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Full Length Research Paper

Economics of Catfish *(Clarias gariepinus)* and Tilapia *(Tilapia zilli)* under Monoculture and Polyculture Production in Aguata Local Government Area of Anambra State, Nigeria: A Comparative Approach

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Abstract

The study compares the economics of catfish and tilapia under monoculture and polyculture production in Aguata L.G.A of Anambra state. The specific objectives were: to determine cost and return of polyculture of catfish and tilapia and the monoculture of catfish, determine the factors affecting the net return as well identify the constraints faced by fish farmers in the study area. It was hypothesized that there was no significant difference in net return between the monoculture of catfish and polyculture of catfish and tilapia. Data were collected with a structured questionnaire administered to 50 fish farmers selected purposively. Data collected were analysed using descriptive statistics, budgetary technique and ordinary least square multiple regression model. The net return and gross margin for catfish monoculture were N84,040 and N114,040 respectively. The net return and gross margin of polyculture were N485,700 and N460,700 respectively. Double-Log function was the lead equation with R^2 (0.86) and F-value (3.17). Household sizes, pond size, level of education, farming experience, cost of labour and cost of feed were significant at 5%. Pond size, farming experience and level of education had positive correlation with net return and labour cost, feed cost and household size had an inverse relationship with net return. The major constraints include high cost of fingerlings and inadequate funds for expansion. Adequate provision be made to ensure the availability of fingerlings and feeds at cheaper rates.

Keywords: *Net return, monoculture, polyculture, fish farmers*

Introduction

Nigeria is endowed with abundant natural resources and water bodies. It has a vast network of inland waters like rivers, flood plains, natural and manmade lakes and reservoirs These water bodies according to Shimang (2005), were estimated to be about 12.5 million hectares of inland waters capable of producing 512,000 metric tons of fish. These potential notwithstanding, fish production has failed to meet the country's domestic demand (Food and Agricultural Organization, 2007). Available data shows that domestic fish production in Nigeria is far below its demand as shown by Nigeria Institute of Oceanography and Marine Research (1999) who reported that fish production was 34.078 metric tons in 1992 and 447.387 metric tons in 1998 showing an annual increase of about 1.3%. In 2002, aquaculture accounted for 25,000 metric tonnes which was far below its estimated potential of 2.50million metric tonnes annually (Federal Department of Fisheries, 2005). FAO (2007) further showed that Nigeria imports about 560,000 tonnes of fish estimated at about $400 million annually while annual domestic fish supply in Nigeria stands at about 400,000 tonnes. Considering the total fish production and supply, there is an insignificant difference compared with Nigeria annual population increase rate of 2.8% according to Nigeria census 1999. This shows a supply gap exist and only be filled by embarking on intensive homestead fish production.

The usefulness of fish cannot be overemphasized. Globally, fish provides more than 1.5 billion people with almost 20 percent of their average per capita intake of animal protein, and 3.0 billion people with at least 15 percent of such protein (Food and Agricultural Organization, 2010). Furthermore, the report stated that out of the142 million tonnes of fish supplied the world through capture fisheries and aquaculture, 115 million tonnes was used as human food, providing an estimated per capita supply of about 17 kg (live weight equivalent). Fish is a ready source of raw materials to manufacturers and producers of all types of feeds and animal rations. Fish offal, gills and scales can be incorporated as fish meal which is often an integral component of all animal feeds.

Many research works on fish production are available in literature. Ekunwe and Emrkaro (2009) examined the technical efficiency of catfish farmers in Kaduna metropolis Kaduna State, Nigeria using the stochastic frontier production function analysis. Fargade *et.al.,* (1986) pointed out that stocking a combination of species is preferred because proper combination of the species will ensure adequate space utilization and food use. Offern *et.al.,* (2009) proved that stocking a combination of African catfish, Heterobranchus species and Tilapia in polyculture is an effective way of controlling overpopulation in tilapia in culture, thus, producing fish of high marketable size and value. Only few of these compared monoculture and polyculture. One of such is by Nwosu *et al., (*2002) who asserts that fish yield and profit accruable to the fish farmers are higher in the polyculture system than in

the monoculture system. Against this background this paper set to achieve the following objectives: to determine and compare the cost and return of polyculture of catfish and tilapia and the monoculture of catfish in the study area; to ascertain the determinants of net return of fish farmers in the study area and to determine the constraints faced by fish farmers in the study area.

