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ANALYSIS OF THE EFFECT OF FARMERS' SOCIO-ECONOMIC FACTORS ON NET FARM INCOME OF CATFISH FARMERS IN SELESCTED LOCAL GOVERNMENT AREAS OF KWARA STATE, NIGERIA

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Abstract
The study analyzed the effect of farmers' socio-economic attributes on the net farm income of catfish farmers in Kwara State, Nigeria. Primary data were collected from selected catfish farmers with the aid of well-structured questionnaire and a multistage sampling technique was used to select 102 catfish farmers in the area. The analytical techniques involved the use of descriptive statistics and multiple regression analysis. The findings revealed that 60% of the catfish farmers in the study area were male, with mean age of 47 years, mean household size was five persons while the mean year of fishing experience was five years. The result also revealed that stock capacity (X_3), labour (X_4) and accessibility to credit (X_7) were the main determinants of catfish productivity in the area. In addition farmer's sex, household size, no of ponds, distance of the farm from market and access to credit were the main socio-economic factors influencing the net farm income of the catfish farmers in the area. The most serious constraints militating against catfish production in the study area were high mortality rate, insufficient market, inadequate credit facilities and inadequate skilled labour needed for daily production routine. Based on the findings, it was therefore recommended that, to reduce the mortality rate of catfish, extension agents should organize training workshops on improved methods and techniques of raising catfish right from juvenile to market size.

Key words: Net income, credit, mortality, catfish production

Introduction

Fish plays a vital role in feeding the world's population and contributes significantly to the dietary protein intake of hundreds of millions of the populace on a global scale as it accounts for about one fifth of world total supply of animal protein (Ideba *et al.*, 2013). According to FAO (1991), its supply has risen five folds over the last forty years from 20 million metric tons to 98 million metric tons in 1993 and projected to exceed 150 million metric tons by the year 2010. Currently, the per Capita consumption stands at 13.5 kg/day/person while the projected fish production and demand are 730, 248 tons and 2,175,000 tons, respectively leaving the fish supply gap deficit at 1,444,752 tons. Nigeria requires about 2.66 million metric tons of fish annually to satisfy the dietary requirement of its citizens. However, the total aggregate domestic fish supply is less than 0.7 million metric tons per annum, hence, Nigeria has to import about 0.7 million metric tons of fish, valued at about $500 million annually to augment the shortfall. This massive importation of frozen fish has ranked Nigeria the largest importer of frozen fish in Africa (Gamal, 2011). In order to reduce the importation of frozen fish in country, a lot of efforts have been directed into the production of catfish (*Clarias spp*) and other culturable fish species such as Tilapia and Carp. Among these, catfish is most preferred because it adapts well in diverse environments and could survive on natural or artificial food. It can be cultured in different culture systems such as ponds, cages, tanks and water re-circulatory system. In addition, its growth is rapid and can be cross-bred to enhance certain favourable traits such as better body conformation (smaller head, more flesh), more hardiness, higher fecundity, improved survival of fry, and adaptation to supplementary feed. It has a higher market value when compared to other species (Oguntola, 2008 and Tsue *et al.*, 2012). In areas where land for agricultural use is scarce, catfish and other fishes can be produced conveniently because it requires smaller portion of land when compared to other livestock.

The importance of catfish and other fish species in the diet of an average Nigerian cannot be overemphasized. Fish protein is amajor source of food for the human race which has put an end to the unsavoury outbreak of anaemia. According to Olagunju *et al.* (2007), it guards against kwashiorkor which is prevalent among the poorest of the people in the rural areas and has low cholesterol component compared to other animal protein sources. It is a cheap and safest source of animal protein when compared to beef, chicken, pork and mutton and serves as a source of employment and income for many Nigerians. It also allow for protein improved nutrition in that it has a high biological value in terms of high protein retention and assimilation in the body as compared to other animal protein sources (Olagunju *et al.*, 2007). Therefore, for Nigerians to continue to enjoy the benefits accruing from catfish production and for importation to be reduced, there is the need to investigate various socio-economic characteristics of fish farmers and how they affect their net income. This is believed to assist the policy makers to improve the welfare package of the farmers to boost their morale on increased local catfish production in order to reduce unemployment, increase accessibility of Nigerians to cheap protein source, improved health status, income and, living standards thereby alleviating poverty among the rural and urban dwellers. It is against this backdrop that this study attempted to examine the effect of socio-economic factors on the net income of farmers, the determinants of catfish production and the constraints militating against catfish production in the study area.

