INNOVARE JOURNAL OF AGRICULTURAL SCIENCE

Vol 5, Issue 3, 2017

ISSN- 2321-6832

Research Article

ALLOCATIVE EFFICIENCY OF RESOURCE UTILIZATION IN FISH FARMING IN OWO LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA

ASIRU MONDAY ABBAS*, BEN AHMED

Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, Kaduna, Nigeria. Email: asiruabbas@gmail.com

Received: 25 March 2017, Revised and Accepted: 20 April 2017

ABSTRACT

Objective: The study assessed resource-use efficiency among fish farmers in Owo Local Government Area of Ondo State, Nigeria.

Methods: A multi stage sampling technique was used to select 50 fish farmers for the study. Data were collected during 2013 production cycle. Multiple regression analysis was used to determine the effects of variables determining the quantity of fish harvested. Allocative efficiency of resources used in raising fish was determined using marginal value product and marginal factor cost.

Results: Significant determinants of the quantity of fish harvested at the end of the production cycle were fish seeds (0.647) and the quantity of feeds used (0.339). The two productive resources were significant at 0.01 probability level. The values of allocative efficiency of all the inputs used indicated that pond size (7.041) and fish seeds (11.500) were under-utilized while labour (0.705) was over-utilized; only feeds (1.032) were optimally utilized during fish production process.

Conclusion: Under-utilized resources should be optimally used in order to obtain the best possible output. Excessive use of labour should be reduced so as to cut cost of production and increase profit margin. It is also recommended that fish farmer's capacity should be developed through regular training on how to allocate productive resources efficiently.

Keywords: Fish, Resource, Marginal, Utilization, Farming, Efficiency, Feeds, Allocation.

INTRODUCTION

Fish is a major source of animal protein for people all over the world, especially for those in the lowest stratum of the society in the developing countries who live on less than a dollar per day [1] reported that fish accounted for about 17% of the global population's animal protein intake and 6.7% of all protein consumed in 2013. Moreover, fish provided more than 3.1 billion people with almost 20% of their average per capita intake of animal protein. In addition to being a rich source of easily digested, high quality protein containing all essential amino acids, fish provides essential fats (e.g., long-chain omega-3 fatty acids), vitamins (D, A, and B), and minerals (including calcium, iodine, zinc, iron, and selenium), particularly if eaten whole [1]. Even modicum quantities of fish can have an essential positive nutritional impact on plant-based diets such as maize, wheat, cassava, sorghum, and yam and this is the case in many developing countries like Nigeria.

Fish farming as an agricultural business has great capability or potential to raise family income, provide employment opportunities, and reduce the problem of food insecurity among rural, periurban, and urban dwellers [2]. Estimated 56.6 million people were engaged in the primary sector of capture fisheries and aquaculture in 2014, of whom 36% were engaged full time, 23% part-time, and the remainder were either occasional fishers or of unspecified status. Following a long upward trend, numbers have remained relatively stable since 2010, while the proportion of these workers who engaged in aquaculture increased from 17% in 1990 to 33% in 2014 [1].

Nigeria needs about 2.66 million metric tons of fish annually to meet the dietary requirement of her citizens. Regrettably, the total aggregate domestic fish supply from all sources (capture and culture fisheries) is <0.7 million metric tons per annum [3]. Nigeria has to import about 1.96 million metric tons of fish valued at about $500 million annually to augment the shortfall. This colossal importation of frozen fish into the country has ranked Nigeria the largest importer of frozen fish in Africa [3]. It has been observed that Nigeria can be self-sufficient in fish production if domestic capacity is greatly enhanced so as to transform the country from being a net importer of fish into a net exporter of fish. To reverse this negative trend of huge fish importation with its attendant drains on the nation's economic reserve, it is pertinent to ensure that resources being used in fish farming are allocated efficiently to produce fish that will not only reach market weight within the shortest period but also meet local demand and also to ensure that fish farmers can make quick returns from their investment of money, time, energy, and resources.

