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EFFECT OF CATFISH PRODUCTION ON WELFARE OF SMALLHOLDER FARMERS IN OSUN STATE, NIGERIA

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Abstract. The study examined the effect of catfish production on smallholder farmers' welfare in Osun State, Nigeria using the Odo-Otin Local Government Area of Osun State as a case study. A purposive sampling technique was used in selecting 109 farmers and a structured questionnaire was used to collect data. Descriptive statistics, gross margin analysis and a multiple regression model were used to analyse data. Results show that the majority (67.9%) of the catfish farmers were male, married (64.2%), with s mean age of 44 years (±13.1), and more than three-quarters (78.9%) had tertiary education. The majority of the catfish farmers (85.3%) raised fish to table size (grow-out) and 55.0% used static renewal technology. The average gross margin of ₦172,246 ($545) per production season (5–6 months) and BCR of 1.66 indicate that catfish farming is profitable and feasible. Regression results indicate that cost of feed and quantity of catfish harvested significantly increase the quantity of catfish sold, and quantities of catfish harvested and sold significantly increase food expenditure by farmers. Therefore, farm inputs (especially feed) should be subsidised by governments to encourage effective use of inputs to increase catfish production and subsequently, the welfare of farmers. Also, effort should be intensified at building the capacity of the farmers through education so as to enhance the adoption of technology which would invariably translate to better yields and income.

Key words: benefit-cost ratio, catfish production, gross margin, food expenditure, Nigeria, production technology, welfare

INTRODUCTION

Fish is an important source of animal protein for many households. According to FAO (2007), fish contributes more than 60% of the world supply of protein, especially in the developing countries. The Federal Government of Nigeria (FGN, 2011) disclosed the information that about 10 million Nigerians are actively engaged in both the upstream and downstream areas of fisheries operations. According to figures provided by the National Bureau of Statistics in 2013, the fisheries sector contributed 1.31% of total GDP in 2012, and this rose to 1.38% at the end of the third quarter of 2013. These figures represent 3.3% and 3.5% of agricultural GDP respectively. The Federal Ministry of Agriculture and Rural Development projected in 2011 that the per capita consumption of fish would be 13.5 kg from 2010 to 2015, while the projected demand would increase from 1,430,000 tons in 2000 to 2,175,000 tons in 2015 with supply gap deficit of 1,444,752 tons.

Welfare on the other hand, refers to the general human well-being. It covers aspects ranging from good fortune, health, happiness, and to prosperity among others. Farmers' welfare is therefore anything that aids or promotes well-being for their benefit. The indicators of welfare therefore include consumption levels, access to assets, and human capital. Welfare is also defined as the

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command over market and non-market goods and services at the household level (Ravallion, 1996).

The increase in human population and reports of large numbers of undernourished or starving people, especially in the developing countries, have made the need for food production a worldwide concern (Olasunkanmi, 2012). According to Olasunkanmi (2012), the most reliable source of protein for many people in the developing economies is fish. Fish farming provides important services including supporting nutritional wellbeing, providing feedstock for the industrial sector, making contributions to rural development, increasing export opportunities, more effective administration of natural resources and conservation of biological diversity (Dagtekin et al., 2007). Recent knowledge shows that the world's natural stocks of fish and shell fish, though renewable, have finite production limits, which cannot be exceeded even under the best management regimes (Okechi, 2004).

Nigeria is one of the countries in sub-Saharan Africa with a great potential to attain the sustainable fish production via aquaculture considering the extensive mangrove ecosystem available in the country (FAO, 2005). With an annual fish demand in the country of about 2.66 million tonnes, and a paltry domestic production of about 780,000 tonnes, the demand-supply gap stands at staggering 1.8 million tonnes (Oyinbo and Rekwot, 2013). With importation of more than 750,000 million tonnes of fish, more than USD 600 million is spent in foreign currency and thousands of jobs are exported (USAID, 2010), thereby leading to a negative trade balance in the country.

