EFFECTIVE FEEDBACK MECHANISM IN THE TRANSFER AND ADOPTION OF FISH TECHNOLOGIES IN SOUTH EASTERN NIGERIA

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ABSTRACT
The study was aimed at identifying effective feedback processes from fish farmers to fish research institute, fish farmers to extension and extension to fish research institute in the transfer and adoption of fish technologies in South East Geo-political zone of Nigeria. Two states in the zone (Abia and Imo) which are known for fish farming were chosen for the study. From each of the states, 60 fish farmers were selected making a total of 120 fish farmers. Furthermore, 45 extension staff were selected from each state making, this gave a total of 90 extension staff. Later 16 National Institute for Freshwater Fisheries Research (NIFFR) scientists were selected. This gave a total of 226 respondents. Structured questionnaire was used to collect information from the sampled fish farmers, extension officers and the fish research institute scientists. Percentages, means and frequency count were used to analyse the data collected from the study. Result of the analyses shows that farmers visit to the extension officer and use of cell phone were the only effective feedback process between farmers and extension agents. Feedback process between the extension agents and the research scientists are established only through the Monthly Technology Review Meeting. None of the communication methods was effective in maintain appropriate feedback between farmers and the research scientists.

Keywords: Feedback, Adoption, Transfer, Fish, Technologies, Farmers

INTRODUCTION
Fish is one of the quality food items rich in nutrients required to meet the nutritional needs of the populace. Diets enriched with fish are healthy for all categories of people- children, youths, elders, men and women as well as the invalids. Fish is a rich source of protein, vitamins, minerals, water, `lipids and carbohydrate. Nutrients from fish are superior to other protein sources from livestock and plants. Bene *and Hecks* (2005) wrote that a few hundred grams of fish consumed at subsistence level can make the difference between good and bad nutrition, between recovered health and prolonged illness, or between food security and starvation. Kudi, Bako and Atala (2008), quoting Amiengheme (2005) enumerated the importance of fish in human diet to include;
1. Food fish has a nutrient profile superior to all terrestrial meats (beef, pork and chicken, etc) being an excellent source of high quality animal protein and highly digestible energy;

2. Fish is a good source of sulphur and essential amino acids such as lysine, leucine, valine and arginine. It is therefore suitable for supplementing diets of high carbohydrates contents;

3. Fish is also a good source of thiamine as well as an extremely rich source of Omega-3 polysaturated fatty acids, fat soluble vitamins (A, D and E) and water soluble vitamins (B complex) and minerals (Calcium, Phosphorus, Iron, Iodine and Selenium);

4. It has a high content of Polyunsaturated (Omega III) fatty acids, which are important in lowering blood cholesterol level and high blood pressure. It is able to mitigate to alleviate platelet of (cholesterol) aggregation and various arteriosclerosis conditions in adult populations;

5. It reduces the risk of sudden death from heart attacks and reduces rheumatoid arthritis;

6. Omega-3 fatty acids also lower the risk of age related muscular degeneration and vision impairment; and

7. It decreases the risk of bowel cancer; and reduces insulin resistance in skeletal muscles.

Fish is often regarded as the most important source of animal protein. In Nigeria it accounts for over 40% of animal protein intake nationally (Eyo, 2006). However among Nigerian rural dwellers fish and fish products constitute more than 60% of the total protein intake in adults. This is possible since fish is seen as one of the cheapest sources of animal protein in sub-Sahara Africa (FAO, 2006). Ruma, (2008) noted that estimated fish demand in the country is 2.1 metric tonnes per annum at 11.5kg per capita consumption. According to him, out of this only about 500,000 metric tonnes is supplied by artisan fisher – folk leaving the country with a deficit of 1.6million metric tonnes. The yearly deficit is met through massive importation by government valued at 0.5 billion US dollars per year (Kudi *et al*, 2008)

This is so even when Nigeria has a land area of 923,768Km2 with a continental shelf area of 47,934Km2 and a length of coast line of 853Km. It also has a vast network of inland waters like rivers, flood plains, natural and man-made lakes and reservoirs (Shimang, 2005). The inland water mass was estimated to be about 12.5 million hectares of inland waters capable of producing 512,000 metric tons of fish annually. As well there are two fisheries research Institutes dedicated to developing proven fish production and processing technologies in the country. These are the National Institutes of Oceanography and Marine Research (NIOMR) and the National Institutes for Freshwater Fisheries Research located at New Bussa, Niger state. The government provides the required fund to encourage the development of fish production and processing technologies in Nigeria.

