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Determinants of Adoption of Improved Fish Production Technologies among Fish Farmer in Delta States, Nigeria

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Abstract: This study was conducted to isolate the determinants of improved fish production technologies in Delta State, Nigeria. Data were collected from a sample population of 250 fish farmers from 10 randomly selected Local Government Areas of Delta State. Data were elicited from structured interview schedule while descriptive statistics and multiple regression analysis were used to analyze the data. The recommended fish farming technologies at different stages of adoption process were p^H testing and regulation, testing of dissolved oxygen level, feed formulation, polyculture, practices integrated fish/poultry or rice farming, re-circulation method, cage system, spawning and stocking density. The grand mean adoption score and adoption index are 0.96 and 0.19, respectively. The low level of adoption was attributed to cost of the technologies, their complexities and lack of extension contact. Level of education age, of farmers, farm size, farm income and extension contact were the major determinants of fish production technologies adoption at 0.05 level of significance.

Key words: Determinants, adoption, improved, fish, production, technologies, fish farmers, delta states, Nigeria

INTRODUCTION

There is a steady rise in human population in Nigeria and this has not been matched by the corresponding increase in food production (Ekokotu and Ekeldemu, 1999). According to Akagbejo (1997) while human population growth is rising at a rate of about 4-5 and livestock production is trailing behind at a rate of 2to 3%. This shows that there is a wide gap between supply and demand of animal protein. The consequences of the sceneries is the soaring cost of animal protein. This has made it almost impossible for the poverty stricken Nigerian to meet their animal protein needs. Thus, the need arises to explore alternative avenues for accessing animal protein as a way of increasing protein consumption. This alternative source could be achieved if farmers could adopt better aquaculture technologies in Delta State in particular and Nigeria in general.

The bulk of the total fish produced in the country accounted for by capture fisheries was 97% Federal Department of Fisheries (FDF) 1995, while culture fisheries contributed a mere 3% of the fish produced in the last decade. There was a gross short fall in fish production compared with the projected mean annual demand figure of 752,297 metric tons (Utomakili, 1987). To close the gap between fish protein supply and demand in Nigeria, suggested a number of options including the development of efficient, rural based, low external input and sustainable small scale fish culture (Ekkotu and Ekelemu, 1999). The easy with which culture fisheries was practiced and the fact that fisher folks also practice integrated fisheries will further improve food availability and protein sustainability in the country. This initiative will arrest food shortage. This reform is also practiced outside Nigeria hence (Gupta, 1990) observe that the economic status of the rural dwellers especially women in Bangladesh, who practice integrated fishery have been considerably improved through small scale fish farming carried out in ditches, ponds, road side canals and borrow pits (Gupta, 1990). In Nigeria, where integrated fishery is being practice by the fisher folks who produce over 65% of the nations food and occupy about 85% of our land mass, the nation's need for food and fibre is adequately met. According to Akinbode (1982) rather than engage in

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direct production, the ADP was designed to stimulate and motivate small-scale farmers to the use of modern techniques of fish farming through farm extension education. The extension services has a vital role of increasing and improving fish production through their linkage between researchers and end-users. Without extension services most research endeavour will be a futile exercise (Adebolu and Ikotun, 2001). The adoption level of modern fish management, methods, is an index of the success of extension delivery service.

Ofuoku *et al.* (2005) observed that the farmer's decision for or against the adoption of any sciences-base production technology was described as a mental process, consisting of several stages. Such activity will provide firm knowledge on which action could be based, with regard to persuading farmers to try the new technologies to provide the information necessary for actual implementationand provide information needed to assess results of decisions and hopefully to confirm it.

The available culture fish production technologies include improved breeds, stocking density, polyculture fishery integration feed formulation among others. There is need to advice reasons why fish farmers do not adopt these technologies and to find out what the determinants of the adoption of improved fish production technologies are this could be of help to agricultural extension programme planners. This is particularly so as studies have shown that the people involved in the adoption of innovations are not passive elements. They have choices over the technologies they adopt (Adebayo *et al.*, 2003). It is therefore hypothesized that the socio-economic characteristics of the farmers do not significantly influence their adoption of improved fish farming technology.

