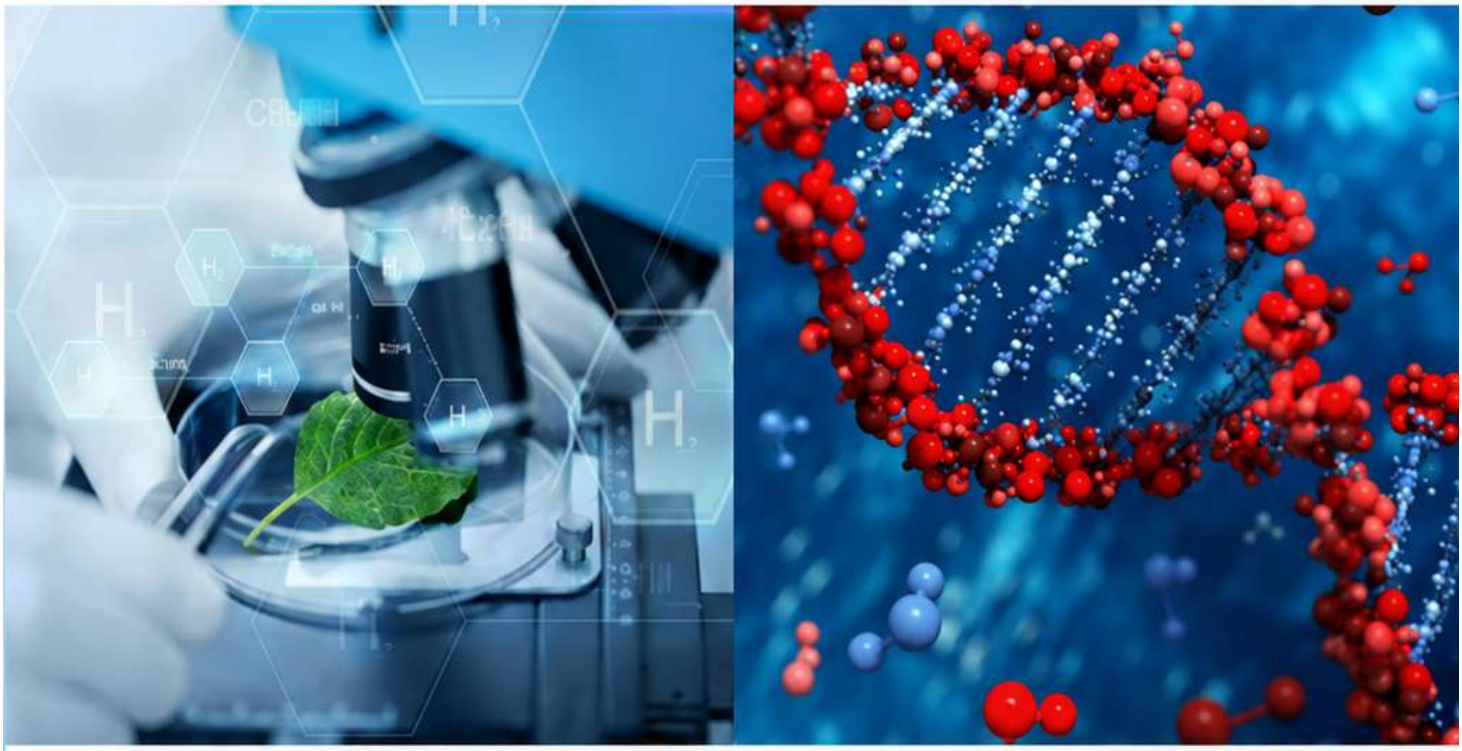
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NOUN JOURNAL OF PHYSICAL AND LIFE SCIENCES (NJPLS)

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EDITORIAL

Designing strategies to cultivate research culture requires tact. Adopting a project action plan matrix would help a business-like approach that would enable higher education institutions to be better managers. The special Feature is a compendium to guide strategy development and project management in higher education institution.

It is our hope that this issue would be a great reference resource material.

