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Research Paper

Determination of effectiveness of extension approaches and adoption levels of fisheries technologies at Akpabuyo, Cross River State, Nigeria

[1]Ubi, W., [1]Okweche, T.A. and *[2]Ubi, M. W.

[1]School of Science and Technology National Open University of Nigeria, Calabar Study Centre.
[2]Cross River Agricultural Development Programme, Calabar, Cross River State, Nigeria.
*Corresponding author E-mail: martinaubi@yahoo.com

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A study was carried out on the status of fisheries technologies in research and extension systems in Akpabuyo, Cross River State of Nigeria.The four villages in Akpabuyo used for the study were: Ikang, Esigie, Idebe and Iffiang King Duke, using structured questionnaire to obtain information from Farmers and Agricultural Development Programme (ADP). Results of the study showed that the range of awareness and adoption levels of fisheries technologies were 4.0-67.5% and 2.0-55.0% respectively. The farmer's most important sources of information on production recommendations were radio and television which formed the most effective channels of communication to fisher folks (97.5%). Method demonstration was the most popular approach for technology transfer that most farmers at Akpabuyo were familiar with (87.5% fisher folks), and equally was rated as the most effective. However, the major constraints to adoption by farmers include high cost of inputs, insufficient awareness and inadequate interactions with village extension agents. The major problems of ADP were poor funding and poor staffing situation, reflecting in low mobility of field staff, poor job motivation and ill-equipped technology demonstration centres. Improved funding of research and extension agents, promotion of low cost and sustainable technologies and paying more attention to the promotion of non-crop technologies by ADP are some of the recommendations made to address the problems of fisheries extension.

Key words: Extension services, aquaculture, adoption of technology.

INTRODUCTION

The Cross River State fisheries sub-sector of the Ministry of Agriculture and Natural Resources is still bedeviled with low productivity. Although some of the research institutes and Universities in the state have carried out some researches in developing improved technologies to solve the problem of low productivity, yet the levels of adoption of technologies have remained low. The reasons for this were due to a combination of factors like faulty agricultural policies, poor institutional framework, unfavourable socio-economic disposition of producers and distorted consumer preferences (Bilorunduro and Arokoyo,2009).Technology generation and dissemination are important components that would enhance productivity in the sub-sectors. Observations and documented studies indicate that methods of dissemination of fisheries technology especially in the

training and visit extension approach (where the uniqueness of fisheries extension is distinct) had not been very successful. The fisheries sub-sector of the Cross River State economy has been making significant contribution to the protein intake of average Cross Riverian in spite of the problems that are cyclical to the sub-sector over the years (CIMMYT, 2003; NIFFR, 2008). The uniqueness of the sub-sector calls for distinct attention in the area of research extension and development.

Technologies developed to address the problem of low productivity in fisheries on farm trials in Cross River State have remained largely on-self waiting dissemination. These include harvesting technologies for increasing protein output of fish product (LPTTP, 1997). Other factors that have been hindering fisheries technology delivery include the problem of suitable adaptability of on-farm adaptive research (OFAR) and small plot adaptive technology (SPAT) concepts of fisheries; insufficient manpower at the Agricultural Development Project (ADP) for grass roots extension delivery services, unpredictable natural disasters like flood, erosion and run-offs across ecological zones. However, products from "Artisanal" fisheries contribute significantly to the protein intake of Cross Riverians. The introduction of technologies in time past on motorizations of canoe, development of fishing terminals and fish smoking skills improvements, were considered costly to subsistence of fishermen and therefore not sustainable. Fish farming (aquaculture) is still alien to majority of rural farmers and contributes less than 8% of the total domestic fish production.

Despite these constraints fisheries research institutes have packaged on-shelf technologies at on station trials of which only very few have been disseminated resulting in low adoption level of fisheries technologies (NAERLS, 2009). Shelf technologies available to tackle the low productivity problems, include profitable homestead fish pond management, control of production of tilapias, control of common diseases of fish, appropriate species combination and stocking density, development of fast growing species, development of quality feeds, for fast and healthy growth, suitable manure and fertilization procedures; improved smoking kilns, longer shelf life of smoked fish and good fishing methods (NIFFR, 2008; NIOMR, 2006).

Extension however has been facing an uphill task in channeling these technologies properly to the grass-roots due to the peculiarity of fisheries, inadequate manpower, difficulties in adapting fisheries technology transfer like OFAR/SPAT and reluctance of farmers to adopt fish culture technologies due to initial high cost and scarcity of fisheries inputs. The general objective for this work was to investigate the adoption levels of improved technologies fisheries and approaches used in their dissemination. The specific objectives were designed to identify approaches for technologies dissemination and the effectiveness, determine the awareness/adoption levels of the technologies among fisher folk and to identify factors affecting dissemination and adoption of such technologies.

