Full Length Research Paper

Socio-economic and policy issues determining sustainable fish farming In Nigeria

Oluwasola Oluwemimo* and Ajayi Damilola

Department of Agricultural Economics, Faculty of Agriculture, Obafemi Awolowo University, Ile- Ife, Osun State, Nigeria.

A major agricultural sub-sector where achieving food security has become elusive in Nigeria is the fish production subsector. Demand for fish in Nigeria stands at about 1.5 million metric tonnes per annum while domestic production is just 511,700 metric tonnes. The nation spends about ₦150 billion (US$1billion) annually to bridge the gap between supply and demand. Consequently, several policy measures have been put in place to stimulate local fish farming. Till date, the results from the colossal investment and policy have not yielded the desired results. Hence, this study attempted to examine the factors determining the sustainability of fish farming in Nigeria with a view to stimulating private investment in the sector, meet national market demand through domestic production and export the excess to enhance the income of farmers. Regression and budgetary analyses were used to analyze data obtained from 100 fish farmers in ten local government areas of Osun State. The result showed that the average net income in the study area was ₦318,640.75 while the gross margin was ₦457,327.95. The benefit-cost ratio was 1.5 indicating that for every ₦100 invested, the enterprise yields additional ₦50. The regression analysis showed that experience of farmers in fish farming, quantity of feed used, access to credit and size of pond were significant determinants of fish farm production in Nigeria. Major challenges confronting fish farming in the study area are lack of access to credit, high cost of inputs and poor extension services.

Key words: Fish farming, inland waters, nutrition, employment, poverty, sustainable, pond.

INTRODUCTION

In spite of her enormous oil wealth, Nigeria is confronted with a number of developmental challenges especially in the areas of reducing poverty which currently stands at nearly 75% of its population; providing jobs for her teeming unemployed youths, estimated at about 39.9 million going by an unemployment rate of 23.9% (Business Day, 2012); and meeting adequate nutritive requirement of its 167 million people. A key agricultural subsector where government efforts have been directed to solve these three challenges in one fell swoop is through the promotion of fish farming where the nation has huge untapped potentials. The major compelling factor for the development of the sector is the huge domestic market with an existing demand of about 1.5

million metric tonnes per annum. Incidentally, domestic fish catch which comes mostly from artisanal sources with its dwindling fortunes (Ojo and Fagbenro, 2004) is just 511,700 metric tonnes leaving a wide gap of 988,300 metric tons that could possibly be bridged through fish farming.

FAO (2005b) pointed out that Nigeria with extensive mangrove ecosystem should be able to achieve sufficient and sustainable fish output to meet domestic demand. Nigeria has over 14 million hectares of inland water surface out of which 1.7 million are available and suitable for aquaculture (FAO, 2006b). According to Tobor (1990), there are about 1.75 million hectares of suitable land for fish farming in Nigeria and 25% of this will yield 656,820 tonnes of fish per year when placed under cultivation. Shimang (2005) reiterates this point further when he pointed out that Nigeria has a vast network of inland waters like rivers, floodplains, natural and man-made lakes totaling about 12.5 million hectares and capable of

---

*Corresponding author. E-mail: oluwemimo_oluwasola@yahoo.com. Tel: 234-(0)803-727-4784

producing 512,000 metric tonnes of fish annually. Similarly, Welcome (1979) reported that there are about 1.5 million hectares of floodplains and swampland in the Niger Delta hydro-ecological zone which are suitable for fish farming and can produce about 60,000 metric tonnes of fish per year. Furthermore, about 6,450 tonnes of fish can be produced annually from 75,000 hectares of coastal lagoons (Kapetsky, 1981).

Fish farming has the potential to help expand the resource base for food production and reduce the pressure on conventional sources of fish which are harvested faster than they can be regenerated. For developing countries like Nigeria where the economy is largely agrarian, fish farming can generate significant employment, enhance the socio-economic status of the farmer as well as generate foreign exchange. As observed by Davies (2005), the involvement of small scale aquaculture projects in the towns and villages will create employment and thereby alleviate poverty among youths. With dwindling food production, degrading agricultural environment, widespread poverty and insecurity in Africa, fish farming, even at the backyard provides the poor and hungry with a low cost and readily available strategy to increase food production using less land per caput, and less water without further damage to the environment (Pretty et al., 2003).

