



## COMPARATIVE ANALYSIS OF MANAGEMENT PRACTICES AND PROFITABILITY IN EARTHEN AND CONCRETE-WALL PONDS IN RIVERS STATE, NIGERIA

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### ABSTRACT

The study highlights the demographic characteristics of earthen and concrete pond fish farmers with special reference to management practices needed by the farmers and the profitability of each culture system. Sixty (60) farmers were randomly sampled from selected fishing communities in Ogba/Egbema/Ndoni Local Government Area of Rivers State, Nigeria. The instrument used for this study was a structured questionnaire which was based on the purpose of the study. The data collected from respondents was treated and analyzed using mean, percentages and standard deviation, and 2.50 were taken as the cut off point for each questionnaire item. Profitability of fish production was estimated using net returns while the relative income distribution among inputs was computed from the relative factor shares. Results obtained indicated that majority of the farmers (55%) were within the productive age of 30-40 years, with 95% of them being males. Earthen pond fish farmers indicated 14 out of the 24 management practices as those needed by them; while the concrete pond fish farmers indicated 16 out of the 24 management practices as those they need for daily running of the farms. The amount spent on stocking of fingerlings formed the bulk of the input cost ranging from 28.7% in earthen ponds to 29.6% in concrete fish ponds. Net returns over a one year period was ₦525, 185 and ₦548, 780 for earthen pond and concrete pond fish farmers respectively, with a return cost ratio of 1.48 and 1.47 respectively

**Keywords:** concrete fish pond, earthen fish pond, management practices, return/cost ratio

### INTRODUCTION

Fish is an important source of animal protein in Nigeria. The demand is on the increase annually. This has been attributed to a number of factors such as high population growth rate, increasing national income and increasing cost of other sources of animal proteins such as livestock (Adeniyi, 1987; Akolisa and Okonji, 2005).

In Nigeria, fish alone contributes, on the average, 20 – 25% per caput animal intake and could be as high as 80% in coastal and riverine communities (FAO, 2000). Tobor (1992) and Ajana (2002) reported that the average annual demand for fish in Nigeria between 1995 and 2000 was estimated at 1.22 million metric tons and that this might increase to about 1.425 million metric tons by the year 2005. FAO (2000) estimated the projected population and fish demand/supply from 1997 to 2025, with domestic fish production by the year 2007 as 0.77 million tons. Aliu and Abolagba, (1998) and Ajao (2011) also reported that Nigeria produces about 0.7 million metric tons of fish annually which results in shortfall of about 1.0 million metric tons annually. They also observed that only 5% of this 0.7 million metric tons produced locally was from aquaculture while the remaining 95% was from the captured fisheries dominated by the artisanal fish farmers.

The fisheries sector of the Nigerian economy is made up of the artisanal, industrial and culture fisheries. These three sub-sectors contribute to the total fish production within the nation; the artisanal fisheries and fish culture (aquaculture) makes up the domestic fish production

Fish farming is the culture of fishes in marine, freshwater or brackish water bodies. More than 100 fish species are cultured for human consumption. Apart from high protein derived from fishes, it also makes the farmer self employed and provides extra income for the family. The aim of fish culture principally is to produce quality fish food for human consumption. It is also to enhance culture based fishery by providing enough fingerlings for re-stocking open waters like natural and artificial lakes, reservoirs and running streams in order to prevent the extinction of commercially important species of fish especially when and where there is over-exploitation. Fish culture also provides additional income to farmers and their families thereby alleviating poverty particularly among the rural populace. On a national level, it can serve as a source of foreign exchange. Right now, Nigeria imports more than 50% of fish consumed locally. Through fish culture, land that cannot be used for any agricultural purpose can be put to productive use. Finally it provides employment opportunities for thousands of people directly or indirectly. Culturable species of food fishes in Nigeria include carp, tilapia and catfish.

Earthen pond is the most common type of fish production system in Nigeria. The ponds used vary in size ranging from small (less than ½ hectare) to medium (0.5 – 1 hectare) and large (1 hectare and above). Earthen ponds can be embankment pond, excavated pond or barrage pond. Earthen ponds are easier to manage, and production is usually faster because of the addition of nature foods to supplement the feed given to the fish. They are however prone to predators if not properly managed, which can reduce production drastically.

In concrete ponds performance of fish can easily be assessed and fish must be fed with adequate diet to obtain maximum yield. If not properly managed, there could be constant outbreak of disease. Stocking density is usually higher than those obtained in earthen ponds. Ugumba and Okoh (2010) reported that earthen ponds were more profitable than the concrete ponds irrespective of the fact that the concrete ponds farmers were in the majority. In a related study Tanimu et al. (2013) observed better water quality in earthen ponds than concrete fish ponds.

