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ANALYSIS OF CATFISH FARMING SYSTEM AND ITS IMPACT ON NET FARM INCOME IN ANAMBRA STATE, NIGERIA

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ABSTRACT

The study examined catfish farming system and its impact on net farm income in Anambra State, Nigeria. A total of 256 respondents were selected through a multistage random sampling technique and interviewed for the study. However, 204 returned useful copies of questionnaire used to collate primary data for analysis. Both non-parametric and parametric statistical tools were employed for data analysis. A mean net farm income of ₦734, 850 proved catfish farming a profitable enterprise in the study area. Majority of the farmers (76%) favoured the practice of catfish farming using concrete ponds, flow-through water supply method and intensive feeding technique. Net farm income was significantly influenced by age, cost of feed, farm area, pond type and stock size. Measures that would encourage the establishment of more concrete ponds, such as the expansion of extension services and provision of cheap credits, must be pursued to create more employment opportunities and retard the increasing rate of unemployment in the area.

Keywords: catfish, farming system, net farm income, Anambra State.

INTRODUCTION

Farming systems vary from farm to farm and from country to country (Bird *et al*., 1995). No farm is organized exactly like any other, but all farms can be classified according to their farm management characteristics (Duckharm and Masefield, 1971). Farming system has been broadly defined by Agboola (2000) as encompassing the arrangement of crops, or the distribution of plants and animals in time and space as dictated by the prevailing ecological situation. However, sustainable farming system is the freedom to access and combine on- and off-farm production factors and practices that are compliant with natural laws that lead to increased production of crop and livestock products sufficient for local and export markets. A sustainable farming system must ensure economically, increased food production, productivity and income, while simultaneously protecting the environment.

According to Igbinnosa (2006), farming systems can be classified based on food needs and fadama ecosystem degradation into three groups namely: Traditional Farming Systems (TFS), Transitional Farming Systems (TsFS), and Modern Farming Systems (MFS). The TFS include shifting cultivation (phase I), bush fallow (phase I), rudimentary sedentary agriculture, compound farming, terrace farming and extensive fish farming. The TsFS are made up of shifting cultivation (phase II), bush fallow (phase II), mixed farming and oil palm based alley farming. While the MFS are composed of livestock ranching, intensive livestock production, large scale plantations, specialized horticulture, agro-forestry, and fish farming (intensive and semi-intensive).

Phonekhampheng (2006) opined that intensive fish farming system is one that uses very high density of fish and well balanced feed that supplies all the energy and nutrient needs of the cultured fish. The computed daily feed ration is given in equal doses from as low as three to as high as six times a day. On the other hand, the semi-intensive systems uses supplementary feeding and are managed by the application of inputs and the manipulation of the environment by way of water management through the use of pumps and aerators.

In the study area, catfish farming system involves certain fish farming practices which naturally align themselves according to reverine and non-riverine areas. Meanwhile, most of the modern fish culture practices (i.e., intensive and semi-intensive practices) are observed in the non-riverine areas comprising 15 out of the 21 Local Government Areas (L.G.A.s) of the State. Based on this scenario, one might be prompted to ask the following questions:

* What is the modern catfish farming system in the study area?
* Which fish farming practice is most patronized by catfish farmers?
* Why do catfish farmers patronize the practice?
* What are the likely effects of farmers' socio-economic factors on net farm income?

The need to provide answers to some of these questions gave rise to this study. The specific objectives are:

- To identify the average socio-economic statistics of catfish farmers in the study area;
- To describe the catfish farming practices in the area; and
- To examine the impact of socio-economic factors on net farm income.

METHODOLOGY

The study area is Anambra State of Nigeria. The State is comprised of 21 L.G.A.s and four Agricultural Zones. It occupies an area of 4,416 square kilometers. The population as at 2006 national population census was about 4 million (Federal Republic of Nigeria (FGN), (2006). The number of farm families is 338,721 with an

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average size of 8 persons per farm family or household (ASADEP, 2003). The climate is humid with substantial rainfall and mean temperature of 87°F. Agriculture is the predominant occupation in the rural areas engaging more than 70% of the rural population. Food crops grown and sold for cash include maize, yam, cocoyam, cassava, vegetables, e.t.c., and animals reared for the same purpose are poultry, sheep, and goat. Fish is the major source of animal protein in the diet of people in the State especially the ruralites. This has encouraged the establishment of household concrete fish farms to utilize waste from crop and animal farms and homes (Ugwumba, 2005).