Nwachukwu (2003) wrote that the problem of food (fish) production in Nigeria neither lies on large expanse of land nor setting up of intimidating research apparatus. He lamented that as research institutes are striving to expand the frontiers of knowledge in food and fibre production the people daily get closer to food crisis. There is a widening gap between what research says is possible and what is obtained in the field. Here lies the problem, poor linkage between the research institutes and the

farmers who are the intended beneficiaries of agricultural innovations. This is due to ineffective   feedback process between research and extension, extension and farmers then farmers and research.

Feedback is the response or clue a receiver of message gives to the source of message. More specifically, Oyetoro and Akinboye (2010) explained that feedback is the process of relating information from farmers back to researcher after having received or adopted an innovation earlier disseminated to it. It helps to understand the different constraints to participation faced by men and women and the current strategies needed to ensure further participation. Oyetoro and Akinboye (2010) noted that feedback is important because farmers relay their views on certain conditions of their farm either of the innovation introduced to them if applicable or not. It is presumed that the last stage of communication on technology transfer process is feedback and it is important for equity and efficient consideration. It helps to overcome the gap between farmers and research. This study hence seeks to identify effective feedback processes for the transfer of fish technologies from National Institutes for Freshwater Fisheries Research New Bussa, Niger state to fish farmers in Abia and Imo States in South East Nigeria.

METHODOLOGY

The study was conducted in south east geo-political zone of Nigeria comprising of Abia, Anambra, Enugu, Ebonyi and Imo States. The zone lies between latitude 4.20^O and 7.25^O North and longitude 5.25^O and 8.51^O East. It occupies a land mass of about 109.524km which is approximately 11.86 percent of the total land area in Nigeria with a human population of twenty nine million, nine hundred and forty nine thousand, five hundred and thirty (29,949,530), (NPC, 2006).

Purposive sampling technique was used to select Abia and Imo States for the study. The states were selected based on the fact that they had large number of farmers engaged in aquaculture fish farming. From each state, 60 fish farmers were selected making a total of 120 fish farmers. Furthermore, 45 extension staff were selected from each state making a total of 90 extension staff. Finally, 16 National Institute for Freshwater Fisheries Research (NIFFR) scientists were also selected. This gave a grand total of 226 respondents. Structured questionnaire was used to elicit information from the sampled fish farmers, extension officers and the fish research institute scientists. Simple descriptive statistical tools were used to analyse the data collected from the study.

In determining the effectiveness of feedback processes for the transfer of fish technologies, 5 point rating scale of never (0), low (1) moderate (2), high (3) and very high (4) was used. Based on this, a mid- point value 2.0 was obtained. That is, (0+1+2+3+4= 10:-5=2). Mean of 2.00 was used as the basis for the discussion. Decision was then dichotomized into two, that is, effective and not effective. Hence, for the purpose of interpretation, any mean response on the communication avenue /source of information higher or equal to 2.0 is regarded as "Effective" and any response that is lower than 2 was regarded "not effective"

RESULTS AND DISCUSSION
Effective Feedback Mechanism From the Fish Farmers to Extension Officers
The analysis in Table 1 shows the feedback process from farmers to extension officers. According to the table of an array of channels of information delivery only farmer's visit to the extension officers (3.3) and the use of cell phone (3.6) had mean score above 2.0 in both Abia and Imo States. This implies that it was these two communication avenues that had high level of effective feedback mechanism from the fish farmer to extension, when mean score of 2.0 was the bench mark. However, the table indicated that the rest of the communication avenues had low mean score and low feedback mechanism from the fish farmers to extension. In Abia State, the mean scores were OFAR (1.3), REFILS activities (1.5), farmers visit to ADP office (1.8), Focus Group Discussion (1.0), Trade fair/Agric show (0.9), workshop (1.3), seminar (1.3), Internet services (0.9). In Imo State, the mean scores of the communication avenues were OFAR trials (1.3), REFILS activities (1.5) farmers visit to ADP officer (1.1) focus group discussion (1.3), trade fair/agric. show (0.6), workshop (1.3), seminar (1.4), and internet services (0.8).

