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Economics and Profitability Assessment of Medium Scale Catfish Farms in Yobe State, North East, Nigeria

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Abstract: *Despite the potential of the fisheries resources, the sector has not been given its deserved position in Nigerian National Economy but investment in aquaculture production has been declining in Yobe State. This study was undertaken to assess the profitability of some fish farms and investigate the factors influencing fish farming in Yobe State, Nigeria. The factors influencing fish farming are: poaching, unstable and defective government policy, inadequate/ non-updated environmental audit reports and not adopting modern methods of aquaculture negate the development and profitability of this sector in the State. An average production cost of N550/kg, sales N650/kg, profit margin N100/kg of catfish. The gross turn-over ratio is 0.8 while the net income realized per capital invested is 0.2. The aquaculture practice in Yobe state is still profitable. Recommendations to increase the production and improve the profit margin and sustainability of the sector were made.*
Key words*: Profitability, small scale, fish farms, fish production*

I. Introduction

Aquaculture remains a growing, vibrant and important production sector for high protein food. The reported global production of food fish from aquaculture, including finfish, crustaceans, mollusks, and other aquatic animals for human consumption, reached 52.5 million tons in 2008 and 55.1 million tons estimate for 2009. The contribution of aquaculture to the total capture and aquaculture fisheries predators continued to grow from 34.5% in 2006 to 36.9% in 2008. Globally, aquaculture accounted for 46.6% of the World Fish food production for human consumption in 2008 (1).

FAO (2010) also documented that fresh water aquaculture production contributes 59.9% of World aquaculture production where seawater account for 32.3% by quantity and 30.7% by value. The over exploitation of the natural fisheries resources due to increasing human population and consequent protein demand made aquaculture one of the means of combating malnutrition in developing countries according to (2).

Aquaculture in Nigeria occurs only in inland and recently has the coastal region been in the focus of development (3). The fish farmers in Nigeria practiced traditional method of fish culture in tidal pools and flood plains for generations (4 and 5). These are extensive systems which do not conform to the modern perspective of aquaculture and cannot contribute any significant role to the nation economy. In intensive aquaculture system, the cultured animals are artificially always reproduced in hatchery and stocked at high densities, fed several times daily with pelleted nutritionally balance feeds, so that fish production is independent of natural production (6).

The Yobe State is endowed with vast agricultural and livestock development potentials. Fish farming, fishing and livestock rearing therefore provides employment to over 80% of the population. It is blessed with river and streams and an area of 47,153 Sq.km with the population of 2.5m. It is estimated that the demand of fish in the state is about 1,500 tons while fish supply was about 100 tons in 2008. It has also been reported that Yobe state has over 20 commercial aquaculture farms and over 2000 homestead ponds distributed across the state (7).

(8) reported that the fisheries sector is a growing economic sector and its contribution to the supply of animal protein for both human and animals is expanding rapidly. The increase of fish production in the State need not to be over-emphasized. This study is therefore an attempt to find out the various factors responsible for slow growth of aquaculture in Yobe state.

II. Methodology

The study area is Yobe State of Nigeria, which derived its name from the River Yobe on 27th August, 1991. The state is made up of 17 Local Government Areas and covers an estimated area of 47,153km^2 and shares international boundary with the Republic of Niger to the north. Within the country, it shares borders with Jigawa and Bauchi states to the west, Borno and Gombe states to the east and also some part of Borno states to the south. The population of the state is 2.5 millions as per the National head count conducted in March, 2006. Agriculture is the main activity of the state's economy. Yobe state is endowed with vast agricultural and

livestock development potentials. Farming, fishing and livestock rearing therefore provides employment to over 80% of the population.

