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Influence of Personal and Institutional Factors on Adoption of improved pond management practices among fish farmers in Isoko Local Government Area, Delta State

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Abstract

This paper sought to determine personal and institutional factors influencing adoption rate of improved pond management practices among fish farmers in Isoko South Local Government Area of Delta State. Structured interview schedule was used in collecting data from eighty-four fish farmers randomly selected from the area. Percentages and double logarithmic regression were used for statistical analysis. The results showed that primary occupation being fish farming, level of educational attainment and availability of inputs had positive influence on respondents' adoption of improved pond management practices. However, majority of the respondents were involved in fish farming on a secondary basis. These findings suggest that there is an urgent need to organize programmes to motivate farmers to invest more in fish farming if they are to adopt these practices and keep apace with human population growth in the country.

Keywords: Adoption, pond management, fish farmers, personal and Institutional factors.

Introduction

Fresh water and marine fishes are very important food resources for most countries of the world (especially developing countries with large rivers and coastline), providing up to 180 calories per caput per day and contributing approximately 5% of the total protein in human diet worldwide (Food and Agricultural Organization (FAO) of the United Nations, 2000). Across the world trans-boundary water pollution has led to degradation of aquatic life ecosystem leading to the realization that resources of the sea and other natural water bodies are not unlimited (Revenga and Mock, 2000; Faturoti, 1999). In other words, the world decline of ocean fisheries stocks has provided impetus for rapid growth of aquaculture, a cheaper and more reliable method of fish production (Naylor *et al.*, 2000; Directorate for Food, Road & Rural Infrastructure, 1988). Hence, contrary to the leveling in production from capture fisheries, aquaculture is expanding rapidly especially in the developing world and many governments have included aquaculture in development goals (Samaki News, 2003).

Fish contains 15.24% protein that is easily digestible and contains essential amino acids and 0.1-20% fat content (Clucas and Ward, 1996). The fats (and oil) of fish have been reported to contain unsaturated fatty acid, which reduces blood cholesterol hence their recommendation in diets of patients with coronary heart disease (FAO, 1994). They have been found to contain fat-soluble vitamins (A and D) and negligible carbohydrate (Potter and Hotchkiss, 1995). Oil extracted from fish is used for manufacturing paints, candles, soap and for medical purpose while the meal obtained after oil extraction is an excellent source of crude protein for animal feed production containing about 63.1% protein (Alison-Oguru, 1995; Aduku, 1993).

According to FAO (2002) in all countries of the world, except China, (the biggest producer), aquaculture's contribution to per capita has grown from 0.5kg in 1970 to 1.8kg in 2000 (4.5% per year), while in China, it has contributed 11% growing from 1kg in 1970 to 11kg in 2000. Naylor *et al.* (2000) further stated that as the world population continues to expand beyond six billion, its reliance on farmed fish production, as an important source of protein will continue to increase.

In Nigeria, about 600,000km^2 and 400,000km^2 of potential area for subsistence and commercial fish farming respectively have been identified (FAO, 1994). Central Bank of Nigeria (1994) and Federal Office of Statistics (1997) estimated total domestic fisheries production from 1990 to 1996 at 315,000; 343,000; 343,000; 338,642; 251,275; 273,276; 200,170 tonnes respectively. Until recently, aquaculture development has primarily social objectives of nutrition improvement in rural areas, generation of supplementary income, diversification of income activities and creation of employment. However, in recent years aquaculture has been viewed as an activity likely to meet national shortfalls in fish supply to reduce fish imports (Andre *et al.*, 1994).

To boost fish production through fish farming in Delta State of Nigeria, several pond management practices were developed and disseminated by the Delta State Agricultural Development Programme (DTADP) under the fishery sub-programme to fish farmers to ensure maximum productivity (Ajieh, 2004). These include such technologies as fertilization, supplementary feeding, liming, weed control, stocking density, water quality control and fish health management, among others, which are necessary to ensure maximum productivity of fish farms. The pertinent questions therefore include: To what extent do farmers make use of these technologies and what are the personal and institutional factors influencing their decision to use or not to use these practices? This study therefore sought to determine the influence of personal and institutional factors on adoption behaviours of fish farmers in Isoko South Local Government Area of Delta State with high potential for aquaculture development.

