ASSESSMENT OF COST AND RETURNS TO CULTURED FISH PRODUCTION IN KOGI STATE OF NIGERIA

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Abstract
This paper examines the socio economic characteristics, cultured fish production techniques, and the costs and returns to cultured fish production in Kogi state of Nigeria. Data used for this study were collected over one production cycle in 2012 using a structured questionnaire. A total of 51 respondents were drawn from a sampling frame of 94 registered cultured fish farmers through random sampling technique. Analytical tools used for the study were descriptive statistics and farm budgeting technique. The study shows that net farm income was estimated at ₦ 3,316.06 per m^2/cycle with a rate of return calculated at 184% was realized from cultured fish production by farmers in Kogi. It was concluded that cultured fish production in the study area is profitable. Based on the findings of the study, it is concluded that fish production is profitable and the potentials for enhancing its profitability exists. However, due to the low access of farmers to formal credit, the study recommended that government should link the farmers to formal source for formal credit in addition; the government should also endeavor to encourage more women participation, particularly in homestead cultured fish production. The government will also do well to create a support system comprising the establishment of a number of one-stop shops at convenient locations for farmers where necessary fish inputs can be accessed by fish farmers at considerable prices. By this, the cost of production will be minimized and this will lead to increase in the farm returns.

Keywords: Cost, Cultured fish, Returns, Farm, Production

Introduction
The agricultural sector is one of the most important components of the Nigerian economy. This is in the sense that it plays significant roles in the nation's economic development. These roles include contribution to the country's Gross Domestic Product, source of income, decent living for a large proportion of the population, provision of food for the people, supply of raw materials required by the industrial sector, generation of foreign exchange through export and provision of employment opportunities for the teeming population [1]. The importance and relevance of the agricultural sector in economic growth and development cannot be over emphasized. However, until recently, there seem to be no consistent pattern of improvement, irrespective of whether activities in the sector are controlled by the government or market forces. The sector contributes 41.15 % of the country's GDP. It employs about 65% of the total population and provides employment to about 90% of the rural population. The fishery sub-sector, which is the focus of this study, accounts for 3.3 % contribution to the GDP on the average [2]. This contribution is relatively low when compared with the crop and livestock sub-sector's contribution to the economy. The best animal protein choices are fish and poultry. It has been estimated that fish constitutes about 3.5% of per capita food consumption in Nigeria, about 36.6 gramms per day in a meal [3]. Fish is a highly acceptable source of protein, accounting for as much as 50 percent of animal protein intake in most developing countries [4]. On a global scale, almost 16 percent of the total intake of animal protein was attributed to fish [4]. However,

of great concern for the stakeholders in Nigeria is the low intake of protein by its citizen which is still below the World Health Organization (WHO) recommendation. WHO recommends 0.45 grams of protein per kilogram of ideal body weight per day [5]. This perhaps might have informed the emphasis placed on the fishery sub-sector by the States and Federal Governments in recent times. Hence, the need for this empirical study that focused on Kogi State where recent statistics revealed an upsurge in the number of new entrants into the cultured fish business.

The main objective of the study is to examine the profitability of the prevalent cultured fish production in Kogi States, to also describe the socio economic characteristics of cultured fish farmers; identify cultured fish production techniques in the study area; and to determine the costs and return to cultured fish production in the study area.

Material and Methods

The Study Area: Kogi State is located in the North central zone of Nigeria. The State which has 21 Local Government Areas was created on the 27th of August 1991 from the merger of parts of Kwara and Benue State. It is bounded by the following States, Edo and Ekiti to the West, Nasarawa and Benue to the east, Anambra and Delta to the south, Kwara, Niger and the Federal Capital Territory, Abuja to the North. It is located on longitude 6.5783° E and latitude 7.5619° N. The two major rivers, Niger and Benue flow through the State exposing expanse of low lying swampy plains. The river Niger which is close to 300 km in length forms a confluence with the River Benue at Lokoja, the State's capital [6]. The two States that constitute the study area have two distinct climatic seasons, the wet (Rainy) and dry (Harmattan) seasons. The rainfall in Kogi extends between November and February. This climatic condition as well as fertile soil makes the States favorable for arable crop production such as rice, millet, yam, cowpea etc [6].

Data Collection: Primary data were collected using a structured-questionnaire. The primary data were collected between the months of December, June, 2012 to June 2013. A minimum of three visits were occasioned to the identified farms in the State under consideration; the first two visits were to pre-test the Data, while the latter were to administer the fine-tuned questionnaire.