Fish farming also has enormous potentials of improving the nutritional standard of the masses of the people. The average protein intake in Nigeria is about 19.38 grams/caput/day which is far below the FAO requirement of 75 g/caput/day (FAO, 1995). Fish contains higher percentage of protein than meat and is important for its high nutritive value and significance in improving human health. Fish farming is uniquely placed to reverse the declines in supplies experienced from capture fisheries and has notable potentials for new livelihood opportunities, providing mechanism for lower priced fish, enhanced nutritional security and employment for poor communities (Jagger and Pender, 2001).

Recognizing the benefits of fish farming and the existing potentials, the government of Nigeria has shown its interest through setting up various national 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). Part of the plan of government is to distribute fingerlings to small scale fish farmers free while large scale farmers will be subsidized up to 50% of the cost (FMAWR, 2008). This is in addition to sensitizing Nigerians to the various methods of fish farming. Interests in fish farming have increased over the years as a result of the awareness of its importance both to the household to increase protein in-take and to the national economy to reverse the ₦150 billion (US$1billion) spent annually to import the product. In Nigeria however, fish

farming is predominantly an extensive land based system practiced majorly at small scale subsistent level (Anyawu-Akeredolu, 2005). Large scale commercial fish farming is yet to become widespread with most fish farmers operating small scale fish farm enterprises ranging from homestead concrete ponds (25 to 40 m) to small earthen ponds (0.02 to 0.2 ha) (Fagbenro, 2005). In spite of the growing interests shown by the government and the private sector, the gap between the demand of fish in Nigeria (1.3 million metric tonnes annually) and the supply of fish from domestic production (about 0.45 metric tonnes annually) has continue to widen (FAO, 2000). Hence, this study examines the effect of policy as well as the socio-economic factors determining the profitability of fish farming in the study area.

METHODOLOGY

Sampling procedure and data collection

This study was carried out in Osun State located in the Southwestern part of Nigeria. The selection of Osun State was purposive as the state government is embarking on a massive promotion of fish farming to complement the Federal Government goals of poverty reduction, employment generation and ensuring improved nutrition among the populace. The location of the state within the rainforest belt of the western uplands provides it with adequate rainfall to feed into the several rivers and streams in the region (Agboola, 1979). Osun State covers an area of approximately 14,875 km^2 and lies between longitude 4 and 5° E and latitude 7 and 8°N. Although the economy is largely agriculture based, the state is also one of the fastest urbanizing areas of the nation making the region to be subjected to intense deforestation, unplanned cities and pollution of the rivulets through poor sanitation and waste disposal. In addition, its location on the western uplands with steep sloping ridges and hills makes the land susceptible to erosion and degradation.

Multistage sampling technique was used to select respondents for this study. Ten of the thirty Local Government Areas (LGAs) were randomly selected for this study. These were Ife Cenral, Ife East, Ife North, Osogbo, Ilesa,West, Ede South, Olorunda, Ejigbo, Irepodun and Egbedore LGAs. The lists of fish farmers in the selected LGAs were obtained from the zonal office of the Osun State Agricultural Development Programme (OSADEP) from which a random sample of 10 fish farmers in each LGA was made. In all, a sample of 100 farmers was selected for this study. Data were collected from respondents with the aid of pre-tested structured questionnaire.

Data analysis

Data collected were analyzed using descriptive statistics, budgetary analysis and the multiple regression model. Descriptive statistics, including frequency counts, means and percentages were used to describe the socio-economic characteristics (age, family size, farm size) of selected fish farmers in the study area. Budgetary analysis was employed to estimate costs and returns to fish farm enterprises using the gross margin as stated in Equation (1):

$$\pi_i = P_i Q_i - TCi \qquad (1)$$

Where, π_i = net revenue from enterprise (₦); P_i = price per unit

of fish produced (₦); Q_i = fish output (Kg); TCi = total costs of production (fixed cost {FC} plus variable cost {VC}) (₦)

Variable costs (VC) included in the analysis were expenditures on labour, seedlings, fertilizers, agrochemicals and transportation. Items that could be used for more than a production cycle were classified as fixed costs (FC). These included cutlasses, sprayers and farm-bans.