Professor Monioluwa O. Olaniyi

Editor-in-Chief

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CORRELATES OF AQUACULTURE BUSINESS DECISION AND PROFITABILITY STATUS OF SELECTED FIRMS IN KADUNA, NIGERIA

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Abstract

This study examined the variables that can influence business decisions towards profitability of fish farming in Kaduna State, Nigeria. The study mapped the socioeconomic characteristics of farmers, fish farm characteristics, constraints to fish farm productivity and rate of profitability. Simple random sampling technique was used to select seventy-five respondents drawn from list of Agricultural Development Programme contact farmers in three Local Governments Areas (Chikun, Igabi and Kaduna North). A well-structured questionnaire was used to obtain primary data. Data analysis was done using descriptive statistics, gross margin, net farm income analysis and profitability ratios. Results showed that majority of the respondents (74.7%) were married. About 45.3 percent of farmers are within the age of 31-40 years. About 50.7 percent had about 5 years experience in fish farming. About 69.3 percent went through tertiary education. About 40 percent of the fish farmers have household size of 4 – 6. A large proportion (42.70%) of the fish farmers are civil servant. About 42.7 percent of fish farmers' objective was to make profit. Majority (66.7%) of fish farmers source their fingerling from breeders. About 68 percent started fish farms with their own personal savings and majority (70.7%) indicate that they have stable market for culture Clarias species of fishes. Pond construction and feed cost accounted 19.57% and 14.12% of fixed and variable inputs of the total cost, respectively. Gross margin of fish farmers was N743, 219.16 with a Net Farm Income of N8, 190.36. The profitability ratio gave a benefit-cost ratio of 1.05, rate of return of 0.05, gross revenue ratio of 1.37, expense structure ratio of 1.89 and operating ratio of 0.36. Constraints encountered by the farmers includes; inadequate and high cost of feed, lack of personnel management problems, poaching, scarcity of fingerling, high cost of fuel inconsistent and input procurement.

Keywords: Fish Farm, Aquaculture, Profitability, Constraints

Introduction

Man's transition from extractive economic expeditions to cultured entrepreneurship remains significant contribution to economic advancement and development, especially in the wake of declining supplies from natural reservoirs, caused by sudden but gradual weather/climatic changes, alongside human induced ecological unfriendly activities (UNFCCC, 2018). Start-ups may be more effective in exploiting new technologies and introducing radical innovations, which can help address some of the major challenges of our times [such as climate change]" (Breschi *et al.*, 2018). Therefore, the emergence of aquaculture epitomized the novelty of human creativity in achieving fish supply adequacy, transiting from the conventional fisheries captures in the wild to an intensive fisheries culturing. This form of aquatic agricultural practice has contributed remarkably to the global fisheries production to meet up with daily consumption ever since the relative static harvest of fishery in the late 1980s. Aquaculture fishery contributes about 47% to the global fish supply chain in 2016, and it first value share is estimated at 232 billion USD (FAO, 2018).

Aquaculture fishery was introduced in sub-Saharan Africa in the 1940s having as main objectives to improve nutrition in rural areas, generate additional income, diversify activities to reduce risk of crop failure and create employment. Nigeria experience of aquaculture was in the 1940s, it is obviously viewed as the strategic means of attaining self- sufficiency in fisheries production and a catalyst for improving socio-economic welfare. Nigeria remains the largest aquaculture fish producer in the sub-Saharan Africa accounting for 54% of the total fish production in the sub-region. The country's aquaculture focus is mainly on fresh-water fishes, with catfish species accounting for 64% of the country's aquaculture production in 2015(FAO 2017). Nigeria fish trade deficit increased from 350 thousand tonnes to nearly 2 million tonnes between 2000 and 2011 before declining to 940 thousand tonnes in 2013. Fish production grew from 26000 tonnes in 1980 to over 1 million tonnes in 2015 aquaculture quota increased from 2% in 1980 to over 30% in 2015 (FAO,2015). However capture fisheries is still the main source of production. The fish demand projections by FAO shows that in the early 2020s demand will raised to 600000 tonnes higher than the mid - 2010s levels due to income and population growth in the country, and that aquaculture fisheries would require to grow at 22% per year from mid- 2010s to early 2020, to bridge demand-supply gap. The Nigerian fisheries statistics report further affirms the deficit fishery production gap, the report in 2016 puts fisheries demand to be 3.32 million metric tonnes, with domestic output of 1.12 million tonnes leaving about 2.22 million tonnes as deficit. This clearly reveals the country's sub-optimal fisheries production level thus, making fish import inevitable. The deficit in fisheries production portends an excellent opportunity for substantial investment in aquaculture fisheries, in order to reverse the import fisheries trend, which has gulp 1.2 billion USD in 2013 according to FAO (2017).

