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Original Research Article

Awareness of Improved Hatchery Management Practices among Fish Farmers in Lagos State

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Abstract

During the last decade, hatchery infrastructure and table fish production systems have been exclusively targeted towards catfish production in Nigeria. These efforts have not translated to sufficient domestic fish production. The shortfall in demand for fish fry and fingerlings by growing population of fish farms in Lagos State confirms the fish seed production deficiency. This study investigated the level of awareness of improved hatchery management practices among fish farmers in Lagos State. Using simple random sampling method, 150 fish farmers from 12 local government areas of Lagos State were selected and interviewed using a structured questionnaire. The majority of the respondents were male (68%) and married (76.6%), with dominant age range of 41–50 years (55.3%) and a farming experience of 5–10 years (68%). Personal saving (46.7%) and cooperative societies (31.3%) were the respondents' main sources of fund and fortnight visits by extension agent was of commonest frequency (86%). Extension agents and research institutes ranked first and second, respectively, among the sources of information, and accounted for the main sources of information to the farmers. The farmers either strongly agreed or agreed on almost all the hatchery management practices, while they expressed their need for advisory and input support services from government and non-governmental organizations. The significant relationship which exists between age and marital status, and farmers' awareness shows that greater communication of improved hatchery management practices will lead to adoption, thereby increasing the output of the farmers. Improved hatchery output will lead to greater availability of fish seeds for table size production as well as greater income to the fish farmers. In addition to more intensive extension efforts, other channels of information notably mass media should be revitalized in delivering improved management practices to the fish farmers.

Keywords: Perception; fish seed; structured questionnaire; extension agents; information dissemination.

INTRODUCTION

Nigeria as a nation is blessed with various aquatic environments which range from freshwater to brackish and marine waters. Expected of these natural endowments is sufficient fish production, which is capable of meeting the dietary protein requirements of her citizens. However, over-reliance on fish stock in the wild has diminished the output of aquatic environments in terms of fish supply. This has made aquaculture the viable alternative to capture fisheries. Nigeria is endowed with over 14 million hectares of reservoirs, lakes, flood plains, ponds and major rivers (FDF, 2007), out of which about 1.75 million hectares, equivalent to only about 12.5%, is available and suitable for aquaculture (FAO, 2006). Despite this huge natural endowment, Nigeria remains the largest importer of fish products in sub-Saharan Africa (Tunde et al., 2015).

Aquaculture is regarded as being uniquely positioned to reverse declining supplies from captured fisheries, and has notable potential for new livelihood opportunities, providing mechanism for lower priced fish, enhanced nutritional security and employment for communities by servicing urban markets (Jagger et al., 2001). Most recent investment in aquaculture has been targeted towards catfish farming. Presently, live catfish attracts premium price in Nigeria, with a high Return on Investment (ROI) ranging between 30 to 40% in some very successful enterprises. This has attracted several private sector investments.

During the last decade, almost all hatchery infrastructure and table fish production systems have been exclusively targeted towards catfish production because of its hardiness and ease of culture. This has led to emergence of large number of fish farms under small-, medium- and large-scaled production systems. This has been accompanied with increasing demand for fish fry and fingerlings. However, output from government- and privately-owned hatcheries has not been adequate to meet the demand for fish seed in

Nigeria. The development of hatchery production, among other aspects of aquaculture, can only be enhanced by introduction of improved technologies. Technology transfer would be more effective when there is a greater interaction among the developers, transfer agencies and the farmers (Dlamini, 2003). It is, therefore, necessary to ensure that improved production technologies are disseminated to the end users which are fish farmers among other stakeholders in the fisheries sector.

Dissemination of proven technologies entails sharing and distribution of information to target audience to bridge knowledge gap and bring change in attitude as well as improving skill of the end users. Due to the wide gap between demand and supply of fingerlings and table size fish, a package tagged 'improved breeding and hatchery management practices' was designed and disseminated to farmers in Lagos state. The package comprised of introduction of improved broodstocks, which was to increase the quality and quantity of fish seed, introduction of hormonal treatment to brood stock to improve fecundity rates. Management practices such as early sorting of fry, use of hatching troughs, siphoning of hatchlings use of graders were introduced to improve survival rates of fry and fingerlings (Ofuoku et al., 2008). Flow through systems and the use of air stones were also among the technology in the disseminated package which was to improve the water quality. According to Ike and Onuegbu (2007), the package was publicized to improve the quality and quantity of fish seed which will directly increase fish production in Lagos State. Despite the dissemination of this package, the fish seed production of the state is still low and inadequate to meet the increasing fish farms' demand for fry and fingerlings. Hence, this study investigated the level of awareness of improved hatchery management practices among fish farmers in Lagos State.