Research has shown that there are no cases of successful development of a major country in which the rise in agricultural productivity did not precede or accompany such development (Abubakar *et al.,* 2009). Reports have also shown that successes of agricultural development programmes in most developing countries largely depend on the nature and extent of use of extension services and mass media for dissemination of technologies to farmers. Researchers in agricultural extension have reported the significance of the use of effective extension dissemination approaches and adaptive levels in meeting farmers needs (Ogunbameru, 2001; Ani, 2007).

According to Ani (2007) radio and television are channels of communication which can expose large number of farmers to the same information at the same time with a short space of time. The use of radio and television, as well as extension agents, research institutes, friends and NGO's are some of the approaches through which technologies are transferred or disseminated to farmers in all the sub-sectors of Agriculture (FAO, 1998).

Extension service organizations use radio and television, extension agents, friends and Non-Governmental Organizations (NGOs) because of the high speed and low cost with which information can be communicated over a wide area. These approaches have been found to be fundamentally useful as sources of initial information to farmers and veritable tools conveying production information technologies to fish farmers and others. Thus, effective approaches required for the communication of new technologies through research findings for farmers at the grass roots remain a promising strategy for increasing agricultural productivity (Banmeke and Olowu, 2005).

In general, production information that are usually disseminated to fish farmers include technologies of soil testing for fish pond maintenance, handling of fingerlings, pond fertilization, harvesting techniques, fish curing and handling, feeding, disease prevention, hygiene, improved smoking kilns and fresh fish quality retention techniques (FAO, 1998, Ani 2007; Egbule and Njoku, 2010). There is also, a problem of widespread non-literate fish farmers, most of whom the use of television and pamphlets are meaningless to them.

In this case the use of small plot adoptive technology, train the trainers method, result demonstrations, and friends, had been found to be very useful in bringing understanding of new technologies to the illiterate fish farmer at the grassroots.

Effective extension approach has been the road-map to relating with farmers on technology transfer and training for improved production, greater economic returns and improved livelihood. This approach is necessary to

increase fish production to meet the high demand by the teeming population. This study therefore is aimed at increasing fish production using improved extension services methods adaptable to the farmers' environment.

METHODOLOGY

Study area

The study area is in Akpabuyo Local Government located in the Southern Cross River State (latitude 05°12° and 04°57'N; longitude 07°15' and 08°28'E). It has a humid tropical climate and rainforest vegetation characterized by high rainfall with distinct wet and dry season. The wet season normally starts from March to late October followed by the dry season from November to late March. The mean annual temperature is 27°C, annual rainfall is 3,775.41 mm and the relative humidity is 82%. Akpabuyo Local Government Area is made up of several communities or villages from where four fishing areas were selected for this study. The areas are: Ikang, Idebe, Esigi and Iffiang King Duke. The study area lies 20 km from Calabar Urban, along Calabar Ikang road and two kilometer from Ikot Nakanda, the headquarters of Akpabuyo Local Government Area (Figure 1).

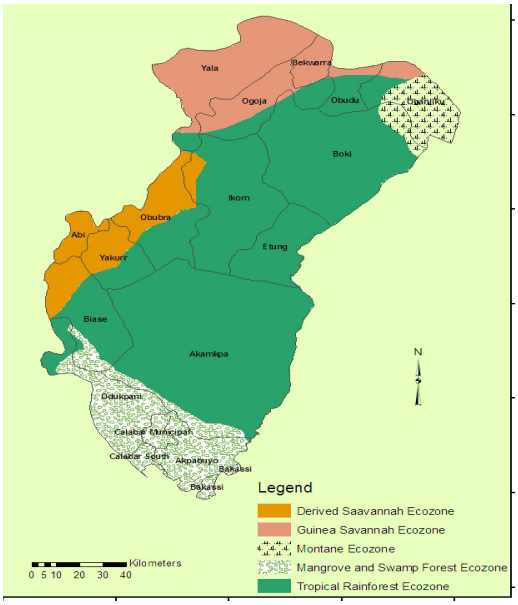

Figure 1. Map of Cross River State showing the study area.