Specifically this study was designed to:

1. describe the socio-economic characteristics of the fish farmers in the area;
2. determine the extent of adoption of improved pond management practices among the farmers and
3. determine the influence of some personal characteristics and institutional factors on adoption of improved pond management practices

Materials and Methods

The study was conducted in Isoko South Local Government Area (LGA) of Delta State, well known for fish farming. The LGA like all other parts of the Niger Delta Area of Nigeria has a humid subequatorial climate with long wet

season lasting from March to October and a shorter dry season lasting from November to February with an annual rainfall of about 2,800mm (Aweto, 2002). The vegetation of the areas is mainly deciduous and evergreen forest with scanty mangrove forest. Apart from the main occupation of farming and fishing, the area is also one of the oil producing areas of the state and is made up of ten (10) communities namely: Aviara, Emede, Enwhe, Erowah, Igbide, Irri, Oleh, Olomoro, Umeh and Uzere.

Six communities namely Avaira, Igbide, Irri, Oleh, Olomoro and Uzere well known for fish farming in the LGA were purposively selected for this study. Specifically, fifteen (15) fish farmers from each of the community were selected through simple random sampling technique making a total of 90 fish farmers for the study. However, 84 respondents fully participated in the study and their responses were used for the statistical analysis. A structured interview schedule was used to collect the relevant information from the respondents.

Measurement of Variables

In order to determine the socio-economic characteristics of the fish farmers, questions were asked with respect to age, fish farming experience, primary occupation and years of schooling as well as institutional factors such as source of credit, extension agents visits per year and availability of farm inputs. To determine the level of adoption of improved pond management practices, improved practices were listed out and respondents were asked to indicate their adoption stages for the various practices using the seven steps (not aware, aware, interest, evaluation, trial, adoption and rejection) adoption model with values of 0, 1, 2, 3, 4, 5 and 6, respectively (Agwu, 2000).

Percentage was used to describe the socio-economic characteristics of fish farmers and the adoption level of improved pond management practices. Regression analysis, using the double logarithm transformation was used to determine the influence of some personal characteristics (age, primary occupation, fish farming experience and years of schooling) and institutional factors (source of credit, extension agents' visit per year and availability of inputs) on adoption of improved pond management practices. Adoption level of each respondent was measured as a percentage of the nineteen (19) pond management practices disseminated. Rejection with the value of 6 was later changed to zero such that unaware and rejected were scored as zero while awareness to adoption was given values of 1 to 5. Respondent's score for each practice were added and measured as a ratio of complete adoption (19 x 5 = 95). This ratio was converted to percentage to get the adoption rate with values ranging from 0-100%. This was used as the dependent variable. The predictors were age, fish farming experience, years of schooling, primary occupation, and source of credit, availability of inputs and extension visit per year. Primary occupation, source of credit and availability of inputs were dummy variables. Dummy variables were ascribed the values of 2 and 1 instead of the conventional 1 and 0 so as to fit them into the regression model since log 0 is undefined.

The model for adoption rate (AR) is as follows:

AR = f(AGE, PRIOCC, FFEXP, YRSCH, SOUCR, AVINPUTS, and EXTVISIT)

AGE = Age measured in years; PRIOCC = Primary occupation, a dummy variable with values 2 if fish farming and 1 otherwise; YRSCH = Years of schooling measured in number of years spent in

school; SOUCR = Source of credit, a dummy variable with values 2 if formal source and 1 otherwise; AVINPUTS = Availability of inputs (agrochemicals, fingerlings and supplementary feed), a dummy variable with values 2 if available and 1 otherwise; ENTVISIT = Extension agents visit per year measured in number of visits received from extension agents in the past one year.

The beta (β) is the estimated change in the dependent variable for a unit change in the standardized value of the jth predictor and 100 (β) is the estimated percentage change in the dependent variable for a unit change in the standardized value of the jth predictor.

Results and Discussion

Personal Characteristics of Farmers

Sex

The data in Table 1 show that 95.24% of the respondents were males, while 4.76% were females. This indicates that fish farming is predominantly a male occupation in the area. This supports Andre *et al.* (1994) who reported that in Africa, fish farming is an activity taken up by male farmers. However field observations showed that the women folks were more involved in the processing and marketing of fish.

Age

The data in Table 1 reveal that majority (26.19%) of the respondents were within the age bracket of 30-39 years, while 25% were between 20-29

Table 1: Percentage distribution of respondents by personal characteristics (n = 84).