Methodology

Study Area

The study was conducted in Kwara State, Nigeria. Kwara State is in the North-central zone of the country with a population of 2,591,555 which reached 3,080,544 in 2013 at an annual growth rate of 2.5% (World Bank, 2014). Kwara State covers a total land area of 332,500 square kilometres and lies within latitude 7˚45'N - 9˚30'N 45' and longitude 2˚30'E - 6˚2'E (Ojo, 2014). It is bordered in the north by Niger State, Kogi State in the east; Oyo, Osun and Ekiti States in the south and the Republic of Benin along its north-western part. The model for the determinants of catfish production was specified explicitly as:

$$Y_i = a + \beta_{i1}X_1 + \beta_{i2}X_2 + \beta_{i3}X_3 + \beta_{i4}X_4 + \beta_{i5}X_5 + \beta_{i6}X_6 + \beta_{i7}X_7 + \varepsilon_i \quad (2)$$

The climatic condition of Kwara State is divided into wet and dry seasons with temperature ranging from 33˚C to 37˚C. Agriculture is the predominant economic activity in the State and the major type of crops grown are majorly yam and cassava. The main cities in Kwara State are Ilorin, Afon, Iponrin, Jebba, Kaima, Lafiagi, Iloffa, Offa, Omu-aran and Patigi. The main ethnic groups in Kwara State are the Nupe, Fulani, Bariba and Yoruba people even though the yorubas were the early settlers in the State. Seven languages are spoken in Kwara State; of these, Ebira, Nupe and Yoruba are the major ones. Christianity and Islam are the main religions in Kwara State, although a fair amount of traditional religion is practised. It consists of sixteen Local Government Areas (LGAs) which are Baruteen, Edu, Ekiti, Ifelodun, Ilorin East, Ilorin South, Ilorin West, Irepodun, Isin, Kiama, Moro, Offa, Oke-Ero, Oyun and Patigi.

Sampling Techniques

A multistage sampling technique was used to select the catfish farmers in the study area. The first stage involved the random selection two out of the sixteen LGAs in the State. The selected LGAs were Ilorin west and Ilorin south. The second stage involved the random selection of three towns from each of the LGAs while the third stage involved the random selection of seventeen catfish farmers from each town making a total of one hundred and two cat fish farmers in the State.

Method of Data Collection

Primary data were collected with the aid of a structured questionnaire for a one year period to elicit information from the targeted catfish farmers on relevant information regarding catfish production in the State.

Data Analytical Techniques

These were achieved using descriptive statistics such as mean, frequency distribution, percentages and mean to describe the socio-economic characteristics as well as the constraints facing the catfish farmers in the study area. Multiple regression model was adopted in the analysis of the determinants of catfish production and the effect of socio-economic factors on the net income of the farmers in the study area.

Where,
Y = Output (kg)
X_1 = Pond size (m^2)
X_2 = Quantity of feed (kg)
X_6 = Fertilizer (kg)
X_7 = Accessibility to credit (access = 1, non access = 0)
U_i = Error term

While the model for the effect of socio-economic factors on the net income of the farmers was specified explicitly as:

$$Y_i = a + \beta_{i1}X_1 + \beta_{i2}X_2 + \beta_{i3}X_3 + \beta_{i4}X_4 + \beta_{i5}X_5 + \beta_{i6}X_6 + \beta_{i7}X_7 + \beta_{i8}X_8 + \varepsilon_i \quad \text{.....(3)}$$

Where,

X_3 = Stock capacity (No.)
X_4 = Labour (man-days)
X_5 = Lime (kg)