Sampling Procedure: The study employed a single stage random sampling procedure. Given the unavailability of a comprehensive sampling frame for the study area, a sampling frame was developed from a list of fish farmers obtained from the Kogi State Ministries of Agriculture, the Kogi State ADP and the Fadama Development Project. Thus a population size of 94 farmers was obtained. A table of random numbers was thus constructed. From this a sample size of 51 farmers were randomly selected for the study. Thereafter, 51 structured questionnaires were respectively administered to cultured fish farmers in the study area. A detail of the samples is required in terms of geographical spread in the State.

Analytical Techniques: The data collected for the study were analyzed using descriptive statistics and farm budgeting technique. The model for estimating the farmer's returns to labour and management is outlined thus: Partial budget analysis was employed to determine Net Farm Income (NFI) and the returns to Farmer's Labour per hectare derived from catfish production in the study area. The model for estimating the farmer's return to labour and management is outlined thus:

Gross Value Output (TR) – Total Variable Cost of production (TVC) = Gross Margin 1

Gross Margin – Fixed cost = Net Farm Income 2

Net farm Income – Imputed cost of Family Labour = Returns to Farmer's Labour and Management 3

Return to Farmer's Labour and Management / Net Farm Income are the focal point for the costs and returns analysis of this study.

Rate of Return (ROR) provides a measure of financial performance of the enterprise employed expressed in percentage (%) (i.e. profit/₦ invested)

Returns to Farmer's Labour and Management

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$$ROR = \frac{TR}{TC} \times \frac{100}{1} \qquad 4$$

Results and Discussion

Socio-economic Characteristics

Table 1 shows the distribution of the cultured fish farmers with respect to their socio-economic characteristics. 90.2% were male; 86.3% had formal education and 88.2% were married; fish farming appear to be a male dominated activity in the study area. This is similar to the findings of [7, 8]. The latter in a study of cost and returns found that fish farming was majorly a male dominated activity. This practice is not peculiar to Nigeria alone as [7]. in their study reported similar trend in China, Philippine, India and Bangladesh. Eighty point four percent of the farmers are 36 years and above. Table 1: Socio-Economic Characteristics of Respondents

Table 1: Socio-economic Characteristics

		Frequency	Percent
Sex	Male	46	90.2
	Female	5	9.8
	Total	51	100.0
Formal Education	Had formal	44	86.3
	No formal	7	13.7
	Total	51	100.0
Marital Status	Single	5	9.8
	Widow	1	2.0
	Married	45	88.2
	Total	51	100.0
Age	<35	10	19.6
	36-45	20	39.2
	>45	21	41.2
	Total	51	100.0
Years of Experience	<6	37	72.5
	06-10	7	13.7
	11-15	4	7.8
	>15	3	5.9
	Total	51	100.0
Aquaculture as Main Income	No	33	64.7
	Yes	18	35.3

	Total	51	100.0
Other Sources of Income	Other Agric-based	11	21.6
	Trading	13	25.5
	Salaried Job	27	52.9
	Total	51	100.0
Source of Fund	Money Lenders	3	5.9
	Bank loan	2	3.9
	Friends	10	19.6
	Remittance	-	-
	Personal Saving	36	70.6
	Total	51	100.0

Source: Field Survey, 2012

Most of the cultured fish farms examined have at their disposal a mixed blend of labour supply e.g. husband, wife, children or siblings to manage them. Furthermore, the operations of most of the farms encountered required minimal labour as they are mostly small holder farms that requires less than hour per day of farm operations. Of the sampled cultured fish farmers in the study area, 86.3% had formal education to varying levels. This is similar to the works of Olaoye *et al*., (2013); Adebayo and Daramola (2013). Fish farming was not the main source of income in the State. A good percentage of farmers sampled are salary earners (52.9%). This is similar to the works of Adewuyi *et al*., (2010). Cultured fishing is largely seen as supplementary enterprise in the study area. Petty trading also serves as an alternative source of income for some farmers in the study areas. Fund for fish farming were mostly from personal savings. Virtually all the respondent did not access financial credit from lending institutions perhaps due to the stringent conditions attached to their services (70.6%).

Production Techniques of Cultured Fish Production

Average pond size was 117 m^2 and 70.6% of respondents were found to be engaged in mono cultured production (Table 2). This similar to the findings of Olagunju *et al*., (2007); Ele *et al*., (2013); and Omobepade *et al*., (2015). Earthen pond type was prevalent in the study area. The pond type employed no doubt had implication on the system of water supply. The mode of acquisition of Land in the study area is mainly through purchase and leasing, with a few cases of acquisition by traditional inheritance. In fishery, swamps which are particularly good for the construction of earthen ponds are considered as land resource. More over acquired spaces were concrete ponds can be constructed or fibre/plastic ponds are placed are also considered as land resource. The measurement of pond size is in square meters. The location of the land usually pre-determines the production technique. In some cases farmers simply excavate land located in swampy areas to make earthen pond. In other cases, farmers took advantage of little swath of lands bordering their residential abodes. 82.4% of stocked fish in Kogi were catfish, while tilapia accounts for the remaining population. The system of water supply was about 72.5% of stagnant water in Kogi State.