The shortfall of fish supply in the country has led to a low annual per capita fish consumption rate of only 7.5 kilogrammes as against 15 kilogrammes per annum as recommended by the Food and Agricul ture Organisation (FGN, 2011). Domestic production needs to be increased in order to meet the shortfall between demand and supply, and to diversify the country's resources. According to Mwangi (2007), aquaculture production involves more than the biological processes of fish growth. It also includes paying a critical attention to the financial aspects of production. Efficient financial management of aquaculture can determine the extent of profit maximization. Greater improvements in catfish production can be achieved with a proper analysis of the level of profitability of catfish farming and its effect on farmers' welfare which constitute the basis for this study. Therefore, this study examined the effect of catfish production on farmers' welfare using food consumption as a proxy for welfare measure. Specifically, the study examined the production systems, types of and technologies used in catfish production; determined the profitability of catfish production; unravel determinants of catfish production and some of the constraints faced by the farmers in the study area.

RESEARCH METHODOLOGY

The study area is the Odo-Otin Local Government Area of Osun State. The study area was selected because catfish farming is one of the main livelihood activities the residents are engaged in. The Osun State is divided into six fisheries zones which indicates that it is characterized by a substantial number of catfish farmers (Olasunkanmi, 2012). The main instrument for collecting the primary data used for this study was a structured questionnaire. The catfish farmers were asked to provide quantitative information on quantities of output produced and inputs used, the costs of production, as well as the prices of inputs. Information was obtained on the socioeconomic characteristics such as age, sex, marital status, household size, and years of experience in catfish farming. Also, data were collected on the culture types, production systems, types and technologies adopted by catfish farmers, as well as factors affecting the progress of catfish production, and data on food consumption levels of the farmers.

A hundred copies of the questionnaire were distributed during the meeting period of the Catfish Farmers' Association of Nigeria (CAFAN) and Aquaculture Farmers Association of Nigeria (AFAN) which are the two prominent catfish farmer groups in the state. Catfish farmers were also chosen purposively from ten areas within the Local Government where catfish farms are located. These areas are: Agbeye, Oore, Iyeku, Opete, Asi, Asaba, Inisa, Ekusa, Ekosin, and Oyan. A total of two hundred copies of the questionnaire were given out for this study but one hundred and twenty one were returned. However, only one hundred and nine (109) with complete datasets that were used for the analysis.

The socioeconomic profile of the respondents was analysed using the descriptive statistics such as

frequency tables, percentages and means. Gross margin analysis and benefit cost ratio were used to determine the costs and returns, and hence, profitability of fish farming in the study area. The multiple regression analysis was used to examine the factors affecting catfish production and the effect of catfish production on food consumption level (welfare) of the farmers.

Gross margin analysis

Gross margin analysis is given by equation (1).

$$GM = TR - TVC \quad (1)$$

Where:

GM – Gross Margin (₦)
TR – Total Revenue (₦)
TVC – Total Variable Cost (₦).

The Benefit-cost ratio analysis was measured using:

$$BCR = TR/TC$$

Where:

BCR – Benefit-Cost Ratio
TR – Total Revenue (total fish output (kg) x unit price (₦))
TC – Total Cost (summation of total variable cost and total fixed cost (₦)).

BCR must be greater than 1 for an investment in catfish farming to be worthwhile.

Multiple Regression Analysis

In examining the factors affecting catfish production, the production was measured by the quantity of catfish sold. The relationship between the quantity of catfish sold (Y) and the explanatory variables is stated implicitly as $Y = f(X_1, X_2, \ldots, X_8)$. The lead equation was the double log which is expressed explicitly below:

$$\log Y = bo + b\log X + b\log X + b\log X + b\log X + \\ + b_5\log X_5 + b_6\log X_6 + b_7\log X_7 + b_8\log X_8 + U_i \quad (2)$$

Where:

Y – quantity of catfish sold (kg), X_1 – marital status (dummy), X_2 – household size (number), X_3 – cost of fingerlings (₦), X_4 – cost of feed (₦), X_5 – cost of land (₦), X_6 – infrastructure (access = 1, no access = 0), X_7 – quantity consumed (kg), X_8 – quantity harvested (kg), U_i – error term assumed to have a zero mean and constant variance, bo – constant, b_i – regression coefficients.