Finally, the multiple regression model was used to estimate the socio-economic factors determining the profitability in fish production in the study area. The model was specified as:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \beta_9 \ln X_9 + \mu_i \qquad (2)$$

where, Y = total farm income (₦); X_1 = age of farmer (years); X_2 = experience of farmers (years); X_3 = family size; X_4 = educational level of respondents (years); X_5 = quantity of feed used (kg); X_6 = amount of credit accessed by farmers (₦); x_7 = cost of fingerlings (₦); X_8 = pond capacity (number of fingerlings stocked); X_9 = wage paid to labour (₦); ln = the natural logarithm; βi = the regression coefficients; $β_0$ = intercept; μi = error term.

A priori expectations was for X_2, X_4, X_5, X_6, and X_8 to be positively correlated with farm income (Y) while X_1, X_7 and X_9 to be negatively correlated. X_3 could be either positively or negatively correlated depending on whether the family is a production or consumption unit.

RESULTS AND DISCUSSION

Socio-economic distribution of fish farmers

As shown in Table 1, 60% of the fish farmers were less than or just 40 years of age while another 20% aged between 41 and 50 years. The remaining 20 percent were over 50 years. The mean age of fish farmers was 38.9 years with a standard deviation of 12.4 years. Unlike conventional crop farming where the farmers are mostly over 50 years in age (Oluwasola and Alimi, 2007; Ayanwale and Oluwasola, 2008), these set of farmers were very young and in their prime age for production. The young age of the respondents should, all things being equal have positive impacts on enterprise size, earnings, and the ability to take risks and adopt modern innovation which they perceive to be capable of yielding higher incomes. Sixty seven percent of the farmers were married, 30% were single while only 3% were widowed. The table further shows that family sizes were very small with 78% of the farmers having between 1 and 5 members while average family size was only 3.8 members. Traditional agriculture tend to have large household sizes (Oluwasola and Alimi, 2007; Aihonsu, 2002) because labour is the most significant resource input and could be scarce at very critical periods.

However, in small scale farm enterprises, the family size is sufficient to sustainably manage the business. The fish farmers had very high level of education as 66% of them attended tertiary (post-secondary educational) institutions. This high level of education will enable farmers to understand the technical requirements of fish

farming as well as make use of innovations and new techniques of fish management, access credit as well as comprehend policy measures put in place to ensure socio-economic and environmental sustainability of fish farming. In addition to fish farming, all the farmers had other occupations like civil service, artisans and trading which they practiced alongside fish farming. While this will enable farmers to earn incomes from other sources which they could invest in the enterprise, it has the disadvantage of keeping fish farming at small scale.

In the study area, fish farming is a recent phenomenon as 83% have just being involved only in the last five years. Fourteen have been farming for between 6 and 10 years while the remaining 3% have been involved for more than 10 years. The mean experience of fish farming in this study area was 3.6 years. The hard economic realities that has affected living standards of middle income earners (as nearly 70% of Nigerians live below the poverty line of US$1 per day) and increasing population as well as improved education that has led to increased demand for fish products have given impetus to government policy drive to develop the fisheries subsector to reduce the huge resources used in importing the product. The socio-economic characteristics of the fish farmers found in this study in terms of age, family size, experience and gender are quite similar to studies carried out in Ekiti and Oyo States (Oluwatayo et al., 2010).

Fish farming process

In Table 2, 93% of the respondents depended on earthen ponds which are dug along water courses. This implies that since they have no control at water points at the upstream sections of their ponds, they will be subjected to problems of externalities in terms of deposition of solid wastes and sanitation along water channels which could be harmful to the fishing enterprises. In addition, vagaries in climate and security from poaching constitute major challenges especially since all the fish farmers have other means of livelihood that takes them away from the ponds during the day. Nine percent used concrete ponds while 2% used tanks. Most of the fish farmers operated on small scale although on commercial basis. About 56% had a pond size that did not exceed 2,000 m^2; 8% operated a pond size of between 2,001 and 4,000 m^2, while 10 and 16% operated pond sizes between 4,001 and 6,000 m^2 and 6,001 and 8,000 m^2 respectively. Only 7% had a pond size of more than 10,000 m^2. The average pond size operated in the study area was 4,760.2 m^2 which indicates that farmers were mainly small holder operators. This is not unexpected since all of them had other means of livelihood. A major factor that could affect the sustainability of the fish farming enterprises is the tenural arrangement through which the farmers came to use the land.

