Effects of Input Policies on the Profitability of Fish Farming in Osun State, Nigeria

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ABSTRACT

The study examined the effect of input support policy measures on fish farming in Osun State, Nigeria. Multistage sampling technique was used to select 200 fish farmers as respondents. Data collected were analyzed using descriptive statistics and the policy analysis matrix. The results on the socio-economic characteristics of fish farmers showed that the mean age of the fish farmers was 43.63 years while the enterprise is dominated by men (83.2%). Respondents spent an average of 9.62 years in school. The mean household size of the fish farmers was 5.0 while the mean experience of farmers was 2.42 years. The sizes of the fish dams were small with an average size of 0.53 ha. The results of the Policy Analysis Matrix revealed that the average net income from fish farming was ₦79,337.89 while the net social benefit was ₦5,226.93. The result also showed that the Nominal Protection Coefficient (NPC) was 0.979 implying that the farmers were implicitly taxed on the product while the Nominal Protection Coefficient on Tradable Inputs (NPI) was 1.194 indicating that the farmers were taxed in purchasing the tradable inputs. The Effective Protection Coefficient (EPC) was 0.942, indicating that the fish development policy measures resulted in a net dis-incentive to produce the commodity. The study concluded that there is the need for government to ensure that its policies are properly implemented and targeted for fish farmers to get the subsidized inputs.

Keywords: ***Inputs, policy measures, profitability, fish farming, dis-incentive, tradable, nominal, coefficient***

INTRODUCTION

The importance of fish to the socioeconomic and dietary wellbeing of Nigerians cannot be overemphasized. It provides over 40% of the dietary intake of animal protein of the average Nigerian (FDF, 2011). As the fastest growing subsector in agriculture, its contribution to GDP at 2005 current factor cost rose from ₦162.61 billion to ₦373,570.19 billion in 2011 (CBN, 2012). Local demand for fish amounts to 1.5 million metric tonnes while domestic output stands at 650,000 metric tonnes (Osawe, 2007; FISON, 2007). Although domestic production of fish in the country witnessed a decline as a result of decrease in output from artisanal sources from 90% in 1990 (Tobor, 1990) to 40% in 2006 (Global Agriculture Information Network {GAIN}, 2007), intensification in fish farming has resulted in the increase of the commodity (FAOSTAT, 2013), the nation has witnessed some increase in the supply of the output. However, domestic output has not been able to meet up with demand.

This has resulted in the country importing about 680,000 metric tonnes annually (Osawe, 2007; FISON, 2007) to bridge the shortfall in supply at a cost of about ₦50 billion in foreign exchange. This huge drain on the foreign exchange earnings of the country that could have been allocated to foster development in other areas coupled with the enormous potentials of the country to produce the commodity locally (Oluwasola and Ajayi, 2012; FAO, 2006b; FAO, 2005b; Shimang, 2005; Tobor, 1990; Kapetsky, 1981 and Welcome, 1979) has encouraged the governments of the nation to intensify efforts in increasing the production of fish locally.