The Semi-log functional form was the lead equation in examining the effect of catfish production on the food consumption level of the farmers and this is presented in equation (3).

$$Y = bo + b_1\log X_1 + b_2\log X_2 + b_3\log X_3 + b_4\log X_4 + \\ + b_5\log X_5 + b_6\log X_6 + b_7\log X_7 + b_8\log X_8 + \ldots b_9\log X_9 + \\ + b_{10}\log X_{10} + b_{11}\log X_{11} + I \quad (3)$$

Where:

Y – food consumption expenditure (₦), X_1 – quantity of fish harvested (kg), X_2 – quantity of fish sold (kg), X_3 – household size (number), X_4 – educational status (dummy), X_5 – fingerling cost (₦), X_6 – technology cost (₦), X_7 – outdoor (raising catfish outdoor =1, if no = 0), X_8 – fish feed sale (₦), X_9 – feed cost (₦), X_{10} – labour cost (₦), X_{11} – credit (access = 1, no access = 0), Ui – error term assumed to have a zero mean and constant variance, bo – constant, bi – Regression coefficients.

RESULTS AND DISCUSSION

Socioeconomic profile of respondents

Table 1 shows the summary of the socioeconomic characteristics of the catfish farmers. Descriptive analyses of the socioeconomic characteristics show that majority (67.9%) of the catfish farmers were male, married (64.2%) with a mean household size of 6 persons (±1.18), and at the economically active age of 31–60 years (66.1%) with mean age of 44 years (±13.1). A similar result by Alawode and Jinad (2014) indicates the mean age of catfish farmers in the Oyo state to be 44. The catfish farmers attained one level of formal education or another. The majority (78.9%) of the catfish them were graduates of higher institutions. This explains why the mean period of experience in catfish farming was relatively low (8.2 ±6.50). It also implies that most catfish farmers go into the business probably after being unable to secure white collar jobs upon graduation or because of the need for an extra source of income. There were also adults who made fish farming a reliable source of income after their retirement (Alawode and Jinad, 2014).

Table 1. Socioeconomic characteristics of catfish farmers
Tabela 1. Socjoekonomiczny profil hodowców suma

Variable Zmienna	Frequency Częstotliwość występowania (n = 109)	Percentage Udział procentowy
Sex – Płeć		
Female – Kobieta	35	32.1
Male – Mężczyzna	74	67.9
Marital status – Stan cywilny		
Single – Kawaler/panna	39	35.8
Married – W związku małżeńskim	70	64.2
Household size – Liczba osób w gospodarstwie domowym		
1–5	30	27.5
6–10	79	72.5
Mean = 6.0 (±1.18) Średnia = 6,0 (±1,18)		
Age category – Grupa wiekowa		
<30	23	21.1
31–60	72	66.1
>60	14	12.8
Mean = 44 (±13.1) Średnia = 44 (±13,1)		
Educational Status – Wykształcenie		
Primary – Podstawowe	3	2.8
Secondary – Średnie	20	18.3
Tertiary – Wyższe	86	78.9
Working experience – Doświadczenie zawodowe		
<10	75	68.8
11–30	25	22.9
>30	9	8.3
Mean = 8.2 (±6.50) Średnia = 8,2 (±6,50)		

Source: field survey, 2015.
Źródło: badania terenowe, 2015.

Production systems, types and technologies used by catfish farmers

From Table 2, 8.3% of the farmers raised catfish indoor, 76.1% raised catfish outdoor and 15.6% raised catfish both indoor and outdoor. According to the farmers that raised catfish indoor, recirculation aquaculture system (RAS) represents a new and unique way to raise fish. Instead of the traditional method of growing fish outdoors

Table 2. Production systems, types and technologies used by catfish farmers
Tabela 2. Systemy, typy i technologie produkcji wykorzystywane przez hodowców

Production systems/types/technologies Systemy/typy/technologie produkcji	Frequency Częstotliwość występowania	Percentage Udział procentowy
Production systems – Systemy produkcji		
Outdoor – Zewnętrzny	83	76.1
Indoor – Wewnętrzny	9	8.3
Both – Oba	17	15.6
Where catfish is raised – Miejsce chowu		
Earthen pond – Staw ziemny	93	76.2
Cages – Klatki	5	4.6
Tanks – Akwaria	53	48.6
Culture system – System rolniczy		
Monoculture – Monokultura	98	89.9
Polyculture – Polikultura	11	10.1
Production type – Typ produkcji		
Fish feed – Tuczenie	24	22.0
Grow out – Hodowla ryb towarowych	93	85.3
Brood stock – Wylęgarnia	42	38.5
Fingerling – Hodowla narybku	44	40.4
Spawning – Tarlisko	40	36.7
Production technology – Technologia produkcji		
Static renewal – Testy semistatyczne	60	55.0
Flow through – Testy przepływowe	53	48.6
Re-circulatory systems – Obiegi recylkulacyjne	15	13.8