The site was chosen because of the nearness to Calabar where fish is sold and consumed in large quantities. The terrain is relatively undulating being a flood plain with small streams available around the location. There were thirty two questionnaires for the four study areas. Each area was assigned eight questionnaires, randomly assigned to eight respondents for each of the four areas, giving a total of thirty two respondents. A purposive random sampling technique was employed based on the information given by the fishermen. Structured questionnaires were designed for the study. Twenty questionnaires were administered to the people in the four communities while ten were randomly distributed to the fishermen, mainly at the fishing units. Two procedures used to administer the questionnaire were oral interpretation of the questions in the questionnaire to illiterate respondents and self administration by the literate respondents. The technique used in analyzing the data and responses to the questionnaires were descriptive statistics such as tables, frequency counts and percentages. Cash analysis such as gross margin and net return were also employed. Gross margin GM = total value of production. Revenue - variable costs of production. Net return = Gross margin - fixed cost.

RESULTS

Age distribution and educational status of fishermen

Table 1 shows that 46.88 percent of the respondents were between the ages of 40-49 years followed by 25 percent that corresponds to the age of 50 - 60 years. A total of 9.37 percent respondents were over 60 years of age. There were no respondents that were less than 20 years examined in the study areas. The educational status indicates that 43.75% of the fishermen had secondary education, 21.89% tertiary education and 15.61% primary education, a total of 18.75% of respondents had no formal education.

Table 1. Percentage age distribution and educational status of fishermen.

Age group	Frequency	Percentage
<20	0	0.00
21 - 30	2	6.25
31 - 40	4	12.50
41 - 50	15	46.88
51 - 60	8	25.00
>60	3	9.37
Total	32	100
Education		
No formal education	6	18.75
Primary education	5	15.62
Secondary education	14	43.75
Tertiary education	7	21.88
Total	22	100

Gender distribution and marital status of fisher folks

Table 2 reveals that 90.62% of the respondents were male while 9.38% were female and that 96.88% of the respondents were married while 3.12% were single.

Table 2. Percentage gender and marital status of fisher folks.

Gender	Frequency	Percentage
Male	29	90.62
Female	3	9.38
Total	32	100
Single	1	3.12
Married	31	96.88
Total	32	100

Religion of fisher folks

Table 3 indicates that 96.88% of the respondents were Christians while 3.12% were of traditional belief.

Table 3. Percentage of religion of fisher folks.

Religion	Frequency	Percentage
Christian	31	96.88
Traditional	1	3.12
Moslem	0	0.00
Total	32	100

Years of experience in fishing

Table 4 shows years of experience of the fisher folk in which 31.25% of respondents had 21 - 30 years of experience, followed by 11 - 20 years which corresponds to 25%. The least years of experience were 0-10 and 50 - 60 years, which formed 6.25% for each.

Table 4. Years of experience in fishing.

Years of experience	Frequency	Percentage
0-10	2	6.25
10 - 20	8	25.00
21-30	10	31.25
31 - 40	6	18.75
41 - 50	9	12.50
51 - 60	2	6.25
Total	32	100

Structure of fishing industry

The fishing industry is classified into small, medium and large scale fish farmers, based on the number of people engaged and capital investment in production as follows: small scale has less than five employees: medium scale fish farming has more than five employees but less than ten: large scale fish farming: ten employees and above.

Table 5 indicates that majority of the fishing establishments were operating as small scale enterprises accounting for 90.63 percent of the total number with 21 employees. The medium scale fishing enterprise ranked second with 9.37% while .there was no large scale fishing enterprise in the study areas.

Table 5. Percentage distribution of fishing enterprises, showing the scale of production.

Scale	Number of cooperatives	Percentage	Employees/ Establishment	Percentage
Small	29	90.63	21	56. 70
Medium	3	9.37	16	43.24
Large	0	0.00	0	0.00
Total	32	100	37	100

Acquisition of fishing skills

Table 6 shows that most of the enterprises in the small scale fishing operation are family fishing units (75%) which would neither form any partnership nor would welcome any interference from anybody outside their family. This is a very peculiar character of the fishing industry in the study areas. A total of 25% of the producers acquired their skills through formal education. However, the increasing number of fishermen indicates a tendency towards adoption of modern fishing technology that encourages partnership.

Table 6. Percentage of acquisition of fishing skills.

Skill acquisition	Numbers of fishermen	Percentage respondents
Inherited acquisition	24	75
Formal acquisition	8	25
Total	32	100

Organization of fishing business

The sole proprietorship is a business owned by a single individual, who decides on his capital and the extent of his operation without any interference from outside. Table 7 indicated that 71.88% of fishing establishments on the study area were operated under sole ownership due to their cultural orientation,18.75% of operated under partnership while 9.37% operated as family.