Investment decision is prompted by the profitability projections and risk (uncertainty) forecast about the intended business undertake or startups, likewise aquaculture fisheries. Avalanche of studies reveals aquaculture fisheries as a profitable business venture in Nigeria (Ugwumba,et al., 2010; Ihere, et.al., 2014; Cynthia Jeh Mkong *et al.* 2018). It is ironic that, such a profitable agro- business sector output remains sub-optimal, relative to the country's fishery demand. According to FAO (2017), the contribution of aquaculture fishery to fishery production in Nigeria stood at 31%. The National Bureau of Statistic (NBS, 2017), indicated that out of 5.79 million tonnes of fish production between (2010-2015) in Nigeria, artisanal and industrial fishing contributes 69% and 4% respectively, while aquaculture stood at 27%. Although the profitability profile of aquaculture fishery business outlook is positive based on studies (Adewuyi et al., 2010, Ekanem et al., 2012, Thompson *et al.*, 2014, and Omobepade et al., 2015), but the margin of profitability is also of paramount interest to a prospective fish farmer, and it is key determinant that can influences the allocation of resources to the business (Cynthia Jeh Mkong *et al.* 2018). Profit margin of fish farming perhaps might be one of the major constraints affecting the aquaculture fisheries supply chain as the best alternative of meeting Nigeria fishery self-sufficiency level. Therefore it is

imperative to examine the incidences of constraints and profitability of aquaculture firms, which is the focus of this study, while the study objective is to identify, analyze aquaculture fishery firm characteristics and assess the impact of constraints on profitability. Aquaculture potential or prospects in meeting fish supply-demand need is certainly not in doubt but mitigating the constraints elements for a better profit margin is imperative, and being a capital intensive business it requires a skilled managerial capacity for operational efficiency/effectiveness and competiveness for it profit realization motive as a private business. Constraints may vary subject to the country's ecological regions but could be broadly viewed or classified into spectrums: economic, technical and effective policies and good institutional framework. The economic spectrum of the constraint highlights the challenges of sourcing for both operating and investment capital at low cost for the business financial sustainability and expansion or transiting from subsistence level to commercial level, while technical category of constraints boarders on skilled knowledge gap in fish production, processing, marketing and cost effective. The latter focused on governmental policies/strategies towards enhancing the sector through; extension services, research and financial intermediation or subsidies and physical infrastructure provision.

In a similar study on measuring profitability in small scale aquaculture enterprises in south west Nigeria, Samson and Adeoye (2012) and Yemi and Deji (2012) analyses the economics of fish farming to determine the possibility of making money generally from the business by performing enterprise budget analysis and simple profit/loss calculation to determine the profitability of the system. The result showed that fish farming in south west Nigeria was viable since BRC (benefit cost ratio) was greater than one but not profitable enough with the rate of returns at 1.05 implying that for every one naira invested N1.05 would be gained and that only 25% of the firms operated profitably. The study survey reveals; high price of fish feeds and high mortality of stocked fish, as the most serious constraints believed to have contracted the profit margin although the margin was not indicated. Also in another related study by Cynthia, Ernest and Stephanie, (2018)., on determinant of profitability of fish farming in Cameroon showed that profitability was significantly affected by price of fingerlings, where a unit increase in it price will lead to 13% decrease in the net profit ($p<0.01$) while price of feed showed a positive relationship with net profit ($p<0.1$), a unit increase in price of feed will lead to 0.94% increase in net profit, cost of labour was significant at 1% ($p<0.01$), indicating that a unit increase in labour cost will lead to a 0.49% increase in net profit from marine fishing but contrary to *a priori* expectation and that cost of transportation and years of experience had no significant effect on profit. The study concluded that fish farming in Cameroon is profitable, it levels of profitability is being determined by price of feed, price of fingerling and cost of labour.

Materials and Methods

The study was conducted in the metropolis of Kaduna (a City in North Western Nigeria) capital of Kaduna State. Kaduna State is comprised of 23 Local Government Areas with a total land area of about 46,053 km^2 and an estimated population of 6,066,562. Kaduna State is mostly populated by Hausa, Gwari, Katab and Banjjuu ethnic communities. The State is bordered by Sokoto, Katsina, and Kano States to the North, Bauchi to the East, Plateau to the East and South, Niger to the West and Abuja (FCT) to the South. Local Government Areas (LGAs) selected in Kaduna metropolis for the study includes: Chikun, Igabi and Kaduna North.