MATERIALS AND METHODS

The Study Area

Lagos is the former state of federal capital city of Nigeria. During that period, the state witnessed massive industrial development and an accompanied high human population surge. It remains the commercial nerve centre of Nigeria, even after the transfer of federal capital to Abuja. The state has 5 administrative divisions which were further divided into 20 local government areas (LGAs). Lagos State lies between latitude 06°25′N and longitude 03°27′E, with about 3,577 sq. km. land size and a maritime shoreline of about 180 km, as its southern border. About 22% of the total landmass is made up of a network of creeks, rivers and lagoons (NES, 2006). Although the state has about 147,877 hectares of swampland and large areas of water bodies suitable for aquaculture as natural endowment, Lagos has not been able to produce sufficient fish to feed its ever increasing human population. In fact, only 61.28 hectares, which represents about 0.04% of the aquatic landmass, is under used for aquaculture.

For the purpose of this study, 12 out of the 20 LGAs of the state were selected using simple random sampling technique. Also a total of 150 fish farmers were selected randomly as respondents from all the 12 local government areas. The respondents were interviewed using structured questionnaires drawn based on the objective of this study. Data obtained were analyzed using descriptive statistics while chi-square was used to test the relationship between demographic characteristics of respondents and the level of awareness of improved hatchery management practices.

RESULTS AND DISCUSSION

Table 1 shows the socio-economic characteristics of the respondents. The respondent demographic features shows that their majority was male (68%), married (76.6%), with primary, secondary and tertiary education at 56%, 28% and 16%, respectively. Age range of 41–50 years was dominant among the respondents with 55.3% majority. About 86% of the respondents' population engaged in farming as occupation, with 68% majority having farming experience of 5–10 years, while 86% of them practice fish farming on farm size which is less than 1 acre of land. Personal savings (46.7%), followed by cooperative societies (31.3%) were the two (2) main sources of funds among the farmers. In fact, 88.7% of them were members of one cooperative society or another. Fortnight visit was the commonest frequency (86%) of visit by extension agents to the farmers.

Table 1. Socio-economic characteristics of respondents

Characteristics	Frequency	Percentage (%)
Age		
31-40	20	13.3
41-50	83	55.3
51-60	47	31.3
Sex		
Male	102	68.0
Female	48	32.0
Marital Status		
Single	35	23.3
Married	115	76.7
Educational Level		
Primary	84	56.0
Secondary	42	28.0
Tertiary	24	16.0
Occupation		
Farmer	129	86.0

Characteristics	Frequency	Percentage (%)
Trader	21	14.0
House Hold Size		
3-4	15	9.3
5-6	51	45.3
>7	51	45.3
Number of Children		
1-2	7	4.7
3-4	55	50.0
5-6	53	45.3
Farming Experience		
6 months	7	4.7
< 5 years	41	27.3
5-10 years	102	68.0
Establishment of Farm		
1990-1995	7	4.7
1996-2000	21	14.0
2001-2005	75	50.0
2006 and above	47	31.3
Farm Size		
Less than 1 acre	129	86.0
1-2 acre	14	9.3
2 acres and above	7	4.7
Source of Funds		
Personal savings	70	46.7
Government	6	4.0
Bank loan	21	14.0
Cooperative societies	47	31.3
Other sources	6	4.0
Annual Income from Fish farming		
< 50,000	21	14.0
50,000-100,000	21	14.0
100,000-500,000	83	55.3
>500,000	19	12.7
1 million and above	6	4.0
Membership of Cooperative Societies		
None	17	11.3
Ifelodun	9	6.0
Ohunjeloju	7	4.7
Agbelere	12	8.0
Irewolede	23	15.3
LASCAFFA	12	8.0
Igbehinadun	27	18.0
Ileri-Oluwa	30	20.0
Unity	13	8.7
Frequency of Extension agents' visit		
Once in a Week	7	4.7
Fortnightly	129	86.0
Monthly	7	4.7
Occasionally	7	4.7

