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Gender Roles and Constraints in Aquaculture Biosecurity in Ekiti State, Nigeria

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Abstract

Adoption of proper biosecurity practices that could assist in averting fish disease crisis is needed for sustainable fish farming to bridge the fish demand-supply gap in Ekiti State, Nigeria. Fish farmers in the state were partial adopters because of financial constraints. This study aimed to examine gendered roles and constraints in adopting aquaculture biosecurity measures in Ekiti State. 150 fish farmers were randomly interviewed using structured questionnaires in the three ADP zones in the state and only 144 were retrieved. Mean, Likert scale and T-Test were employed. The findings revealed that only 24.3% of the respondents have access to loan. Egg/fry disinfection (54.9%), quarantine (53.5%), water quality monitoring (54.9%) and pond maintenance (42.4%) were considered men roles, while movement control (40.3%), disposal of dead fish (47.9%), record keeping (56.9%) and treatment/ proper feeding (50.0%) with daily fish observation (45.1%) were assigned to women. Moreover, laboratory analysis (2.2708), use of disinfectants and PPE (2.1806), equipment disinfection (2.1667), medical consultation (2.1597), and facility for changing/ shower/ toilet (2.1458), predator/pest control (2.1389), and purchase of disease-free seedlings (2.0417), quarantine (2.0069) and use of signs/maps (2.0069) were expensive for them to adopt. There is a significant difference between gender and the constraints they faced in adopting biosecurity measures because the F-calculated is 0.890 (t = 0.019, df = 23.459, mean of the biosecurity constraints faced by the men is 2.3968 and std is .56780, while the mean for the women is 2.2667, whereas std is .54131. This study concluded that both genders were faced with financial constraints in adopting proper biosecurity measures with women being the most disadvantaged. It is therefore recommended that both genders need to be given adequate and impartial support so that they can be able to adopt efficient biosecurity measures that could promote sustainable fish production.

Keywords: option; Diseases; Disinfection; Gender; Perception; Ekiti State.

Introduction

Fisheries and aquaculture is an important aspect of agriculture for ensuring food and nutrition security, as well as employment for millions of people across the globe (Githukia, 2020). Nevertheless, fish supply is insufficient to meet the demand, due to declining natural

fish stocks which necessitated increased fish imports in developing countries such as Nigeria. Fish farming is known to be the most fitting substitute for capture fisheries (Kaleem and Sabi, 2021). However, the success of aquaculture is limited by various factors such as escalating cost of feed, lack of sufficient seedlings, lack of adequate technical know-how and disease outbreak. The effects of fish diseases cannot be overemphasized because of its impact on aquaculture. Diseases are causing decline in the quality and quantity of the fish, loss of market access, amplified bacterial load and loss of employment (Omitoyin and Osakuade, 2021a). Most aquaculture disease outbreaks have occurred in developing countries where over 90 percent of aquaculture takes place, reducing revenues, eliminating jobs, threatening food security, and undermining development goals (World Bank, 2014). Although the sector is growing rapidly, disease prevention and treatment practices are still far from standardization or regulation (FAO, 2012), and the emerging infectious diseases in farmed finfish often cause devastating socio-economic losses (Walker and Winton, 2010; Okaramu and Fiest, 2011). High mortalities in aquaculture are caused when parasites infect farmed fish and are subsequently invaded by bacterial pathogens (Xu *et al.,* 2012).