Materials and methods

The study was conducted in Aguata local government area of Anambra state. The area lies between Longitude 7^0 10 ^{1} East and Latitude 7^0 01^0 North of the equator. The area has a land mass of approximately 19,906.25 km2 and a population of 369,972 people (National Population Commission, 2006). It has an annual rainfall of 2000mm and a temperature range from 25^0 to 32^0c with two distinct seasons, rainy and the dry seasons. The area experiences an intermediate harmattan haze between November and January. The major crops grown in the area are yam, cassava and palm trees. The inhabitants are farmers, a great number engage in trading, hunting, while some are civil servants and only few fishermen.

Data for this study were collected from both primary and secondary sources. Primary data were collected using well structured questionnaire. Secondary source of data were obtained from textbooks, internet, library, journals, magazines, seminar papers, etc. A purposive sampling method was used to draw samples from the study area. Purposive technique was used because fish farmers are few in the study area. 25 catfish farmers, 15 tilapia fish farmers and 10 polyculture farmers were selected giving a total of fifty fish farmers.

Data were analysed using descriptive and inferential statistical tools. Descriptive tools used include means, frequency tables and percentages. Data were also analysed using net return and ordinary least square regression models. Depreciation on ponds was calculated using the straight line depreciation method. For the ordinary least square multiple regression technique, data were fitted into linear, semi-log, double log and exponential equations. The model with the highest value of coefficient of multiple determination (R^2), highest number of significant variables and F-values was selected as the lead equation.

The regression model is stated implicitly as:

Y = f (X1, X2, X3, X4, X5, X6, e)……eqtn 1

Where

Y = Net farm income (Naira)

X1 = Household size (Number)

X2 = Size of pond (Square Meters)
X3 = Farming experience (Years)
X4 = Cost of labour (Naira)
X5 = Cost of feed (Naira)
X6 = Level of education (Years)
e = Error term

It is expected a priori that;

X1 X2 X3X6, > 0; X4 and X5 < 0

The cost and return model is stated as follows
∏ = TR-TC……eqtn 2
TC = TFC + TVC
GM = TR - TVC
Where,
TT = Net return
TR = Total revenue
TVC = Total variable cost
TFC = Total fixed cost
GM = Gross margin

Results and discussion

Costs and Returns Analysis of Monoculture Fish Production

The average yearly cost of inputs and outputs per farmers in Aguata LGA under monoculture of catfish is shown in Table 1. The table shows an average total return and total cost of N221.740 and N137,700 respectively per fish farmer. The total fixed cost and the total variable cost contributed 21.79% and 78.21% respectively. The cost of feed was the most crucial cost factor in the study area accounting for 50.8% of the total cost. This is followed by the cost of pond construction (21.79%) and the cost of fingerlings accounting for 17.42%. The cost of labour, fertilizers and other output contributed 2.92%, 0.74% and 6.33% of the total cost of

production respectively. The net return and gross margin were N84,040 and N114,040 respectively. These values show the venture was profitable. Also the net return per Naira was 0.61 implying that for every naira invested 61 kobo was realized.

Table 1: Average Cost and Return for Monoculture of Catfish

Items	Quantity	Unit Price (N)	Value (N)	%Contribution to Total Cost
Total revenue			**221,740**	
Variable cost				
Family labour	Manhr/8months	502.5/mth	4,020	2.92
Cost of fingerlings	800	30	24,000	17.42
Cost of fish feed	15bags	4665.33	69,980	50.8
Cost of other inputs			8,700	6.33
Cost of fertilization			1,000	0.74
Total variable cost			**107,700**	***78.21***
Fixed cost				
Pond Construction (depreciated value)			30,000	
Total Fixed Cost			**30,000**	**21.79**
Total Cost			**137,700**	**100**
Gross margin			**114,040**	
Net return			**84,040**	
Gross margin/Naira			0.83	
Net profit / Naira			0.61	

Source: Field survey Data (2014)
NB: One US Dollar = N160

Costs and Returns Analysis of Polyculture of Catfish and Tilapia
Table 2 shows the average cost ant return for polyculture of catfish and tilapia.

Table 2: Average Cost and Return for Polyculture of Catfish and Tilapia

Items	Quantity	Unit Price (N)	Values	%Contribution To Total Cost
Total return			**652,750**	
Variable cost				
Hired labour	Manhr/8months	975/mth	7,800	4.06
Cost of fingerlings		45	45,000	23.43
Cost of fish feed	1000	5300	101,250	52.72
Other Costs	19bags		12,500	6.51
Fertilization			500	0.26
Total variable cost			**167,050**	**86.98**
Fixed cost				
Pond construction (depreciation value)			25,000	**13.02**
Total fixed cost			25,000	**100**
Total cost			**192,050**	
Gross margin			485,700	
Net returns			460,700	
Gross margin/ Naira			0.74	
Net return / naira			0.70	

Source: Field survey Data (2014)

From the table the total cost incurred was N192,050 with 86.96% representing the total variable cost. The cost of feed had the highest percentage contribution (52.72%). This is followed by the cost of fingerlings (23.43%) and cost of pond construction (13.02%). However, the gross and net return of the polyculture stood at N485,700 and N460,700 respectively compared to those of monoculture which stood at N114,040 and N84,040 respectively. Whereas the net return per naira of polyculture was 0.70 that of monoculture was 0.61. This shows that for every one naira invested 70K was realized for polyculture and 61k for monoculture showing that polyculture was more profitable than monoculture.