The prevalence of males among the respondents implied that more males were engaged in fisheries activities in the study area. This is in agreement with findings of Alfred and Fagbenro (2007) which affirms male dominance among tilapia farmers in coastal region of Ondo State, another southwestern state of Nigeria. The results also showed that middle age of 41–50 years represents an active age range which is accustomed with learning and wanting to try new innovation. This is in line with findings of Lemchi et al. (2003). The fact that majority of the respondents chose fish farming as an occupation with 5-10 years farming experience shows that fish farming is highly lucrative in the study area. However, shortage of land due to the status of Lagos as commercial nerve centre of Nigeria as well as the increasing development of residential areas to accommodate the state's rising population may have contributed to limited available land for aquaculture; the reason majority of the respondents are practicing fish farming on less than 1 acre of land. Personal funds and cooperative societies, being the major source of funds to the respondents, is in line with findings of Adesehinwa and Bolorunduro (2007) which affirms that most farmers use their personal funds for aquaculture, preferring cooperatives as their second source of fund. Most fish farmers may have belong to a cooperative society because of credit facilities that they enjoy, in addition to sharing of ideas among the members. Fortnight visit by extension agents to the farmers is in line with the findings of Okunlola and Olofinsawe (2007) who also reported that the highest frequency of extension agents' visit was fortnightly.

As evident from Table 2, ten (10) sources of information were drawn against each of the improved hatchery management practices. Results revealed that the respondents got informed of various improved hatchery management practices mainly through the extension agents. This was followed poorly by information sources such as Research Institutes, fellow fish farmers, co-operative societies and Ministry of Agriculture. In all, the use of mechanical aerators and air stones, and water temperature regulator were the two management practices from Ministry of Agriculture; the use of sorting trays, trash fish as substitute for fish meal and effluent waste management were obtained from fellow fish farmers; while information on the use of hatching troughs, glass jar incubators and siphoning of hatchlings were obtained from the various cooperatives societies which the respondents belong. The use of hatching jars in the hatchery was the only hatchery management practice which the farmers got informed about from the television. Apart from the above listed improved hatchery management practices, the extension agents and research institutes accounted mainly as the source of information for the remaining hatchery practices. The prevalence role of extension agent and research institutes as

Table 2. Frequency distribution showing sources of information for fish farmers

TECHNOLOGY	SOURCES OF INFORMATION									
	1	2	3	4	5	6	7	8	9	10
Improved brood stock	20 13.3	102 68.0	7 4.7	14 9.3					7 4.7	
Early sorting of fry	13 8.7	53 35.3	21 14.0	42 28.0	14 9.3				7 4.7	
Hatching troughs	13 8.7	20 13.3	12 8.0	21 14.0	77 51.3				7 4.7	
Sieve cloth/Glass jar incubators	54 36.0	7 4.7	6 4.0	27 18.0	49 32.7					
Feeding with live Artemia	61 40.7	7 4.7	6 4.0	42 28.0	27 18.0	7 4.7			7 4.7	
Feeding with Daphnia	46 30.7	21 14.0	6 4.0	14 9.3	7 4.7			21 14.0	35 23.3	
Use of sorting trays	20 13.3	41 27.3		63 42.0				7 4.7	19 12.7	
Use of trash fish as substitute for fish meal	34 22.7	13 8.7	14 9.3	70 46.7				12 8.0		7 4.7
Use of Graders	125 83.3	12 8.0	6 4.0	7 4.7						
Hatching jars	55 36.7	18 12.0			21 14.0				49 32.7	7 4.7
Siphoning of hatchlings	34 22.7	13 8.7	6 4.0	6 4.0	56 37.3			7 4.7	28 18.7	
Pituitary Hormone	118 78.7	12 8.0			13 8.7				7 4.7	
Dried Common carp Pituitary Hormone	131 87.3	19 12.7								
Ovaprim	111 74.0	39 26.0								
HCG Hormone	131 87.3	6 4.0	6 4.0		7 4.7					
Mechanical aerators/air stones	34 22.7	41 27.3	42 28.0	6 4.0	14 9.3	6 4.0		7 4.7		
Use of Kakaban	118 78.7	19 12.7			13 8.7					
Flow through water system	34 22.7	74 49.3	35 23.3							7 4.7
Recirculatory water system	118 78.7	25 16.7	7 4.7							
Water temperature regulators	55 36.7	18 12.0	56 37.3	14 9.3	7 4.7					
Effluent waste management	48 32.0	32 21.3	21 14.0	49 32.7						
Water quality management	27 18.0	88 58.7	21 14.0	7 4.7						7 4.7
Use of hammock for transporting brood stock	125 83.3	25 16.7								
Use of indigenous floating pellets	48 32.0	75 50.0	6 4.0	14 9.3				7 4.7		