Y = Net income (₦)
X_1 = Sex (Male = 1, 0 otherwise)
X_2 = Age (Years)
X_3 = Household size (No.)
X_4 = Level of education (Years)
X_5 = Experience (Years)
X_6 = No. of ponds (No.)
X_7 = Distance of farm to market (km)
X_8 = Access to credit (access = 1, 0 otherwise)
$\mathcal{E}_i$ = Error term

The linear, semi-log, power and exponential functions were used for the analyses. The function with the highest number of significant variables, F-ratio and R^2 was used as the 'lead' equation for each of the two objectives. These functional forms were explicitly expressed as:

Linear equation

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + \mathcal{E}_i \quad \text{.....(4)}$$

Double -log function

$$\ln Y = a + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + b_6\ln X_6 + b_7\ln X_7 + b_8\ln X_8 + \ln \mathcal{E}_i \quad \text{...(5)}$$

Semi − log Function

$$Y = a + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + b_5\ln X_5 + b_6\ln X_6 + b_7\ln X_7 + b_8\ln X_8 + \ln \mathcal{E}_i \quad \text{.....(6)}$$

Exponential

$$\ln Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + \mathcal{E}_i \quad \text{.....(7)}$$

Where,
$Y_1, X_1, X_2, X_3, X_4, X_5, X_6$ and X_7 are as defined in the implicit form
$b_1 - b_7$ = regression coefficient
a = constant term
$\mathcal{E}_i$ = error term

Results and Discussions

The socio-economic characteristics of catfish farmers were as presented in Table 1. The Table reveals that 60 percent of the catfish farmers in the study area were males, while 40 percent of them were females. It was revealed that male gender dominated fish production activities in the study area. Tsue *et al.* (2012) corroborated this in a study conducted on the profit efficiency among catfish farmers in Benue State, Nigeria where it was discovered that catfish production was primarily a male dominated (89.5 percent) enterprise in the area. Distribution of the farmers by age showed that the catfish farmers within 31 – 50 years of age had the highest percentage of 57 percent. The mean age was 47 years. This implied that majority of the farmers were in their economically active age, full of life and vigour and could contribute positively to the production and productivity of catfish in the study area. This was supported by Joshua *et al.* (2012) who reported that majority of the fish farmers in Nassarawa State, Nigeria were between 41 – 50 years accounting for (56.7 percent) which they attributed to the fact that fish farming requires patient which could mostly be provided by the old people above forty years.The results of the analysis of the marital status of the farmers revealed that 97 percent of the catfish farmers in the study area were married, while three percent were divorced. The study also revealed that singles in the study area were not into catfish production.This result of the analysis of the marital status could be advantageous where hired labour is in short supply and family labour is willing and available to partake in the production process. The non involvement of the singles in catfish production as an enterprise may probably be because it is capital intensive and needed a lot of expertise. However, they might have been useful as hired labour to compound feeds, feed the fish or harvest as the case may be. This study was corroborated by Oluwasola and Ajayi (2003) in the study on the socio economic and policy issues in determining the sustainable fish farming in Ile-ife, Osun State, Nigeria. It was reported that 98 percent and 2 percent of the catfish farmers in the study area were married and singles, respectively. The distribution of household size as shown in Table 1 revealed that 58 percent of the farmers had one to five household size while 42 percent had between six to ten household sizes. The mean household size was five. The result of the household size revealed that the farmers may not need much of the assistance of hired labour if the members of the household were willing to engage in the production process. This finding is similar to the study conducted by Oluwasola and Ajayi (2003) who reported that 65% of the catfish farmers in his study area had one to five household size. The

analysis of the educational level of the farmers revealed that 50 percent had primary education, secondary 26 percent, post-secondary 11 percent while 14 percent had tertiary education. This result revealed that all the farmers had formal education at various degrees of educational level which may help in the adoption of innovation on improved methods of catfish production in the study area. This may also reduce drudgery of labour and increase productivity of the farmers. This research finding confirmed the opinion of Ideba *et al.* (2013) ina research on the economic analysis of fish farming in Calabar, Cross River State where it was revealed that 100 percent of the catfish farmers in the study area were educated. Furthermore, it was revealed that 76 percent of the catfish farmers had one to ten years of experience in catfish production while 24 percent had 11 years and above. The mean year of experience was five.