Allocative efficiency defines a point whereby a business enterprise or organization is able to achieve maximum result (i.e., realize the highest yield or the highest possible output) at least-cost combination of resources or inputs. Although some studies exist on fish farming in Ondo State, only limited studies exist on allocative efficiency of resources used in fish farming in the state, particularly in Owo Local Government Area (LGA) of the state, and that is why a study like this is essential to serve as a guide on how limited or scarce resources can be utilized efficiently so as to obtain maximum yield in fish production.

METHODS

Description of the study area

Owo LGA is one of the 18 LGAs in Ondo State. Owo traced its origin to the scenic and ancient city of Ile-Ife, the cradle of Yoruba culture. The coordinates of the LGA are $7^0$11'N and $5^0$35'E. The LGA is blessed with tropical rain forest climate and high humidity with a temperature that ranges between 21°C and 28°C [4]. Owo in 2006 has a total population of 222,262, with males accounting for 112,056 and females accounting for 110,206 [5]. With an annual growth rate of 2.87%, the projected population of Owo in the year 2017 is put at 292,430. The present-day Owo is an agrarian society that is involved in fish farming, growing, and trading of yams, cassava, maize, peppers, okra, cocoa, etc.

Sampling method

A multistage sampling procedure was adopted for this study. In the first stage, Owo LGA was purposively selected out of the 18 LGAs in Ondo

State for this study because of its high profile aquaculture status in the state. This prominent aquaculture status was attested to by Ondo State Fisheries Department of 2013, in which Owo LGA was listed as having 97 registered fish farmers. Simple random sampling technique was then used to select fifty fish farmers from the LGA, which represents 51.5% of the active fish farmers in the LGA.

Method of data collection

Primary data were collected through the use of interview schedule and questionnaires distributed to fish farmers. The information gathered through the use of questionnaires and interview schedule includes inputs used (fish seeds, feed, water, labor) and output of the farming exercise (the quantity of table size fish harvested in kilogram).

Analytical technique

Data obtained from the study were analyzed using regression method. Equation 1 was used to derive the marginal physical product (MPP) with respect to each input while equation 2 was used to determine the effect of certain variables on the quantity of fish harvested at the end of the production cycle.

$$Y = a_0\left(x_1^{a1}\, x_2^{a2}\, x_3^{a3}\, x_4^{a4}\, e^{u}\right) \qquad (1)$$

Using logarithm to transform equation 1

$$\text{Log}Y = \log a_0 + a_1 \log x_1 + a_2 \log x_2 + a_3 \log x_3 + a_4 \log x_4 + e \qquad (2)$$

where

Y = Quantity of fish in kg.

x_1 = Pond size (meter square).

x_2 = Fish seeds (unit).

x_3 = Feeds (kg).

x_4 = Labor (man-days).

e = Error term, i.e., random variable which captures factors outside farmer's control.

a_0 = Constant term.

a_1-a_4 = Regression coefficients.

Allocative efficiency in fish farming can be determined using certain physical parameters such as MPP, unit cost of each input used, and unit price of table size fish harvested at the end of production cycle. The MPP with respect to each input is obtained from the first derivative of equation 1. For instance, the MPP for pond size is given as $MPP_{x1} = dY/dx_1$. Therefore, the allocative efficiency of resources or inputs used in production process like fish farming is given as follows:

$$AL_{eff} = \frac{MPP_{xi} * P_y}{P_{xi}} \qquad (3)$$

$MPP_{xi} * P_y$ = MVP while P_{xi} = MFC. Therefore, allocative efficiency can also be written as

$$AL_{eff} = \frac{MVP}{MFC} \qquad (4)$$

where

AL_{eff} = Allocative efficiency.

MPP_{xi} = Marginal physical product of the i[th] input. It is the change in output as a result of a unit change in a particular input.

P_y = Unit price of table size fish and it is obtained by dividing total revenue by the quantity of table size fish produced.

P_{xi} = Unit cost of i[th] resource used in raising fish. It is obtained by dividing the total cost of that particular input by the quantity of such input used.

MVP = Marginal value product, which is the change in the total value of product due to a unit change in the amount of variable input used in production.

MFC = Marginal factor cost, which is the addition to total cost of production as a result of using an extra unit of input.