Key for sources of information
1-Extension Agent, 2-Research Institutes, 3-Ministry of Agriculture, 4-Fellow Fish Farmers, 5-Co-operativesocieties, 6-Federal Dept. of Fisheries, 7-Extension Publication, 8-Radio, 9-Television, 10-others

Table 3. Respondents' attitude towards improved hatchery practices

Improved management practices	SA	A	UD	D	SD
Improve broodstock selection determine the fertility rate of hatchery management success	122 (81.3%)	28 (18.7%)	-	-	-
Improved broodstock selection determine fecundity rate for hatchery management success	32 (21.3%)	111 (74.0%)	7 (4.7%)	-	-
Improved broodstock selection influences survival rate of hatchling	105 (70.0%)	45 (30.0%)	-	-	-
The weight of broodstock affects breeding success	124 (82.7%)	26 (17.3%)	-	-	-
The use hatching troughs enhances hatching rate of fertilized eggs	54 (36.0%)	68 (45.3%)	21 (14.0%)	7 (4.7%)	-
Hatching troughs make separating hatchlings from unhatched eggs easier	82 (54.7%)	54 (36.0%)	-	14 (9.3%)	-
The use of hatching troughs is not necessary for siphoning of fry	53 (35.3%)	13 (8.7%)	14 (9.3%)	63 (42.0%)	7 (4.7%)
Frys respond better to daphnia than artemia	34 (22.7%)	53 (35.3%)	42 (28.0%)	14 (9.3%)	7 (4.7%)
Daphnia is cheaper to use than artemia	26 (17.3%)	110 (73.3%)	7 (4.7%)	-	7 (4.7%)
Daphnia is easy to culture	46 (30.7%)	97 (64.7%)	7 (4.7%)	-	-
Daphnia production in hatchery can completely replace Artemia	26 (17.3%)	54 (36.0%)	42 (28.0%)	28 (18.7%)	-
Artemia is easier to use in feeding fry than daphnia	45 (30.0%)	98 (65.3%)	7 (4.7%)	-	-
Early sorting has an effect on growth rate of fry	129 (86.0%)	21 (14.0%)	-	-	-
Early sorting has an effect on survival of fry	123 (82.0%)	27 (18.0%)	-	-	-
NIOMR sorting trays are effective in sorting fingerlings	101 (67.3%)	42 (28.0%)	7 (4.7%)	-	-
Pilot asset acquisition makes farmer more adaptable to programme implementation	101 (67.3%)	42 (28.0%)	7 (4.7%)	-	-
Advisory services and input support is not an important aspect of programme implementation	25 (16.7%)	-	21 (14.0%)	98 (65.3%)	6 (4.0%)

chief sources of information to the farmers affirms the findings of Asiabaka (2002) which established that dissemination of agricultural information and practices are central roles of agricultural extension.

Table 3 revealed the attitude of respondents towards improved hatchery practices. As pointed out in the Table, 81.3% respondents' population strongly agreed that improved broodstock selection determines the fertility rate of hatchery management success, although 21.3% and 74% strongly agreed and agreed, respectively, that improved broodstock selection determines fecundity rate for hatchery management success. Similarly, 70% majority strongly agreed that improved broodstock selection influences survival rate of hatchlings; 82.7% strongly agreed that the weight of broodstock affects breeding success; only 36.0% strongly agreed, although 45.3% agreed, that the use of hatching troughs enhances hatching rate of fertilized eggs; while 54.7% and 36.0%, respectively, strongly agreed and agreed that hatching troughs make separating hatchlings from un-hatched eggs easier. However, a simple majority of 42.0% disagreed that the use of hatching troughs is not necessary for siphoning of fry, although 35.3% strongly agreed.