Table 2: Production Techniques of Respondents in Kogi State

Techniques		Frequency	Percent
Pond type	Concrete tank	20	39.2
	Earthen	21	41.2
	Fibre/tarpaulin	10	19.6
	Total	51	100.0
Average Pond size	Kwara: 114m^2		
	Kogi: 117m^2		
Labour	Family	36	70.6
	Hired	12	23.5
	Both	3	5.9
	Total	51	100.0
Cultured System	Poly Cultured	16	31.4
	Mono Cultured	35	70.6
	Total	51	100.0
System of water supply	Stagnant Water	37	72.5
	Flow through system	5	9.8
	Circulatory system	9	17.6
	Total	51	100.0
Type of Fish Stock	Others	7	13.7
	Tilapia	2	3.9
	Cat fish	42	82.4
	Total	51	100.0
Seedling system	Juvenile	35	68.6
	Fingerlings	16	31.4
	Total	51	100.0

Source: field Survey, 2012

Costs and Returns to Cultured Fish Farming

The farm budget analysis was used to determine the profitability of the enterprise. The Net Farm Income is basically the difference between the total returns from production (total revenue) and the total costs of production. The total revenue refers to the gross income accruing to fish farms as a result of the sales of table-sized fish, [9]. This is obtained by multiplying the unit price of average table-sized fish by the quantity sold. The variable costs are those costs that vary with the level of output. In this study the relevant variable costs items are fish feed, fingerlings and labor. The fixed costs items under fish farming are land, pond and other equipment. However, for the purpose of arriving at fixed cost of the fish farms for a given year, the straight line depreciation method was used taken into consideration, the expected life span of the different fixed cost items. Using the straight line method, the annual depreciation expenses were calculated on the fixed cost and used to arrive at the net farm income. The various costs incurred on the resources used and the returns from the sale of fish were estimated based on the market price at the period under consideration (one stocking cycle in year 2012. This is as presented in Table 3. The gross returns per m^2 pond size in the study areas were *₦3, 466.10*. The rate of return on investment (ROR) for Kogi State was 184%. This implies that for every ₦1 invested into cultured fish, ₦1.84 was made as revenue for the Kogi. That is, about 84 kobo was realized as returns. The rate of return on investment (ROR) otherwise called efficiency level was

respectively 0.84. This suggest both viability and profitability of fish farm enterprise in the study areas as this value is extensively higher than current lending rate of between 6 and 25% charged by both cooperative society and commercial banks in the study area. The study revealed that for every 1000 unit of fingerlings/juveniles purchased, about 80 to 100 are lost (died) before maturity. This mortality rate of about 10% of total fingerlings/juveniles per farm appeared rather high. The reason behind this high mortality rate may be that most of the farmers do not consider the use of drug and /or fertilizer necessary for their production. This is perhaps because these farmers have not been educated and/or enlightened on the importance of the use of these feed supplements. Another reason could also be low access to meet water requirement of the cultured fish farm. Poor power supply could also lead to poor water supply for most fish farms. This in turn have adverse effect on the health status and performance of fingerlings/juvenile

Table 3: Returns to investment ₦/m^2*per one stocking cycle (6 months)

Item	Amount (N)	
Total Revenue		5,194.64
Cost of Labour	90.44 (5.20)	
Cost of Fingerlings/Juvenile	521.78 (30.20)	
Cost of Feeds	994.71 (57.56)	
Depreciation	121.61 (7.04)*	
Total Variable Cost	1,728.54 (92.01)	1,728.54
Gross Margin		3,466.10
Total Fixed Cost	150.04 (7.99)	150.04
Net Farm Income/Profit (NFI)		3,316.06
Rate of Return on investment (RORCI)	1.84 (184%)	
Efficiency level/ (ROR) (%)	0.84 (84%)	

Figures in parenthesis are % of total cost.
*average linear depreciation on all equipment was used, *2012 1st cycle
Source: Field Survey, 2012

The labour used consists of family, hired and group labour. The wage rate varies slightly depending on the operation to be performed on the Fish farm. About ₦90.44 was spent on labour requirement per m^2 pond size in Kogi. The cost of fingerlings/juveniles does not account for differences observed in the total cost of production. This cost varies from as low as ₦25 to as high as ₦100 per fingerlings or juvenile depending on the market situation. The mean cost of fingerlings/juvenile was estimated at ₦48.5. The study observed that there was high cost of feeding in the study area. Adequate feeding of the fingerlings/juvenile is an important step to better performance of fish farming therefore depends not only on how well the fish are fed but of the quality as well. This explains why feeding took the bulk of the total variable cost. Most respondents agreed that the cost of Fingerlings/Juvenile is increasing by the day. This may have contributed to the slow growth observed in the sub-sector, since most farms identified the cost of feed as one of the problems militating against the enterprise. Furthermore, the study revealed that it cost about ₦355.*39* on the average to raise a typical fingerlings/juvenile to approximately 1 kg in the study area. Arithmetically, a unit of 1000 fingerlings/juvenile will cost approximately ₦*355,390.00* in Kogi and with the average sales price of ₦*578.43* in the study area; a good return in investment is expected.