Twenty percent inherited the land while 55% purchased

Table 1. Socio-economic characteristics of fish farmers.

Socio-economic characteristics	Frequency	Percentage	Cummulative percentage	Mean values
Age of respondents (years)				
≤ 20	4	4.0	4.0	
21 - 30	30	30.0	34.0	
31 - 40	26	26.0	60.0	38.9
41 - 50	20	20.0	80.0	
51 - 60	16	16.0	96.0	
>60	4	4.0	100.0	
Marital status				
single	30	30.0	30.0	
married	67	67.0	97.0	
widowed	3	3.0	100.0	
Family size of respondents				
1 - 5	78	78.0	78.0	
6 - 10	21	99.0	99.0	3.8
11 - 15	1	1.0	100.0	
Educational status of respondents				
Completed primary school	2	2.0	2.0	
Did not complete secondary school	4	4.0	6.0	
Completed secondary school	28	28.0	34.0	
Completed tertiary education	66	66.0	100.0	
Experience in fish farming (years)				
≤ 5	83	83.0	83.0	
6 – 10	14	14.0	97.0	3.6
>10 y	3	3.0	100.0	

Source; Field survey, 2011

the land. While another 20% rented the land, the remaining 5% received the land as gifts from their friends.Clearly, 80% of the farmers had tenure over the land. This in turn could affect the quantum of investment that would be put in place to ensure that income is realized from the enterprise in perpetuity. Kay (1988) posits that such investments will require cash expenditures which can only yield returns in the long term. Since they own the land, it is expected that the farmers will be able to adopt long term planning horizons that will ensure increased output on a sustainable basis. The remaining 20% will not enjoy this advantage. Lack of tenure will not encourage them to make investments that have long term horizons hence, externalities like pollution, theft and dispute over land in use could bring operations to a halt. Table 2 shows that about 55% of the respondent farmers operated only 1 pond, 22% had 2 ponds while 11% had 3 ponds. The remaining had more. On the average, each farmer owned 1.45 ponds. However, not all the ponds were fully utilized. About 67%

of the farmers operated only one plot, 25% stocked two ponds while only 3% stocked 5 ponds. The mean pond stocked in this study area was 1.17. The stocking capacity of the ponds further emphasizes the scale of operation of the fish farmers. 76% of them had a pond capacity of just about 2,000 fingerlings, some had less. 21% had between 2,001 and 4,000 while just 3% could stock between 4,001 and 6,000 fingerlings. The mean stocking capacity of the ponds was 1,840.12.

The average age of the fish ponds was 3.9 years with an age range of between 2 and 15 years. In fact the age of 77% of the ponds was less than 5 years indicating that fish farming is still in its infancy in the area. Eight percent of the fish farmers were involved in hatchery to produce fingerlings for other farmers while 4% produced brood stock used for breeding. The remaining 88% produced table sized fish for the market. From the field survey, 92% of the fish farmers obtained their fingerlings from private sources while the other 8% who produced fingerlings also serviced their farms. In the drive of government to fast

Table 2. Fish farm operating processes.