Questionnaires Administration, Validation And Data Collection

The data for the study was collected from primary source by the use of objective questionnaire. The validity and reliability of all the items in the questionnaire in assessing catfish farming in Yobe state were all tested. In a situation where the respondents cannot read and write, personal interview was scheduled with them and their responses were entered accordingly into the questionnaire. Data were also collected from secondary source particularly Ministry of Animals and Fisheries, Ministry of Information and Culture, National Population Commission and Yobe State Agricultural Development Programme (YOSADP).

Population Size

The state is divided into six zones for the administration of the questionnaire. These zones are; Zone I which include Fika, Potiskum and Nangere; Zone II include Fune and Jakusko; Zone III include Gujba, Damaturu and Gulani; Zone IV include Bursari and Geidam; Zone V include Bade, Karasuwa Nguru and Machina and Zone VI include Yunusari and Yusufari (Fig. 3.2)

Sample Size

Sixty questionnaires were administered for the study and those retrieved were use for the analysis of data. To establish the level of reliability, a pilot study was conducted in Damaturu, Yobe state. Data generated were treated with a split half method, and established. The instrument used was Fish Farm Management Questionnaire (FFMQ). The validity of the instrument was based on comments from peer review.

Source: Yobe State Ministry of Information and culture

Fig. 3.2 Map of Yobe State showing Local Government Areas

Profitability Indicators

Profitability is defined as the ability to earn returns over and above the cost of capital with consideration of the risk involved. Profitability indicators are: Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR), cash payback period and accounting rate of return.

III. Data Analysis

The method employed for the analysis of the collected data was mainly simple descriptive statistics. In particular, frequency distribution and percentage were used to summarize the data. While statistical inference (Chi-square) was used to determine whether or not there exist a relationship among the hypotheses and the status of aquaculture. That is to achieve the objective at 5% level of significance. See the formula below.

- Mean = $\frac{\sum X}{N}$

  Where $\sum X$ = sum of all observations = 1, 2, 3, ------- n
  N = Number of observations.

- Percentage (%) = $\frac{\sum X_i}{N}$ X 100

Where $\sum X_i$ = observed frequency
N = total frequency

- Chi-square (q^2) of the explicit form.

$$q^2 = \frac{\sum (F_o - F_e)^2}{F_e}$$

Where F_o = observed frequency.
F_e = expected frequency.

IV. Results

Sixty (60) questionnaires were administered and fifty-two (52) were retrieved and used for the analysis as shown in table 1.

Table 1: Administration of questionnaires

Sex		Number Administered	Number Retrieved	Questionnaires Death
Male	Female			
40	12	60	52	8

Source: Survey, 2013.

Demography Of The Catfish Farmers In Yobe State

Age of Farmers: From the above analysis of questionnaire, the result shows that people with ages above 50 years has the highest percentage as shown in table 2.

Table 2: Age distribution of farmers

Age group (Yrs)	Frequency	Percentage
0 – 10	0	0
11 – 20	3	5.8
21 – 30	5	9.6
31 – 40	10	19.2
41 – 50	15	28.8
50 – above	19	36.5
Total	**52**	**100**

Source: Survey, 2013.

Sex: From the analysis, it has shown that male have the highest percent (76.9%) while female have only (23.1%) table 3.

Table 3: Sex distribution of fish farmers

Sex	Frequency	Percentage
Male	40	76.9
Female	12	23.1
Total	**52**	**100**

Source: Survey, 2013.

Educational Status : 44.2% had tertiary education and 55.8% had primary education.

Table 4: Educational distribution of fish farmers

Type of Education	Frequency	Percentage
Not educated	6	11.5
Quadratic	10	19.2
Primary school	4	7.7
Post primary	9	17.3
Tertiary	23	44.2
Total	52	100

Source: Survey, 2013.

Marital Status: 63.5% of the respondents are married while the rest 36.5% are not, they are either widow, divorce, single or widower.

Table 5: Marital status of fish farmers

Marital status	Frequency	Percentage
Married	33	63.5
Single	8	15.4
Divorce	3	5.8
Widow	5	9.6
Widower	3	5.8
Total	52	100

Source: Survey, 2013.