The more the years of experience especially in fishing techniques, breeding and fish culture, the better their understanding of the business of fish production This will assist in generating more revenue, reduce cost of production and eventual increase in profit levels of the farmers. To a certain extent, years of experience will also assist in risk management whenever the need arises. This finding also conforms to that of Tsue *et al.* (2012) who discovered the mean years of experience of 5. The results of their analysis showed that 76 percent of the respondents had about one to ten years of experience in catfish farming. This implied that the ability to manage fish pond efficiently depended on the level of experience of the catfish farmers which is also directly related to the total productivity of the catfish farmer in the study area.

Table1: Socio-economic Characteristics of Catfish Farmers

Variables	Frequency	Percentage (%)
Sex		
Male	61	59.8
Female	41	40.2
Total	102	100.0
Age		
<30	1	1.0
31 – 40	40	39.2
41 – 50	17	16.7
51 – 60	26	25.5
>60	18	17.6
Total	102	100.0
Mean	47	
Marital status		
Married	99	97.1
Divorced	3	2.9
Total	102	100.0
Household size		
1 – 5	59	57.8
6 – 10	43	42.2
Total	102	100.0
Mean	5	
Educational level		
Primary	51	50.0
Secondary	26	25.5
Post secondary	11	10.8
Tertiary	14	13.7
Total	102	100.0
Years of experience		
1 – 5	51	50
6 – 10	26	25.5
11 – 15	11	10.8
>15	14	13.7
Total	102	100.0
Mean	5	

Source: Filed 2014

Determinants of catfish production in the study area

The result of the determinants of catfish production in the area was as presented in Table 2. Of the four functional forms tried, linear model was chosen because thesigns and magnitude of the coefficients, the number

of significant variables, the value of the coefficientof determinations (R^2) and the signi ficance of Fratio conformed with *a priori* econ omic and statistical criteria for selecting the'le ad' equation.

The estimated coefficient of determina tion (R^2) was 0.44 which showed that 44% of t he variation observed in output of the farmers was explained by the included explanatory vari ables. The F-ratio of 10.44 showed that the

whole model was significant at one percent level. The result of the analysis revealed that stock capacity (X_3) and accessibility to credit (X_7) were positively related to level of output at $p = 0.01$ level while labour (X_4) was negatively related to level of output at $p = 0.05$ level. The result implied that a unit increase in X_3 and X_7 led to an increase in the level of output while a unit increase in X_4 resulted in decrease in level of output of the farmers. This finding concurred with the study conducted by Ele (2008) in a study conducted on the economic analysis of catfish production in Calabar, Cross River State, Nigeria. It was discovered that factors such as stock capacity and accessibility to credit were those factors affecting catfish production in the study area.

Table 2: Determinants of catfish production in the study area

Variables	Coefficients	t-values
Constant	6345.961	2.872**
Pond size (x_1)	1.235	0.765
Feed(x_2)	-4.921	-1.397
Stock capacity (x_3)	0.908	3.913***
Labour (x_4)	-1.691	-2.478**
Lime (x_5)	13.642	0.488
Fertilizer (x_6)	17.489	1.427
Accessibility to credit (x_7)	-3003.91	-2.875***
$R^2 = 0.444$	F-ratio = 10.44***	

Source: Filed 2014*** $p = 0.01$; **$p = 0.05$; *$p = 0.10$

Effect of socio-economic factors on the net income of the catfish farmers

The multivariate analysis of the multiple regression models was used to determine the effect of socio-economic factors on the net income of the catfish farmers in the study area. Out of 8 included predictors, X_1, X_3, X_6 and X_7 were significant at $p = 0.01$ alpha level while X_8 was significant at $p = 0.05$ alpha level. The coefficient of determination (R^2) was 0.53 which implied that 53% of the variability in the net income of the farmers were explained by the included predictors. The F-ratio of 12.857 showed that the whole model was significant at $p = 0.01$ alpha level. The coefficient of farmer's sex, household size, no of ponds, distance of the farm from market were positive and significant ($p = 0.01$).