Source: field survey, 2015.
Źródło: badania terenowe, 2015.

in open ponds and raceways, this system rears fish at high densities in indoor tanks with a controlled environment. On the other hand, most farmers preferred to raise catfish outdoor because it is less expensive, easy to maintain and does not require a skilled technical assistance to successfully manage when compared to the indoor system.

The results also indicate that more than three-quarters (76.2%) of the farmers raised catfish using earthen pond, 48.6% used tanks either concrete, plastic, fibreglass or trampoline while 4.6% used cages. According to the farmers, earthen ponds are more profitable and less expensive compared to concrete ponds. Tanks, on the other hand, can be constructed within the living environments of the farmers where an adequate supervision can be given. Also, results show that 89.9% of the catfish famers practiced monoculture while 10.1% practiced polyculture. According to the farmers, they practiced monoculture system to prevent cannibalism among different species of fish and food competition among fishes.

Again, from Table 2, 22.0% of the catfish farmers were involved in the fish feed production. This indicates that only few catfish farmers were into a feed production.

According to Gabriel et al. (2007), one of the major hindrances to the development of the aquaculture industry in Africa is the lack of the locally produced high quality fish feed. Also, 85.3% were into growout or table size production because it is a profitable enterprise with high returns on the investments (Olagunju et al., 2007; Olasunkanmi, 2012). Further, 38.5% produced brood stock to sell to other farmers or used them to develop fries. Also, 40.4% produced fingerlings all to be sold to other farmers or develop some into growout, and 36.7% were into spawning.

More than half (55.0%) of the farmers used the static renewal systems while 48.6% used flow through systems (tanks and troughs), and 13.8 used the re-circulatory system. According to the farmers, the static renewal systems are cheaper to construct, easy to maintain and are also available for hire. The re-circulatory system allows catfish to be reared in sites where the amount of the available water is low but it requires an assistance of well trained technical personnels to maintain it.

Profitability of catfish production

The profitability of catfish farming was determined by using Gross Margin Analysis and Benefit Cost Ratio. The Gross Margin and total profit obtained for the catfish farmers were ₦18,774,827 ($59,602) or ₦15,378,178 ($48,820) respectively while on the average, each farmer earns ₦172,246 ($547) or ₦141,084 ($448) per production season which is usually five to six months.

Gross margin analysis

Total fixed cost (TFC) = ₦3,396,649 ($10,783), (Depreciated value)
Total Variable Cost (TVC) = ₦20,079,523 ($63,745)
Total cost (TC) = TVC + TFC = ₦20,079,523 + ₦3,396,649 = ₦23,476,172 ($74,528)
Total Revenue (TR) = ₦38,854,350 ($123,347)
Gross Margin (GM) = TR – TVC = ₦38,854,350 – ₦20,079,523 = ₦18,774,827 ($59,602)

$$\text{Average Gross Margin} = \frac{\text{Gross Margin}}{\text{Total no of respondents}}$$

$$= \frac{₦18,774,827}{109} = ₦172,246\ (\$547)/\text{catfish farmer/production season}$$

Profit = TR – TC, ₦38,854,350 – ₦23,476,172 = ₦15,378,178 ($48,820)

$$\text{Average Profit} = \frac{\text{Profit}}{\text{Total no of respondents}}$$

$$= \frac{₦15,387,178}{109} = ₦141,084\ (\$448)/\text{catfish farmer/production season}$$

Source: data analysis, 2015.
Źródło: analiza danych, 2015.

This result shows that catfish production is profitable because the values of the gross margin and profit are high. Catfish farmers with higher gross margins/profit will have more money left over to spend on other important things, especially food, to improve their welfare.