Consequently, it is paramount to pursue sustainable fish farming which will help in bridging the ever-increasing fish demand-supply gap through the necessary biosecurity practices that could assist in averting the fish diseases crisis. Biosecurity is a set of practices employed to hinder the transmission of pathogens and infectious diseases into a fish farm and fish stocked together in a pond. According to Lishomwa (2016), biosecurity specifically refers to farmers' on-farm animal health and hygiene practices that need to be carried out daily to guarantee effectiveness. Small-scale fish farmers needed financial support to be able to religiously carry out some biosecurity measures such as having sufficient tools to restrict the use of tools within a designated area, use of active footbath or vehicle spray, diagnosis of dead/moribund fish etc. Mankad (2016) reported that poor management of diseases can lead to hazards for animal as well as human health. Studies confirmed that approximately 50% of production loss in aquaculture is a result of diseases that are exceptionally severe in developing countries with infectious diseases taking the lion share by causing multibillion-dollar loss annually (Assefa and Abunna, 2018). Tavares-Dias and Martin (2017) reported that diseases are accounting for a yearly loss of about 15% of production for freshwater fish farms in Brazil and thus estimated a loss of about US$ 84 million, aggravated direct and indirectly by diseases in farmed stocks. According to Pettersen *et al.* (2015) pancreas disease in farmed Atlantic salmon (*Salmo salar*) was estimated at 55.4 million Norwegian kroner. The impacts of diseases may occur as direct losses due to the treatment of sick fish or mortalities or indirect effects such as decreased production (e.g. decreased growth rates, feed conversion efficiency or product quality) or loss of business reputation. Therefore, information is needed on the cost implication of biosecurity measures and biosecurity roles being carried out by genders to enable policymakers to determine effective policies that will favour good aquaculture practices.

Women and men are involved in all nodes of the aquaculture value chain (Veliu *et al.,* 2009), but the value chain activities are highly gendered in aquaculture. Women are more involved in post-harvest activities (Adeoye *et al.,* 2020), while men dominate roles such as provision of fingerlings and other input (e.g., fish feeds), wholesalers and exporters, which tend to be highly profited roles. In most countries, animal health monitoring and delivery systems tend to be male-dominated, thus contributing to the exclusion of "women's livestock" from organized animal health activities (Miller, 2011). A study in the dairy sector in Tanzania found that both men and women respondents were involved in animal health management and had similar knowledge of diseases, yet

women were found to face more constraints than men in accessing veterinary services, information on diseases, and animal medicines (Gali`e *et al.* 2014). The socio-demographic uniqueness of farmers influences their roles, constraints and opportunities. Women may face stiffer constraints concerning economic factors of production since most of these factors are controlled by men in their capacity as head of the household. FAO (2013) emphasized the importance of eliminating hurdles limiting women's control over access to assets to attain gender equality. Consequently, addressing inequalities in gender by exposing women to equal access to resources and opportunities like men will increase farm production and raise agricultural output and promote food security (Gallant, 2019).

The Federal Department of Fisheries reported that fish demand in Ekiti State stood at 26,825 metric tonnes per annum. Out of which only about 200 metric tonnes were produced locally leaving a deficit of 26,625, which are being supplied by importation thereby negatively affecting the economic growth of the State and that of the country as a whole (Omobepade *et al.,* 2014). There is a paucity of literature describing the roles and responsibilities of men and women in aquaculture biosecurity in the study area. Although many studies have been conducted on fish farming in Ekiti State and Nigeria, for instance, Omitoyin and Osakuade (2021a and b) explored the awareness level of fish farmers on biosecurity measures constraints as well as the adoption level in Ekiti and reported that most fish farmers in Ekiti State are partial adopters and are faced with financial constraints and inadequate monitoring by extension agents Ayanboye *et al.,* (2014) reported that access to some economics/productivity in fish farming in the study area does not favour women and maybe the factor hindering full participation of women in aquaculture. It is paramount to study the perceptions of the fish farmers on which gender should carry out a particular biosecurity role and find out the constraints each gender faced in carrying out such roles. Therefore, this study aimed to unveil gender roles, their perception and constraints in adopting aquaculture biosecurity practices in Ekiti State.

Materials and Methods

i. Description of the study area This research was carried out in Ekiti State between March and August 2017. The state is situated between Longitude 40 5′and 50 45′ East of the Greenwich meridian and Latitudes 70 15′and 80 15′ North of the Equator in Southwestern Nigeria (Omitoyin and Osakuade, 2021a). It has a tropical climate with two distinct seasons, namely the rainy season (April-October) and the dry season (November-March) (Bayowa *et al.,* 2014). Ekiti people are hardworking and usually engaged in farming as staple and cash crops as their source of livelihood. The state have a total number of 2,398,957 people based on the provisional population census conducted in 2006 (Nigeria Data Portal, 2006).