Sampling Technique and Data Collection Method:

The simple random sampling technique was used to select 75 respondents from the list of Agricultural Development Project (ADP) contact farmers in the study areas. Twenty-five (25) fish farmers were selected at random from Chikun, Igabi and Kaduna North LGAs. The data for the study were collected between March 2018 and August 2018, through well – structured questionnaire.

Data Analysis Technique:

In order to estimate the cost and returns in this study, the following formulae are used;

Net farm Income (NFI): Net farm Income (NFI) is the Total Revenue less the Total cost of maintenance (addition of fixed cost and variable cost).

$NFI = TR - TC, Where, TR = Total\ revenue\ and\ TC = Total\ cost$

Gross margin (GM): This is computed by subtracting Total variable cost from Total revenue.

$GM = TR - TVC, Where, TR = Total\ revenue\ and\ TVC = Total\ variable\ cost$

Depreciation (DEP): is the ratio of Cost of the fixed farm items less Salvage value to Useful life of the fixed items.

$DEP = \frac{C-S}{N}$, $Where, C = Cost\ of\ the\ fixed\ item, S = Salvage\ value\ and\ N = useful\ life\ of\ the\ fixed\ items.$

Profitability ratio in fish production

In order to estimate the profitability ratios in this study, the following formulae are used;

Benefit Cost Ratio (BCR): is the ratio of Total Revenue to Total Cost.

$BCR = \frac{TR}{TC}$, $Where, TR = Total\ Revenue\ and\ TC = Total\ cost$

Rate of Return (ROR): is the ratio of Net Farm Income to Total Cost.

$ROR = \frac{NFI}{TC}$, $Where, NFI = Net\ farm\ Income\ and\ TC = Total\ cost$

Rate of Return (ROR): is the ratio of Total Fixed Cost to Total Variable Cost.

$ESR = \frac{TFC}{TVC}$, $Where, TFC = Total\ fixed\ cost\ and\ TVC = Total\ variable\ cost$

Gross Revenue Returns (GRR): is the ratio of Total Cost to Total Revenue.

$GRR = \frac{TC}{TR}$, $Where, TFE = Total\ farm\ expenses\ (TC) and\ TR = Total\ revenue\ (TR)$

Net Profit Margin (NPM): is the ratio of Total Farm Income to Total Revenue.

$NPM = \frac{NFI}{TR}$, $NFI = \ Total\ farm\ income\ and\ TR = Total\ revenue$

Results and Discussion

Socio-economic Characteristics of Fish Farmers

Table 1 presents the result of the descriptive analysis of the socio economic characteristics of the sampled farmers in the study area. The results show that majority (45.3%) of farmers are within the age of 31-40 years. However, few (16.0%) of the farmers are less than 30 years in age. This suggested that youths that are in their productive ages are mostly involved in fish farming in the study area. The finding on age agrees with the work of EI-Naggar et al. (2010) and Olasunkanmi (2012) reported that the age bracket 31-50 years is usually made up of innovative, motivated and adaptive individuals. By implication, most of these farmers are still in their active age and therefore, have the tendency to be more productive in fish farming in the study area. Among all the famers, about 74.7% of the farmers are males while 25.3% are females. This literally means males are more involved in fish farming than the females in the study area. This study buttress Oparinde and Ojo (2012) who reported that, it is a prior expectation to have more male in aquaculture than female. Ideba et al. (2013) consented to this finding that male dominated the production aspect of aquaculture than female.

This may be due to the fact that fish farming is a herculean task which makes males to be more involved. Also, 74.7% of the farmers are married, 20.0% are single while the remaining 5.3% are in other categories. These findings reinforce the report of Agbebi (2011) where it was established that a high percentage of married individuals in a community is an indication that they are permanent settlers in the area hence a cheaper family labor.

The farming experience revealed that majority (50.7%) of the fish farmer s had 1-5 years of experience in fish farming business, while 40 % of fish farmers had 6-15 years of experience, then 9.3% of the fish

farmers had 16-20 years of experience. The implication of this finding is that high percentage of the fish farmers in the study area are experienced which encourages increased production and innovation adoption. This is in agreement with that of Akinrotimi et al. (2010) in survey of brackish water aquaculture status in Rivers state.

