ANALYSIS OF SOCIOECONOMICS AND FEED EFFICIENCY OF CATFISH PRODUCTION IN OYO STATE, NIGERIA

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ABSTRACT

Catfish farming is capital intensive, and its profitability depends on efficient combination and utilization of input variables. This study examines the socioeconomic characteristics of small-scale catfish farmers as well as the contribution of various input resources to catfish production and catfish feed efficiency. Structured questionnaire was used to collect data from 200 catfish farmers in four randomly selected local government areas of Oyo State, Nigeria. Descriptive statistics and economics ratios were used to analyze the collected data. This result showed that the ages of catfish farmers vary between 27 and 72 years with a mean of 41±1.65 years old. Majority (74.5%) of catfish farmers were male while 25.5% were female. Most (63.0%) catfish farmers are married. Most (67.5%) catfish farmers have household size that varied between 5 and 8. The survival percentage of catfish in the study areas varies between 73.3% and 97.5% with a mean of 87.88 ± 0.93%. Feed is the single largest contributing input variable in catfish production. There is no conventional method of feeding fish. The mean feed conversion ratio (FCR) was 1.42±0.12. The gross yield varied between 0.04 g/ft^2 and 3.49 g/ft^2 with a mean of 0.93 ± 0.08 g/ft^2. Likewise, the growth rate of catfish varied between 4.10 (g/day) and 14.83 (g/day) with a mean of 7.68 ± 0.29 (g/day). Therefore, farmers should know that the lower the FCR, the lower cost of production and the higher the profit.

Keywords: Earthen Pond, FCR, Feed, Growth rate, gross yield, Survival

INTRODUCTION

Nigeria is a nation that supports agriculture in all of its forms including aquaculture or fish farming. Nigeria incorporates agriculture into her economy and as such agriculture becomes a major contributor to Nigerian economy. Different development programs in Nigeria are aimed to increase agricultural production and improve the livelihood of farmers. Therefore, each State in Nigeria has different agricultural development projects initiated in suitable zones within the State. Aquaculture, a form of agriculture is the cultivation of animal and plant life under water. These include fish, Oyster, rice etcetera (Carballo *et al*. 2008; Chakrof, 1976). It plays a major role in food and livelihood security and sustainability, having the same objectives as agriculture. Fish farming is a major form of aquaculture that deals with rearing of fish.

Small-scale fish farming is the production of fish with minimum available resources, with a larger percentage of the labour provided by household members. Available resources, acquired technical knowledge, marketing and

effect of climate change are some of the determining factors of success in small scale fish farming. Small-scale operations generally do not require expensive equipment or structures, and the resources needed for production may already be available on the farm. It requires low capital for start-up and can provide an appreciable income opportunity for an individual that is engaged in it. Small-scale fish farmers sell their products directly to the consumer to achieve high profit. Some farm materials and structures have low opportunity costs or low costs associated with alternative uses and could be used as resources for fish farming (Siar and Sajise, 2009).

Inputs are the needed materials for the production of a desired product. In fish farming especially catfish production, the inputs include land, skills (technical know-how), ponds, water, fish seeds (fingerlings and juvenile), feeds, chemicals (lime, antibiotics etc), labour, time, security and marketing skill. These inputs are not evenly distributed but are limited in most cases. The limitations of inputs coupled with inappropriate combination of them limit the success and profitability of catfish production in Nigeria. Some catfish farmers recorded losses despite remarkable growth and profitability of the enterprise and they stopped producing catfish (Ajagbe and Ojo-Fakuade, 2019; Ashley-Dejo *et al*. 2017). Many attributed their losses to non-profitability of the operations as a result of high cost of input variables, especially feeds and poor market price of the products (Ideba *et al*. 2013; Abdullah, 2011).

Inefficient use of inputs in aquaculture has been a great problem that can result to loss. Since there are no basic principles to follow in combining or use resources for optimum profit, individual fish farmers therefore followed the rule of thumb or their experiences. This creates disparity in the level of profit earned among farmers, even with all things being equal. Stocking density, pond size, pond type, water quality, labour, and feed quantity and type, are some of the vital factors that need to be efficiently combined together for fish production. The right combination of these resources determines the cost and revenue obtained at the end of operation. Therefore, this study aims to analyze the socioeconomic characteristics of small-scale catfish farming, contributions of inputs and feed efficiency to the profitability of catfish production.

MATERIALS AND METHODS

The Study Area

Oyo State is a State in the southwest geopolitical zone of Nigeria. The capital city is Ibadan. Oyo State has 33 local government areas with four agricultural zones under Oyo State Agricultural Development Programme (OYSADEP). These are Ibadan/Ibarapa, Ogbomoso, Oyo and Saki agricultural zones. Oyo State is favoured and suitable for aquaculture with little or no record of pollution caused by oil spillage or mining activities. Small-scale fish farming, predominated by catfish farming is a major form of agribusiness practices in Oyo State.