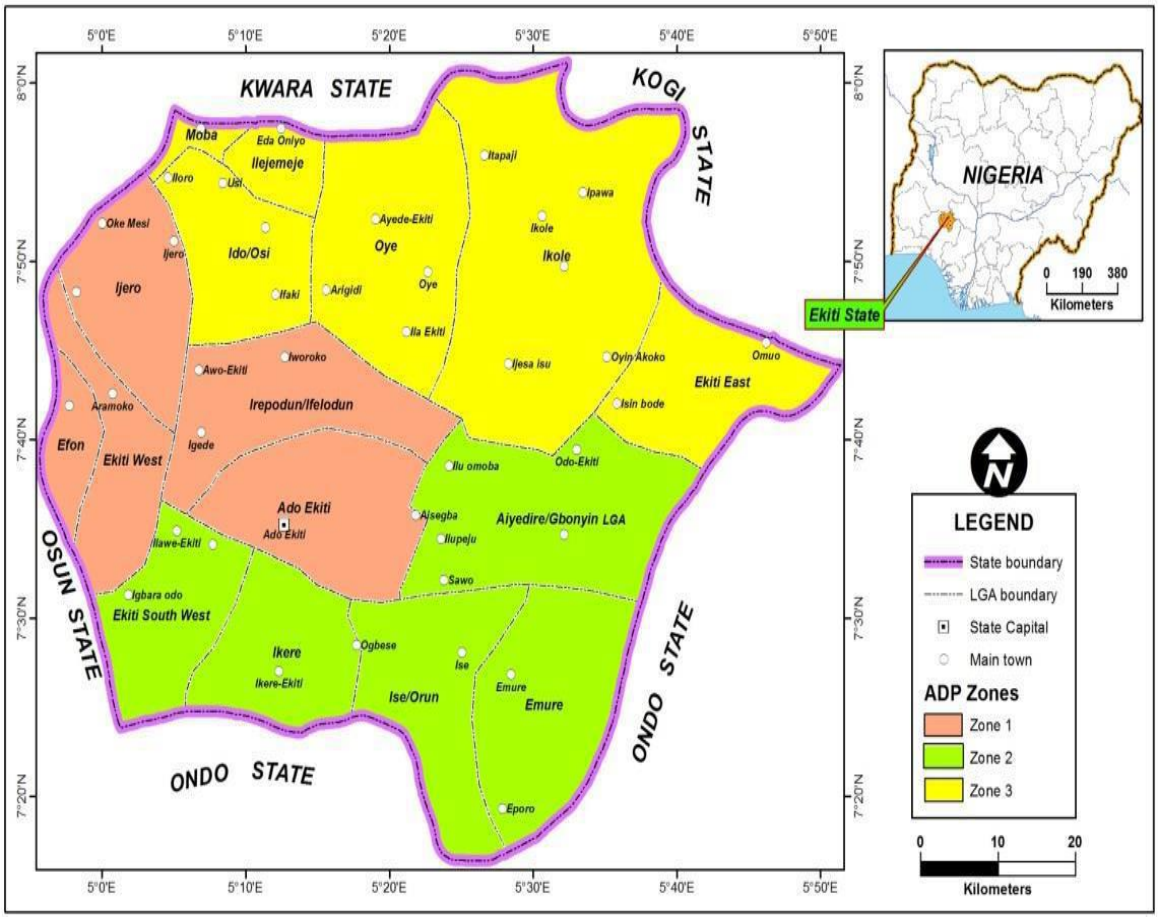

Figure 1: Ekiti State map showing the three selected ADP zones
Source: Omitoyin and Osakuade, 2021a.

ii. Sampling Techniques and Data Size

A total of 150 fish farmers were randomly picked from the three ADP zones in Ekiti State (Figure 1) via a multi-stage sampling technique. The information gathered from Ekiti State Ministry of Agriculture and Natural Resources (Fisheries Department) revealed that Aramoko zone is the zone with the highest number of fish farmers, therefore, seventy (70) fish farmers were unsequentially chosen from its 5 blocks. Then forty (40) respondents each were randomly selected from four cells out of five blocks in Ikere and also from three cells out of six blocks in Isan zones respectively.

