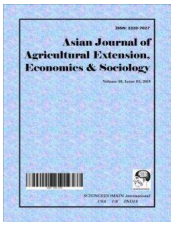

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Analysis of the Constraints to the Adoption of Improved Fish Farming Technologies by Farmers in Yola North and South Local Government Areas of Adamawa State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors BIT and ISU designed and wrote the protocol. Author ISU supervised the work. Author BIT managed the analyses and wrote the first draft of the manuscript. Authors AAG and ISU managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

The study analyzed the constraints to adoption of improved fish farming technologies by fish farmers in Yola North and South Local Government Areas of Adamawa State, Nigeria. Primary data which were obtained through the use of questionnaires and personal interview administered to 98 respondents were used for the study. The study revealed that ten technologies were available for the farmers in the study area. Results on the adoption of the technologies shows that site selection (soil testing) and preservation after harvesting (chilled storage) were the least adopted technologies by 2.0% of the respondents respectively. Pond maintenance and pond stocking with fish based on recommendation were the most widely adopted technologies by 73.5% and 89.8% of

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the respondents' respectively. The result of the correlation analysis revealed a negative relationship at 5% level of significance between constraints and adoption of recommended fish farming technologies. Insufficient funds, high cost of feeds and inadequate extension visits were the major constraints faced by fish farmers in the study area. It is recommended that agricultural credit schemes should be pursued and implemented and supply of quality fish feeds should be facilitated by all stakeholders at the right time and controlled prices. Extension workers should rededicate their efforts towards dissemination of information and visiting farmers' fish farms so as to supervise and advice on the best methods of fish farming.

Keywords: Analysis; adoption; constraints, farmers; fish farming; technology.

1. INTRODUCTION

Fish farming is the breeding and rearing of fish in ponds or any enclosure for direct harvest of the product as reported by Usman [1]. Its production provides employment opportunities to millions of people and serves as a source of foreign exchange earnings to many countries as revealed by Eyo [2]. According to Adebayo [3], it is also an important source of rich protein and provides about 40% of the protein intake for nearly two third of the world's human population. Fish is a good source of vitamins (A, D, E and K) which makes it one of the protective foods for human beings. It is preferred for its lysine, methionine, iron, calcium, iodine, copper, magnesium and phosphorus content which are relatively in greater proportion than in many other foods.

The aquaculture sub sector contributes between 0.5% and 1% to Nigeria's domestic fish production as revealed by Adewuyi, et al. [4]. Adesina [5] observed that the country spends about N125 billion (N220/ US$1) every year on fish importation in order to meet its demand which is estimated at 2.7 million metric tonnes. With the rapid increase in population of the Nigeria, there is huge increase in the demand for animal protein (which is essentially higher in quality than plant protein). The average protein intake in Nigeria which is about 19.38/output/day is low and far below FAO requirement of 65 g/output/day. Adewuyi, et al. [4] further observed that the nutritional requirement is particularly crucial in a developing country like Nigeria where malnutrition and starvation are the major problems faced by millions of rural dwellers. The malnutrition and starvation are an indication of shortage of high quality protein food in the diet of Nigerians. Despite the increase in the major sources of animal protein such as livestock and poultry industries, the problem of protein deficiency still continues unabated. The protein deficiency in diet is equally associated with the inability of fish farming industry to supply the required quantity and quantity of fish. The situation causes poor health, low efficiency, low productivity and poor standard of living. This is the most reason why there should be greater participation in improved fish production so as to not only increase the output but quality as well. Fish specie which is commonly cultured is *Clarias gariepinus.* It is culture because it has the advantage of being smoked to add value when not sale fresh. Most of the consumers preferred smoked *Clarias gariepinus* than other fish species. It also has the advantage growing fast to an average weight of 1.8 kg within 4 months of culture. The fish culture is done in enclosures such as tanks and cement block constructed pond.