Allocative efficiency of pond size, for instance, can be determined as follows:

$$AL_{eff} = \frac{MPP_{x1} * P_y}{P_{x1}}$$

To determine the efficiency of resources used in production process, the following decision criteria were established [6,7].

a. $\frac{MVP_{xi}}{MFC} > 1$ indicates underutilization of resources.

b. $\frac{MVP_{xi}}{MFC_{xi}} < 1$ indicates overutilization of resources.

c. $\frac{MVP_{xi}}{MFC_{xi}} = 1$ indicates optimal utilization of resources.

RESULTS AND DISCUSSION

Results of regression analysis

To determine the effect of factors such as pond size, fish seeds (fingerlings or juveniles), feeds, and labor on the quantity of fish harvested at the end of the production cycle, a regression analysis was conducted and the double log form specified in equation 2 was used. The results are presented in Table 1.

The results indicated that variables such as fish seeds and feeds were positive and significant while pond size and labor were not significant but positive.

In line with apriori expectation, the regression coefficient of the number of fingerlings or juveniles stocked was positive and significant at 1% level of probability. This indicates that a unit increase in the number of fish seeds stocked will lead to an increase in fish output. This result is in consonance with the findings of Nwosu and Onyeneke [8] in their work on the effect of productive factors of pond fish on fish output in Owerri, Imo State, that farmers who stocked more fingerlings or juveniles recorded higher output than their counterparts who stocked less.

The amount of feeds administered in raising fish was positive and significant at 1% level of probability. This implies that feeds are very essential in raising fish to reach marketable size within the shortest period. This is in tandem with the work of Ele *et al.* [9] that an increase in the amount of quality feeds applied in raising fingerlings or juveniles will definitely lead to an increase in the quantity of table size fish that will be cropped at the end of the production cycle.

The coefficients of pond size were positive but not significant, implying that a lot of the farmers in the study area were small-scale fish farmers with small ponds, while labor was also positive but not significant.

Estimates of allocative efficiency of resources utilized in fish farming

The calculation of allocative efficiency of resources used in fish farming involve the estimation of physical parameters such as marginal value product (MVP), marginal physical product (MPP) and Marginal factor cost (MFC). The results are presented in Table 2.

The results show that productive resources such as pond size and fish seeds were under-utilized, labour was over-utilized while there was optimal use of feeds. It must be noted that pond is a fixed input and it was depreciated using the straight line method shown below:

$$D = \frac{P-S}{N}$$

Table 1: Regression estimates of variables determining the quantity of harvested fish

Variables	Coefficients	Standard error	t-statistic	Mean±SD	p-value
Pond size	0.014	0.600	0.235	2.394±0.500	0.816
Fish seeds	0.647	0.089	7.289**	3.509±0.490	0.000
Feeds	0.339	0.055	6.136**	3.019±0.680	0.000
Labor	0.021	0.079	0.264	2.458±0.287	0.793
R^2	0.940				
Adjusted R^2	0.935				
F-statistic	177.55**				0.000
Durbin–Watson	1.718				

**p<0.01

Table 2: Values of allocative efficiency of resources used in fish farming

Variables	MPP	P_Y(₦)	MVP(₦)	MFC(₦)	AL_{eff}	Explanation
Pond size	0.1255	561.00	70.41	10.00	7.041	Under-utilization
Fish seeds	0.4715	561.00	264.51	23.00	11.500	Under-utilization
Feeds	0.4984	561.00	279.60	271.00	1.032	Optimal-utilization
Labor	0.2200	561.00	123.42	175.00	0.705	Over-utilization

Source: Field Survey, 2013

Where
D = Depreciation,
P = Purchased value,
S = Salvage value,
N = Life span of input.

Pond size was under-utilized because farmers in the study area used numerous small ponds. This could also be due to the fact that farmers in the area did not have sufficient technical-know in raising fish. This result corroborates the findings of [10] who reported that pond size was under-utilized.

Inadequate capital might have led to farmers not stocking their ponds with adequate and quality fish seeds that will reach marketable size within the shortest period of time. The fact that fish seeds were under-utilized in the area buttresses the point that fish farmers need to scale the hurdle of financial difficulty in order to have a thriving fish farming business. This result is contrary to the findings of a study like allocative efficiency in pond fish production in Delta State, Nigeria where it was reported that fish farmers over-stocked their ponds with slow growing, economically less viable species of fish [10].