Sampling procedure

Structured questionnaire was designed to collect the data needed for this study. The information collected include data on socioeconomic characteristics of catfish

farmers; contribution of various input resources and feed efficiency in catfish production. Multi-stage sampling technique was used in the collection of data. The first stage involved random selection of one local government from each of the agricultural zones. The selected Local Government Areas are Oluyole, Ogbomosho North, Saki West and Iseyin. Then, 50 catfish farmers were randomly selected from each Local Government Areas, making a total number of 200 respondents.

Empirical Model

Descriptive statistics such as frequency, percentage, mean, standard deviation and graph were used to analyze the socioeconomic characteristics of catfish farmers. In addition, graphical illustration was used to depict the contribution of input resources to the cost of production of catfish in Oyo State Nigeria. Analysis of feed efficiency was done by adopting Engle (2010) method:

$$Feed\ Conversion\ ratio = \frac{Weight\ of\ feed\ fed}{Average\ size\ of\ fish\ harvested - Average\ size\ of\ fish\ stocked} \ldots\ldots(1)$$

$$\text{Cost of production (₦/g)} = \frac{Total\ Costs}{Weight\ of\ fish\ sold} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$\text{Gross yield (g/pond area)} = \frac{Weight\ of\ fish\ sold}{Pond\ Area} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$\text{Net yield (g/pond area)} = \frac{Weight\ (g)\ of\ fish\ sold - Weight\ (g) of\ fish\ stocked}{Number\ of\ acres} \ldots\ldots (4)$$

$$\text{Survival (\%)} = \frac{Number\ of\ fish\ sold * 100}{Number\ of\ fish\ stocked} \ldots\ldots\ldots (5)$$

$$\text{Average size of fish harvested (g)} = \frac{Weight\ of\ fish\ harvested}{Number\ of\ fish\ harvested} \ldots\ldots\ldots\ldots (6)$$

$$\text{Growth rate (g/day)} = \frac{Average\ size\ of\ fish\ harvested - Average\ size\ of\ fish\ stocked}{Number\ of\ days\ of\ production} \ldots\ldots\ldots (7)$$

RESULTS

Socio-economic Characteristics

The socio-economic characteristics of farmers used in the analysis included their age, gender, marital status, household size, level of education, source of income and social group or association (Table 1). The ages of catfish farmers varied between 27 and 72 years with a mean of 41±1.65 years old. Most (53.5%) catfish farmers are within the age class 41 and 50 years old. Majority (74.5%) of catfish farmers were male while 25.5% were female. This implies that men are more into small-scale catfish production in the study areas.

Most (63.0%) catfish farmers are married. This implies that fish farming enterprises is a viable livelihood that can support family wellbeing. Most (67.5%) catfish farmers have household size that varied between 5 and 8. The level of literacy among catfish farmers was high. This has advantage to increase productivity through the use of new technology. The primary source of income of most (50.5%) respondents is fish farming. This implies that they are full time catfish farmers; it is an indication that catfish production is a viable business that can support livelihood and guarantee food security. Many (57.5%) catfish farmers were trained as catfish farmers while 42.5% were not trained.

TABLE 1: SOCIO-ECONOMIC CHARACTERISTICS OF FISH FARMERS IN OYO STATE, NIGERIA

Variables	Frequency	Percentages (%)
Age Group		
21 – 30	19	9.5
31 – 40	15	7.5
41 – 50	107	53.5
51 – 60	51	25.5
≥ 61	8	4.0
Mean: 41±1.65	Min: 25	Max: 72
Gender		
Male	149	74.5
Female	51	25.5
Marital Status		
Single	22	11.0
Married	126	63.0
Widow	36	18.0
Divorced	16	8.0
Household Size		
1 – 4	44	22.0
5 – 8	135	67.5
9 – 12	19	9.5
>12	2	1.0
Level of Education		
No formal education	0	0
Primary	15	7.5
Secondary	57	28.5
ND/NCE	28	14.0
HND/BSc	73	36.5
MSc	27	13.5
Primary Source of Income		
Fish Farming	101	50.5
Artisan	22	11.0
Civil servants	5	2.5
Farming	39	19.5
Pension	31	15.5
Business	2	1
Trained fish farmers		
Yes	115	57.5
No	85	42.5

Contribution of Input Variables to Catfish Production in Oyo State, Nigeria

Figure 1 show that the cost of feed is the most contributing input variable to the catfish production cost in Oyo State. This implies that efficient use of feed will determine the profitability of catfish production. Farmers must learn how to feed fish efficiently without feeding the pond; which is just a waste and a minus to the expected profit. The

cost of securing water in good quality and abundant quantity is the second most important contributing input variable to the cost of catfish production. But many catfish farmers disregard the cost of securing abundant good water quality as a part of production cost. This may due to the fact that most catfish farmers cited their farms along or near natural source of water. The cost of fish seed (fingerlings or juvenile) is the third variable that contributes to the production. Fish seeds must be of good quality for optimum yield at harvest. The cost of renting pond for catfish production came close to occupy the fourth position. Other input variables are also important but their contribution is minimal compared to those highlighted above.