Research institutions and the universities have made effort in developing improved technologies so as to increase production to the demand of the country and even export. These technologies are new improved ideas, methods, practices, innovations and inputs which supersede the ones previously in use, it provide the means of achieving a sustainable increase in farm productivity and consequently leading to an improved living standard of the people as stated by Adams [6] But according to Bolorundu, [7] the level of adoption of these technologies by the fish farmers is very low. This is due to the combination of various factors among which are faulty agricultural policies, institutional framework and unfavourable socio-economic environment.

The adoption of new technologies by fish farmers is very important for agricultural development. For quite sometimes, a lot of fishery technologies had been introduced by research institutes, federal and state ministries of agriculture and other related organizations concerned with fishery innovations, but the response of the farmers had been negligible. It has been noted that people do not just adopt a technology because it is available to them. In their submission, Berdgue and Eswbar [8] even when the technologies are available and appropriate,

some constraints tends to exert influence on their decision to adopt or not. For instance agricultural development project and farming skill acquisition centers in the state has for long been assisting fish farmers on how to develop fish farming and to increase production so as to meet the increasing demand of animal protein using the modern recommended fish farming technologies, various training programmes were conducted toward achieving these objectives but less attention is given to assessing their level of adoption and problems faced in production. Thus it becomes necessary to analyze the adoption behavior of farmers with respect to these technologies. The specific objectives of the research were to: assess whether fish farmers adopted the recommended technologies; identify the constraints to adoption of recommended fish farming technologies and ascertain the relationship between the constraints to adoption and the adoption of recommended fish farming technologies.

2. METHODOLOGY

2.1 The Study Area

Yola North and South Local Government Areas were the area of focus in this study. Yola is the headquarters of Adamawa state with a population of 389,854 as reported by the National Population Commission-NPC [9], and with a projected population of about 473,354 based on the growth rate of 2.8% per annum as at 2014. It has a combined total land area of 8,068 km^2 with an altitude of 185.9 meters above sea level. The area is located in the north eastern region of Nigeria, the most backward regions in terms of employment level and standard of living with many household living below US$1/day. It lays between latitude 9° to 12° N of the equator and longitude 11° to 12° E of Greenwich meridian and area lies within the hot climatic guinea savannah zone of Nigeria with distinct dry and rainy seasons and rainy season starting in April and ends in October while dry season commences in November and ends in April. The mean annual rainfall in the area is 759 mm while the mean annual temperature 34.6°C as given by Adebayo [3].

2.2 Source of Data

The data for this study were obtained from primary source through the administration of structured questionnaires and complemented by personal interviews where respondent cannot read or write.

