



Assessment of Awareness and Constraints of Aquaculture Biosecurity among Fish Farmers in Awka North and South, Local Government Areas of Anambra State

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Abstract

This Study investigated the level of awareness and constraints the farmers were facing in adopting effective biosecurity measures in their farms in Awka North and South Local Government Areas of Anambra state. Primary data were collected using a stratified sampling procedure to select fish farms. A structured questionnaire that focused on socio - economics characteristics of the respondent, aquaculture species, culture techniques and systems, Level of awareness of biosecurity, Units of the farm where biosecurity is practiced and constraints to biosecurity practices. A total of sixty fish farmers were involved in this study. Most of the fish farmers were male (50.00%), Investigation into years of experience indicated that most of them (58.30%) had 11-15 years of experience and were between the ages of 36-45 years, (50.00%) and they had been engaged in fish farming alongside with poultry production. About (86.70%) knew about Biosecurity. It is believed that this awareness will enable them to identify when there is risk on their farm and steps to be taken. Lack of Finance, inadequate information on Biosecurity, lack of materials, lack of interest, improper understanding of Biosecurity practices and Government policy were perceived as the major constraints.

Keywords: Aquaculture; Biosecurity; Fish; Awareness; Diseases

Introduction

Aquaculture is one of the fastest growing food production sector in the world. Aquaculture, the farming of aquatic organisms, has become a vital component of global food production. Production from aquaculture has grown at an impressive annual rate of approximately 11% since 1980 [1]. One of the significant challenges to the expansion of aquaculture production is from disease outbreaks. Diseases caused by viral infection are not easily treated under current

technology and have caused significant economic losses.

Potential economic losses from disease outbreaks are significant, and can affect the survival of the industry Lightner DV [2]. Aquaculture in Awka, Anambra State, like in many parts of Nigeria, is a significant source of livelihood, contributing to food security, income generation, and employment. Its development is very important especially when we take into account all the health benefits of fish in a human's diet. One of the significant challenges to

the expansion of aquaculture production is from disease outbreaks. Fish is a reasonably priced and important resource of animal protein which contains vitamins, minerals and oils with low levels of cholesterol [3].

Biosecurity is a set of standard scientific measures adopted to exclude pathogens from culture environments and hosts and, more broadly, limit the establishment and spread of pathogens. Biosecurity measures are essential for maintaining healthy farms Horrillo A, et al. [4]. Therefore, it is important to promote farmers' adoption of biosecurity measures to sustainable fish farming. Biosecurity awareness refers to a subject's understanding of specific information, government policies, and safety values; this aspect has an important impact on the overall prevention and control of fish diseases Breen R, et al. [5]. Farmers' biosecurity awareness reflects whether they understand the methods for maintaining the biosecurity situation of the farm and whether they have a sense of responsibility for this action. The expansion of farmers' awareness of biosecurity may help guide the emergence of biosecurity behaviors among fish farmers.

A sound biosecurity program for a fish farmer's aquaculture facility is intended to incorporate disease prevention, disease monitoring, cleaning and disinfection between production cycles and general security precautions Smith AS [6]. Good biosecurity also includes reducing stressful conditions that can make fish more susceptible to disease; this involves the practices, habits, procedures and policies used to prevent the introduction and spread of disease causing organisms as well as invasive species. However, the sector faces numerous challenges, including disease outbreaks and inadequate biosecurity measures, which can severely impact productivity and sustainability. Biosecurity in aquaculture encompasses practices aimed at preventing the introduction and spread of infectious diseases in aquatic animal populations [7].

Given the growing importance of aquaculture in Anambra State, Understanding the awareness and constraints related to biosecurity among fish farmers is crucial. The development of biosecurity measures on fish ponds and the transfer of technologies improves the health of fish, which is very important from the point of view of the safety of the final product and consequently the preservation of the health of the population. Increased fish production is needed to boost food security for the ever increasing human population, coupled with declines in catch from the wild Anyanwu PE, et al. [8,9]. All hands must be on deck to ensure that the introduction or spreading of diseases and diseases causing agents are reduced to the barest minimum in the aquaculture sub sector towards adoption of biosecurity measures at all levels to improve fish production

and ensure food availability Boyd, et al. [10]. The research aims to provide insights that could inform the development of targeted interventions, policies, and support mechanisms to enhance biosecurity practices, mitigate disease risks, and promote the sustainable development of aquaculture in Awka, Anambra State. The aim of this study is to examine the level of awareness and constraints of biosecurity measures among fish farmers in Awka, Anambra State.