iii. Data Collection

Information on their socio-economic characteristics, perception of which gender should take a biosecurity role and constraints faced by each gender in adopting some effective biosecurity measures on their fish farms were gathered through structured questionnaires. Only 144 questionnaires were recovered out of the 150 distributed and were analyzed for this study.

iv. Analytical Techniques / Data Analysis

Data obtained from the field was subjected to descriptive and inferential statistical analysis, using the analyzed Statistical Package for Social Sciences (SPSS-Version 20) computer programme. Likert scale was used to analyze the data for cost implication and perceived gender roles in aquaculture biosecurity, the mean and standard deviation were presented. Likewise, T-Test was used to compare gender

roles and constraints being faced by gender in adopting biosecurity measures.

Results

Socio-economic characteristics of the respondents

Some farmers usually join different associations to enjoy the benefits, especially the exchange of information on improved management practices that can facilitate increase in yields. Table 1 shows that only 37.5% and 5.5% of males and females respectively are members of different associations. This makes up a total of 43.1% of the total sampled population, while the larger proportion (56.9%) of them does not belong to any association. Most of those that are members of the association (31.3%) belong to farmers' association. About 24.3%) of those that belong to the association indicated that they get access to loans. While about 16.7% of them do not join any association because they believed they might not get access to a government loan. Most (38%) of the male respondents earn over ₦70,000 per annum, while most (45%) of female respondents, on the other hand, earned between ₦50,000 and ₦60,000 within the same period (table 2). Majority (65.3%) of the male fish farmers in the study area owned the lands they are using for fish farming, while most (40.0%) of the female fish farmers get the land they use for fish farming on lease. Most of the male respondents (25.8%) had between 7-9 years of fish farming experience, while most (30.0%) of the female in the study area had between 1-3 years of fish farming experience.

Respondents' perception of the cost implication of some biosecurity measures

The perception of the respondents on the cost implication of some biosecurity measures was analyzed with Likert scale and the mean values were taken. The data on this is presented in Table 3 from those perceived to be most expensive to the cheapest ones to adopt. Fish farmers consider the regular sampling of fish and water for laboratory analysis (2.2708), use of foot bath/ hand-wash facilities, protective clothing and boot (2.1806), routinely cleaning/disinfection of equipment (2.1667), use of fish health specialists (2.1597), facility for changing/shower/toilet (2.1458), control of predator/pest in the farm (2.1389), purchase of disease-free seeds for stocking/broodstock (2.0417), quarantine ((isolation of incoming fish) (2.0069)) and use of signs/maps for restricted areas/instruction (2.0069). However, use of pathogen-free water source (1.9514), control of people/vehicles (1.9375), proper handling/stress minimization (1.9236), disinfection of incoming water supply (1.8819), daily observation of fish and its environment (1.8264), recording daily fish mortalities/sick fish (1.7778), use of protective clothing and boot (1.7569) and use of prophylactic treatments on fish before stressful situations (1.6597) were seen as being affordable to be adopted.

Gender roles and constraints in aquaculture biosecurity

Table 4 shows that egg/fry disinfection (54.9%), quarantine (53.5%), water quality monitoring (54.9%) and pond maintenance (42.4%) are biosecurity roles that can only be properly carried out by male workers while most of them believe that visitor and vehicle control (40.3%), disposal of dead fish (47.9%), record keeping (56.9%) as well as fish treatment and proper feeding of fish (50.0%) with daily observation of fish (45.1%) are biosecurity measures that can only be properly handled by the female gender. However, effluent discharge (50.7%), farm/facility/equipment sanitation/disinfection (38.9%), vector/predator control (43.1%) and use of protective clothing and boot (53.5%) were seen as biosecurity roles that could be equally carried out by both genders.