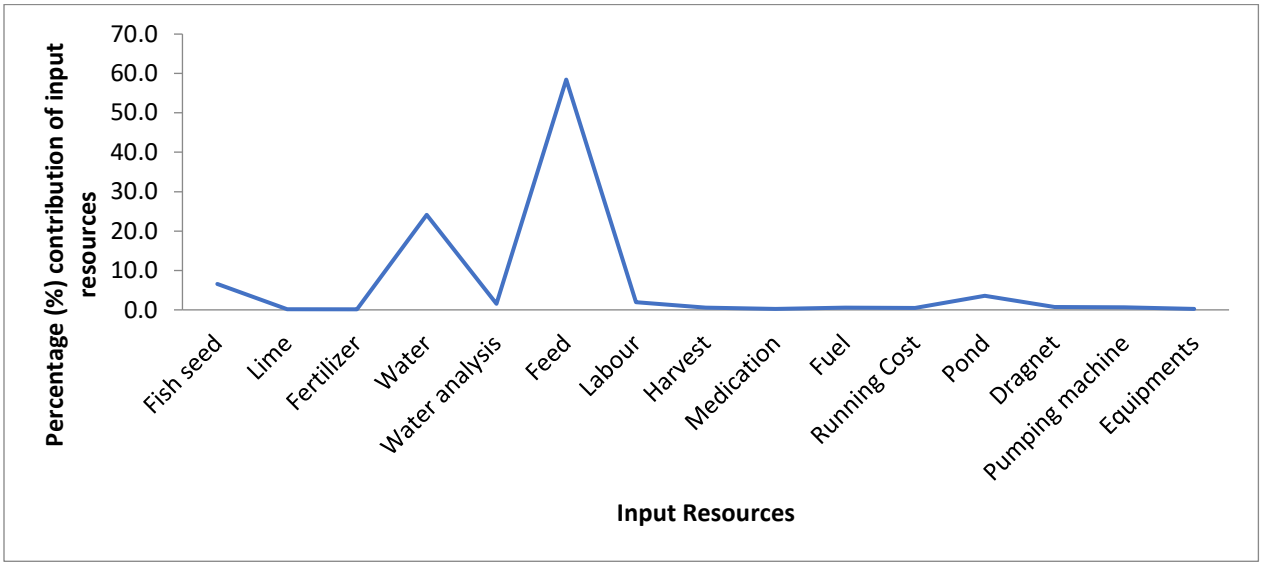

Figure 1: Contribution of Input Resources to Catfish Production Cost in Oyo State, Nigeria

Analysis of Feed Efficiency

Table 2 shows the results of analysis of input and catfish production efficiency. It shows that feed conversion ratio (FCR) varied between 0.53 and 5.83 with a mean of 1.42 ± 0.12. This is the rate at which catfish convert feed to flesh or weight. The result shows that catfish produced in the study area efficiently convert feed to flesh with a mean value of 1.42 ± 0.12. Moreover, the gross yield varied between 0.04 g/ft^2 and 3.49 g/ft^2 with a mean of 0.93 ± 0.08 g/ft^2. This indicates the efficiency of the pond area to the weight gain of the fish. The result shows that one foot of the pond area will yield 0.93g on average. The survival percentage of catfish in the study areas varied between 73.33% and 97.50% with a mean of 87.88 ± 0.93%. Likewise, the growth rate of catfish varied between 4.10 (g/day) and 14.83 (g/day) with a mean of 7.68 ± 0.29 (g/day). This result shows that it required about 130 days (4.5 Months) of cultivation period for catfish to be raised to a body wet weight of 1Kg (all things being equal).