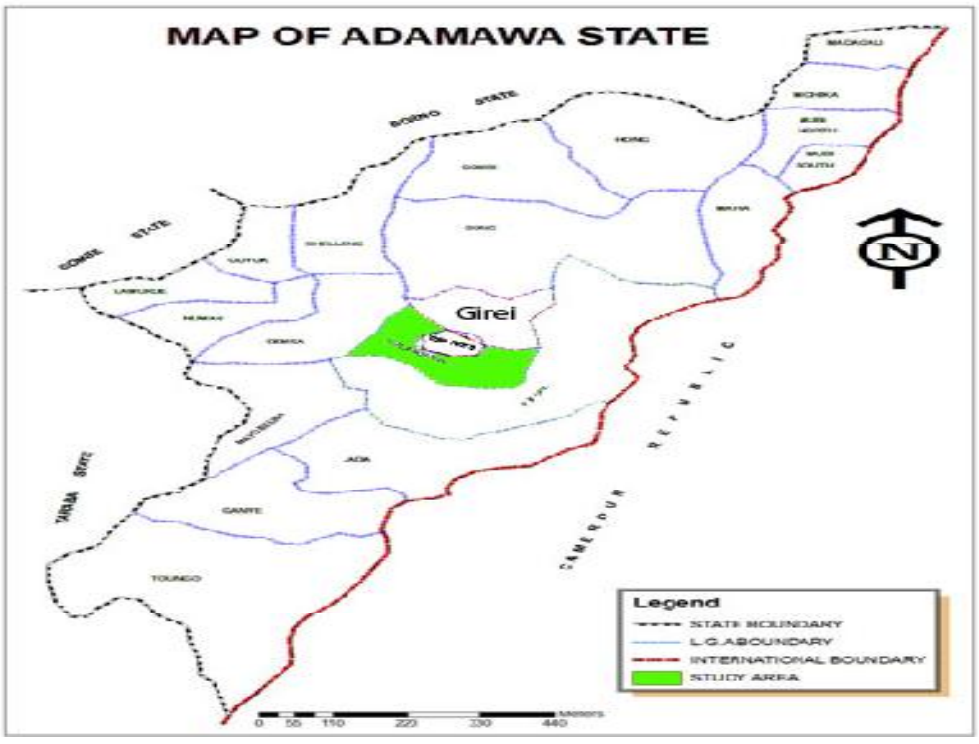

Fig. 1. Map of Adamawa State, Nigeria showing study area

2.3 Sampling Technique

The list of one hundred and fifty registered fish farmers across the two local government areas was obtained from fish farmers association (Yola Fish Farmers Multipurpose Society). From the list, a total of one hundred respondents were randomly selected using ballot methods that were served with questionnaires. However, out the 100 questionnaires served, 98 were found to be valid and used for the study.

2.4 Analytical Tools

The data obtained were analyzed using both descriptive and inferential statistics comprising of frequency and percentages were used in analyzing awareness and adoption of recommended technologies and constraints to the adoption of fish farming technologies. Pearson Product Moment Correlation Analyses was used to analyze the relationship between the constraints to adoption of recommended technologies and adoption of the technologies.

Level of adoption was measured by the percentage number of the total technologies adopted from the package as used by Usman [2].

3. RESULTS AND DISCUSSION

3.1 Awareness and Adoption of Recommended Practices

Ten recommended practices were made available to the farmers to determine their level of awareness and adoption. The first technology from the package is site selection. The technology materials recommended that a proper site should be selected in terms of choosing appropriate topography with perennial source of water, and ensuring good quality of soil through soil analysis. Only 32.7% of the respondents indicated their awareness of selecting suitable site for fish production, out of this 2.0% adopted the practice (Table 1). The adoption of the site selection recommendation was low. This could be because the respondents in the study area practiced artificial pond construction (Tanks, blocks, tarpaulin etc.). According to the respondents there is no need testing soil for artificial ponds not earth. Table 1 also reveals that 91.8% of the respondents were aware of the standard/ recommended dimensions of ponds, but only 40.0% adopted it. This may because fish farming is being practiced houses with limited space. Table 1 further show that 89.8% of the respondents adopted the recommended fingerlings stocking rate. This may be the respondents want maximized profit by marking maximum utilization of space in the pond.

About 55% of the respondents adopted the recommended feeding technique. This could be due high cost of the formulated feeds and sometimes non availability of the feeds in the market and are not easily compounded locally. The result consonance with the findings of Nwachukwu and Onuegbu [10] in a study conducted on adoption of aquaculture technology by fish farmers in Imo state of Nigeria, they reported that feeding and maintenance of the pond were adopted by less than half of the respondents. They went further to report that feeding was always a problem because farmers were not always able to afford the cost of the feed and to devote themselves to required feeding regime. This could be due to sudden change in the price of feed as a result of inflation. Sometimes, the feed would not even be available in the market. Due to the low quality of locally produced fish feed, farmers often depended on imported feed. However, these are more expensive and may be scarce because of import policies.

Thirty three percent (33%) and only 2% adopted the harvesting and processing technologies. The low levels of the adoption of these technologies could be because most of the respondents operate at subsistence level and costs of cool storage equipment high when consider their level of production they preferred selling it directly to consumers during harvest.

3.2 Constraints to the Adoption of Fish Farming Technologies

Generally, fish farming like any other business is faced by many constraints which may include lack of access to information, inadequate funding few research institutes on aquaculture. Result on Table 2 reveals that there are many problems which affect fish farmers hinder adoption of modern fish farming technologies. About 93% of the respondents complained of insufficient fund. As a result of this problem, many farmers cannot afford to buy enough feeds, construct standard ponds or buy land for expansion so as to get maximum benefits of the new technologies. Ofuoku et al. [11] reported a similar findings in a related research conducted on the determinants of adoption of improved fish production technologies among fish fanners in Delta state, Nigeria.