Factors Influencing the Net Return of the Respondents in the Study Area
Based on having the highest value of the coefficient of multiple determination (R^2), highest F-Value and more significant variable coefficients; double log function was chosen as the lead equation as shown in Table 3.

Table 3: Results of Determinants of Net Returns in the Study Area

Explanatory variable	Double-log	Semi-log	Linear	Exponential
Household size	-0.0753	2.55.95	-11.0803	0.0083
	(-3.4541)**	(-1.1914)	(-1.0717)	(-0.1691)
Pond size	0.0664	3.0843	16.5021	0.0073
	(2.9123)**	(1.0419)	(3.1801)**	(2.6071)
Farming experience	0.0559	4.9917	19.1184	0.0051
	(3.3879)**	(2.6152)**	(1.0585)	(1.1861)
Cost of labour				
	-0.0873	-1.5993	-17.8026	-00081
Cost of feed	(-2.1036)**	(-1. 3524)	(-1.1133)	(-2.6667)*^
	-0.0651	-4.0318	-13.1165	-00081
Levelof education	(-2.1414)**	(1.2682)	(-1.1133)	(-2.1316)
	0.0942	2.1165	17.9413	0.077
Constant	(3.0485)**	(1.0302)	(2.9388)	(1.2623)
R^2				
F-Value	223.0814	289.1055	349.1065	173.4903
	0.8639	0.4015	0.4833	0.5912
	3.1714	0.3354	0.4683	0.7245

*** = Significant at 5%; t-ratios are the values in bracket;*
Source: Field survey Data (2014)

The coefficient of multiple determinations (R^2) is 0.8639. This implies that 86.39% of the variability in net return was explained by the combined effect of the independent variables in study area and 13.61% of the total variation was not captured in the model. The result also indicates that Household size, pond size, farming experience and level of education, cost of labour and cost of feed were significant at 5% level of significance.

Household size, cost of labour and cost of feed were negatively correlated with net return. This implies that the higher they are, the less the net return obtained the fish farming in the study area. The inverse relationships of cost of labour and cost of feed with net return are consistent with the finding of Henri-Ukoha *et al*., (2011) as well as Nwosu and Onyeneke (2013) who reported that as cost of labour increases output increases also. The result on household size is supported by Ugwumba (2010) who opined that output and net income decrease as household size increases.

More so, pond size, farming experiences and level of education were positively related to net return, implying that the greater the size of a fish pond, the higher the net return and as more educated and experienced the respondents are the greater their net returns. The finding on literacy level is supported by Adebayo and Daramola (2013) against the result by Ugwunba (2011) which showed a negative relationship with net return. The positive result of farming experience is in line with Ideba (2013). Finding by Nwosu and Onyeneke (2013) shows a positive correlation between pond size and output of fish which is also positively related to net return.

Constraints to Fish Farming

Figure 1 is a bar chart representation of the problems encountered by fish farmers in the study area.

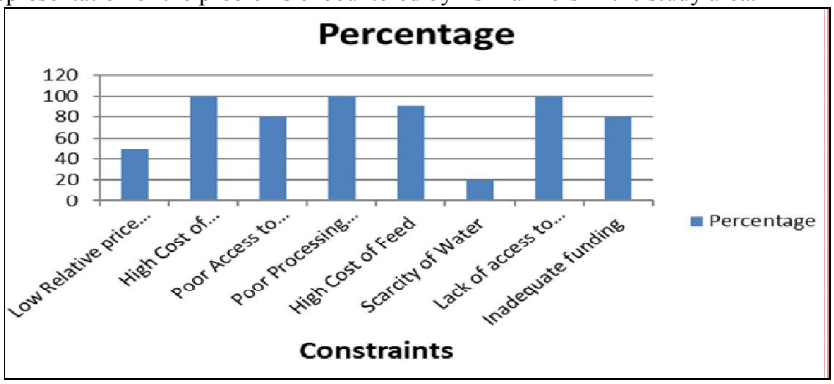

Fig 1: Bar Chart Representation of the Constraints Faced By Fish Farmers
Source: Field survey Data (2014)

The figure above shows the major constraints faced by pond fish farmers which include low relative price of fish products, high cost of fingerlings, poor access to market, poor processing technology, high cost of fish feed, scarcity of water, lack of extension and inadequate funding. The figure shows multiple responses and indicates that all the respondents specified high cost of fingerlings, poor processing techniques and lack of access to extension as the problems they faced. 90% and 80% of them indicated high cost of feed and poor access to market respectively as the problems they encountered.