Generally result of the study shows that only the interpersonal communication methods of personal visit of the extension agent and use of cell phone are effective feedback processes used in the interaction between farmers and extension agents. The fish farmer's visit to extension officer made the communication to be inter- personal. The major feature of interpersonal communication is the feedback mechanism between the sender and the receiver of the message (Nwachukwu, 2003). The result equally agrees with the assertion that cell phone is a major means of communication generally, and a boost in agricultural development (Agwu and Chah 2007). Agwu *et al* described the cell phone is a means of reducing the incidence of agricultural losses by obtaining quick information response. The result showed that the level of interaction (feedback) between fish farmers and the extension officers were not high resulting in the low pooled mean (Abia; 1.7, Imo;1.8) as well as the low mean score of most of the communication avenues. Aquaculture problems such as ineffectiveness of information by Ifejika *et al* (2008), low knowledge of extension agents by Olaleye (2006), shortage and incompetence of extension agents by Olatunji (2008) and low adoption of technologies by Haruna (2006) are yet to be addressed to enhance fish production.

Table 1 Level of Effective Feedback Mechanism from the Fish Farmers to the Extension Officers.

Communication avenues	Never Abia	Imo	Low Abia	Imo	Moderate Abia	Imo	High Abia	Imo	Very high Abia	Imo	Mean $\overline{X}$ Abia	Imo
OFAR trails	7 (11.7)	8 (13.3)	35 (51.7)	37 (61.7)	8 (13.3)	7 (6.7)	10 (16.7)	8 (13.3)	0 0	0 0	1.4	1.3
REFILS activities	13 (21.3)	19 (31.7)	23 (38.3)	18 (13)	20 (33.3)	23 (38.3)	4 (6.7)	9 (15)	0 0	0 0	1.3	1.5
Farmer's visit to the ADP offices	5 (8.3)	17 (28.3)	11 (18.3)	14 (23.3)	15 (25)	18 (30)	12 (20)	6 (10)	8 (13.3)	9 (15)	1.8	1.7
Farmer's visit to the extension officer	1 (1.7)	2 (3.31)	4 (6.7)	1 (1.7)	7 (11.7)	10 (16.7)	13 (21.7)	11 (18.3)	35 (58.3)	36 (60)	3.3	3.3
Focus group discussion	23 (38.3)	20 (33.3)	14 (23.3)	12 (20)	23 (38.3)	20 (33.3)	0 0	8 (13.3)	0 0	0 0	1.0	1.3
Trade fair/agric. Show	29 (48.3)	34 (56.7)	15 (25)	18 (30)	11 (18.3)	8 (13.3)	5 (8.3)	0 0	0 0	0 0	0.9	1.4
Workshop	15 (25)	11 (18.3)	17 (28.3)	22 (36.7)	24 (40)	27 (45)	4 (6.7)	0 0	0 0	0 0	1.3	1.3
Seminar	9 (15)	11 (18.3)	26 (43.3)	17 (28.3)	25 (41.7)	27 (45)	0 0	5 (8.3)	0 0	0 0	1.3	1.4
Cell phone	2 (3.3)	3 (5)	4 (6.7)	2 (2.3)	3 (5)	5 (8.3)	25 (41.7)	16 (35)	26 (43.3)	35 (50)	3.3	3.6
Internet services	20 (33.3)	23 (38.3)	29 (48.3)	26 (43.3)	9 (15)	11 (18.3)	2 (3.3)	0 0	0 0	0 0	0.9	0.8

Source: Field Survey, (2014)

Effective Feedback Mechanism from the Fish Farmers to the Fish Research Institute (NIFFR)

The data in Table 2 indicates that none of the communication avenues used by the fish farmers in interacting with the fish research scientists (in both Abia and Imo States) had effective feedback mechanism in fish technology transfer using the midpoint value of 2.0. In Abia State the mean of the communication avenues were-farmers visit to NIFFR (0.02), Participatory Rural Appraisal (0.1), trade fair/agric show (0.2), OFAR management (1.8), REFILS activities (0.6), workshop (1.8), seminar (0.7), internet services (0.9), and cell-phone (0.4). In Imo State, the mean communication avenues were as follows-farmers visit to NIFFR (0.2), Participatory Rural Appraisal (0.1), Trade fair/Agric show (0.6) OFAR management (1.8), REFILS activities (1.0), workshop (0.8), Internet services (1.0) and cell-phone (0.2).