Personal characteristics	Percentage	Mea
Sex		
Male	95.24	
Female	4.76	
Age		
20-29 years	25.00	
30-39 years	26.19	
40-49 years	25.00	38.9
50-59 years	17.86	
60-69 years	5.95	
Academic Qualification		
None	1.19	
Primary School Leaving Certificate	13.10	
West Africa Examination Certificate	34.52	
Diploma/OND/NCE	19.05	
HND/First Degree	28.57	
Higher Degree (PGD and M.Sc)	3.57	
Fish Farming Experience		
1-10 years	78.57	
11-20 years	13.09	8.36
21-30 years	5.95	
Primary Occupation		
Fish Farming	32.14	
Civil Service	25.00	
Farming	22.62	
Trading	17.86	
Fishing	2.38	

years and 40-49 years respectively. About 18% were between 50-59 years. However, 5.95% of the respondents were 60 years or above. The average age of the respondents was 38.89 years indicating that most of the respondents were young and able-bodied men. This is an indication that fish farming is gaining importance among the youths. Belloncle (1985) in his analysis of age as a factor in the adoption of innovation by farmers reported that elderly farmers seemed to be less inclined to adopt new farm practices than younger ones. Hence portraying a brighter future for fish farming in the area, as young farmers are more inclined to adopt innovative practices.

Academic Qualification

As shown in Table 1, 34.52% of the respondents had the West African Examination Certificate while 28.57% had Higher National Diploma or First Degree Certificate. About 13% had Primary School Leaving Certificate while 19.05% had Ordinary National Diploma Certificate or National Certificate of Education and 3.57% had Higher Degree Certificate such as PGD and M.Sc. Only 1.19% had no formal education. This show that majority (51.19%) of the respondents had post-secondary school education indicating a high degree of literacy among them. Ayeni (1995) also reported that about 50% of the fish farmers in Nigeria have a university degree.

Fish Farming Experience

The data in Table 1 also show that the fish farming experience of the respondents ranges from 1-30 years with a mean of 8.36 years. However, majority (78.57%) of the respondents had between 1-10 years experience in fish farming. This indicates that though fish farming has been practiced for up to 35 years in the area, its prospect as a lucrative enterprise started gaining recognition in the past ten years. Andre *et al* (1994) reported that until recent years, fish farming has not been viewed as an activity likely to meet national shortfalls in fish supply but as an activity with primarily social objectives of nutrition improvement in rural areas.

Primary Occupation

Table 1 further show that 32.14% of the respondents were primarily engaged in fish farming while 25% were civil servants. Other primary occupations engaged in by respondents were farming (22.62%), trading (17.86%) and fishing (2.38%). This indicates that most (67.86%) of the respondents were involved in fish farming on secondary basis. Andre *et al.* (1994) had earlier stated that fish farming is basically a secondary part-time activity in sub-Saharan Africa.

Institutional Factors

Extension Agents Visit per Year

The data in Table 2 also show that most (72.62%) of the respondents had no contact with extension agents, while 22.62% were visited 1-4 times by extension agents. About 1% was visited 5-9 times while 3.57% were visited 10 times or more in the past one-year. This shows that extension agents were not visiting the fish farmers adequately implying inefficiency of the Agricultural Development Programme (ADP) and Shell Petroleum Development Corporation (SPDC) extension systems within the area. The Federal Ministry of Agriculture (1996) reported that fisheries extension in Nigeria is relatively inadequate when compared with other sub-sectors of agriculture. However, according to Asiabaka *et al.* (2001), technical assistance is one of the factors necessary for adoption of new technologies. Institutional inefficiencies in the development and delivery of relevant information as well as assistance from national extension

systems are often major reasons why farmers do not adopt farming innovations.

Sources of Credit

Table 2 also reveals that majority (88.09%) of the respondents sourced their credit from personal savings and farm income while 2.38% sourced credit from friends and relatives. Only 25% of the respondents sourced credit as loans from co-operative societies. However, none of the fish farmers claimed to have received credit from either the community or commercial banks, which are prevalent in the area. This indicates that formal sources of credit are hardly available to respondents supporting United States Agency for International Development (USAID, 2000) report that informal sources provide bulk of the agricultural credit in Nigeria due to the low access to formal credit. The implication of this is lack of capital to invest in large-scale production, which is necessary if fish farmers are to adopt new technologies. Unfortunately, the resource level of the fish farmers in the area can hardly be said to be enough for any meaningful large-scale production. This will lead to persistent small-scale production, which is detrimental in a society where natural fish supply is declining and fish farming is expected to bridge the gap.