To encourage fish production in Nigeria, agricultural price policy instruments including taxes, subsidies, international trade restrictions and direct controls were put in place (Manyong *et al*., 2005). Sector specific programmes and projects such as the Aquaculture and Inland Fishery Project (AIFP), National Accelerated Fish Production Project (NAFPP), Fishing Terminal Projects (FTP), Fisheries Infrastructures provision/Improvement (FIP), and the Presidential Initiative on Aquaculture (PIA) (FAO, 2005a) were also put in place. Fish production incentive support for inputs such as fingerlings, fertilizer, drugs and other fish resources were put in place by the Federal Government of Nigeria. It also encouraged State governments as well as Local Government Councils to subsidize these inputs as additional incentives to fish farming (Manyong *et. al*., 2005). However, until the advent of democratic governance in 1999, the national policy on fish production favoured the artisanal and industrial fishing sector (Miller *et. al.*, 2006). The crafting of a new national policy that will promote fish farming became imperative as output from the artisanal sources continued to dwindle. The new national policy (FMAWR, 2008) set goals which include: short term goals (producing one billion fingerlings through private operators, restocking government owned dams and reservoirs, promoting of fish processing, distribution of fingerlings to farmers (free for small scale fish farmers while large scale farmers will be subsidized up to 50% of the cost), capacity building for fish farmers, provision of inputs including credit,); medium term goals (development of fish meal and fish feed industry, fish processing, preservation, packaging and distribution) and long term goals (developing local fish feed technology, commercialization of fish seed production, development of technologies for preservation, storage of fish and development of a nationwide transportation and marketing systems). To accelerate fish production, the Federal Government also established the Growth Enhancement Support scheme for fisheries and agricultural value chains in the country. The goal of the scheme involves a phased reduction of fish imports by 25% annually between 2013 and 2018 (Punch, 2014) when importation will finally stop. Government hoped within the four years of the scheme, to provide critical inputs including 1.25 billion metric tonnes of fingerlings and 400,000 metric tonnes of fish feed.

In spite of these support and incentives, fish output has remained far below the level of domestic demand. The rapid turnover of government policies especially as governments change have led to the enactment of policies that in some cases

are mutually antagonistic rather than being mutually reinforcing. According to Fapohunda (2005), a change in government or government policies are risks to the utilization of capital by farmers. Hence, this study examined the effect of input support policy measures put in place on fish farming in Osun State.

Materials and Methods

Sampling Procedure and Data Collection

The study was carried out in Osun State, in the Southwestern geopolitical zone of Nigeria. The State was selected because of the predominance of emerging fish farming enterprises resulting from the State government promotion of fish farming to combat the twin problem of unemployment and poverty. Osun State lies between longitude 4 and 5° E and latitude 7 and 8 °N. The State is bounded to the north by Kwara State, to the East by Ondo and Ogun States, to the south by Ogun State and to the west by Oyo State. The State has a population of 3,423,535 (National Population Commission, 2006).The State is located within the tropics and enjoys two distinct climatic seasons. The wet season which commences from April to October and the dry season which operates between November and March (Agboola, 1979).

Primary and secondary data were used for this study. Primary data were collected from fish farmers. Multistage sampling technique was used to select respondents. At the first stage, proportionate sampling method was used to select 10 Local Government Areas (LGAs) from the three agricultural zones of the State. These are: Ife east, Ife -Central, Ilesa east and Ilesa west in Ife/Ijesa zone; Ede north, Ede south, Osogbo and Olorunda in Osogbo zone; and, Iwo and Ejigbo in Iwo zone. From the lists of fish farmers in the selected LGAs obtained from the zonal office of the Osun State Agricultural Development Programme (OSADEP), 20 fish farmers were randomly selected in each LGA. In all, a sample of 200 farmers was selected for this study. Primary data including age of respondents, level of education, family size, farm size and source of initial capital invested, were collected with the aid of well structured and pre-tested questionnaire. In addition, secondary data were obtained from Osun State Ministry of Agriculture and Natural Resources, Osun State Agricultural Development Programme (OSADEP), the National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN).

Data Analysis

Data collected were analyzed using descriptive statistics and the policy analysis matrix (PAM) following Monke and Pearson (1989). Descriptive statistics, including frequency counts, means and percentages was used to describe the socio-economic characteristics of respondents while the policy analysis matrix was used to examine both financial and social profitability of the production system as well as the overall impact of fish farming policies on fish farmers in the State.

The Policy Analysis Model

The policy analysis matrix (PAM) is a static model used to calculate the competitiveness of an agricultural production system and to estimate the efficiency of the system (Monke and Pearson, 1989). It is a product of two

accounting identities in which one identity defines profits attained as the difference between revenues and costs while the other measures the effect of distorting policies or market failures (divergences) as the difference between observed parameters and parameters that would exist if the divergences were removed (Yao, 1997). PAM therefore enables both the determination of profitability (financial and social) of a production system as well as the incentive(s) to produce the commodity involved.