A multistage random sampling technique was used to draw samples of 256 farmers for the study as follows: Stage one involved the sampling of 8 L.G.A.s out of the remaining 15 L.G.A.s by simple random sampling. That is, six L.G.A.s (3 each) were selected from Awka and Aguata agricultural zones. And one L.G.A. each was picked from Onitsha and Anambra agricultural zones from where 6 L.G.A.s were purposely excluded to complete the 8 L.G.A.s used for the study. The next stage was the selection of 4 communities by simple random sampling method from each of the 8 selected L.G.A.s, giving a total of 32 communities. Finally, a list of catfish farmers engaged in the different catfish farming practices was compiled and 8 farmers randomly selected from each of the communities giving a total of 256 catfish farmers for the study. The services of Local Government agriculture and fisheries officers, extension agents and village heads facilitated the compilation.

Data for the study were collected from primary sources using a set of structured questionnaire or interview schedule. In all, 256 copies of the questionnaire were administered through the help of trained enumerators fluent in both English and the local languages of the area. However, 204 copies of the returned questionnaire were found useful and there after utilized to collate data for analysis. Data collection was for one production period of 6-12 months (Ocmer, 2006), and in this case January to December, 2009. Data were collected on respondent's socio-economic variables such as age, household size, educational level, fish farming experience, cost of feed, pond types, water supply methods, feeding method, stock size, farm area. Quantities and unit prices of output and input items were also obtained for the determination of net farm income. Secondary sources of data from Journals and publications of Federal and State research institutions and Ministries with fisheries bias were used as supplements.

Analytical framework

Data analysis was by means of descriptive statistics including means, frequency distribution, percentages, e.t.c. and parametric statistics of the multiple regression form. The multiple regressions were used to determine the influence of the socio-economic factors on net farm income. Three functional forms- linear, semi-log and double log- were tried on the data and the linear form was found to fit the data best. The explicit form of the linear regression is given as:

$$NFI = b_0 + b_1 AGE + b_2 EDU + b_3 EXP + b_4 HOS + b_5 FAA + b_6 COF + b_7 PDT + b_8 WSM + b_9 FDM + b_{10} STS + e$$

Where

NFI = net farm income (₦)
AGE = age of farmer (years)
EDU = educational level (years)
EXP = farming experience (years)
HOS = household size (number)
FAA = farm area (m^2)
COF = cost of feed (₦)
PDT = pond type (Dummy: concrete = 1, earthen = 0)
WSM = water supply method (Dummy: flow-through = 1, stagnant = 0)
FDM = feeding method (Dummy: intensive = 1, semi-intensive = 0)
STS = stock size (number of fingerlings stocked)
bi = parameters to be estimated
e = stochastic error term

RESULTS AND DISCUSSIONS

Socio-economic statistics of the respondents

A summary of the socio-economic statistics of the respondents is shown in Table-1.

Table-1. Average statistics of the farmers (n = 204).

Variable	Mean value
Age	47.90 years
Education	13.10 years
Experience	8.23 years
Household size	5.53 number
Stock size	2,771.65 fingerlings
Family labour	26.14 man-days
Hired labour	77.86 man-days
Farm area	162.03 m^2
Cost of feed	₦863,382.45
Output	3,866.67 kg
Net farm income	₦774,850

Source: Field survey, 2009
Note: One US dollar = ₦150

The result indicated that, on the average, a typical catfish farmer was 47.90 years, attained 13.10 years of education (i.e., secondary education) and gained about 8.23 years of experience in catfish enterprising. The mean household size, stock size, family labour and hired labour were 5.53, 2,771.65 fingerlings, 26.14 man-days, and 77.86 man-days respectively. More so, a typical farmer had an average farm area of 162.03 m^2, spent a mean value of ₦863, 382.45 on feeds, in order to generate an average of 3,866.67kg of live-catfish and consequently earn mean net farm income of ₦734, 850.

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The positive mean net farm income value attests to the profitability of catfish production in the study area. It also lends credence to the fact that majority of the farmers (Table-2) adopted the farming practice of raising catfish in concrete pond using flow-through water supply and intensive feeding methods. This result corroborates Osawe (2007) and Kudi *et al*., (2008) who reported similar findings in Lagos and Kaduna States of Nigeria, respectively. However, it is at variance with that of Obasi (2004) who concluded that the extensive system is a better production system than intensive system in Imo State, Nigeria.