Again 80% of them indicated inadequate funding as their constraint to fish production; this is also supported by Ugwumba and Chukwuji (2010) and Nwosu and Onyeneke, (2013).Whereas 50% of them indicated low relative price of product **(**supported by Falodun, 2011), 20% of them specified scarcity of water as their problem. This is consistent with the findings of Kudi et al., (2008) who specifies water scarcity as a limiting factor to fish production.

Conclusion and Recommendations

The study compared net return from monoculture (catfish) and polyculture (catfish and tilapia) fish productions. The result indicated a higher net return from polyculture than monoculture fish production. Household size, cost of feed, level of educations, cost of labour, size of pond and fishing experience are the determining factors. The major constraints include high cost of fingerling, poor processing technology and lack of access to extension.

Based on the findings, the following recommendations were made:

- ✓ Measures that would ensure the availability of fingerlings and feeds at cheaper rates should be put in place
- ✓ Soft loan with minimal interest rate should be made available to fish farmers to enable fish farmers boost their production

References

Adebayo, O. O. and Daramola, O. A. (2013). Economic Analysis of Catfish Production in Ibadan Metropolis Discourse *Journal of Agriculture and Food Sciences* Vol. 1(7): 128-134.

Fagede S.O and A. Adebisi (1986). Strategies for Establishment of Profitable Fish Farming in Nigeria. Proceedings of the Fisheries Society of Nigeria.

Falodun, O M (2011). Analysis of Marketing Channels And Efficiency of Marketing System for Smoked Fish Market in Ogun State, Nigeria Unpublished Project of Department Of Aquaculture and Fisheries Management Federal Department of Fisheries (2005). Fisheries Statistics of Nigeria Pp. 2-43.

Food and Agricultural Organization (2007). State of World Fisheries and Aquaculture http:www.fao.org fisoft/fishplu.asp.

Food and Agricultural Organization (2010). State of world fisheries and Aquaculture report.

Ideba E. Ele, Otu W. Ibok, Essien A. Antia-Obong, Iniobong E. Okon and Ekaette S. Udoh (2013). Economic Analysis of Fish Farming in Calabar, Cross River State, Nigeria *Greener Journal of Agricultural Sciences* ISSN: 2276-7770 Vol. 3(7): 542-549.

Henri-Ukoha, A., D. O. Ohajianya, F. O. Nwosu1, S. U. O. Onyeagocha and U. E. Nwankwo (2011**).** Effect of World Bank Assisted Fadama II Project on the Performance of Fish Farming in Imo State, South East Nigeria: A Comparative Evaluation *American Journal of Experimental Agriculture 1(4): 450-457, SCIENCEDOMAIN international.*

Kudi, T.M.; Bako, F.P.; and T.K Atala (2008). Economic of fish production in Kaduna State, Nigeria. ARPN *Journal of Agricultural and Biological Science.* Vol-3, No.(5) (6) :17-21.

National Population Commission (2006). Human Population Figures of Census in Nigeria.

Nwosu M.C, Madukwe P.O and P. Udealor (2002). On Farm Evaluation of Fish Productivity and Acceptability of Polyculture System, presented at the 13th Annual South-East Zonal REFILS Workshop at NRCRI Umudike.

Nwosu, C.S. and R.U Onyeneke (2013). Effect of Productive Inputs of Pond Fish Production on the Output of Fish in Owerri Agricultural Zone of Imo State, Nigeria *Global Advanced Research Journal of Agricultural Science* (ISSN: 2315-5094) Vol. 2(1) :023-028.

Shimang G.N. (2005). Fisheries Development in Nigeria, Problems and Prospects. A presentation by the Federal Director of Fisheries, in the Federal Ministry of Agriculture and Rural Development on Homestead Fish Farming Training for Serving and Retiring Public Servants in the Federal Ministry of Agriculture and Rural Development, FCT, Abuja.

Ugwumba C.O.A and C.O Chukwuji (2010). The Economics of Catfish Production in Anambra state, Nigeria: A Profit Function Approach. *J. Agric. and Soc. Sci.* 6 (4): 105-10.

Ugwumba C. O. A.(2011). Analysis of Catfish Farming System and its Impact on Net Farm Income in Anambra State, Nigeria *ARPN Journal of Agricultural and Biological Science* VOL. 6 (2): 26-30.

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