This result implies that there was low level of communication between the fish farmers and the fish research institute. The result is in consonance with the findings of Ifejika *et al* (2008), on the involvement of NIFFR in the dissemination of aquaculture technologies to fish farmers in Anambra state. They found that the level of interaction between the fish farmers in the state and NIFFR was as low as 0.5%. The low level of the feedback mechanism could be attributed to the distance between the studied area (Abia and Imo states) and the fish research institute that is located in New Bussa, Niger state. According to FAO (2007), publication as reported in Ifejika (2010), south east geo-political zone comprising of Abia, Anambra, Ebonyi, Enugu and Imo states ranked 4th in fish farming in the country.

Table 2 Effective Feedback Mechanism from the Fish Farmers to the Fish Research Institute (NIFFR)

Communication avenues	Never		Low		Moderate		High		Very high		Mean $\bar{X}$	
	Abia	Imo	Abia	Imo	Abia	Imo	Abia	Imo	Abia	Imo	Abia	Imo
Farmer's visit to research Institute (NIFFR)	59 (98.3)	53 (88.3)	1 (1.7)	5 (8.3)	0 0	2 (3.3)	0 0	0 0	0 0	0 0	0.02	0.2
Participatory rural appraisal	55 (91.7)	56 (93.3)	5 (8.3)	4 (6.7)	0 0	0 0	0 0	0 0	0 0	0 0	0.1	0.1
Trade fair/agric show	48 (80)	34 (56.7)	12 (20)	16 (26.7)	0 0	10 (16.7)	0 0	0 0	0 0	0 0	0.2	0.6
OFAR management	11 (18.3)	12 (20)	23 (38.3)	29 (43.3)	16 (26.7)	12 (20)	0 0	0 0	0 0	0 0	1.8	1.8
REFILS activities	36 (60)	26 (43.3)	14 (23.3)	17 (28.3)	10 (16.7)	11 18.3	0 0	6 (10)	0 0	0 0	0.6	1.0
Workshop	24 (40)	31 (61.7)	13 (21.7)	7 (11.7)	10 (16.7)	6 (10)	8 (13.3)	10 (16.7)	5 (8.3)	0 0	1.3	0.8
Seminar	35 (40)	37 (61.7)	15 (25)	13 (21.7)	6 (10)	10 (16.7)	4 (6.7)	0 0	0 0	0 0	0.7	0.6
Internet services	27 (45)	30 (50)	18 (30)	16 (26.7)	9 (15)	12 (20)	6 (10)	6 (10)	0 0	0 0	0.9	1.0
Cell phone usage	41 (68.3)	47 (78.3)	12 (20)	13 (21.7)	7 (11.7)	0 0	0 0	0 0	0 0	0 0	0.4	0.2

Source: Field Survey (2014)

Level of Feedback Mechanism from Extension to the Fish Research Institute (NIFFR)

Data in Table 3 shows that the only communication avenue by the respondents that its feedback mechanism was effective in both Abia and Imo State was Monthly Technology Review Meeting (MTRM), with a mean score of 3.8 and 3.4 respectively. MTRM is the avenue where the fish research institute transfers the fish technologies to extension via fish farmers. In enumerating the objectives of MTRM, Unamma *et al* (2004) stated that MTRM helps in establishing strong linkage between research and extension. That is where research upgrades the knowledge of the extension staff (SMS) on production recommendations; extension equally updates the research scientist's knowledge on farmer's farming environment and their problems. However, the rest of the communication avenues had mean scores that was below the 2.0 midpoint value of effectiveness. In Abia State, the communication avenue mean scores were-workshop (1.0), seminar (1.3), Internet services (1.7), cell-phone (0.5), Extension visit to NIFFR (0.1), REFILS (1.5), OFAR (1.8). In Imo State, the communication avenue mean scores were-workshop (0.9), seminar (1.8), Internet (1.6) cell-phone (0.2), Extension visit to NIFFR (0.2), REFILS (1.7) and OFAR (1.8).