Table 4: Cost of Cultured Fish Production ₦/kg

Measured variable	Kogi
Feeds (₦)	124.45
Cost of purchase of fingerlings(₦)	48.50
Other Cost (₦)*	182.44
Total cost	355.39
Average sale price	578.43

*includes cost such as labour, fertilizer/drug cost, water/electricity supply and linear depreciation on machine. Approximate average size of catfish is 0.954 kg.

Conclusion

Based on the findings of the study, it is concluded that fish production is profitable and the potentials for enhancing its profitability exists. However, due to the low access of the respondent farmers to formal credit, the study recommended that government should link the farmers to formal avenues for formal credit. Inaddition; the government should also endeavor to encourage more women participation, particularly in homestead cultured fish production. The government will also do well to create a support system comprising the establishment of a number of one-stop shops at convenient locations for farmers where necessary fish inputs can be accessed by fish farmers at considerable prices. By this, the cost of production will be minimised and this will lead to increase in the farm returns.

Authors' Contributions

AKANBI, Usman Oladipo designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. MUSA, John Jiya managed the analyses of the study and the search for relevant literature review. The two authors read and approved the final manuscript.

References

Adebayo, O. O., & Daramola, O. A. (2013). Economic analysis of catfish (Clarias gariepinus) production in Ibadan metropolis. *Discourse Journal of Agriculture and Food Sciences.* 1(7), 128 - 134.

Adewuyi, S. A., Phillip, B. B., Ayinde, I. A., & Akerele, D. (2010). Analysis of profitability of fish farming in Ogun State, Nigeria. *J. Hum. Ecol*, 31(3), 179-184

Central Bank of Nigeria (2013). Annual report.

Ele, I. E., Ibok, O. W., Antia-Obong, E. A., Okon, I. E., & Udoh, E. S. (2013). Economic analysis of fish farming in Calabar, Cross River State, Nigeria*. Greener Journal of Agricultural Sciences*, 3(7), 542 – 549.

Esu, B. B., Asa, U. A. & Iniedu, M. O. (2009). Costs and returns of fish production using earthen ponds in Akwa Ibom State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, 5(2-4),26-29.

Federal Ministry of Agriculture and Rural Development –FMARD (2003). Project appraisal document for the second national fadama development project*.*

Fejika, P. I., Ayanda, J. O. & Sule, A. M. (2007). Socio-economic variables affecting Aquaculture production and practices in Borgu local government area of Niger state, Nigeria. *Journal of Agriculture and Social Research, 7(2), 34 – 38.*

Food & Agriculture Organization (2010). *The state of world fisheries and aquaculture. Retrieved on 12/04/2012 at* www.fao.org.

Indoorclimbing.com (2013). Protein per kilogram of ideal body weight per day. Retrieved on 12/11/2013.

Kogi State Agricultural Development Project (2009). Progress Report (www.Kogiadp.com) Retrieved on the 5/10/2009.

Olagunju, F. I., Adesiyan, I. O., & Ezekiel, A. A. (2007). Economic viability of cat fish production in Oyo State, Nigeria. *J. Hum. Ecol.*, 21(2):, 121-124

Olaoye, O. J, Ashley-Dejo, S. S, Fakoya, E. O, Ikeweinwe, N. B, Alegbeleye, W. O., Ashaolu, F. O., & Adelaja, O. A. (2013). Assessment of socio-economic analysis of fish farming in Oyo State, Nigeria. *Global Journal of Science Frontier Research Agriculture and Veterinary*, 13(9) 44-55.

Oloyede, H. O. B. (2005). *All for the Love of nutrients.* The seventh inaugural lecture, University of Ilorin library and publication committee, Unilorin Press Nigeria.

Olukosi, J. O. & Erhabor, P. O. (2005). *Introduction to farm management economic, principles and applications.* Zaria: AHITAB Publishers. P. 114.

Omobepade, B. P., Adebayo, O. T., Amos, T. T., & Adedokun, B. C. (2015). Profitability analysis of aquaculture in Ekiti State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, 11(1), 114 - 119