Comparing the response of fry to daphnia (*Daphnia* spp.) and artemia (*Artemia* spp.), 34.0% and 35.3% strongly agreed and agreed respectively that fish fry respond better to daphnia than artemia, in addition to the fact that 73.3% respondents' majority agreed that daphnia is cheaper to use than artemia. Despite that 64.7% agreed that daphnia is easy to culture, while 65.3% agreed that artemia is easier to use in feeding fry than daphnia, only 36.0% agreed that daphnia production in hatchery can completely replace artemia. Even as 86.0% and 82.0% of the respondents strongly agreed that early sorting has an effect on growth rate and survival of fry,

Table 4. Relationship between respondents' socio-economic characteristics and their level of awareness of improved hatchery management practices

Personal characteristics	X^2	df	P	Remark
Age	30.838	14	0.000	S
Sex	0.219	7	0.239	NS
Marital Status	4.373	7	0.037	S
Educational Level	3.714	14	0.075	NS
Farm Size	0.052	14	0.820	NS
Farming Experience	0.092	14	0.762	NS

respectively, only 67.3 % strongly agreed that NIOMR sorting trays are effective in sorting fingerlings. Also, 67.3 % strongly agreed that pilot asset acquisition makes farmer more adaptable to programme implementation while 65.3 % disagreed that advisory services and input support is not an important aspect of programme implementation. This shows that the respondents recognize the value of advisory and input support services.

Table 4 shows the relationship that exists between the demographic characteristics of the respondents and their awareness on the improved hatchery management practices. As evident on the table, age and marital status had significant relationship ($P < 0.05$) with the respondents' level of awareness, while the remaining socio-economic characteristics had no significant relationship with awareness level of the respondents. This corroborates the reports of Ofuoku et al. (2008) which found out that age and marital status are positively related to the awareness of production techniques among fish farmers. This shows that the youthful age range of the respondents' majority are willing to learn and try new production methods as well as take risks. Therefore, the youth majority is better targeted for introduction and usage of improved hatchery management practices. The relationship between marital status of the respondents and awareness of improved hatchery management further justifies the role of fish farming as an occupation capable of sustaining family needs.

Table 5 reveals the relationship that exists between the respondents' socio-economic characteristics and their attitude towards the improved hatchery management practices. Age, farm size and farming experience had significant relationship ($P < 0.05$) with the respondents' attitude towards improved hatchery management practices while sex, marital status and educational level of the respondents had no significant relationship with the respondents' attitude towards the improved management practices. The inference that can be drawn from Table 5 is that youthful age range, increasing farm size and accumulated farming experience have positive ways in affecting farmers' attitude towards improved hatchery management practices.

CONCLUSION

It can be deduced that fish farmers in Lagos State are aware of the improved hatchery management practices through their contact with extension agents and other source of information. The role of research institutes cannot be overlooked, as they contribute to the farmers' knowledge of improved hatchery management practices. The awareness level of the farmers may have been enhanced by their socio-economic attributes since majority of them are within the active age range which is adapted to learning and trying new ideas. In addition to credit facilities enjoyed from cooperative societies, it may have also served as a channel of awareness on various improved hatchery management practices. The need for advisory and input support services was also highlighted by the famers as a way of boosting their awareness of improved hatchery practices.

Among the respondents' socio-economic characteristics, the significant relationship which exists between age and marital status, and farmers' awareness shows that greater communication of improved hatchery management practices will lead to adoption, thereby increasing the output of the farmers. Increased

Table 5. Relationship between respondents' socio-economic characteristics and their attitude towards improved hatchery management practices

Personal Characteristics	X^2	Df	P	Remark
Age	7.053	24	0.008	S
Sex	0.659	12	0.417	NS
Marital Status	0.316	12	0.574	NS
Educational Level	1.431	24	0.232	NS
Farm Size	3.957	24	0.047	S
Farming Experience	7.665	24	0.006	S

hatchery output will translate to greater income and availability of fish seeds for table size production. Existence of significant relationship between age, farm size and farming experience, and farmers' attitude towards improved hatchery management practices affirms that increased farm size as the year runs will boost the farmers' awareness, towards improving hatchery production. In addition to more intensive extension efforts, other channels of information notably mass media should be revitalized delivering improved management practices to the fish farmers.

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