As shown in Table 1, the PAM framework consist of:

i. Disaggregation of the cost of inputs into tradable and non-tradable components; and.
ii. The valuation of revenues, costs and benefits using both private and social prices.

Tradable inputs are inputs (fertilizer, fish feed) that can be traded in the world market, while non-tradable inputs (land, labour and local capital) are those that cannot be traded internationally. Most inputs, however, have tradable and non-tradable components. Private prices are simply the open market prices while the social prices are shadow prices of inputs and outputs computed from the world prices obtained from the secondary data. The world prices are adjusted for transportation costs and marketing costs to be comparable with farm gate prices. Table 1 presents the values on a per land unit basis.

Table 1. Structure of PAM

	Revenue	Tradable Inputs Costs	Domestic Factor Costs	Profits
Private Accounts	A	B	C	D
Social Accounts	E	F	G	H
Divergences	I	J	K	L

D = (A - B - C); H`1 ` = (E - F - G); I = (A - E); J = (B - F); K = (C - G); L = (D - H) = (I - J - K)

Source: Monke and Pearson (1989), p.89.

Four most commonly used parameters from PAM are the Nominal Protection Coefficient (NPC), Nominal Protection Coefficient of Tradable Input (NPI), Effective Protection Coefficient (EPC) and Domestic Resource Cost (DRC). The NPC is the ratio of the domestic market price of a product to its social parity price (NPC = AE^{-1}) while NPI is the ratio of the private to the social values of all the tradable inputs (NPI = BF^{-1}). EPC measures the total effect of intervention in both markets. It is defined as the ratio of value added measured at private prices to that measured at social prices (EPC = $(A-B)(E-F)^{-1}$).

An NPC >1 implies farmers are positively protected while an NPC<1 implies farmers are implicitly taxed. An NPC =1 indicates a neutral situation. Again an NPI>1

implies that farmers are taxed in purchasing tradable inputs while an NPI<1 implies that farmers are subsidized. An NPI=1 indicates an indifferent situation. When the EPC >1, it implies that the overall impact of the existing policy results in a net positive incentive to produce fish. An EPC<1 represents a net disincentive, while EPC=1 implies either no intervention or the net impact of the policy measures results in a neutral effect on value added in both the input and product markets. DRC is the ratio of domestic factor cost valued at the social prices to the value added created by the same resources at social prices (DRC = $G(E-F)^{-1}$). A DRC >1 implies the product (here, fish) is produced inefficiently as its value addition is lower than the resources used in producing it while a DRC <1 implies production is efficient. A DRC=1 implies an optimal point of domestic resource allocation.

Data on fish cropped, major inputs used (land, cement, fish feed, breeding stock, fertilizer, liming materials, nets, measuring scale, pumping machine, drugs and labour) and ruled (prevailing) retail prices of the inputs were collected using survey questionnaire. Mean values of fish cropped (kilograms) and key inputs (fertilizer {kg}, drugs{ml} breeding stock {kg} and labour {man -days}), per hectare, were calculated. Private and social prices for tradable commodities were obtained using secondary data including cost, insurance and freight (*c.i.f)*, free on board (*f.o.b)*, official exchange rate (₦152.70/US$), foreign exchange premium (1.83 percent), import tariff, port charges, unloading charges, warehouse charge and conversion factor for estimating transport (0.8491 - adapted from Monke and Pearson, 1989). Private and social prices for non-tradable commodities were arrived at using simple arithmetic procedures to process the ruled retail prices of the items.