Benefit-cost ratio

According to calculations below, the value of the BCR is 1.65. This indicates that catfish business is feasible and profitable because the value of BCR is greater than one. This result agrees with Oladejo (2010) who also found catfish production feasible and profitable with a BCR of 2.2.

$$\text{Benefit Cost Ratio (BCR)} = \frac{\text{Total Revenue (TR)}}{\text{Total Cost (TC)}}$$

$$= \frac{₦38,854,350}{₦23,476,172} = 1.66$$

Source: data analysis, 2015.
Źródło: analiza danych, 2015.

Determinants of catfish production

Catfish production was measured by the quantity of catfish sold. From Table 3, the feed cost had a positive relationship with the quantity of catfish sold at 10% level of significance by 0.018. This implies that the higher the cost/amount of fish feed, the higher the quantity of catfish sold per production. This is because quality fish feed is necessary for the growth of catfish to have good yield at the end of the production season. Also, the quantity of catfish harvested was positive at 1% level of significance by 0.968. This implies that an increase in the quantity harvested will increase the quantity sold. On the other hand, the quantity of fish consumed had a negative relationship with the quantity of catfish sold at 10% level of significance by 0.036. This is because an increase in the quantity of catfish consumed reduces the quantity that could be sold.

Table 3. OLS Estimates of the determinants of catfish production
Tabela 3. Szacunkowe wartości determinant produkcji suma afrykańskiego metodą najmniejszych kwadratów

Variables Zmienne	Coefficient Współczynnik	*p*/*z*	*t*-ratio Współczynnik *t*
Constant Stała	0.161	0.683	0.410
Marital status Stan cywilny	–0.105	0.328	–0.991
Household size Wielkość gospodarstwa domowego	0.109	0.259	1.135
Fingerlings cost Koszt narybku	–0.010	0.237	–1.111
Feed cost Koszt żywienia	0.018*	0.069	1.800
Land Ziemia	–0.027	0.727	–0.346
Infrastructure Infrastruktura	0.017	0.613	0.500
Quantity of fish consumed Liczba spożytych ryb	–0.036*	0.058	–1.895

Asterisks ***and * implies that parameters are significant at 1%, and 10% respectively.
Number of observations = 109.
F (8, 100) = 192.84, Prob. > F = 0.0000.
R-squared = 0.9391, Adj R-squared = 0.9343.
Source: data analysis, 2015.
Oznaczenia *** oraz * wskazują na parametry istotne odpowiednio na poziomach 1% i 10%.
Liczba obserwacji = 109.
F (8, 100) = 192,84; Ist. > F = 0,0000.
R-kwadrat = 0,9391, Skor. R-kwadrat = 0,9343.
Źródło: analiza danych, 2015.

Effect of catfish production on welfare of catfish farmers

Welfare was measured by the food expenditure (a proxy) of catfish farmers. The results of the effect of catfish production on the welfare of the farmers are presented in Table 4. From the results, the quantity of catfish harvested and the quantity of catfish sold had a significant positive relationship with the amount spent on food at 1%. This implies that an increase in the quantity of catfish harvested and sold increases the income of the farmers and this translates into more money to spend on food. These findings are corroborated by the work of Umeh and Asogwa (2012) on determinants of the farm households' food expenditure, in rural Nigeria. Also, a household size and educational status had a posi tive relationship with the amount spent on food and they were statistically significant at 1% and 5% levels respectively. These are in agreement with the *a priori* expectations. An increase in a household's size by one individual increases the household's expenditure on food, as well as an increase in the number of the family labour on the farm. In the same vein, the higher the level of education, the more knowledgeable or informed catfish farmers are with respect to the modern technology and ability to prepare records for managerial decisions. These can increase the total output thereby increasing the farmers' income and thus, a higher amount of money is spent on quality food.

The fingerling cost, technology cost and raising fish outdoor had a negative significant effect at 5%, 5% at

Table 4. OLS estimates of the effect of catfish production on food expenditure of catfish farmers
Tabela 4. Szacunkowy wpływ produkcji suma afrykańskiego na wydatki żywieniowe hodowców metodą najmniejszych kwadratów