Farm processes	Frequency	Percentage	Cumulative percent	Mean values
Pond type				
Earthen pond	93	93.0	93.0	
Concrete pond	5	5.0	98.0	-
Tank	2	2.0	100.0	
Distribution of respondents by fish-farm size (m^2)				
≤ 2,000	56	56.0	56.0	
2,001 - 4,000	8	8.0	64.0	
4,001 - 6,000	10	10.0	74.0	4,760.2
6,001 - 8,000	16	16.0	90.0	
8,001 - 10,000	3	3.0	93.0	
>10,000	7	7.0	100.0	
Method of land acquisition				
Inheritance	20	20.0	20.0	
Purchase	55	55.0	75.0	
Rent/Lease	20	20.0	95.0	
Gift	5	5.0	100.0	
Number of ponds owned by farmers				
1	55	55.0	55.0	1.45
2	22	22.0	77.0	
3	11	11.0	88.0	
4	6	6.0	94.0	
5	3	3.0	97.0	
6	1	1.0	98.0	
7	1	1.0	99.0	
8	1	1.0	100.0	
Number of ponds stocked by farmers				
1	67	67.0	67.0	
2	25	25.0	92.0	
3	4	4.0	96.0	1.17
4	1	1.0	97.0	
5	3	3.0	100.0	
Pond stocking capacity	76	76.0	76.0	
≤ 2,000 fingerlings				1,840.12
2,001 - 4,000 fingerlings	21	21.0	97.0	
2,000 - 6,000 fingerlings	3	3.0	100.0	
Fish varieties farmed				
Clarias gariepimus	70	70.0	70.0	
Heteroclarias	29	29.0	99.0	
Dutch	1	1.0	100.0	

Source: Field survey 2011

track fish production in the state, the state owned Agricultural Development Programme (ADP) was saddled with the responsibility of supplying viable fingerlings to farmers. It appears that there is no linkage between the

Table 3. Problems encountered in fish farming.

Problem	Frequency	Percentage
Lack of access to credit	100	100.0
High cost of inputs	100	100.0
Poor extension services	78	78.0
Predators	49	49.0
Pollution of water sources	46	46.0
Unviable/insufficient fingerlings	42	42.0
Climatic uncertainties	40	40.0
Land acquisition problems	32	32.0

Source: Field survey, 2011.

farmers and this government institution. While the private sources are most likely to be costlier, the viability of the fingerlings could also be questionable. Main fish farmed is the cat fish varieties including *Clarias gariepimus* (705), *Heteroclarias (*29%) and *Dutch* spp. (15). These farmers produced for the local market as cat fish is much of a local delicacy.

The fishing environment

Only 5% of the farmers had enough resources to practice intensive fish farming. The remaining 95% practiced semi-intensive farming. The latter group of farmers who practiced semi-intensive farming will depend more on nature for their production processes. While nine percent depended on ground water sources through wells and bore holes to supply the much needed water to the fish ponds, 91% depended mainly on perennial streams. As shown in Table 3, the major challenges confronting all the fish farmers were lack of access to credit and high cost of inputs like feed and fingerlings. There were few sources of fingerlings and other inputs which raises production cost. If the farm business is to be economically viable, fish farmers must be accessed to viable, efficient and cheaper input sources. In addition, none of the farmers was able to access credit from the commercial and/or specialized banks. At between 17 and 19% interest rate (CIA, 2012), it becomes uneconomic to access loans from commercial banks. Incidentally, subsidized credit from specialized banks did not get to the farmers. Another 78% of the farmers faced the challenge of poor extension services which deprived them expert advice in the area of pond construction, maintenance and manage-ment. 49% complained about the problem of predators disturbing their ponds while 46% were affected by pollution from upstream. 42% complained of inadequate supply of fingerlings as well as the viability of the ones they got from private sources while 40% were adversely affected by shortage of water resulting from climatic variability. Finally, 32% complained of the problems of acquiring land for their enterprise.

Policy environment of fish farming

About 66% of the respondents claimed to be aware of the policies put in place by government to enhance fish farming in Nigeria while 34% said they were not aware of any policy. Major policy strategies of government that was known was the plan of government to provide free inputs especially fingerlings (and the sale of other inputs like nets, hooks and twine through the Nigrian Agriculture, Cooperatives and Rural Development Bank (NACRDB).(FMAWR, 2008). Of those who claimed to be aware, only 2 of them claimed to have benefitted from these policy measures in terms of credit. The remaining 64 claimed not to have benefitted from any of policy strategies of government. Clearly, the capacity of policy makers to implement strategies to achieve the goal of increasing fish output have been wrongly targeted if indeed it was implemented.

Costs and returns to fish farming enterprises

Table 4 shows that the average variable cost was ₦480, 755.55, constituting about 78% of the total cost of production while the fixed cost was just ₦138, 687 of the total ₦610, 442.55 incurred on production. The average revenue of farmers was ₦938, 083.30 given an average net revenue of ₦318, 640.75. This gives a monthly income of ₦26, 553.40 which is higher than the ₦19, 000 (US$126.67) national minimum wage. The gross margin to enterprise was also ₦457, 327.75, indicating the enterprise was able to recover all variable costs during the production period.