Materials and Methods

Description of the Study Area

The research work was carried out in Awka, Awka is the capital of Anambra State, Nigeria. The state is located in the southeastern region of the country and boundaries are formed by Delta State and Edo state to the west for about 97 km across the River Niger, Imo State and Rivers State (for four km) to the south , Enugu state to the east for 139 km , and Kogi state to the North for about 40 km. It is located between latitudes $06^{\circ} 06' N$ and $06^{\circ} 16' N$ and longitudes $07^{\circ} 01' E$ and $07^{\circ} 10' E$. Awka is made up of two local government areas, namely: Awka South and Awka North. The area lies within the tropical rainforest zone of West Africa with an average humidity of 80%.

Selection of Fish Farms

A cross-sectional study was carried out during the period of November 2023 to January 2024 using a stratified sampling procedure to select fish farms. The selection procedure took into consideration costs, road accessibility (including distance and time to trek to farms), period at which farmers will harvest fish and farmer's willingness to participate in the study. The manager of previously known farms helped to identify other farms until all farms were identified. Information was collected from the respondents on their awareness and constraints they face in adopting aquaculture biosecurity practices on their fish farms through questionnaires. 60 questionnaires were recovered and analyzed out of which were administered.

Questionnaire Survey of Farmers and Scoring of Fish farms

Primary data for the study was obtained from fish farmers using structured questionnaires. 60 questionnaires were distributed to fish farmers, Face to face interviews and on-farm observations were used to complete a questionnaire composed of five sections (socio - economics characteristics of the respondent, Aquaculture species culture techniques and systems ,Level of awareness of biosecurity, Units of the farm where biosecurity is practiced and constraints to biosecurity practices) which were used to obtain responses

from fish farmers who were either the owners of the fishponds or took part in the management of the fishponds.

Data Analysis

A total of 60 questionnaires were recovered and used for data analysis. Descriptive and inferential statistics were used in the analysis of data. Descriptive analysis was used to describe the socio economic variables. The method was used to describe the variables of gender, age, years of experience in fish farming and income generated. Descriptive statistics include frequency counts, mean and percentages. This was used to summarize the socioeconomic and demographic variables of the respondents.

Results

Socio-Economic Characteristics of the Respondent in the Study Area

Data on the socio-economic characteristics of the fish farmers in the study area is presented in Table 1. Overall, 60 fish farms were used in the present study. The male constituted about 83.30% of the population, while the remaining 16.70 % were females. The age of the respondent indicated that majority (50.00%) of the respondents were within the age bracket 36-45 years, while others were 46 - 60 years (13.30%) and above 60 years (36.70%). Investigation into years of experience indicated that most of them (58.30%) had 11-15 years of experience. The analysis also showed that majority of the respondents had an income generated from the farm annually which was above #1 million from the fish farm. This indicated that the fish farming business is lucrative enough to be a source of revenue to fish farmers to sustain their family.

Aquaculture Species Culture Techniques and Systems

The study showed that most fish farms (96.70%) in Awka were involved in monoculture, while just a few (3.30%) practiced integrated fish farming .The fish species cultured were Catfish(93.30%) and it was observed that (70.00%) of the fish farmers operated on a large scale with a land size greater than 2.5 hectare and small scale (30.00%) with a

land size less than 1 hectare. The culture system practiced among the fish farmers involved more of the plastic culture system (86.70%) and tank culture (10.00%) , while just a few practiced earthen pond systems (3.30%) in Table 2.