Results and Discussions

Socio-economic Characteristics of Fish Farmers

The socio-economic characteristics of the respondents are shown in Table 2. The mean age of the fish farmers was 43.63±12.61 years indicating that the fish farmers were still in their productive years which agrees with the findings of (Aihonsu and Olatingiri, 2012; and Olawumi *et al*., 2010). in a similar studies conducted in southwestern Nigeria. Targeting these set of farmers in any strategy to increase fish output in Nigeria could yield positive results as they are at the age where they are economically active and able to take risks (Akinola and Adeyemo, 2008) to venture into an enterprise that is still developing. Fish farming in Osun State is an enterprise dominated by men (83.2%). This could have resulted from the drudgery of fish farming especially when it involves earthen ponds. It could also have resulted from the prevailing gender division of labour with women involved mainly in the processing and marketing of the fish products (Oluwasola, 1998). The level of education of the fish farmers was fairly high with an average of 9.62±6.33 years spent in school. This compares favourably with findings from other studies (Fregene *et. al*.,2011; Fregene and Digun-Aweto, 2008). However, this may not translate into fish farmers having the necessary skills or training in fish farming management as only 28.3% of the respondents were full time farmers. The

remaining were part time farmers who had other livelihood means including retired and serving civil servants, trading and artisans. Household sizes were fairly small with a mean of 5.0±3.0 members. The small size of households could adversely affect family labour supply to the farm which constitute a key input in small farm enterprises (Oluwasola and Alimi, 2007) Very importantly the mean experience of farmers was 2.42±0.67 years indicating that fish farming still very new in the region. The sizes of the fish dams were small with an average size of 0.53±0.32 ha. About 64.20% owned the land on which the fish ponds were constructed while the remaining leased or rented the land. The main source of water used by most of the farmers (85.5%) was streams as they operated earthen ponds. This implies that they have to depend on nature and vagaries in weather as in prolonged dry seasons as well as pollution of water sources in their upstreams could bring great loss to the enterprise.

Table 2: Socio-Economic Characteristics of Respondents

Variable	Frequency	Standard Deviation
Mean age (years)	43.63	12.61
Gender (male)	83.20 %	
Mean level of education (years)	9.62	6.33
Mean household Size	5.0	3.0
Mean fish farming experience (years)	2.42	0.67
Mean farm size (ha)	0.53	0.32
Number that owned their land	64.20%	
Main source of water: (streams)	85.5%	
Occupational status: Primary	28.3%	

Source: Field survey, 2013

Effect of Inputs on Fish Production

Table 3 shows the private and social prices of fish as well as that of the major inputs used by the fish farmers. The private parity price of fish was ₦102.38/kg which implies that a kilogram of fish must not sell less than this amount for fish farmers to recoup all costs incurred in producing the commodity in Osun State and for them to make minimal profit during the production period. The market value for a kilogram of unsubsidized imported fish sold for between ₦480 and ₦500 (Issa *et. al*., 2014). This clearly shows that farmers could take advantage of the very high prices to invest and increase the output of fish in the study area. In addition, Table 3 also shows that the social price of fish was ₦104.62 which implies that a kilogram of fish produced locally using available human and non-human resources will increase national income by ₦104.38.

Table 3: Private and Social Prices for Fish and the Major Inputs

Item	Private Price	Social Price
Fish (₦/Kg)	102.38	104.62
Fingerlings	17.50	17.50
Feed (₦/Kg)	206.19	210.98
Fertilizer (₦/kg)	66.29	67.72
Labour (₦/manhour)	75.96	75.96