In the household size of the selected fish farmers, about 40.0% of them have their household size between 4-6 members and on the other extreme 9.3% have it to be more than 10 members. The large household size in the study area could be an advantage in providing family labor. The finding supports the preponderance of large family sizes among the poor in rural areas Kainga and Adeyemo (2012). Based on educational qualification, majority (69.3%) of the farmers has tertiary education and this is followed by secondary education with about 25.3% and primary education with 5.3%. This implies that majority of the fish farmers are educated. Good education is believed to enhance innovation as well as enhance proper documentation in farm business (Olasunkanmi *et al.*, 2.012). A large proportion (42.70%) of the fish farmers are Civil servant, 25.3% are traders, 18.24% are core farmers, 6.70% are into Crop/ Livestock farming and just about 1.30% are artisanal fisher men. This means that fish farming does not prevent the selected respondents from getting involved in other means of earning. Further more, about 42.7% indicate profit making as their fish farm goal while 9.30% is for consumption and the remaining 48.0% are for both profit and consumption

Table 1: Socio-Economic Characteristics

Items	Characteristics	Frequency	Percentage
1	**Age (Years)**		
	Less than 30	12	16
	31 to 40	34	45.3
	41 to 50	15	20
	Above 51	14	18.7
2	**Gender**		
	Male	56	74.7
	Female	19	25.3
3	**Marital Status**		
	Single	15	20
	Married	56	74.7
	Other	4	5.3
4	**Year of experience**		
	1 to 5	38	50.7
	6 to 10	19	25.3
	11 to 15	11	14.7
	16 to 20	7	9.3
5	**Household status**		
	1 to 3	26	34.7
	4 to 6	30	40
	7 to 9	12	16
	10 and above	7	9.3
6	**Educational Status**		
	No Formal Education	0	0
	Primary School	4	5.3
	Secondary School	19	25.3
	Tertiary	52	69.3
7	**Other Occupation**		
	Civil servant	32	42.7
	Trading	19	25.3

	Crop/ Livestock farming	5	6.7
	Artisanal fishing	1	1.3
	Farming	18	24
8	**Goal of Production**		
	Profit	32	42.7
	Consumption	7	9.3
	Both	36	48

Note: N=75 fish firms respondent

Fish Farm Characteristics

The results in Table 2 show that majority (64.0%) of the farmers practice fish farming on less than 0.25hacters of land. 42.7% of the fish farmers acquired their land through purchase. Majority (66.7%) of the fish farmers obtained their fingerlings from other farms while 29.3% obtained theirs through on-farm breeding. Adewuyi *et.al.*, (2010) reported that 90.3% of fish farmers in Ogun State obtained their fingerlings from farm gate. Majority (62.67%) of the respondents obtained their broodstock from on-farm, 36% obtained theirs from other pond owners, only 1.33% collected from rivers/streams. Opiyo and Charo-Karisa (2012) affirmed that although Kenya fish farmers has a number of fish hatcheries, some fish farmers still obtain fish seed from recruits in their ponds after harvest. According to respondent, those sourced from hatchery are more likely to be healthier and disease free. This is supported by Obande and Solomon (2000) who observed that fingerlings sourced from hatcheries, have high rate of growth and may be diseased free.

Majority (68%) of the respondents sourced their fund from personal savings while family and friends account for 17.35% of sources of fund while very few (5.3%) obtained bank loan. 65.3% of the respondents obtained credit facility of between N100, 000.00 and N500, 000.00, while 6.7% obtained above N500, 000.0 and majority (70.7%) farmer indicate that they have stable market. This is similar to Ekanem *et al.*, (2012) and Adewuyi *et al.*, (2010) who said majority of fish farmers in Cross River and Ogun State sourced capital from personal savings. The inability of fish farmers to assess bank and Government loans might be connected to its high rate of interest, stringent conditions and inability to provide collateral.

The results further indicate that majority (81.3%) of the of the respondents cultured mud/catfish, 18.2% cultured Heteroclarias, 7.3% cultured tilapia fish while 1.8% cultured Heterobranchus. According to the respondents, majority cultured mud/catfish because of its high preference/marketability, resistant to harsh environmental condition and can survival even in running and stagnant water. This finding is in agreement with FAO's position (2000) that catfishes have a market value of two to three times that of tilapia. Okwu and Achenje (2011) also showed that in Nigeria, Catfish is cultured by a large number of farmers because of its good marketability, resistance to harsh environmental conditions and survival in diverse water conditions.