Level of Awareness of Biosecurity

The fish farmers' awareness on Biosecurity Table 3 showed that (86.70%) of the respondents knew about biosecurity . It is believed that this awareness will enable them to identify when there is risk on their farm and steps to be taken. Nearly (86.70%) of the respondents are practicing biosecurity on their farm, majority of fish farmers knew about this biosecurity through other farmers (80.00%) and few farmers knew through different medium which involves the use of radio (6.70%),television (3.30%),internet (3.30%) and social media(6.70%) are willing to introduce it to other farmers believing that majority of disease outbreaks which occurs in the farm which may be as a result of the source from which the fish were purchased, or they may be prone to stress from rough handling during transportation to the farm. Most of the respondents had experienced an outbreak of fish disease on their farms as a result of poor management practices.

Units of the Farm where Biosecurity is Practiced

Table 4 showed that (50.00%) of the respondents carried out biosecurity practices through the entrance of their farm indicating that predators can gain entrance into the farm and can be a carrier of disease causing organisms thus the practice of biosecurity at the entrance of the farm would reduce the spread of infectious diseases. (33.30%) applied biosecurity practices in the hatchery unit. Also, (13.30%) in their various offices and (3.30%) in the feed mill.

Constraints to Biosecurity Practices in the Study Area

Constraint faced by the respondent in adopting biosecurity measures is as presented in Table 5. They include Finance(50.00%),inadequate information on Biosecurity(5.00%) ,lack of materials (3.30%), lack of interest(3.30%), improper understanding of Biosecurity practices(3.30%) and Government policy(35.00%).

Variables	Frequency	Percentage (%)
Sex		
Male	50	83.3
Female	10	16.7
Total	60	100
Age(Years)		

15-25	0	0
26-35	0	0
36-45	30	50
46-60	8	13.3
Above 60	22	36.7
Total	60	100
Years of Experience		
5-Jan	0	0
10-Jun	20	33.3
15-Nov	35	58.3
16-20	3	5
Above 20	2	3.3
Total	60	100
Income generated from the Farm Annually		
#50,000-#100,000	0	0
#101,000-#200,000	0	0
#201,000-#500,000	4	6.7
#501,000-#1,000,000	10	16.7
Above 1 million	46	76.7
Total	60	100
Level of Farm		
Small scale	18	30
Large scale	42	70
Mega farm	0	0
Total	60	100

Source: Field survey (2023).

Table 1: Socio-economic Characteristics of the Respondent in the Study Area (n=60).

Variables	Frequency	Percentage(%)
Species Cultured		
Catfish	56	93.3
Tilapia	4	6.7
Others specify	0	0
Total	60	100
Aquaculture Techniques Practices		
Monoculture	58	96.7
Poly culture	0	0
Integrated fish farming	2	3.3
Monosex culture	0	0
Total	60	100
Culture System		

Tank culture	6	10
Earthen pond	2	3.3
Plastic tank	52	86.7
Total	60	100

Source: Field Survey (2023).

Table 2: Aquaculture Species, Culture Techniques and Systems Practiced by Fish Farmers in the Study Area (n=60).

Variables	Frequency	Percentage(%)
Are you Aware of Biosecurity Practices in Aquaculture?		
Yes	52	86.7
No	8	13.3
Total	60	100
If yes, through what Medium?		
Radio	4	6.7
Television	2	3.3
Internet	2	3.3
Social media	4	6.7
Other farmers	48	80
Total	60	100
Are you Practicing Biosecurity in your Farm?		
Yes	52	86.7
No	8	13.3
Total	60	100
Are you Willing to Introduce it to other Farmers?		
Yes	52	86.7
No	8	13.3
Total	60	100

Source: Field survey (2023).

Table 3: Level of Awareness of Biosecurity in the Study Area (n=60).

Variables	Frequency	Percentage (%)
Hatchery	20	33.3
Feedmill	2	3.3
Groundnut unit	0	0
General office	8	13.3
Entrance of the farm	30	50
Total	60	100

Source: Field Survey (2023).

Table 4: Units of the Farm where Biosecurity is Practiced (n=60).

Variables	Frequency	Percentage(%)
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Finance	30	50.00
Lack of information	3	5.00
Lack of materials	2	3.30
Lack of interest	2	3.30
Improper understanding	2	3.30
Government policy	21	35.00
Total	60	100

Source: Field Survey (2023).