Table 3: Effect of socio-economic characteristics on the net income of the farmers

Variables	Coefficients	Standard error	t-values
Intercept	14.830	1.565	9.471
Sex (X_1)	0.873	0.166	5.244***
Age (X_2)	-0.651	0.487	-1.337
Household size (X_3)	1.128	0.375	3.007***
Education (X_4)	-0.133	0.247	-0.541
Years of experience (X_5)	-0.081	0.131	-0.618
No of ponds (X_6)	0.810	0.183	4.422***
Distance of catfish farm from market (X_7)	0.285	0.096	2.973***
Access to credit (X_8)	-0.633	0.275	-2.295**
	$R^2 = 0.525$	F-ratio = 12.857***	

Source: Filed 2014*** $p = 0.01$; **$p = 0.05$; *$p = 0.10$

In addition, access to credit had negative coefficient ($p = 0.05$). The multivariate analysis of the multiple regression models with $R^2$of 0.53 implied 53 percent of the observed variation in net income earned by the catfish farmers was explained by the included predictors. The F-ratio of 12.857 showed that the whole model was significant at one percent level. Also, the more the

household size and the number of ponds possessed by the farmers and, the closer the distance of the farm to the market, the higher the net income accrued to the farmers. In addition, the type of gender involved could have great influence on the net income of the farmers. The greater the farmers' access to credit, the lower the net income of the farmers. This could occur if the farmers divert the loan to other non productive venture or default in the repayment of the accessed loan. This could pose a great threat to the survival of the business when it becomes bad debt.

Constraints faced by Catfish Farmers in the Study Area

The most serious constraint militating against catfish production in the study area was high mortality rate, insufficient market, inadequate credit facilities/ finance and inadequate skill labour needed for daily production routine which ranked 1st, 2nd, 3rd and 4th, respectively. These were followed by unavailability of fingerlings, high cost of feed and inadequate water availability. The result of the constraints hindering increased catfish production revealed that farmers still do not possess adequate knowledge and skill to reduce the mortality rate of the fish. Also inadequate access to loan/finance could probably be the main reason why singles have not taken up fish farming as an occupation. This result is in line with the findings of Ele (2008) on the economic analysis of catfish production in Calabar, Cross River State, Nigeria who reported that the major constraints affecting increment of output in the area were high cost of inputs, lack of adequate finance, access to credit facilities, security and farm labour problems.

Table 4: Constraints faced by Catfish Farmers in the Study Area

Constraints	*Frequency	Percentage
Mortality rate	100	98.0
Insufficient market	80	78.4
insufficient credit	65	63.7
Inadequate Labour supply	60	58.8
unavailability of fingerlings	47	46.1
insufficient of feed	30	29.4
insufficient water	21	20.6
insufficient transport	15	14.7
insufficient land	2	2.0

Source: Filed 2014 *Multiple response

Conclusion and Recommendations

The study analyzed the effect of farmers' socio-economic attributes on the net farm income of catfish farmers in selected LGAs of Kwara State, Nigeria. The result of the farmers' socio-economic characteristics of catfish farmers reveals that 60% of the catfish farmers in the study area were male gender, mean age was 47 years, mean household size was 5 while the mean year of experience was 5. The result also revealed that stock capacity (X_3), accessibility to credit (X_7) and labour (X_4) were the main determinants of catfish production in the area. In addition, farmer's sex, household size, no of ponds, distance of the farm from market, access to credit were the main socio-economic factors influencing the net farm income of the catfish farmers in the area. The most serious constraints militating against catfish production in the study area were high mortality rate, insufficient demand, inadequate credit facilities/ finance and inadequate skilled labour needed for daily production routine. Based on the findings, it is therefore recommended that farmers should be encouraged to form co-operative to increase their access to credit facilities. Furthermore, to reduce the mortality rate of catfish, extension agents should organize training workshops on improved methods and techniques of raising catfish right from juvenile to market size and finally, government should encourage young graduates to participate actively in the establishment of catfish farms to bring expertise into catfish business.

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