As shown in Table 4, the expense – structure ratio indicates that for every ₦100 spent on fish farming, only ₦22 was spent on fixed inputs while ₦78 went on variable inputs. This suggests that the farmers can easily adjust to market conditions since expenditures on variable inputs constitute a very high proportion of total cost of production. However, it also implies that oscillations in the market price of variable inputs could highly impact the gross margin obtained. Policies that will lead to a reduction in the costs of these inputs will reduce cost of production, increase net returns and make the enterprise attractive to potential fish farmers. Again, the financial ratio shows clearly that the level of capitalization is very low in fish farming in the country. The Cost-Benefit ratio of 1.51 also reveals that fish farming is profitable as every ₦100 invested yields a net return of ₦51 while the Rate of Return on investment of 0.51 (51%) suggests that fish farming is profitable as this was much higher than the rate of interest of between 17 and 19% prevailing at the time of the study (CIA, 2012). This implies that even if credit funds are used to operate the farm business, returns from sales of farm produce were sufficient to pay back   the loan and still return substantial profits to operators. Thus existing credit policies should target fish farmers to transform their enterprises to medium sized

Table 4. Analysis of costs and returns to fish farming

Item	Amount (₦)
Total income	938,083.30
Total variable costs	(480,755.55)
Gross margin	457,327.75
Total fixed costs	(138,687.00)
Total Cost	(619,442.55)
Net revenue	318,640.75
Expense-Structure Ratio	0.22
Benefit-Cost Ratio (TR/TC)	1.51
Rate of Return	0.51

Source: Field Survey (2012).

Table 5. Determinants of income in fish farming enterprises.

Variable	Coefficients	t-Value
Intercept	6.083	0.000
X_1 = age of farmers (years)	0.120	0.110
X_2 = experience of farmers (years)	0.165	0.024**
X_3 = family size	0.053	0.460
X_4 = educational level of respondents (years)	-0.008	0.902
X_5 = quantity of feed used	0.613	0.000*
X_6 = amount of credit accessed by farmers (₦)	0.125	0.066***
X_7 = cost of fingerlings (₦)	-0.024	0.754
X_8 = pond capacity (number of fingerlings stocked)	0.194	0.070***
X_9 = wage paid to labour (₦)	0.029	0.731

$\bar{R}^2$ = 0.766, F-ratio = 21.780, *significant at 1%, **significant at 5%, and ***significant at 10%.

farms for enhanced fish production.

Determinants of the profitability of fish farming

The multiple regression estimates revealed that the model provided a good fit with a significant adjusted coefficient of determination ($\bar{R}^2$) of 0.766 indicating that the variation in income from fish farming enterprises is explained by the variables specified in the model. As shown in Table 5, experience of respondents in fish farming (X_2), quantity of feed used (X_5), amount of credit funds accessed by farmers (X_6), and the capacity of the fish ponds in terms of the number of fingerlings stocked(X_8) were significant determinants of income in fish farming enterprises. A unit increase in the experience by 16.5%. This underscores the importance of experience, whether acquired by the number of years the

farmer has been involved in the business or through training programmes on the profitable management of fish farming enterprises. A unit increase in the quantity of feed used will also increase income by 63.1%. Hence, the quantity and quality of feed fed to the fish is very critical to the size of the fish at harvest and as such to the income realizable to the farmer. Access to loan also shows that a unit increase in this variable will increase income by 12.5%. Finally, a unit increase in pond capacity will increase farm income by 19.4%.

Conclusion

Fish farming is a major strategy of government to reduce poverty, generate employment for the teeming unemployed and meet the nutritional needs of the Nigerian people. The interest hinges on the enormous potentials available in the country and the benefits that the subsector could generate for both the farming household and the economy in general. This study revealed that fish farming is a recent phenomenon attracting younger and well educated farmers. Earthen ponds were mostly used, making the system susceptible to pollution from upstream sections of stream channels and poaching. Key challenges confronting fish farming include lack of access to credit, high cost of inputs and poor extension services. It was also clear that policy measures aimed at enhancing fish farming were not targeted at the relevant farmers.