Table 2: Farm characteristics

Item	Farm characteristics	Frequency	Percentage
1	**Size of farm**		
	Less than 0.25 ha	48	64
	0.26 to 0.5ha	18	24
	0.51 to 0.75 ha	5	6.7
	Above 0.76 ha	4	5.3
2	**Method of land Acquisition**		
	Inherited	19	25.3
	Leased	24	32
	Purchased	32	42.7
3	**What sources are of fingerling**		
	Collection from the wild	0	0
	Purchased from the other farms	50	66.7
	On – farm breeding	22	29.3
	Others (Specify)	3	4
4	**Sources of brood stock**		
	Collection from the wild	1	1.33
	Purchased from the other farms	27	36
	On – farm breeding	47	62.67
5	**Source of finance**		
	Own saving	51	68
	Bank Loan	4	5.3
	Cooperatives	7	9.3
	Family & Friends	13	17.3
6	**Obtained credit facilities**		
	N50, 000 - N100, 000	21	42.7
	N100, 000 - N500, 000	49	65.3
	>N500, 000	5	6.7
7	**Stable market**		
	Yes	53	70.7
	No	22	29.3
8	**Species of fish cultured**		
	Clarias	61	81.3
	Tilapia	5	6.7
	Heterotis	0	0
	Carp	2	2.7
	Clarias and Tilapia	6	8.0
	Clarias and Carp	1	1.3

Note: N= 75 fish farm respondents

Cost and Return of Fish Farming in the Study Area

The variable cost inputs in Table 3, reveals the cost of feed accounted for the largest proportion (14.12%) of the variable cost of fish farming in the study area. This is followed by cost of fingerlings (9.27%). This shows that large amount of money was spent by fish farmers in the study area for purchase of feeds and fingerlings. This is in line with Olawumi et al., (2010) who discovered that labour cost, cost of fingerlings and feed constituted the lion

share of aquaculture production in Ogun State. Okwu and Acheneje (2011) disclosed that the cost of feed and fingerlings accounted for over 50 percent of expenditure for fish farming in Benue State. The fixed cost of production (63.83%) consists of pond construction (19.57%), farmhouse (12.65%), borehole (17.12%), tanks (9.17%), pond equipment (1.08%) such as net, water heater, vibrators etc. The higher value of fixed cost may be due to high cost of construction materials like cements used in constructing a high standard fishpond and farmhouse in the study area.

Furthermore, the results of the respondent in a season presented in Table 3 reveals that, on average, total cost (TC) of N1, 151, 525.64 is recorded by all the fish farmers in the study area while the average total revenue (TR) of about N1, 159, 716.00 was recorded. The average Gross Margin (GM) recorded was N743, 219.16 with a Net Farm Income (NFI) of N8, 190.36. GM and NFI are a good measure of profitability; therefore, the positive value of GM and NFI indicates that fish farming in study area is profitable business in the study area. Furthermore, the results show that fixed cost was more pronounced than variable cost given the average values of N735, 028.80 (63.83% of Total Cost) for fixed cost and N416, 496.84 (36.17% of Total Cost) for variable cost. These depicts that higher amount of money that is spent on fish farming are majorly on procurement of Tank, Pipe Networks, equipment and others equipment or materials.

Table 3: Average Cost and Return of Fish Farming Per Quantity of Fish Harvested

Items (in a cropping season)	Amount (N)	% of Total Cost
A) Variable inputs		
Feed	162,568.12	14.12
Aerators	58,680.00	5.10
Transport Cost	10,260.00	0.89
Drugs	9,172.00	0.80
Labour (Hired)	61,840.00	5.37
Lime	6,887.20	0.60
Fertilizer	289.52	0.03
Fingerling	106,800.00	9.27
Total Variable Cost (TVC)	**416,496.84**	36.17
B) Fixed inputs		
Tank	105,606.67	9.17
Pipe Networks	22,166.80	1.92
Equipment (nets. Scale etc.)	12,407.33	1.08
Borehole/or Well	197,120.00	17.12
Generator/NEPA Charge	26,746.67	2.32
Pond construction	225,306.67	19.57
Farm house	145,674.67	12.65
Total Fixed Cost (TFC)	**735,028.80**	63.83
Total Cost (TC)	**1,151,525.64**	
Total Revenue (TR)	**1,159,716.00**	
Net Farm Income (NFI)	**8,190.36**	
Gross Margin (GM)	**743,219.16**	