Table 7. Percentage of organizational operations.

Ownership	Numbers of Establishments	Percentage
Sole proprietorship	23	71.88
Partnership	6	18.75
Family	3	9.37
Total	32	100

Source of capital

Table 8 indicates that 78.12% of the fisher folks raised their capital from personal saving while 21.88% came from financial institutions. There was no financial aid received from the government.

Table 8. Percentage of source of capital for investment in fishing.

Source	Frequency	Percentage
Financial institutions	7	21.88
Personal saving	25	78.12
Government subsidy	0	0.00
Total	32	100

Awareness and adoption levels of disseminated technology

All the disseminated aquaculture technologies had very low awareness and adoption levels (Table 9). This is inspite of the National Institute for freshwater fisheries research being hosted in the study area. Appreciable level of awareness was recorded for all the disseminated capture fisheries technologies (45.0 to 62.5%), although adoption levels were quite lower (30.5 to 48.4%). More awareness seemed to have been created on technologies of post harvest handling of fish products with awareness levels ranging from 60.5 to 67.5% but with low adoption level from as low as 30.5 to 55.0% (Table 9). The implication of these results is that there is a need to intensify awareness creation on available fisheries technologies by extension agencies in order to boast productivity and enhance the income of practitioners of this sub-sector.

Agencies and channels of information dissemination

Table 10 shows the results of analysis on the contributory roles of research and extension agencies and information channels in disseminating available fisheries technologies to farmers. The Extension Agents from the ADP were the foremost and most popular channels of information dissemination reaching 95.5% of fisher folks. Other agencies playing contributory roles in information dissemination on production recommendations were Research Institutes. Some Non-Governmental Organizations (NGOs), Federal Departments Radio and friends were also important channels for reaching fisher folks.

Effectiveness of extension approaches

The effectiveness of an extension approach as perceived by fish farmers would determine to a great extent the adoption of production recommendations. From this study, method demonstration was highest in effectiveness rating by 55.5% of fisher folks (Table 11). The very low rating of SPAT could be due to the difficulty of adopting the concept to fisheries.Results and method demonstration and field day also had appreciable ratings, while the management training plot (MTP) and agricultural shows were not popular with fisher folks. About 75% of fisher folk were considered as useful in the recommendations passed to them by Village Extension Agents (VEAs), while 35.5% considered them very useful. The implication of these findings is that more emphasis should be placed on method demonstration of fisheries technologies at designate training plots in ADP zones to promote adoption.

Factors affecting fisheries technologies dissemination

Results of data analysis show that the research institute and ADP in the study areas encountered the following problems in disseminating technologies:

1. Lack of reliable field vehicles.
2. High cost of spare parts to service existing vehicles.
3. Lack of field equipments and chemicals.
4. Scarcity and non availability of recommended inputs.
5. Inadequate funding of extension activities.
6. Lack of technology demonstration centres to serve as venue for MTP.
7. Shortage of manpower, especially VEAs to adequately cover all the zones.

Estimation of revenue for sales of fish

Revenue for sales was obtained via asking the respondents to state the total revenue from the sales of their products. The average revenue was obtained thus; total revenue for all the 32 enterprises - N 21,156,000.00; total revenue per enterprise = ₦661, 125.00. Average depreciation values of fixed cost items (though not listed in the text).The annual depreciation values indicate the actual amount spent per year of the fixed cost items. The total annual depreciation was estimated at ₦4, 970.00. Thus, the total cost of production is the total annual depreciation value plus the total variable costs that is, (₦4, 970 + ₦327, 850) = ₦332, 820.00.

Gross margin

The gross margin of an enterprise is the difference between the total revenue of production and the variable cost of production. The average total value of production (revenue) is ₦661, 125.00 and total variable cost of

Table 9. Percentage distribution of fisher folks by awareness and adoption level of disseminated fisheries technologies.

Disseminated technologies	Awareness level (%)	Adoption level (%)
Aquaculture		
Pond construction	25.0	25.0
Fingerlings handling	18.0	15.0
Pond fertilization	20.5	20.5
Improved feeding	18.0	15.0
Disease prevention and control	4.0	2.0
Capture fisheries		
Gear maintenance	45.0	30.5
Mesh size regulation	60.5	35.5
Gear safety	62.5	48.4
Post-harvest handling		
Handling of fresh fish	65.2	55.0
Hygienic processing site	60.5	31.4
Insect prevention and control	55.6	38.5
Packaging dried fish	65.3	32.4
Fresh fish quality retention	67.5	30.5

Table 10. Research and extension agencies and information channels in disseminating available fisheries technologies to farmers.