TABLE 2: ANALYSIS OF FEED EFFICIENCY

Statistics	Min	Max	Mean
Feed Conversion Rate (FCR)	0.53	5.83	1.42 ± 0.12
Gross Yield (g/ft^2)	0.04	3.49	0.93 ± 0.08
Net Yield	0.04	3.48	0.92 ± 0.08
Survival (%)	73.33	97.5	87.88 ± 0.93
Growth Rate (g/day)	4.1	14.83	7.68 ± 0.29

Source: Data Analysis, 2019

DISCUSSIONS

Analysis of input variables of catfish production in Oyo state, Nigeria was examined in this study. The average age of catfish farmers in the study area is 41±1.65 years old; that is, they are within economically productive ages. The implication of this is that majority of the population are in their economically active age with potential for higher productivity that can translate to higher income and higher profitability. This observation is in agreement with the findings of Onyekuru *et al*. (2019); Iruo *et al*. (2018); Olaoye *et al*. (2013); Adebayo and Daramola (2013) in separate studies. There is more participation of men than women in catfish production in the study area. But, Sustainable Development Goal 5 advocates for gender equality and women empowerment. Onyekuru *et al*. (2019) reported that catfish farming is gender bias. Ajagbe and Ojo-Fakuade (2019) and Ogidi (2016) also affirmed the participation of more men than women in catfish farming in separate studies. However, women play significant roles in aquaculture but often under recognized. Women are involved in feeding, processing, marketing and in value chain. Often, women roles are masked by ownership of ponds and land frequently being formally or informally held by male household-member (Ajagbe and Ojo-Fakuade 2019; Kruijssena *et al*. 2018).

Most catfish farmers were married. Iruo *et al*. (2018) reported that this showed that catfish farmers are socially responsible. Ebukiba and Anthony (2019), Onyekuru *et al*. (2019), and Olaoye *et al*. (2013) also confirmed higher participation of married people in catfish production in separate studies. Majority of the respondents are literate. This is in agreement with the study of Ume *et al*. (2016) in Anambra State, Nigeria where 91.7% of catfish farmers were literate. Ohen *et al*. (2014) reported first degree as the highest level of education attained by majority of catfish farmers and wholesalers in Niger Delta, Nigeria. This shows that catfish farming is providing livelihood for Nigerian graduates that are unable to secure white collar jobs. Onyekuru *et al*. (2019) reported that this will influence productivity and profitability of the business. Fish farming is the primary source of income to the majority of the respondents. This implies that they are full time catfish farmers; an indication that catfish production is a viable business that can support livelihood and guarantee food security. This is contrary to the report of Ogidi (2016) that catfish business is mostly operated to compliment other sources of income.

Feed is the single input variable that contributes about 70% cost of production. This observation is consistent with the report of Engle (2010) that feed is frequently the largest single component of the cost of raising an aquaculture crop. This fact is further confirmed with the works of Onyekuru *et al*. (2019), Ashley-Dejo *et al*. (2017), and Okpeke and Akarue (2015). The cost of fish seed (fingerlings and juveniles) varied with respect to the availability and place of production. Onyekuru *et al*. (2019) observed that the contribution of the cost of fish seed to the cost of catfish production is slightly higher than the contribution of the cost of securing water. But Ideba *et al*. (2013) reported a contrary result in their economic analysis of fish farming in Calabar, Cross River State. Ideba *et al*. (2013) also reported that in fish stocking, fish seed contributed highly, followed by water, then the feed. The reason for their result was that, there was no hatchery that produced fingerlings for the farmers. Therefore, fingerlings were brought from other states at a high cost including transportation fee. Consequently, there was high demand for fingerlings and inadequate supply, resulting in increased price of fingerlings.

The feed conversion rate (FCR) of 1.42 ± 0.12 obtained in this study is an indication of profitability with respect to feed used to raise catfish in the study area. This will cause reduction in the cost of production (Robinson and Li, 2015; Engle, 2010) at a stable market price. But, Agbeko *et al*. (2018) reported that catfish can have a FCR of 1.2. The implication of this is that catfish farmers in the study area should improve their skills and expertise in their feeding management to reduce or remove feed waste. Farmers should know that the lower the FCR, the lower cost of production and the higher the profit. Likewise, the better the fish convert feed to flesh and the farmer feed efficiently, the lower the FCR and the higher the profit. Although, no single feed or feeding method is suitable for all circumstances (Robinson *et al*. 2001), individual farmer should feed to meet fish daily nutritional requirements and to maximise profit without polluting the pond water. Likewise, farmer should know that every uneaten feed in the pond contributes to increase in the value of FCR and a loss to farmer; decreasing his profit. Robinson and Li (2015) reported that catfish grown from fingerlings to marketable size (about 0.68 kg) in research ponds routinely exhibit an FCR of 1.8 : 1or less. However, they explained that if the average farm-level FCR could be reduced from 2.5 to 2.0, it would cut the feed cost of producing a pound of catfish to 45 cents, a reduction of about 20% cost of production.

CONCLUSION

Catfish farming is gender biased in the study area, although majority of catfish farmers are literate. Feed is the single largest input variable in catfish cultivation; so, feeding management is the most important activities of catfish cultivation, because it determines the FCR and profitability of catfish farming. Therefore, farmers should know that every uneaten fish is a loss and contributing to reduction of expected profit.

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