Availability of Inputs

The data in Table 2 further reveal that inputs such as agrochemicals, fingerlings and supplementary feed were available to 70.24% of the respondents while 29.76% had no access to inputs. This indicates that inputs are available to most of the fish farmers in the area. Availability of inputs is a major prerequisite to large-scale commercial production. This implies that if farmers are encouraged to increase production, inputs will be available to sustain the increased production. This also implies that acquisition of inputs rather than its availability may be the problem facing fish farmers in the area.

Table 2: Percentage distribution of respondents by institutional factors (n = 84).

Socio-economic Characteristics	%
Extension Agents Visit Per Year	
Zero	72.62
1-4	22.62
5-9	1.19
10 and above	3.57
Source of Credit*	
Personal Saving and Farm Income	88.09
Loans from Co-operatives	25.00
Friends and Relatives	2.38
Availability of Inputs	
Available (agrochemicals, fingerlings and supplementary feed)	70.24
Unavailable (agrochemicals, fingerlings and supplementary feed)	29.26

**Multiple responses*

Extent of Adoption of Improved Pond Management Practices

Entries in Table 3 show the different stages of adoption of improved pond management practices of the respondents. The result shows that cleaning and drying of pond after cropping had the highest adoption (54.76%). This was followed by clearing of pond banks (53.37%). Other pond management practices with relative high adoption among respondents include: constant checking of pond water level (52.38%); repair of leaks and cracks on ponds (52.38%) and filling of pond with water at least two weeks before stocking (50.00%). This shows that farmers have adopted practices that require no input and hence involve less cost. Moreover, these practices can be accomplished by family labour.

About forty-nine percent of the respondents had adopted fertilization of ponds while 47.62 percent and 46.43 percent had adopted bund/ embankment maintenance and supplementary feeding respectively. Also, about 43 percent of the respondents had respectively adopted the following practices: liming, monitoring of pond water quality, and acclimatization of fingerlings to pond water before stocking, checking of fish performance and construction of separate water channels to and from ponds. Furthermore, only

Table 3: Percentage distribution of respondents by stages of adoption of improved pond management practices (n = 84)

Improved Management Practices	Unaware	Aware	Interest	Evaluation	Trail	Adopted	Rejected	Total
Fertilization	5.95	26.19	3.57	2.38	11.9	48.81	1.19	100
Supplementary feeding	2.38	26.19	10.71	5.95	7.14	46.43	1.19	100
Liming	8.33	20.24	16.67	5.95	3.57	42.86	2.38	100
Weed control	23.81	27.38	14.29	5.95	5.95	19.05	3.57	100
Monitoring of water quality	11.9	26.19	9.52	3.57	5.95	42.86	-	100
Checking of pond fertility	21.43	20.24	11.9	1.19	8.33	35.71	1.19	100
Giving of supplementary feed on a spot always	15.48	23.81	10.71	3.57	7.14	33.33	5.95	100
Acclimatization of fingerlings before stocking	15.48	21.43	9.52	2.38	5.95	42.86	2.38	100
Routine check on fish performance	8.33	23.81	7.14	7.14	9.52	42.86	1.19	100
Constant checking of pond water level	7.14	15.48	13.10	5.95	5.95	52.38	-	100
Fish health management	21.43	23.81	15.48	8.33	5.95	23.81	1.19	100
Cleaning of water pipes	25.00	26.19	11.9	5.95	3.59	26.19	1.19	100
Clearing of pond banks	4.76	25.00	8.33	5.95	2.38	53.57	-	100
Repair of leaks and cracks on pond	2.38	21.43	11.90	5.95	5.95	52.38	-	100
Cleaning and drying of pond after cropping	2.38	23.81	11.90	-	4.76	54.76	2.38	100
Construction of compost fences in ponds	30.95	28.57	13.10	5.95	5.95	9.52	5.95	100
Bund/embankment maintenance	8.33	19.05	10.71	9.52	2.38	47.62	2.38	100
Construction of separate water channels to and from ponds	8.33	19.05	11.90	3.57	8.33	42.86	5.95	100
Filling of ponds at least two weeks before stocking	7.14	22.62	13.11	2.38	4.76	50.00	-	100

35.71 percent of them had adopted checking of pond fertility while as low as 33.33 percent gave supplementary feed on a spot always.