Household Size: About 88.5% of the farmers have the household size from 0 – 20 while 11.5% are between the household size of 21 and above as shown in table 6.

Table 6: Household size of fish farmers

Household size	Frequency	Percentage
0 – 5	16	30.8
6 – 10	16	30.8
11 – 20	14	26.9
21 – 30	1	1.9
31 – 40	5	9.6
Total	52	100

Source: Survey, 2013.

Occupation: From the analysis of the questionnaires, 61.5% of the respondents take fish farming as secondary occupation while 38.5% take it as a primary occupation as shown in table 7.

Table 7: Occupational variation of fish farmers

Occupation	Frequency	Percentage
Primary occupation	20	38.5%
Secondary occupation	32	61.5%
Total	52	100

Source: Survey, 2013.

Fish Farming Systems Adopted In Yobe State

System of Farming: About 42.3% of the respondents practice Monoculture, while 36.5% Polyculture and 21.2% practice ranching as shown in table 7.

Table 8: Farm system variation within the fish farmers

System of farming	Frequency	Percentage
Monoculture	22	42.3
Polyculture	19	36.5
Ranching	11	21.2
Total	52	100

Source: Survey, 2013.

Type of Pond Culture System: From the analysis, 36.5% operate outdoor concrete pond system, while 30.8% operate earthen for easy supply of natural feed while less than 35% practice the other two system of pond culture.

Table 9: pond culture system distribution of fish farmers

Type of pond culture system	**Frequency**	**Percentage**
Earthen	16	30.8
Outdoor concrete	19	36.5
Indoor concrete	9	17.3
RAS	8	15.4
Total	52	100

Source: Survey, 2013

Catfish Farm Inputs And Production Fators

Type of Feeds Used: From the report of the respondents, floating feed has the highest frequency with the percentage of 28.8%.

Table 10: Distribution of fish farmers based on the type of feeds used

Type of Feeds Used	Frequency	Percentage
Locally compound feed	11	21.2
Natural feed	12	23.1
Alternative to conventional feed	14	26.9
Floating feed	15	28.8
Total	52	100

Source: Survey, 2013

Cost of Production: Feed has highest frequency of 55.8%. This means that feed is costly; almost double the other costs of fish production

Table 11: Distribution of fish farmers based on cost incurred on fish production

Produce with highest cost	Frequency	Percentage
Feed	29	55.8
Maintenance of water quality	10	19.2
Purchase of fingerling	8	15.4
Medication	3	5.8
Consultancy	1	1.9
Miscellaneous	1	1.9
Total	52	100

Source; Survey, 2013

Forms of Selling Fish: The analysis of questionnaire showed that about 65.4% of the respondents sell their fish fresh while 34.6% sell as processed.

Table 12: Distribution of fish farmers based on the way they sell their product

Sales form	Frequency	Percentage
Fresh	34	65.4
Smoke	14	26.9
Dry/salted	4	7.7
Total	52	100

Source; Survey, 2013

Table 13: Chi-square analysis of the research hypotheses

Research Hypotheses	Null Hypotheses H_0	Alternative hypotheses H_1	Remark
That Fish seeds source do not affect aquaculture production in Yobe State.	7.82	15.2	H_0=>Rejected
That fish feed is not costly	7.82	18	H_0=>Rejected
That poaching is not a problem to fish farming in Yobe State.	7.82	7.3	H_0=>Accepted
That there is inadequate capital for aquaculture in Yobe State.	7.82	15.9	H_0=> Rejected
That there is an unstable and defective government policy on fish production.	7.82	3.2	H_0=>Accepted
That the environmental audit reports of most fish farm in Yobe State are not updated.	7.82	4.8	H_0=>Accepted
That storage facilities is not a problem of fish farmer in Yola State.	7.82	20.1	H_0=> Rejected
That marketing of fish product is not a problem in Yobe State	7.82	29.1	H_0=> Rejected
That aquaculture production is not a profit venture.	7.82	26.5	H_0=> Rejected
That fisheries extension services do not influence fish farming in Yobe State.	7.82	15.3	H_0=> Rejected
Water quality has no any significant effect on fish production in Yobe State	7.82	78.5	H_0=> Rejected
That the level of adoption of modern methods of aquaculture in Yobe State is not a significant.	78.2	5	H_0=>Accepted

Source: Survey, 2013.