The study was therefore undertaken to determine profitability of fish production in earthen and concrete fish ponds in the study area. The specific objectives of the study were therefore:

- (i) To determine the management practices needed by earthen and concrete fish pond farmers in the study area
- (ii) To assess the profitability of fish farming in the study area under concrete and earthen pond system

## **RESEARCH METHODOLOGY**

This study made use of survey method, designed to get relevant information from fish farmers in twelve (12) towns, four towns from each community that makes up the Ogba/Egbema/Ndoni Local Government Area of Rivers State, Nigeria. The sample included sixty (60) fish farmers from twelve (12) towns selected. Four towns from each community; that is five (5) farmers from each of the towns were used. Thus, a total number of sixty (60) respondents were randomly selected to cover the three communities in the Local Government Area.

The instrument used for this study was a structured questionnaire which was based on the purpose of the study; the questionnaire consisted of two sections. Section A elicited information on socio-demographic characteristics of respondents such as marital status, age, sex family size, and educational level. Section B elicited information on the management practices needed by the fish farmers while Section C deals on profitability of fish production in earthen and concrete fish ponds. The researcher personally administered questionnaire, and also retrieved the copies the same period to avoid loss.

Each questionnaire item of needed category (Section B) was assigned a four point response scale of highly needed = 4, needed = 3, moderately needed = 2 and not needed = 1

The data collected from respondents was treated and analyzed using mean, percentages and standard deviation. 2.50 were taken as the cut off point for each questionnaire item. Any point less than 2.50 was taken as management practice not needed.

Profitability of fish production was estimated using net returns, which in this study is defined as returns to labour and management, and the total cost is simply all costs for paid inputs.

NR = net returns to farm resources and management

Y<sub>i</sub> = output value of fish produce

X<sub>ij</sub> = value of paid input j for fish produce i

$$NR = \sum Y_i - \sum X_{ij} \text{ ----- (i)}$$

The relative average productivity of the fish production system (using return/cost ratio) was estimated with:

$$R/C = \sum Y_i / \sum X_{ij} \text{ ----- (ii)}$$

Where

R = Total returns on fish production

C = Total paid costs on fish production

From the perspective of the relative income distribution among inputs, the relative net returns may be computed from the relative factor shares (FS) formulae:

$$FS = \{ \sum Y / \sum X_{ij} \} \times 100 \text{ ----- (iii)}$$

Where FS = factor share of the input (%).

Other notations are as defined in equation (i)

## **RESULTS AND DISCUSSION**

### **Demographic characteristics of respondents**

Table 1 shows the background of respondents. Majority of the fish farmers (55%) were within the age range of 30-40 years, indicating that they were mostly within the productive age. Men were more involved in fish farming than the women, constituting about 95% of the population. This is supported by Asa et al (2011) who reported higher percentage (72.5%) of male concrete fish pond farmers in Akwa Ibom State, Nigeria. Majority of the fish farmers had only primary education (38.5%), while about 29.5% had no formal education. Most of the respondents (88.5%) have between 1 – 3 members in the family, while 11.5% has between 4 – 5 members. This may be expected since most of them young married men or women within the age range of 30-40 within probability of still producing more children. The respondents were mainly married men or women (59%).

**Table 1: Demographic characteristic of respondents (n = 60)**

<b>FISH FARMERS</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age (years)</b>		
Below 30	18	29.5%
30 – 40	33	55%
41 – 50	5	9.1%
51 – 60	4	6.4
<b>Sex</b>		
Male	57	95.0%
Female	3	5.0%
<b>Educational Qualification</b>		
Primary Education	23	38.5%
Secondary Education	14	23.0%
Higher Education	5	9.0%
No formal Education	18	29.5%
<b>Family Size</b>		
1 – 3 members	53	88.5%
4 – 5 members	7	11.5%
<b>Marital Status</b>		
Single	25	41.0%
Married	35	59%

**Management practices used by farmers**

The management practices needed by fish farmers are as presented in Table 2. The earthen pond fish farmers indicated 14 out of the 24 management practices as those needed by them, with a grand mean of 2.55. However the concrete pond fish farmers indicated 16 out of the 24 management practices as those they need for daily running of the farms, with a grand mean of 2.62. The high mean values of environmental quality management practices in fish ponds such as “regularly drain and change water” and “maintain good water quality” in concrete fish ponds than earthen fish ponds agrees with the findings of Tanimu et al. (2013) who noted that the use of an earthen pond may be more adventitious for fish culture in comparison to a concrete pond, in terms of maintenance of a good water quality.