Agencies/channels	Fisher folks
Agencies	
Agricultural development	95.8
Project	35.0
Research institutes	15.0
Non-governmental organizations	25.5
Federal/state departments	
Channels	
Radio	78.0
Television	40.5
Friends	75.5
Extension agents	15.0
Extension publication	12.5

Table 11. Percentage distribution of respondents by perceived effectiveness of extension approaches and usefulness of recommendations.

Approaches/recommendations	Fisher folks %
Approaches	
Small plot adoption techniques	25.5
Management training plot	20.0
Method demonstration	55.5
Results demonstration	50.4
Field day	25.8
Agricultural show	10.5
Recommendations	
Not useful	-
Useful	75.0
Very useful	35.5

production is N327, 850.00. Therefore, the gross margin = (N661, 125.00 - N327, 850.00) = N 333,275.00.

Net returns: The net return is gross margin less fixed cost. Therefore, net returns = (N333, 275.00 - N4,960) = 328,315.00 per annum/enterprise.

DISCUSSION

The findings revealed that majority of the fisher folk fall within the age group 40 - 49 years. The most productive age (20-39 years) representing the active youth is very low in the fishing business. The reason may be youths drift to urban centers for white-collar jobs. Equally, it could be lack of awareness of the profitability of the business in recent times.

Education has an impact on the processing and handling of the fish. Majority of the fisher folks attended primary and tertiary educational institutions. There is clear indication that fishing is mostly the preserve of men in the study areas.

This was earlier reported by FAO 1998, that 95 percent of fisher folk in the area of study are men while only 5 percent are women. Virtually, all the fisher folks are married. This is attributable to the fact that they have families to support them and engage in fishing business to supplement their income. Both traditional believers and Christians engage in fish farming.

There is only little difference between traditional believers and Christians involved in fish farming. This shows that fish farming has no religious barrier in the study areas. Majority of the fisher folk falls into small scale enterprises while only a few are engaged in medium size. No large scale industry was recorded in the study areas, because the fishing industry is still marked with little or no development (NIFFR, 2008).

Organization is a very important part of any business. It determines to a great extent the quantity and quality of products produced in any industry. Three major types of business organizations are encountered in the study areas. They are sole proprietorship, partnership and mixed proprietor and partnership. Presently, sole proprietorship is taking the lead in the fishing business while partnership is just developing gradually, (NIOMR, 2006). Capital rising in fishing industry has been solely from personal savings, though financial institutions are nowadays prepared to loan to fisher folks. However, the federal government has presently considered the transformation of this sub-sector under agricultural transformation agenda. The fish farmers in these areas are yet to benefits from federal government financial packages to fisher folks in the country.

The prices of fish are not arbitrary fixed, but are influenced by the size of fish, the kind of fish, the season and factors of demand and supply (FAO, 1998).

Conclusion and Recommendations

There had been some development in the present day fishing industry since the beginning of democratic dispensation in Nigeria, with civilian governors' in-charge of Cross River State. However its contribution to the Gross Domestic Product is insignificant. The limited growth of the industry has been due to lack of sufficient funds and enterprising business acumen. If more attention is given to this sub-sector of the agricultural business and the ongoing transformation in agricultural sector, then more of its employment potentials will be enhanced. Although the study revealed that the industry is profitable, it has not attained reasonable and profitable levels of production. The fishing industry as a sub-sector of Nigerian agriculture and natural resources has the potentials to contribute significantly to the economic development of the state and nation in general. In this respect, a lot is needed to be done to improve the present situations. The following are recommended in achieving the desired goals.

(1). Formation of co-operative societies. This will enable the fisher folks pool their resources together and with effective or good management, could easily provide enough working capital for a viable industry. The co-operative society system will enhance the opportunity for bank loans, state and federal government assistance in the supply of fishing farm inputs with greater economic returns.
(2). Fisheries school for technological training by Ministry of Agriculture or Agricultural Development Programme (ADP), could occasionally help to improve the performance of fisher folks for better harvest. There are several new technologies farmers are not familiar with hence training that include the operations with new fishing technologies, will in no doubt enhance greater harvest by farmers.
(3).The government should partner with the fisher folks for effective management, better market for products and risk reduction in the production process.
(4).Importation of fish to the country should be minimized if not completely stopped in' order to reduce price competition with local product.

Authors` declaration

We declare that this study is an original research by our research team and we agree to publish it in the Journal.

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