Pond management practices with relative high unawareness level among respondents include: construction of compost fences in ponds (30.95%), cleaning of water pipes (25%), weed control (23.81%) and fish health management (21.43%). Therefore, there is a challenge for the ADP and SPDC extension systems in the area to ensure contact with farmers in order to create awareness of these practices among the fish farmers.

Influence of some Personal and Institutional Factors on Adoption of Improved Pond Management Practices

To ascertain the influence of some personal characteristics and institutional factors on adoption of improved pond management practices, regression analysis using the double logarithm transformation was used. Table 4 shows that only three (3) predictors namely, primary occupation, years of schooling and availability of inputs had significant influence on respondents' adoption rate of fish farming practices (P value = 0.017, 0.026 and 0.200). This implies that a respondent being involved in fish farming primarily compared to a respondent being involved in fish farming on a secondary basis increases adoption rate by 29%. This may be due to a higher investment in fish farming by those engaged in it primarily since more time is allocated to it. Moreover, being primarily a fish farmer means fish farming is the main source of livelihood therefore the farmer will seek to improve the productivity of his fish farm thereby adopting improved practices that will boost productivity and increase income from the farm. El-Osta and Morehart (1994) in their study identified specialization as important factor increasing likelihood of adopting capital-intensive technologies among dairy farmers.

In addition, the result shows that an increase in a respondent's level of education evident in the number of years spent in school boost adoption rate by 24.8%. This maybe attributed to easy acquisition of information on improved practices due to interactions as a result of acquiring higher educational status. Moreover, it was observed that majority of the respondents with post-secondary school education specialized in Fisheries or General Agriculture. The implication of this is that the higher the educational status

Table 4: The distribution co-efficient for the prediction of fish farmers' adoption rate of improved fish farming practices using double logarithm regression

Variables	B co-efficient	t-value	Sig P-value	Â Beta
AGE	0.0901	0.321	0.749	0.045
PRIOCC	0.5330	2.453	0.017	0.290
FFEXP	-0.0681	-0.674	0.502	-0.087
YRSCH	0.4030	2.272	0.026	0.248
EXTVISIT	-0.2120	-1.617	0.110	-0.179
SOUCR	-0.0164	-0.080	0.937	-0.008
AVINPUTS	0.4930	2.378	0.020	0.265
Constant	1.0450	2.319	0.023	

R^2 = 0.269, $\bar{R}^2$ = 0.198, SE = 0.2311, F = 3.781, P = 0.05*

The equation for the double logarithm regression is given below: log AR = 1.045 + 0.0901 log AGE + 0.5330 log PRIOCC - 0.0681 log FFEXP + 0.4030 log YRSCH - 0.2120 log EXTVISIT - 0.0164 log SOUCR + 0.4930 log AVINPUTS

of a fish farmer, the higher the adoption rate. Asiabaka and Owens (2002), Agwu (2000), El-Osta and Morehart (1994) and Feder (1985) reported that education had a positive influence on farmers' adoption behaviour.

The result also shows that availability of inputs increase adoption rate of pond management practices by 26.5%. This may be due to non-scarcity of inputs needed to use the practices. Uwakah et al. (1980) in Offiah (1998) reported that availability of farm inputs was associated with farmers' response to Operation Feed the Nation (OFN) programme in Imo and Anambra States of Nigeria. This implies that being involved in fish farming as a primary occupation, higher education and availability of inputs will increase the adoption of pond management practices.

The result also shows that though fish farming experience, extension visit, source of credit had a negative influence and age a positive influence on adoption rate of respondents, their influences were too negligible and therefore not significant However, Sule et al; (2002) reported that extension contact and age were positively related to adoption of fishing innovations.

Conclusion

The findings of this study show that fish farmers' decision to use improved pond management practices is influenced by their primary occupation being fish farming, the level of educational attainment and availability of inputs necessary to carryout the practice. Though most of the respondents were literate and inputs were available to them, majority were involved in fish farming on secondary basis. This suggests that there is urgent need to organize programmes, which will motivate farmers to invest more in fish farming.

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