**Table 2:** Management practices used by earthen and concrete pond fish farmers

	Management practice	Earthen pond		Concrete pond	
		x	SD	x	SD
1	Use monoculture system	1.89	0.09	2.89	0.21
2	Use polyculture system	2.20	0.13	2.15	0.16
3	Liming of pond	2.85	0.24	2.20	0.19
4	Fence pond site	2.60	0.11	1.84	0.09
5	Clear pond site of bushes	2.85	0.23	1.45	0.22
6	Hunt fish predators	2.78	0.15	2.05	0.17
7	Fertilize pond with inorganic manure	2.10	0.18	2.20	0.32
8	Fertilize pond with organic manure	3.15	0.05	3.28	0.17
9	Fertilize pond with organic + inorganic manure	2.88	0.32	3.18	0.23
10	Allow fish to feed naturally	1.85	0.21	1.82	0.19
11	Use artificial feed	3.35	0.19	3.20	0.33
12	Use feed with high protein content	3.20	0.23	3.35	0.25
13	Sort fish at intervals	2.34	0.19	2.90	0.21
14	Stocking at optimum density	2.60	0.26	3.10	0.19
15	Regularly drain and change water	2.15	0.23	3.21	0.23
16	Maintain good water quality	2.85	0.26	3.14	0.24
17	Treat fish pond with antibiotics	2.14	0.32	2.56	0.25
18	Isolate infected fish	1.89	0.19	2.00	0.32
19	Test cropping	2.05	0.25	2.50	0.23
20	Partial harvesting of fish pond	2.10	0.34	2.15	0.18
21	Total pond harvest	3.22	0.21	2.80	0.19
22	Keeping farm records	2.88	0.26	2.90	0.15
23	Record of fish mortality	2.65	0.32	2.85	0.08
24	Provide security to prevent porching	2.67	0.23	3.10	0.20
	<b>Grand mean</b>	<b>2.55</b>		<b>2.62</b>	

### Input Use, Cost and Returns of Fish Farmers

From Table 3, the amount spent on stocking of fingerlings formed the bulk of the input cost ranging from 28.7 % in earthen ponds to 29.6% in concrete fish ponds. Other costs which contributed highly to total running cost include feed (15.8% -earthen; 16.2% - concrete), labour (13.5% -earthen; 14.8% - concrete) and water supply (14.6% -earthen; 16.2% - concrete). As shown in the table, net returns over a one year period was ₦525, 185 and ₦548, 780 for earthen pond and concrete pond fish farmers respectively which gives a monthly income of ₦43,765 and ₦45,730 respectively per month. Return cost ratio of 1.48 and 1.47 were obtained in earthen and concrete fish ponds respectively. This indicates that for every N100 invested, the enterprise yields an additional ₦48 and ₦47 for earthen pond and concrete fish ponds respectively.

**Table 3. Annual costs and returns of earthen and concrete fish ponds**

Item	Earthen pond		Concrete pond	
	N	%	N	%
<b>Production</b>	<b>880,540</b>	<b>100</b>	<b>950,240</b>	<b>100</b>
<b>Costs</b>	<b>355,355</b>	<b>40.4</b>	<b>401,460</b>	<b>42.2</b>
Fingerlings	252,715	28.7	281,270	29.6
Liming materials	22,015	2.5	19,005	2.0
Feed	139,125	15.8	153,940	16.2
Fertilizers/organic manures	30,820	3.5	38,010	4.0
Drugs	21,135	2.4	20,905	2.2
Labour	118,875	13.5	140,640	14.8
Land rents	42,260	4.8	37,060	3.9
Water supply	128,560	14.6	153,940	16.2
Pond maintenance	44,030	5.0	71,270	7.5
Transportation	29,935	3.4	19,955	2.1
Farm tools and equipment	51,070	5.8	14,255	1.5
<b>Net returns</b>	<b>525,185</b>	<b>59.6</b>	<b>548,780</b>	<b>57.8</b>
<b>R/C</b>	<b>1.48</b>		<b>1.47</b>	

### CONCLUSION

The net returns realized from total cost of production of ₦880,540, over a one year period was ₦525, 185 for earthen fish pond while ₦950,240 total cost of production generated a net return of ₦548, 780 for concrete pond fish farmers. Therefore, fish production using earthen and concrete ponds in the study area were profitable. It is therefore recommended that sufficient information should be disseminated by extension services/development agencies in the study area to all fish farmers, unemployed and underemployed to encourage them to use earthen and concrete ponds for fish production as a means of generating income and self employment. Training on management practices identified in this study is also needed by the fish farmers for increased productivity.

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