MATERIALS AND METHODS

This study was carried out in Delta State. The state is divided into three agricultural zones namely: North, central and south agricultural zones with their zonal offices located in Agbor, Effurun and Warri respectively Delta South. It consists of 25 local government areas. The multi-stage random sampling techniques was applied in the selection of respondents. Ten local government areas were randomly selected from the pool of 25 local government areas Farmers were then selected randomly from a list of farmers in each of the local government areas under the study. This list was provided by Delta state Agricultural Programmes (DTADP) extension agents in each of the local government areas selected. This gave a total number of 250 respondent fish farmers.

Data were collected by using structured interview schedule for the fish farmers: in addition, the services of agricultural science teachers in the local government areas of study was employed. The collected data were analyzed using descriptive statistics percentages and means; and multiple regression analysis. The determinants adoptes were classified into low (0 -4 years technologies) medium (4-6 technologies) and high above 6 technologies). The adoption levels which formed the dependent variable was determined by computing the number of the technologies adopted by the fish farmers in the area of study. The adoption index was arrived at by dividing the overall mean adoption score by the number of adoption stages.

The multiple regression model is implicitly specified as follows:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, U)$

Where

- Y = Level of adoption of improved fish farming technologies (Number of technologies adopted).
- X_1 = Level of education (years spend in school)
- X_2 = Age of farmers (years)
- X_3 = Farm size (population of fish)
- X_4 = Household size (number of persons in the household)
- X_5 = Farm income (Naira)
- X_6 = Extension contact (Number of visits by extension agents)
- U = Error term

The level of significance used was 0.05

RESULTS AND DISCUSSION

Level of adoption of improved fish farming technologies: The level of adoption of the identified (10) recommended technologies among the fish farmers were by computing the adoption scores and adoption index. The scores were arranged in descending order for all innovations. Fish farmers were classified into low, medium and high level adopters. The group of the low adopters were fish farmers who adopted between 0 to 4 of the ten fish farming technologies, medium adopters were those who adopted between 4 to 6 while high adopters were these who adopted above 6 fish production technologies (Table 1) The computation revealed that 74% of the farmers

Table 1: Percentage distribution of fish farmers with respect to fish farming technologies adoption score

Adoption scores of fish production technologies	Frequency	(%)
Low (1-4)	185	74.00
Medium (4-6)	46	18.40
High (>6)	19	7.60
Total	250	100.00

Source: Field survey, 2006

Table 2: Percentage distribution of fish farmers according to adoption decision process

Adoption stage	Uses of improved breeds of fish Holland Charias	p^H testing and reaction	Testing of 0_2 level regulation	Feeding formulation	Polyculture Practices	Int. fish poultry or rice farming	Recirculation method	Cage System	Spawning	Stocking density
Awareness	80.30	32.40	56.00	91.20	74.30	39.60	46.30	75.60	38.40	80.20
Interest	44.60	24.50	43.00	63.40	60.30	62.00	24.00	60.50	47.00	48.30
Evaluation	64.80	41.00	44.30	68.30	61.35	46.20	12.40	66.10	41.60	33.20
Trial	62.30	41.30	46.20	56.10	54.11	51.30	10.40	54.80	62.30	44.50
Use	58.90	23.20	18.10	7.20	45.80	14.00	7.20	46.70	23.40	30.20
Total	310.90	162.40	207.60	350.20	295.86	213.10	100.30	303.70	212.70	236.40
Mean adoption score	1.24	0.65	0.83	1.40	1.18	0.85	0.40	1.22	0.85	0.95

The overall mean (grand mean) adoption score = 0.96, Adoption index = 0.919, Source: Field Survey, 2006

adopted 0-4 technologies, 18.40% adopted between 4 to 6 technologies while only 7.60% of the respondents farmers adopted more than 6 technologies.

The result of this Table 1 revealed that the adoption level was low generally since 74% of the respondents fell under the low adoption category.