Profitability of Fish Farming in the Study Area

The estimation of profitability ratio in Table 4 shows that the Benefit Cost Ratio (BCR) is more than unity (one). Specifically, the ratio is 1.05 implying that the fish farmers get 1.05kobo from every N1.00 spent on the fish farming business. This further confirms that the farming business in the

study area is profitable. Similarly, the rate of returns, 0.05 implies that 5kobo is realized for every N1.00 devoted by the farmers and a gross revenue ratio of 1.89 indicates that for every one naira return to fish farm enterprise, N89 kobo was spent. These parameters shows that aquaculture in the study area was profitable. This result is similar to the work of Okwu and Acheneje (2011) that discovered that fish farming is profitable in Benue State. The value of operating ratio was 0.36 which implies that about 36% of the total cost of production was made up of fixed cost. This implies that the business is worthwhile since increase in the production with variable cost would increase the total revenue leaving the fixed cost unchanged. Though, the results shows a positive business venture just similar to what Yemi and Deji (2012) observed in the South West Nigeria. The margin of profit might not induce high traffic for investors and practicing farmers ought to be cautious of risk that might reduce the relatively low rate of returns on investment.

Table 4: Profitability ratios

Ratios	Value
Benefit Cost Ratio (BCR)	1.05
Rate of Return (ROR)	0.05
Expense Structure Ratio (ESR)	1.89
Gross Revenue Ratio (GRR)	1.37
Operating Ratio	0.36

Incidence of Constraints Faced by Fish Farmers in the Study Area

The distribution of the constraints in Table 7 was influenced by incidences pattern admitted by the respondents towards fish production in Kaduna State. Majority of the respondents (25.33%) indicate that inadequate and high cost of feed was the main constraints in the study area. This was followed by lack of personnel (18.67%), management problems (16%) and poaching (14.67%). Other constraints are scarcity of fingerling (9.33%), high cost of fuel (9.33%), inconsistent (NEPA) (4%) and input procurement (2.67%). The prevalent incidences are different event across sub-Saharan Africa, as noted in Cameroun by Cynthia, et al (2018), the high cost of fish feeding can be injurious to investment design as it constitutes a threat to profitability and risk to investment in general.

Table 7: Percentage distribution of fish farm production constraints in Kaduna state

Item	Constraints	Frequency (N)	Percentage (%)
1	Inadequate and high cost of fish feed	19	25.33
2	Lack of technical personnel	14	18.67
3	Management Problem	12	16.00
4	Poaching	11	14.67
5	Scarcity of fingerlings	7	9.33
6	High cost of fuel	7	9.33
7	Inconsistent (NEPA)	3	4.00
8	Input Procurement	2	2.67

Conclusion:

Aquaculture business decision correlates and profitability status of selected firms in Kaduna, State, Nigeria revealed that even though labour cost, cost of fingerlings and feed constituted the lion share of aquaculture production, the positive value of Gross Margin and Net Farm Income indicates that fish farming in study area is profitable business in the study area. It can also be concluded that aquaculture production was profitable in the study area considering the fact that the farmers were able to cover their operating expenses. Even though the fish farming is profitable, the margin or ratio of profitability (rate of return) is a pertinent issue that requires concerted action towards enhancing its profitability in view of attaining the country's objective of self-sufficiency in fish production. Prospective investors in the state should therefore capitalize

on this highly viable sub-sector of economy should capitalize to increase fish production in the study area as well as increase the economic profile of the state. The production constraints must be address through a deliberate governmental policy particularly the cost of feeds, fingerlings. Farmers in the study area should learn how to formulate quality feeds from locally available feed ingredients so as to reduce the pressure on total cost of production. Government should subsidize feed and other inputs so as to increase fish production in the study area. Government should as a matter of necessity provide capital for fish farmers in the study area in form of soft loan, as this formed the highest problem confronting the success of aquaculture in the study area. Small-scale farmers should organize themselves into fish cooperatives to promote their access to credit facilities, exchange of idea, control of price and technical information among members. However, Government should show more loyalty to the enactment of agricultural credit scheme for coherent service implementation.

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