The implication of the result findings is that the level of effective feedback mechanism from extension to the fish research institute was very low. Agricultural development in Nigeria and other African countries have been hampered by low level of agricultural information exchange (Arokoyo, 2003). Acquisition of knowledge and adoption of technologies are usually enhanced by information exchange between the sender and the receiver of the message. The poor feedback mechanism between extension and the fish research institute is a threat to aquaculture development in Nigeria. It is in recognition of this that Sola (2002) opined that the link and collaboration between the fish farmer, extension agencies and the fish research institutes should be strengthened if fish production is to be enhanced in Nigeria.

Table 3: Effective Feedback Mechanism from Extension to the Fish Research Institute (NIFFR).

Communication Avenues	Never		Low		Moderate		High		Very High		Mean $\overline{X}$	
	Abia	Imo	Abia	Imo	Abia	Imo	Abia	Imo	Abia	Imo	Abia	Imo
Workshop	17 (37.8)	15 (33.3)	14 (31.1)	20 (44.4)	9 (20)	10 (22.2)	5 (11.1)	0 0	0 0	0 0	1.0	0.9
Seminar	14 (31.1)	12 (26.7)	11 (24.4)	5 (11.1)	14 (31.1)	9 (20)	6 (13.3)	19 (42.2)	0 0	0 0	1.3	1.8
Internet Services	8 (17.8)	13 (28.8)	15 (33.3)	11 (24.4)	9 (20)	6 (13.3)	7 (15.6)	11 (24.4)	6 (13.3)	4 (8.9)	1.7	1.6
Cell phone	29 (64.4)	37 (82.2)	16 (35.6)	9 (20)	3 (6.7)	0 0	0 0	0 0	0 0	0 0	0.5	0.2
Extension visit to the fish Research institute (NIFFR)	41 (91.1)	37 (61.7)	4 (8.9)	8 (17.8)	0 0	0 0	0 0	0 0	0 0	0 0	0.1	0.2
REFILS	19 (42.2)	13 (28.8)	5 (11.1)	10 (22.2)	7 (15.6)	9 (20)	8 (17.8)	5 (11.1)	6 (13.3)	8 (17.8)	1.5	1.7
OFAR	2 (4.4)	1 (2.2)	24 (53.3)	22 (48.9)	8 (17.8)	10 (22.2)	11 (24.4)	12 (26.7)	0 0	0 0	1.6	1.8
MTRM	0 0	0 0	0 0	3 (6.7)	4 (8.9)	5 (11.1)	2 (4.4)	9 (20)	39 (86.7)	28 (62.2)	3.8	3.4

Source: Field Survey (2014)

CONCLUSION AND RECOMMENDATION

The findings of the study show that the level of effective feedback mechanism from the fish farmers to extension in South East Nigeria was low. Only two communication avenues, farmers visit to extension officers and use of cell phone that attracted high feedback mechanism. This signifies that the level of interaction between the fish farmers and the extension officers were low. Also the study shows that level of effective feedback mechanism from the fish farmers to the fish research institute as none of the communication avenues was seen as effective. The same applies to the interaction between extension and the fish research institute. Strong linkage between research, extension and farmer makes feedback process effective and functional. Without such linkage and feedback process communication between research, extension and farmers become a one way process and technology generation adopts top down approach. The result of the study shows that feedback mechanism between farmers, extension and fish research institute is weak and ineffective. Despite the availability of an array of communication platform for the interaction of farmers and the fish research institutes, farmers and the extension component of the linkage system as well as extension and fish research institute only few are effectively used. This explains why Nigeria has not achieved self sufficiency in fish production and processing. Until strong linkage and feedback system are established between the fish research institute, extension and fish farmers Nigeria keep depending on fish importation to satisfy her domestic needs.

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