Catfish farming system of respondents

Catfish farming system involves the farming practices adopted by catfish farmers in their production business. In the study area five major practices were identified. The distribution of respondents according to the farming practices is presented in Table-2. It could be observed from the table that majority of the farmers (75.51%) farmed catfish using concrete pond type, flow-through supply water method and intensive feeding technique. The remaining 24.49% of the farmers tried the other four practices in the following descending order: earthen pond type, flow-through water supply method, intensive feeding (12.25%); earthen ponds, stagnant water supply, semi-intensive feeding (7.84%); concrete ponds, flow-through water supply, semi-intensive feeding (2.94%) and the least, earthen ponds, flow-through water supply, semi-intensive feeding method (2.45%). The result which favoured the adoption of concrete ponds, flow-through supply and intensive feeding methods by majority of the farmers is consistent with the resent trends of intensive culture of catfish to ensure increasing productivity and sustainability of the fisheries sub-sector reported by Adediran (2002), Ugwumba and Orji (2007), Adeogun *et al*., (2007) and Ugwumba and Nnabuife (2008).

Table-2. Distribution of catfish farmers according to farming practices (n = 204).

Farming practice	Frequency	Percentage
Concrete pond type, flow-through water supply method, intensive feeding method	152	75.51
Concrete pond type, flow-through water supply method, semi-intensive feeding method	6	2.94
Earthen pond type, flow-through water supply method, intensive feeding method	25	12.25
Earthen pond type, flow-through water supply method, semi-intensive feeding method	5	2.45
Earthen pond type, stagnant water supply method, semi-intensive feeding method	16	7.84

Source: Field survey, 2009.

Impact of catfish farming system on net farm income

The multivariate analysis of the multiple regression version was used to predict the impact of the farming system on net farm income realized by the farmers. A total of 10 predictors were included in the model and the regression output is shown in Table-3. The results indicated that five out of the 10 variables (i.e., age, cost of feed, farm area, pond type and stock size) had significant influence on net farm income, while education, household size and feeding method (intensive and semi-intensive); experience and water supply method (flow-through and stagnant) exhibited negative and positive, but weak impacts on net farm income, respectively.

The coefficient of determination (R^2) value of 0.98 implies that about 98% of the variation in net farm income earned by the catfish farmers was accounted for by variations in AGE, EDU, EXP, HOS, COF, FAA, PDT, WSM, FDM, and STS. The significant F-statistic value of 894.1 is an indication that the 10 variables exerted joint significant impact on income. The Durbin-Watson value is approximately equal to 2, signifying the absence of multicollinearity.

The coefficient of farmer's age is positive and significant (P = 0.05), implying that older farmers are likely to earn more farm income than the younger ones. The reason could be that the older farmers might have accumulated resources and experience over the years to enable them venture into large scale farming and earn more income.

The coefficient of cost of feed, farm area and stock size are positive and significant (P = 0.01). This means that farmers who have large scale farms are likely to stock more fingerlings, spend more money on feeds and earn more income. Another reason could be that large scale farmers might have utilized home-made feeds which are more cost effective. This result agrees with Ugwumba and Nnabuife (2008) who reported that fish farmers who utilize cheaper home-made feeds of comparable quality with costly commercial feeds in their culture would make more profits.

Further result of the analysis shows that pond type is negatively signed and significant at 1% alpha level. This implies that the use of either the concrete or earthen pond type in catfish culture is profitable; however, the

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earthen ponds are likely to return more value on investment than the concrete ponds.

Table-3. Effect of socio-economic characteristics of respondents on net farm income.

Predictor	Coefficient	Standard deviation	T	P
Constant	-339.3	388.4	-0.87	0.384
AGE	16.427	7.024	2.34	0.020**
EDU	-13.777	9.961	-1.38	0.168
EXP	3.655	9.892	0.37	0.712
HOS	-13.15	31.25	-0.42	0.674
FAA	0.986	0.245	4.03	0.000**
COF	0.00194	0.0018	10.76	0.000***
PDT	-712.986	456.23	-5.11	0.000***
WSM	137.0	224.6	0.61	0.543
FDM	-165.6	185.9	-0.89	0.374
STS	0.625	0.458	13.65	0.000***
F-statistic	894.51			
R^2	0.984			
R^2(adj.)	0.971			
Durbin-Watson statistic	1.97			

Source: Field survey, 2009.
*** = significant at 1% alpha level.
** = significant at 5% level of probability.

CONCLUSIONS AND RECOMMENDATIONS

Catfish Farming is a profitable enterprise in the study area. Majority of the farmers (76%) adopted the practice of culturing catfish using concrete ponds, flow-through water supply method and intensive feeding technique. Net farm income was insignificantly influenced by education, household size, feeding method, experience and water supply method. However, farmer's age, cost of feed, farm area, pond type and stock size exerted significant effects on net farm income.

Though the earthen pond farms returned more value per naira of investment, the concrete pond farms were in the majority and thus accommodated more farmers. It is advocated that measures such as expansion of extension services and provision of cheap credit facilities be pursued. These would encourage the establishment of more concrete pond farms, create more employment opportunities and help reduce the increasing rate of unemployment in the State.

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