The results of further analysis (Table 2) raveled that 58.9% of the fish farmers were already using some of the improved breeds of fish like Holland Charlas, Clarias and Heteroclarias, etc. Polyculture was being practiced by 45.80% of respondents, while 46.70% adopted the cage system of fish culture. On awareness bases, the Table revealed that over 90% of the respondents formulate their feeds, over 80% culture improved breeds while 75% practice polyculture fishery. The mean adoption score for using improved fish breeds, polyculture and cage system of fish culture was computed as 1.24, 1.18 and 1.22, respectively. The grand mean adoption score was computed as 0.96, while the adoption index was 0.19 Table 1and 2 indicated that the fish farmers are yet to fully adopt most of the. Recommended fish production technologies. Shingi *et al.* (2004) opined that moving diffusion processes were the major challenges to extension services. While 66% of the respondents revealed that the adoption levels were attributed to the cost of the technologies, 56% attested to the scarcity and complexity of the technologies. More than half of the respondents (68%) complained about non availability of extension agents to introduce, teach and demonstrate the technologies. These observation were confirmed by the works of Ofuoku *et al.* (2005) who maintained that lack of extension contact were the most serious problem. Other agricultural innovations that could be adopted if among other factors, the input and output relationships are favourable, ensure that the procurement cost is low, risk of adoption is low success, of the innovation is glaring sooner or later and the innovation simple to handle (Heidhues, 1994).

Determinants of the adoption of fish farming innovations: The hypothesis of this study state that socio economic characteristics of the fish farmers do not determine the adoption of improved fish production technologies. Multiple regression analytical tool using the Ordinary Least Squares (OLS) method was applied.

The linear function was used as the lead equation because its equation indicated goodness of fit considering the quality of its coefficient, R-squared adjusted R-squaredand F-ratio. The parameters of the estimated linear regression model is shown in (Table 3) revealed that the level of formal education (X_1) was positively correlated with t he adoption of improved fish farming technology at 0.05 level of significance. The implication is that educated farmers readily adopt improved fish production technologies. This is in consonance with Ewuola and Ajibefun (2000), Lemchi *et al.* (2003) noted that technological change is achieved through formal education.

The age of the fish farmers (X_2) revealed a negative correlated with adoption at 0.05 level of significance. This implied that the older farmers are unwilling to accept improved technologies, because they are afraid of risks involved with new technologies (Lemchi *et al.*, 2003; Maduakor, 2001). Farm size (X_3) revealed a positive correlation which revealed that fish farmers with large farms more readily improve adopt improved technologies than farmers with small farm sizes. This is where economics of scale in aquacultural production comes in to play.

Farm income (X_5) also revealed a positive correlate. According to Madukwe (1993) wealth and adoption of innovation go hand in hand. This is the reason why even when new technologies are costly to adopt because requires large amount of money initially, the wealthy farmers readily adopt them. The fish farmers who adopted most of the improved technologies were the rich farmers and this was observed in the study area.

Table 3: Linear regression model estimates of the determinants of fish farming technologies

Variables	coefficient	STD. Error	T-value
Constant	0.997	0.320	3.115*
Level of education (X_1)	6.542E $^{-02}$	0.014	4.66*
Age (X_2)	- 1.559E $^{-02}$	0.006	-2.60*
Farm size (X_3)	0.427	0.070	6.10*
Household size (X_4)	-2.386E $^{-02}$	0.015	-1.60
Farm income (X_5)	9.047E $^{-07}$	0.000025	3.648*
Extension contact (X_6)	0.156	0.017	9.176*

R^2 = 0.708, F = 98.287, * = Significance at 0.05 level, Source: Field survey, 2006

Extension contact (X_6) is positively correlated with the adoption of fish farming technologies. This was because the more extension agents visited the fish farmers and educated them on the more recent technologies the better they understand and adopted them. This observation was in agreement with Asiabaka (1996) who reported that the frequency of extension contact influences, the adoption behaviour of farmers.

CONCLUSION

The study revealed that Delta State Agricultural Development Programme (DTADP) had ten recommended fish farming technologies, but the adoption levels were generally low, recording a mean point of 8.53 out of 30 points. The overall or grand mean adoption score was computed as 0.96 while the adoption index was, 0.191. Five variables were discovered to have influenced the adoption level of improved fish production technologies by the farmers and some of the reasons for non-adoption of the improved technologies; were given as scarcity of the technologies; complexity of the technologies and lack of extension contacts.

Level of education, farm size, farm incomeand extension contact were positively correlated with adoption of the fish production technologies, while age was negatively correlated with regards to fish production technologies.

RECOMMENDATIONS

- More fisheries extension agents should be employed by the DTADP.
- Efforts should be made by the government to enhance the standard of living of the fish farmers so as to boost fish production.
- Extension officers should be sent on training from time to time.
- Interest-free loans should be disseminated to fish farmers so that they will be able to expand and by eventually be able to adopt costly innovation.
- Extension agents should increase the frequency of their visit to fish farmers.
- Adult education programmes should be organized for the fish farmers who are not literate.

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