Source: Calculated from field data, 2013

Fish feed, fingerlings, fertilizer and labour were the main inputs used by fish farmers. Only fertilizer was subsidized by the government. Fingerlings were sourced by the farmers from the open market where they could not get supplies from the State Agricultural Development Programme. The private price of feed was ₦206.19/kg implying that a kilogram of feed should not be sold (purchased by farmers) above ₦206.19/kg if farmers are to make gains after meeting cost of production. As at the time of survey, the market price for the input was about ₦208 (BusinessNews, 2013). This is a major disincentive for attracting investors into the fish farming business except the cost of imported feed is subsidized. This calls for policy action to be put in place to increase the local production of quality fish feed to reduce the cost of production. The social price of feed was ₦210.98 which implies that a kilogram of fish feed used within the accounting period will reduce national income by ₦210.98. The private price of fertilizer of ₦66.29/kg indicates that a kilogram of fertilizer should not be sold in the market or purchased by fish farmers for more than ₦66.29 if farmers are to break even while the social price of ₦67.72 implies that a kilogram of fertilizer used within the accounting period will depress national income by that amount. However, the official price of subsidized fertilizer was ₦5,000 for a 50kg (Ajani, 2012) which translates to ₦100/kg. The private and social cost of fingerlings were equal at ₦17.50. The private price indicates that a kilogram of fingerlings should not be sold for more than ₦17.50 if the farmer is to make profit while the social price indicates that a kilogram of fingerlings used in the fish farm enterprise will contribute ₦17.50 to national income. Finally, the private cost of labour of ₦75.96/manhour indicates that farmers should not hire labour for more than ₦76/ manhour (₦456/ manday) if the fish farm enterprise is to be profitable. In the study area however, cost of hiring an adult male was about ₦166/manhour or ₦1,000/manday. The social price of ₦75.96 indicates that each labour employed to produce fish will contribute ₦75.96 to national income. The price of these inputs were by far costlier than could be profitably utilized by the farmers which is a major reason why in spite of policy efforts to encourage Nigerians to invest in fish farming business to produce enough fish to meet domestic demand, very little has been achieved.

Table 4 shows the fish farm budget. The table reveals that the total value of 1,525.75kg of fish produced from the total ponds measuring 985.48m^2 at a unit price of ₦102.38/kg as indicated earlier was ₦156,206.29 while the estimated social value of the same quantity was ₦159,623.97 at a social price of

₦104.62/kg. In addition, the total market costs of all inputs excluding land was ₦76,868.40 which comprised of ₦27,789.49 tradable inputs and ₦49,078.91 non-tradable inputs. The net profit realised after subtracting the market value of all fish outputs from the market value of all input costs was ₦79,337.89. In the second block, a total social benefit to society was ₦82,425.45 while the social cost was ₦77,198.52 made up of ₦23,277.72 tradable and ₦53,921.80 non-tradable components. The net social benefit of ₦5,226.93 was the worth of benefits enjoyed by the society by engaging in fish farming.

Table 5 shows the policy analysis matrix of fish farming in Osun State and is extracted from Table 3. The first row the revenue, tradable value of the total cost, non-tradable value of the total cost, and profit measured in private prices. The figures were respectively ₦156,206.29, ₦27,789.49, ₦49,078.91 and ₦79,337.89. In the second row are the social values of the same parameters and are respectively ₦159,623.97, ₦23,277.72, ₦53,921.80 and ₦82,425.45 while in the third row are figures indicating differences recorded between the private and social values of the elements of the first two rows and which are respectively - ₦3,417.65, ₦4,511.77, -₦4,842.89 and - ₦3,087.56. The differences implied that there were market distortions. The estimated coefficients of indicators calculated from the Table shows that the NPC was 0.979 implying that the farmers were implicitly taxed on the product while the NPI was 1.194 indicating that the farmers were taxed in purchasing the tradable inputs. The EPC, which relates the net effect of the policies on inputs and outputs, was 0.942, indicating that the fish development policy measures resulted in a net dis-incentive to produce the commodity Consequently, the policy measures put in place have not encouraged farmers to invest more in fish production in anticipation of high returns.

