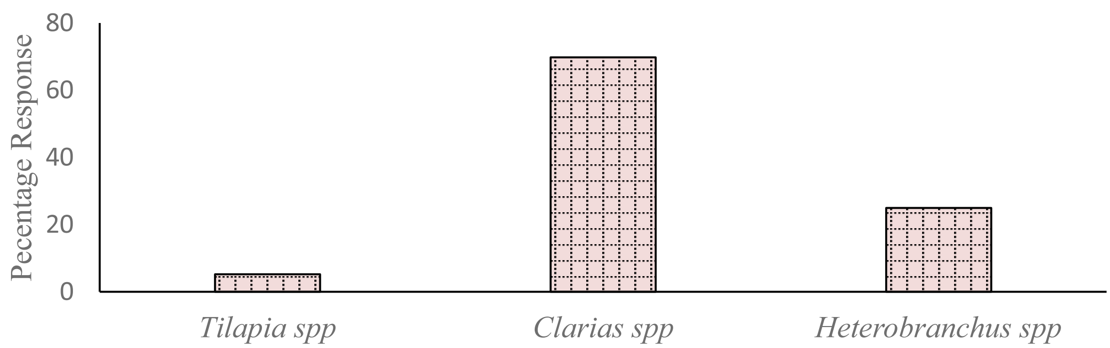

Figure 6: Types of Species Cultured

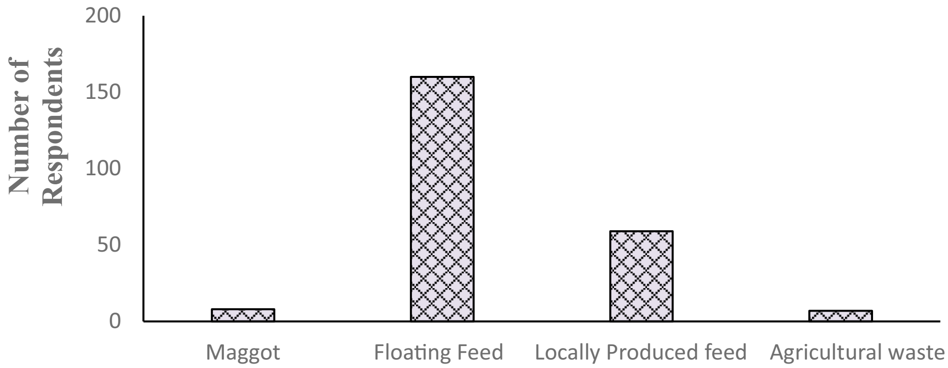

Figure 7: Types of Feed Used

Table 3: Level of Aquaculture Development in Ibi Local Government Area

Development Indices	Responses		Asymp. Sig (2-Tailed)
	Yes	No	
Membership of Cooperative Society	33.60	66.40	0.032*
Membership of Fish Farmers' Association	62.50	37.50	0.041*
Usage of Imported Feeds	29.80	70.20	0.020*
Stocking of Improved Fish Seed	98.70	1.30	0.013*
Construction of Pond with Excavator	1.30	98.70	0.014*
Land Survey/Planning before Construction	34.50	64.50	0.042*
Test Cropping	38.30	61.70	0.041*
Pond Fertilization	31.90	68.10	0.043*
Pond Liming	32.40	67.60	0.041*
Water Analysis before impounding	4.70	95.30	0.012*
Pond Water Aeration	38.30	61.70	0.024*
Predator Prevention	29.80	70.20	0.021*
Attendance of Seminars on fish Farming	7.20	92.80	0.014*
Consultation of Aquaculture Experts	31.90	68.10	0.022*
Sourcing Loans for farm Expansion	46.80	53.20	0.561

Asterisk * indicates statistical significance (p<0.05)

Table 4: Constraints Encountered by Fish Farmers

Constraint	Reponses					Ranking	Decision
	Very Severe	Severe	Not Severe	Not a Constraint	Undecided		
Inadequate infrastructure	154 (66.50)	08 (3.40)	3 (1.30)	70 (30.20)	-	63.0	SA
Inadequate supply fish feed	75 (31.90)	87 (37.00)	70 (29.80)	3 (1.30)	-	0.25	SA
Irregular electricity supply	81 (34.50)	67 (28.50)	14 (6.00)	70 (29.80)	03 (1.30)	9.04	WA
Poor finance	73 (31.10)	22 (9.40)	67 (28.50)	70 (29.80)	03 (1.30)	10.46	WA
Hatchery facility	08 (3.40)	140 (59.60)	26 (11.10)	58 (24.70)	03 (1.30)	11.29	SA
Suitable land acquisition	73 (31.10)	08 (3.40)	137 (58.30)	14 (6.00)	03 (1.30)	8.86	WA
High cost of inputs	95 (40.40)	70 (29.80)	67 (28.50)	03 (1.30)	-	13.03	SA
Diseases	148 (63.00)	84 (35.70)	-	03 (1.30)	-	9.58	SA
Irregular water for stock.	08 (3.40)	73 (31.10)	137 (58.30)	14 (6.00)	03 (1.30)	11.06	WA
Poor water quality for stock.	73 (31.10)	08 (3.40)	70 (29.80)	81 (34.50)	03 (1.30)	10.12	WA
High cost of management	73 (31.10)	92 (39.10)	67 (28.50)	-	03 (1.30)	12.71	WA
Poor extension services	26 (11.10)	206 (87.70)	-	03 (1.30)	-	12.80	SA
Poor marketing	14 (6.00)	137 (58.30)	81 (34.50)		03 (1.30)	9.38	SA
Tech. experts for consultation	81 (34.50)	78 (33.20)	73 (31.10)	03 (1.30)	-	7.98	SA
Cannibalism	67 (28.50)	151 (64.30)	14 (6.00)		03 (1.30)	6.63	SA
Lack of production records	139 (59.10)	12 (5.10)	67 (28.50)	03 (1.30)	14 (6.00)	11.22	SA
Poor quality of fish seed	81 (34.50)	84 (35.70)	67 (28.50)	-	03 (1.30)	13.33	SA
Lack of capital	08 (3.40)	73 (31.10)	125 (53.20)	26 (11.10)	03 (1.30)	11.47	NO
Theft	84 (35.70)	148 (63.00)	-	-	03 (1.30)	12.14	SA

Kandell coefficient = 0.116, Chi-square = 509.37, df = 12, p-value = <0.01, N = 232. SA = strong acceptance, WA = weak acceptance, No = No response