Table 5: Constraints to Biosecurity Practices in the Study Area (n=60).

Discussion

The results of the socio-economic characteristics of the fish farmers in the study area which has been presented in , this results revealed that the they were dominated by males, and this could be associated with the growing demands of families on men, forcing their search for additional sources of income to meet domestic demands. These findings are like the reports of Omitoyin SA, et al. [11] and Ngueguim, et al. [12]. Moreover, Nwabueze AA, et al. [13] and Ali S, et al. [14] stated that males are predominantly involved in fish farming. Most of the fish farmers were between 36 and 45 years of age.

The average age of fish farmers was 45 years, and the oldest above 60 years with 27.5%. It confirms the findings of Awotide BA, et al. [15] which reported that a large number of fisherfolk were educated, and this portends a better future for fish farm production. The respondents were found to be within the productive and economic active age.

According to Ngeywo J, et al. [16] age is a key factor in productivity and profitability performance of the farmer. It was observed that many of the fish farmers are still in their productive ages which is in agreement with the work of Apata OM, et al. [17], Hasimunal OJ, et al. [18]. Younger people tend to be more energetic, adjust faster, and adopt new technologies, thus may be more productive than the elderly who may be more conservative. Pandey DK, et al. [19] reported that more participation of young and middle age groups of peoples in fish production in Tripuna. The work of Kumar P, et al. [20] showed a shifting pattern from old age to young age which means that aquaculture is drawing the attention of the younger age bracket. 58.30% of the respondents had between 11 and 15 years of experience on the farm. This number of years of experience on the farm is beneficial for fish farming in the area of study, As a result, the respondents with highest number of years of experience were adult/elderly married men had good skill (technical

know-how) and better approaches to fish farming business and poorer biosecurity scores than younger farmers. Since farmers with less number of years of experience may be discouraged when they encounter many risks in the early days of the fish farming business [21].

Furthermore, the involvement of most of the respondents in monoculture is similar to the work of Omobepade, et al. [22], Okpeke MY, et al. [23] who observed the same trend. Hasan MM, et al. [24] attested to higher profitability of catfish(*C. gariepinus*) production over other types of fish and also this finding is in line to Olatunji SO, et al. [25] who recorded more farms with *Clarias spp* than *Tilapia spp*. The fish farmers' awareness of fish diseases will enable them to identify when there is risk on their farm and steps to take to minimize it. The low (13.30%) levels of awareness of biosecurity components suggest that farmers were negligent of biosecurity practices and did not apply appropriate biosecurity measures agrees with previous reports that associated poor biosecurity scores to ignorance of farmers (due to lacked training) and inadequate or lack of application (if they knew) of the appropriate measures against disease transmission and occurrence in their farms . Lack of knowledge and understanding, lack of communication, time, audit programs of biosecurity, potential risks and economic constraint have also been recorded as reasons for low biosecurity compliance levels by farmers. The low biosecurity scores in the present study may suggest implementation of few biosecurity measures due to lack of proper knowledge of the importance of biosecurity in a farm. Similarly, little or no practice of biosecurity measures and low biosecurity compliance rates of fish farming have been reported in Ivory Coast, Nigeria, Kenya and intermediate or moderate to high biosecurity practices and compliance levels in other parts of the world Craig SH, et al. [26]. Overall, the respondents' awareness of biosecurity was high (86.70%) but their knowledge, understanding and attitude towards Biosecurity measures and practices were evidently limited.

Conclusion and Recommendations

In view of the great importance attached to the Practice of biosecurity in reducing fish loss and improving fish production, this study presented information on the farmers' Awareness and the constraints they face in their effort towards adopting biosecurity practices Despite the fact that most farmers did not have a thorough understanding of biosecurity protocols, they took some biosecurity precautions to avoid disease introduction and spread on their farms. This suggests that more disease causing pathogens are being identified and in some cases spreading to new locations. It is therefore evident that the risk of diseases in aquaculture production settings cannot be eliminated completely. It is also important to be arrive to the fact that biosecurity

measures for an aquaculture production system will depend on a number of factors, including the type of facility, the purpose of the facility (e.g., stocking food fish), as well as the species and life stages reared.

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