Variables Zmienne	Coefficient Współczynnik	*p*/*z*	*t*-ratio Współczynnik *t*
Constant Stała	3.957655	0.000	30.214
Quantity of fish harvested Liczba poławianych ryb	0.000770***	0.000	5.124
Quantity of catfish sold Liczba sprzedanych ryb	0.000071***	0.001	6.245
Household size Wielkość gospodarstwa domowego	0.083479***	0.000	4.611
Educational status Wykształcenie	0.059870**	0.031	2.222
Fingerling cost Koszty narybku	–2.580000**	0.030	–2.205
Technology cost Koszty technologii	–0.0868655**	0.028	–.2.231
Raising fish outdoor Zewnętrzny chów ryb	–0.137277*	0.094	–1.691
Feed cost Koszty żywienia	1.900000**	0.035	2.140
Fish feed sale Sprzedaż karmy dla ryb	0.088015*	0.098	1.660
Labour cost Koszty pracy	–3.480000	0.333	–0.972
Credit Pożyczka	0.072529	0.092	1.722

Asterisks ***, ** and * implies that parameters are significant at 1%, 5% and 10% respectively.
Number of observations = 109.
F (13, 95) = 10.75, Prob. > F = 0.0000.
R-squared = 0.5952, Adj R-squared = 0.5398.
Source: data analysis, 2015.
Oznaczenia ***, ** oraz * wskazują na parametry istotne odpowiednio na poziomach 1%, 5% i 10%.
Liczba obserwacji = 109.
F (13, 95) = 10,75; Ist. > F = 0,0000.
R-kwadrat = 0,5952, Skor. R-kwadrat = 0,5398.
Źródło: analiza danych, 2015.

10% levels respectively. Higher prices of fingerlings increase the production costs; a high cost of a new technology such as purchasing new machines and imported feed, and continuous rearing of catfish outdoors posing dangers such as theft due to an inadequate security, may lead to reducing the profit. This may reduce the output and revenue, and thereby decrease the amount of money catfish farmers spend on their food consumption.

Table 5. Constraints to catfish production
Tabela 5. Ograniczenia w produkcji suma afrykańskiego

Factors/Problems Czynniki/problemy	Frequency Częstotliwość występowania	Percentage Udział procentowy	Rank Ranga
Inadequate security Niewystarczające bezpieczeństwo	87	79.8	1
High input price Wysokie ceny nakładów	76	69.7	2
Inadequate market Nieodpowiedni rynek	66	60.6	3
Infrastructural problem Problemy infrastrukturalne	60	55.0	4
Technological problem Problemy technologiczne	59	54.1	5
Poor access to credit Słaba dostępność pożyczek	58	53.2	6

Source: field survey, 2015.
Źródło: badania terenowe, 2015.

The feed cost and fish feed sale had a positive significant relationship with the food expenditure at 5% and 10% levels of respectively. The quality fish feed is necessary for the growth of catfish which gives high yield at the end of the production season. Increased yield implies increased profit. Also, catfish farmers who combinethe fish feed production with sale of grow out tend to have more revenue and this eventually leads to an increased food expenditure.

Constraints to catfish production

These are the factors identified by catfish farmers as constraints to their production activities in the study area. From the results in Table 5, all the constraints were severe because more than 50% of the farmers identified each one as a major constraint. An inadequate security was the most severe with a rank of 1 while an access to a credit was the least severe with a rank of 6. Most catfish farmers (79.8%) did not have an adequate security and as such, catfish are stolen once the farmers are not on the farm, moreso, most of the catfish farms were not fenced. Also, high input price was identified by 69.7% of catfish farmers and this is due to the government's to subsidize the needed inputs, especially the feed which is quite expensive. Farmers desired imported feed and only few (22%) produced local fish feed which they used in feeding the catfish. This result agrees with Oladejo (2010). An inadequate market was considered by 60.6% of the farmers a serious constraint because the marketers of catfishpurchase them from the farmers at low prices next sellingthem at very high prices on the market.. As a result, the bulk of the profit goes to the middle men instead of the farmers who carried out the rigours of producing the fish.

Infrastructural problems (identified by 55% of the farmers) were: an inadequate access to the regular power supply, good roads and storage facilities such as ovens, freezers and cold rooms. Lack of storage facilities was important due to the fact that after harvesting, the farmers had to sell off the fish, otherwise, they would die in cases they are not sold and must be taken back to the ponds, The farmers were forced then to sell the fish at very low prices. A poor access to a new technology was identified by 54.1% of catfish farmers; improved feed, machineries, modified re-circulating system, and so on. The catfish farmers (53.2%) did not have an access to credit facilities and this may be due to collateral demanded by banks.