The implication of the Null hypothesis (H_0) indicated that if H_0 value (observed value) is greater than the Alternative value (H_1) (calculated value), then that hypothesis is not a factor affecting aquaculture production in the study area

Cost And Returns

Table 14: Cost of production of 1kg of fish

Production cost (₦)	650	600	550	500	450	400
Frequency	4	8	12	15	8	5
Percentage	7.7	15.4	23.1	28.8	15.4	9.6

Source: Survey, 2013.

From the study, the average cost of producing 1kg of fresh fish is ₦550 table 14.

Table 15: Sales cost of 1kg of fish

Sales cost (₦)	650	600	550	500	450	400
Frequency	8	13	18	10	3	1
Percentage	15.4	25	34.6	19.2	5.8	1.9

Source: Survey, 2013.

The average sales cost of 1kg is ₦650 table 15.

Cost Of Production

From the study, the average cost of producing 1kg of fresh fish is ₦550

Sales Cost

The average sales cost of 1kg is ₦650. This means that the farmer is able to obtained ₦100 per kilogramme of fish.

Gross Turn Over Ratio

The ratio was found to be 0.80. To indicate the profitability the value has to be less than one. The aquaculture production in Yobe State is fairly profitable.

Return On Capital

This is the net income realized per Naira capital invested. Here the result obtained was 0.20 which is very lower. While the higher is the best. But here it indicate that aquaculture production in Yobe State is fairly profitable

V. Discussion

The study revealed that the respondents between the age range of 31 and above representing 84.5% engaged themselves in aquaculture than the ages between 0 – 30 years. This indicates that the young people (15.5%) don't have capital for aquaculture or have something doing instead of farming. So if care is not taking, the aquaculture will die off in the next few years due to old age. The study also revealed that 44.2% of the respondents had tertiary education and 55.8% had primary education. So they are ready to take innovation as explained by (9), when he asserted that education level of the farmers has a significant and positive correlation with adoption. It has shown from the study that male have the highest percentage (76.9%) while female have only (23.1%) table 3. This implies that male have dominated the aquaculture. From the analysis of the questionnaires, 61.5% of the respondents take fish farming as secondary occupation while 38.5% take it as a primary occupation. This may be due to high cost of fish feed, inadequate extension services, poor market for the fish product, etc. From the result of the findings, it has shown that 63.5% of the respondents are married while the rest 36.5% are not, they are either widow, divorce, single or widower. This implies that married people have available labor for aqua-farming.

The study revealed that fish seed source is one of the major problems affecting aquaculture production in Yobe state. This indicated in the survey 63.4% agreed while those disagreed are 36.6%. (10) estimated fingerlings demand-supply gap at over 500 million in Nigeria. Feed has highest frequency of 55.8%. This means that feed is costly; almost double the other costs of fish production. This is because fish fed with improved compounded feed grow faster within the short time then those fed with local feed. (11) stated that fish feed consumed about 70% of the cost of production. This is because a lot of farmers depend on imported quality fish feeds which are expensive and not affordable. This increases the cost of production and reduces profit margin.

From the result of the findings, it has shown that 34.6% agreed that poaching is a factor affecting aquaculture production in Yobe state while 65.4% disagreed. Though the result revealed opposite but as a result of poaching, many farmers have lost substantial, if not all stocks, to poachers. As a result of this, many fish farms have closed down while many more farmers have run into debt. This has also prevented lending agencies from giving out loans to genuine fish farmers and this resulted into decrease in fish production.