Although fish farming was profitable, the level of capitalization was very low. Key factors determining the profitability of the enterprise included experience of farmers in managing the enterprise, quality of feed used, access to credit and the capacity of the ponds. Policy efforts should thus be directed at reducing the cost of inputs especially feed and fingerlings, accessing farmers to credit to enhance farm capitalization and improving feed quality. Policy measures directed at the subsector should properly target actual fish farmers while extension agents should reach out to the fish farmers.

REFERENCES

Agboola SA (1979). An Agricultural Atlas of Nigeria". Oxford University Press, Ibadan. p 32.

Aihonsu JOY (2002) Comparative Economic Analysis of Upland and Swamp Rice Production systems in Ogun State Nigeria". Unpublished PhD thesis submitted to the Department of Agricultural Economics, Obafemi Awolowo University, and Ile-Ife. p. 206.

Ayanwale AB, Oluwasola O (2008). Socioeconomic Determinants of Upland Rice Production in Osun State, Nigeria. Ife J. Agric. Forthcoming.

Anyawu-Akeredolu B (2005). Urban Aquaculture in Nigeria. World Society Annual Report. www.was.org/meetings/abstractdata.

Business Day (2012) Lagos Nigeria http://www.businessdayonline.com Friday March 30, 2012

Central Intelligence Agency (CIA) (2012) World Fact B66ook, January 9, 2012.

Davies RM (2005). Sustainable fish supply through intensive fish

farming for Nigeria's teeming population. A paper presented at a one-day workshop on intensive fish farming, 24th February. p. 8.

Fagbenro OA (2005). Evaluation of Cotton seed cake as fish feed and pond fertilizer in the production of non-cichild fishes. J. Appl. Fisher Hydrobiol. 3:9-14

FAO (1995). *Yearbook Production.* Rome: FAO. p. 45.

FAO (2000). Year Book. Fisheries statistics, FAO publication.

FAO (2005a). Nutritional Benefit of Fish. www.fao.org/docip//68. Retrieved, 11.11.2006.

FAO (2005b). Small Scale Aquaculture in Sub-Saharan Africa. Revisiting the Aquaculture Target Group Paradigm. Rome: FAO Fisheries.

FAO (2006b) Fisheries Management in the Federal Republic of Nigeria. www.fao.org/fi/fep/en/NGA/body.

Federal Ministry of Agriculture and Water Resources (FMAWR) (2008) National Food Security Programme, Federal Government of Nigeria, Abuja.

Jagger P, Pender J (2001) Markets, Marketing and Production_ Issues for Aquaculture in East Africa: The Case of Uganda.ICIARM Quart 24:42-51

Kapetsky JM (1981). Some Consideration for the Management of Coastal Lagoon and Estuarine Fisheries. FAO Technical. p. 218.

Kay RD (1988) Farm Management: Planning, Control and Implementation. McGraw Hills, International Edition.

Ojo SO, Fagbenro OA (2004). Poverty Reduction Strategy in Nigeria – Improving Productivity and Technical Efficiency in Aitisanal Fisheries in Niger Delta Region. Paper presented at the 12th Bi-annual conference of the International Institute of Fisheries, Economics and Trade (IIFET), Tokyo, Japan.

Oluwasola O, Alimi T (2007). Financial Intermediation in Agriculture in Nigeria: Emerging Role of Non-Governmental Organizations (NGOs). Agrosearch. A J. Agric. Food Develop. 9(1&2):43-51 http://www.ajol.info/agrosearch.

Pretty JN, Morison JIL, Hine RE (2003). Reducing Food Poverty by Increasing Agriculture Sustainability in Developing Countries. Agric. Ecosyst. Environ. 95:217–234.

Shimang GN (2005) Fisheries Development in Nigeria: Problems and Prospects. Paper presented at the Homestead Fish Farming Training for Serving and Retired Public Servants, Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria.

Tobor JG (1990). The Fish Industry in Nigeria: Status and Potential for Self-sufficiency in Fish Production. *NIOMR* Technical 54:34.

Welcome RI (1979). The Inland Fisheries of Africa. *CIFA* Occasional 7:77.