Table 5: A PAM of upland fish in Osun State, South-western Nigeria

Accounts	Revenue	Tradable Input Cost	Non-tradable Input Cost	Profit
Private Value	156,206.29	27,789.49	49,078.91	79,337.89
Social Value	159,623.97	23,277.72	53,921.80	82,425.45
Divergence	-3,417.65	4,511.77	-4,842.89	-3,087.56

Source: Osun upland fish farm budget, 2013

$$NPC = \frac{156{,}206.29}{159{,}623.97} = 0.979$$

$$NPI = \frac{27{,}789.49}{23{,}277.72} = 1.194$$

$$EPC = \frac{128{,}416.80}{1136{,}346.25} = 0.942$$

Conclusion and Recommendation

The government of Nigeria has put in place several policy measures especially in the area of accessing fish farmers to major inputs to enhance production to bridge the demand gap. This has been informed by the enormous potentials existing in the fish production sub-sector. Results from this study have shown that the current fish farmers were in the productive age, educated, had small households and operated small fish farms. Most of the farmers were also part time farmers and as many as 76.9% used water from streams. key inputs like fish feed and lime did not enjoy any subsidy resulting in very high cost. The result of the Policy Analysis Matrix shows that there exist significant economic opportunities for increasing the output of fish or investing in the enterprise in the study area as the private parity price (i.e. the breakeven point of production) of fish of ₦102.38 was just about twenty percent of the market price of imported fish which cost between ₦480 and ₦500. Selling the fish products at the ongoing market rate will thus bring high profit to fish farmers. Clearly, fish farming offers ample opportunities for increasing fish output to bridge the demand gap. Hence, policy measures that can attract younger and enterprising farmers into the fish farm business will be a right step as it will further create employment to the teeming youths who are currently unemployed. Although government planned providing free and/or subsidized inputs (especially fingerlings), the costs of the inputs were by far higher than the levels at which farmers could profitably use them. This could be the reason why in spite of government efforts to promote fish farming, response from the investing public have been very marginal. There is thus the need for government to ensure that its policies are properly implemented and targeted to ensure that fish farmers get the inputs. Policy measures aimed at establishing fish feed industries should be accelerated to reduce the cost of feed which is the major component of the variable cost of fish farming. Local research efforts aimed at domesticating high quality fish inputs should be encouraged.

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Table 4: FARM BUDGET SHOWING REVENUES, COSTS AND PROFITS OF RICE PER HECTARE IN SOUTHWESTERN NIGERIA, 2011

	ACCOUNTS	UNITS	PRIVATE VALUES						SOCIAL VALUES					
			PRICE ₦	VALUE ₦	TR SHARE	NTR SHARE	TRV ₦	NTRV ₦	PRICE ₦	VALUE ₦	TR SHARE	NTR SHARE	TRV ₦	NTRV ₦
I.	Revenue a/c													
	Output (kg)	1525.75	102.38	156,206.29	–	–	–	–	104.62	159,623.97	–	–	–	–
II.	Cost a/c													
	A material inputs													
	(i) Fertilizer (kg)	33.56	66.29	2,224.69	0.752	0.248	1,672.97	551.72	67.72	2,272.68	0.817	0.183	1,856.78	415.90
	(ii)Fingerlings	1,653	17.5	28,934.67	0.694	0.306	20,080.66	8,854.01	17.5	28,934.67	0.520	0.480	15,046.03	13,888.64
	(iii) Feed (Kg)	58.90	206.19	12,144.59	0.497	0.503	6,035.86	6,108.73	210.98	12,426.72	0.513	0.487	6,374.91	6,051.81
	B. Labour (mhr)	441.87	75.96	33,564.45	0.00	1.00	0.00	33,564.45	75.96	33,564.45	0.00	1.00	0.00	33,564.45
	C. Land	–	–	–	–	–	–	–	–	–	–	–	–	–
	D. Total cost			76,868.40			27,789.49	49,078.91		77,198.52			23,277.72	53,921.80
III.	Profit a/c (₦/ha)			79,337.89						82,425.45				

Source: Data analysis, 2013.