Unstable and defective government policy and non-updated environmental and audit report are not problems affecting aquaculture production in Yobe state. This is because the report of the respondents indicated that 57.7% and 51.9% disagreed while 42.3% and 48.1% agreed respectively. From the report of the respondents, 69.4% agreed that storage facilities are really a problem of fish production in Yobe state, while 30.6% disagreed. The study revealed that 65.2% supported that adoption of modern fish farming is not a factor affecting aquaculture status in Yobe state while 34.8% go against. This means that old people hardly accept innovation.

Water quality management and supply is also a problem affecting fish production in Yobe state as indicated by the respondents 80.8% supported while 19.2% go against. (12) stated that water quality management and supply play a crucial role in the growth and survival of fish.

From the report of the respondents, floating feed has the highest frequency with the percentage of 28.8%. About 42.3% of the respondents practice monoculture, while 36.5% polyculture and 21.2% practice ranching. From the analysis, 36.5% operate outdoor concrete pond system, while 30.8% operate earthen for

easy supply of natural feed while less than 35% practice the other two system of pond culture. The analysis of questionnaire showed that about 65.4% of the respondents sell their fish fresh while 34.6% sell as processed.

(12) reported that fish are highly perishable food liable to deteriorate quickly and care has to be taken immediately in handling, processing and packaging. This author also supported that fact that many considered fish farming unprofitable due to poor technology in immediate post-harvest preservation and processing resulting in many losses.

The result of the report indicated that 63.5% agreed that capital is also a factor affecting aquaculture production in Yobe state while 36.5% disagreed. The number of operational fish farms in Yobe state has reduced significantly as a result of lack of capital and the expected fish yield is affected, this information is supported by (10).

The result of the analysis indicated that 59.6% agreed that marketing of is another factor affecting aquaculture production in Yobe state, while 41.4% disagreed. Fish markets have remained unpredictable with few or no clear cut out lets (12) most especially as a result of the unrest witnessed for the past few years in the state.

The study revealed that 61.6% agreed that fishery extension services affect aquaculture production in Yobe state while 384% disagreed. This indicated that extension is necessary as stated by (13), aquaculture extension is the assemblage of method used in promoting, propagating and spreading the practice of fish farming. The primary objective of aquaculture extension therefore, is to improve production of aquatic organism for food and economic well being of the farmers as well as for national at large.

From the study, the average cost of producing 1kg of fresh fish is ₦550 and the average sales cost of 1kg is ₦650. This means that the farmer is able to obtained ₦100 per kilogram me of fish, while the gross turnover ratio was found to be 0.80. To indicate the profitability the value has to be less than one. The aquaculture production in Yobe State is fairly profitable. And return on capital which is the net income realized per Naira capital invested. Here the result obtained was 0.20 which is very lower. While the higher is the best. But here it indicates that aquaculture production in Yobe State is fairly profitable.

The analysis of the study questionnaires showed that poaching, faulty data record, environmental data assessment and level of adoption of modern fish farming are not the problems of fish farming in Yobe state rather the problems militating against fish farming in Yobe state are; poor sources of fish seed, high cost of fish feed, inadequate capital, storage facilities, marketing of fish product, low profit, inadequate extension services and water quality management and supply.

From the result of this study, it is understandable that production level of fish in this country and in the study area in particular is far from being status factory. This may be attributed to the problem facing the fish farmers. Hence, following recommendations were made.

i. There is need for the fish farmers to from groups and associations so as to speak with one voice in term of problems facing their venture and also easy access to capital for expansion.
ii. There is need for the establishment of standard hatcheries in each local government so that fish farmers will have access to quality fish seeds.
iii. Government should assist in providing efficiency extension services as well as inputs at subsidies rate.
iv. There is need for networking and marketing information among fish farmers, processors and consumers. This will assist the fish farmers to increase their profit margin.

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