CONCLUSION AND RECOMMENDATIONS

Catfish farming is a profitable enterprise (with high gross margin) especially when there is a high level of education for the proper management of input and technology, as well as infrastructure and security. The production of catfish can be embarked upon without infringing on the peace of neighbours because catfish are noiseless and require little space. Most catfish farmers prefer the growout-type production; they avoid operating hatcheries because they lack the requisite technical knowhow needed to manage them successfuly, while few produce and sell the local feed which would bring about an increase in the revenue.

Also, catfish farmers prefer to raise their fish outdoor (by using an earthen pond) because it is less costly to construct and maintain. However, raising fish outdoor makes the catfish prone to stealing and that explains why an inadequate security is the most severe problem faced in the catfish production. The indoor system is, however, becoming more popular among catfish farmers, especially in the urban areas. This is because it can be constructed within the living premises and thus allows for a closer monitoring of the tanks.

The quantity of catfish harvested by the farmers depends mainly on the feed input. Also, the quantity of fish harvested and quantity of catfish sold, which are related to the production, affected the food consumption expenditure (welfare) of catfish farmers positively and significantly. Therefore, the catfish production has a positive effect on the farmers' welfare by improv ing their living standards in terms of the quality and quantity of the food they consume which brings about a healthy living.

Based on the findings from the study, it is therefore recommended that:

- Inputs (especially feed) should be provided and made available to the farmers by governments at a subsidized rate because this will encourage the farmers to use inputs effectively to increase their production.
- Efforts should be intensified at building a capacity of catfish farmers through their education because it enhances a technology adoption which leads to an increased production and better income.
- Awareness should be created on birth control and family planning techniques in order to moderate a household's size because an increased household size leads to a higher expenditure on food, low per capita income and invariably poverty.

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WPŁYW PRODUKCJI SUMA AFRYKAŃSKIEGO NA DOBROBYT ROLNIKÓW PROWADZĄCYCH MAŁE GOSPODARSTWA W STANIE OSUN W NIGERII

Streszczenie. Na potrzeby niniejszego artykułu zbadano wpływ produkcji suma afrykańskiego na dobrobyt rolników z małych gospodarstw w stanie Osun w Nigerii. Jako studium przypadku przyjęto lokalny obszar administracyjny Odo-Otin w stanie Osun. Techniką doboru celowego wyłoniono 109 respondentów, przy zbieraniu danych posłużono się kwestionariuszem ustrukturyzowanym. W celu przeanalizowania danych skorzystano ze statystyki opisowej, analizy marży brutto oraz modelu regresji wielorakiej. Wykazano, że większość badanych rolników stanowili mężczyźni (67,9%) i osoby pozostające w związku małżeńskim (64,2%); średnia ich wieku wynosiła 44 lata (±13,1), a trzy czwarte (78,9%) miało wykształcenie wyższe. Większość hodowców (85,3%) hodowała ryby do osiągnięcia przez nie długości charakterystycznej dla ryb towarowych, a 55% respondentów do oceny wody wykorzystywało testy semistatyczne. Średnia marża brutto wynosząca 172 246 ₦ (545 USD) na sezon produkcyjny (5–6 miesięcy) oraz wskaźnik BCR (B/C) na poziomie 1,66 wskazują, że hodowla suma afrykańskiego jest opłacalna i efektywna. Analiza regresji wykazała, że koszty żywienia oraz liczba poławianych ryb znacząco zwiększają ich sprzedaż, natomiast liczba poławianych i sprzedawanych ryb znacząco zwiększa wydatki rolników na karmę. Zatem nakłady (szczególnie na żywienie) powinny być subsydiowane przez władze w celu wsparcia efektywnego wykorzystania tych nakładów dla wzrostu produkcji sumów afrykańskich, a w efekcie dla poprawy dobrobytu rolników. Należy również zintensyfikować starania ukierunkowane na rozwój umiejętności rolników przez kształcenie ułatwiające przyswojenie nowych technologii przekładających się na zwiększenie produkcji i dochodu.

Słowa kluczowe: wskaźnik BCR, produkcja suma afrykańskiego, marża brutto, wydatki na karmienie, Nigeria, technologia produkcji, dobrobyt

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