Table 1. Awareness and adoption of recommended practices

Variable	Awareness		Adoption	
	Yes	No	Yes	No
Site selection (Soil testing)	32(32.7)*	66 (67.3)*	2(2.0)*	96 (98.0)*
Pond construction	90(91.8)*	8(8.2)*	40(40.8)*	58(59.2)*
Pond installation	76(77.6)*	22(22.4)*	28(28.6)*	70(71.4)*
Pond preparation	80(81.6)*	18(18.4)*	55(56.1)*	43(43.9)*
Pond stocking	92(93.9)*	6(6.1)*	88(89.8)*	10(10.2)*
Fingerling transportation	96(98.0)*	2(2.0)*	46(46.9)*	52(53.1)*
Fish feeding	97(99.0)*	1(1.0)*	54(55.1)*	44(44.9)*
Pond maintenance	77(78.6)*	21(21.4)*	72(73.5)*	25(25.5)*
Harvesting	98(100.0)*	0(0.0)*	32(32.7)*	66(67.3)*
Preservation	11(11.2)*	87(88.8)*	2(2.0)*	96(98.0)*

*Source: Field Survey, 2014; *Parenthesis indicates percentages*

Table 2. Constraints to the adoption of fish farming technologies

Constraint	Frequency	Percentage
Insufficient fund	91	92.9
High cost of feeds	59	60.2
Inadequate extension visits	78	79.6
Low customer patronage	31	31.6
Lack of credit	83	84.7
Inadequate land for expansion	55	56.1

*Source: field Survey, 2014; * Multiple responds exist*

About 85% of the respondents also revealed that lack of credit was their major constraint to adopting farming technologies. The result is consonance with the findings of Ibrahim and Yahaya [12] in a study conducted in north central Nigeria on women participation in homestead fish farming. Inadequate extension visits was another major constraints faced by fish farmers in adopting the technologies. About 80% of the respondents complained of this constraint, the farmers are in great need for extension workers and services but these are in short supply. The few available ones concentrate more on crop farmers as a result fish farmers are left with lack of or inadequate information of the technology or how to practice the technology. In a study conducted by Donye, et al. [13] on Assessment of Women Participation in Fish Farming in Maiduguri Metropolis, Borno State, Nigeria reported that almost all the respondents complained of inadequate extension visits.

3.3 Result of Correlation Analysis

Result of the correlation analysis in Table 3 shows that, constraints faced by the respondents ($r = -0.209$, $p < 0.05$) was significant but negatively related to the adoption of recommended technologies. This can be interpreted that the more the constraints fish farmers faced towards the adoption of the recommended technologies; the lower the adoption of the technologies.

In a similar research, Kuanyi [14] reported a negative relationship between constraints and to the adoption of fish farming technologies. He went further to report that due to constraints faced by fish farmers in adopting the recommended technologies, most especially feed cost many farmers are becoming discouraged to the complete use of the technology package

Table 3. Result of correlation analysis between constraints and adoption of recommended technologies of fish production

Variable	r-value	p-value
Constraints	-0.209	0.05

Source: Computed from field survey, 2014

4. CONCLUSION

Results from this study showed that the level of adoption of modern fish farming technology in the study area was low due to many constraints that affect the farmers. These among which were insufficient funds, information and high cost of

feeds and inadequate extension visits. Farmers saw technology as a different unit within a component from which to select and adopt only desired practice that they are conformity with situation. It is recommended that agricultural credit schemes be strengthen to provide adequate investible funds and eliminate undue restrictions on small scale fish farmers' access. Supply of fish feeds should be made available by the relevant stakeholders at an affordable prices in addition to training the farmers on community feed formulation to reduce cost. The extension agents should be periodically trained on fish farming technologies and be supported to work closely with the farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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