The allocative efficiency estimate shows that feeds with a value of 1.032 were optimally utilized by fish farmers. This might be connected with the availability of local fish feeds at a relatively cheap price which fish farmers used together with highly nutritive foreign feeds to raise their fish This result is contrary to the findings of [10] on allocative efficiency in pond fish production in Delta State, Nigeria who reported that fish farmers over-utilized feeds in the process of raising fish.

The over-utilization of labour discovered in the study area can be traced to the availability of family labour which fish farmers can easily make use of whenever the need arises. This result is in agreement with the findings of previous research work like evaluation of technical efficiency of catfish production in Oyo State, Nigeria where it was reported that fish farmers over-utilized labour in catfish production [11]. However, this result is contrary to the findings of [12] on resource productivity in small scale catfish farming in Rivers State, Nigeria. They reported that fish farmers under-utilized labour in catfish farming in the state.

CONCLUSION

The results showed that fish farmers in the study area were inefficient in allocating productive resources in fish farming as all the resources (pond size, fish seeds, feeds, and labor) were overutilized. This also indicates that the technical know-how of farmers in the area about fish production is also deficient. To improve efficiency, fish farmers need to reduce the quantity of these resources that are employed in fish production. For instance, instead of having numerous small ponds, the fish farmers should concentrate their efforts on having few ponds that they can manage effectively in such a way as to make maximum profit from their investment. There is need for capacity development on how fish farmers can run their farms efficiently.

REFERENCES

1. Food and Agriculture Organization. The State of World Fisheries and Aquaculture. Rome, Italy: Food and Agriculture Organization; 2016.
2. Omitoyin BO. Introduction to Tropical Fisheries. Ibadan: Ibadan University Press; 2007. p. 48.
3. Federal Ministry of Agriculture and Rural Development. Agricultural Transformation Agenda. Abuja, Nigeria: Federal Ministry of Agriculture and Rural Development; 2011.
4. Fatuase AI, Aborisade AS, Omisope ET. Determinants of adaptation measures to climate change by arable crop farmers in Owo local government area of Ondo state, Nigeria. World Rural Obs 2015;7 Suppl 1:49-57.
5. Federal Government of Nigeria. Legal Notice on Publication of 2006 Census Final Results. Vol. 96. Abuja, Nigeria: Federal Republic of Nigeria Official Gazette; 2009. p. 5-37.
6. Oladeebo JO, Ajao AO, Ambe-Lamidi AI. Resource-use efficiency in cassava processing in Oyo state: Implications for employment generation. In: Fabiyi YL, Ajetomobi JO, editors. In: Proceedings of the 2006 Annual Conference of the Nigerian Association of Agricultural Economists; 2006. p. 74-9.
7. Fasasi AR. Resource use efficiency in yam production in Ondo state, Nigeria. Agric J 2006;1 Suppl 2:36-40.
8. Nwosu CS, Onyeneke RU. Effect of productive inputs on pond fish production on fish output in Owerri, Imo state, Nigeria. Glob Adv Res J Agric Sci 2013;2 Suppl 1:23-8.
9. Ele IE, Ibok OW, Antia-Obong EA, Okon IE, Udoh ES. Economic analysis of fish farming in Calabar, Cross River state, Nigeria. Greener J Agric Sci 2013;3 Suppl 7:542-9.
10. Inoni OE. Allocative efficiency in pond fish production in Delta state, Nigeria: A production function approach. Agric Trop Subtrop 2007;40 Suppl 4:127-34.
11. Alawode OO, Jinad AO. Evaluation of technical efficiency of catfish production in Oyo state: A case study of Ibadan metropolis. J Emerg Trends Educ Res Policy Stud 2014;5 Suppl 2:223-31.
12. Onoja AO, Achike AI. Resource productivity in small scale catfish farming in Rivers state, Nigeria: A trans-log model approach. J Agric Soc Res 2011;2 Suppl 2:139-46.