This research further revealed that there is no significant influence of gender on the biosecurity roles being performed by them on fish farms since the F-calculated is 0.566 (t = 1.159, df = 23.459, mean of the biosecurity roles being played by the male is 2.0691 and the standard deviation is 0.44438, while the mean

for the biosecurity roles played the female is 1.9235, whereas the standard deviation is 0.53270. However, there is a significant difference between gender and the constraints they faced in adopting biosecurity measures because the

F-calculated is 0.890 (t = 0.019, df = 23.459, mean of the biosecurity constraints faced by the men is 2.3968 and the standard deviation is .56780, while the mean for the biosecurity constraints faced by the women is 2.2667, whereas the standard deviation is .54131. This implies that the male and their female counterparts are not being constrained at the same level. The male might probably be privileged to get easy access to land and also a source for assistance and facilities from their colleagues other than their female counterparts.

Table 1: Socio-economic characteristics of the respondents

Variables	Categories	SEX					
		MALE		FEMALE		TOTAL	
		Freq	(%)	Freq	(%)	Freq	(%)
Member of association	Yes	54	37.5	8	5.5	62	43.1
	No	70	48.6	12	8.3	82	56.9
	Fish farmers' association	40	32.3	5	3.5	45	31.3
	Co-operative society	10	6.4	3	2.1	13	9.0
	Monthly contribution	4	2.7	0	0.0	4	2.7
	Not a member	**70**	**48.6**	**12**	**8.3**	**82**	**56.9**
Benefit	**Loan**	30	20.8	5	3.5	35	24.3
	Information	21	14.6	3	2.1	24	16.7
	Labour	3	2.1	0	0.0	3	2.1
	No benefit	**70**	**48.6**	**12**	**8.3**	**82**	**56.9**
Reasons for not being a member	**Inability to refund loan**	1	0.7	0	0.0	1	0.7
	Dishonest of leaders/members	7	4.9	2	1.4	9	6.3
	High charge on loan	13	9.0	0	0.0	13	9.0
	Lack of access to government loan	23	16.0	1	0.7	24	16.7
	Religion	1	0.7	0	0.0	1	0.7
	Lack of interest	16	11.1	1	0.7	17	11.8
	Others	9	6.3	8	5.5	17	11.8
	Already a member	**54**	**37.5**	**8**	**5.5**	**62**	**43.1**

Table 2: Socio-economic characteristics of the respondents

Variables	Categories	SEX					
		MALE		FEMALE		TOTAL	
		Freq.	(%)	Freq.	(%)	Freq.	%
Average income	10,000 – 20,000	2	1.6	0	0.0	2	1.4
	20,000 - 30,000	16	12.9	1	5.0	17	11.8
	30,000 - 40,000	17	13.7	3	15.0	20	13.9

	40,000 - 50,000	22	17.7`	3	15.0	25	17.4
	50,000 - 60,000	14	11.3	9	45.0	23	16.0
	60,000 - 70,000	5	4.0	0	0.0	5	3.5
	Above 70,000	48	38.7	4	20.0	52	36.1
Land Ownership	Owned	81	65.3	7	35.0	88	61.1
	Leased	25	20.2	8	40.0	33	22.9
	Rented	14	11.3	4	20.0	18	12.5
	Borrowed	4	3.2	1	5.0	5	3.5
Years of experience	≤ 1	10	8.1	4	20.0	14	9.7
	1 – 3	21	16.9	6	30.0	27	18.8
	4 – 6	26	21.0	2	10.0	28	19.4
	7 – 9	32	25.8	5	25.0	37	25.7
	10 – 12	24	19.4`	2	10.0	26	18.1

Table 3: Perception of the fish farmers about the cost implication of biosecurity measures

Variables	Mean	Std. Deviation
Use of prophylactic treatments on fish prior to stressful situations	**1.6597**	**0.69124**
Use of protective clothing and boot	**1.7569**	**0.74088**
Recording daily fish mortalities/sick fish	**1.7778**	**0.70408**
Daily observation of fish and its environment	**1.8264**	**0.7874**
Disinfection of incoming water supply	**1.8819**	**0.62013**
Proper handling/stress minimization	**1.9236**	**0.82851**
Control of people/vehicle	**1.9375**	**0.74062**
Use of pathogen free water source	**1.9514**	**0.69292**
Use of signs/maps for restricted areas/instruction	***2.0069**	**0.73377**
Quarantine (Isolation of incoming fish)	***2.0069**	**0.73377**
Purchase of disease-free seeds for stocking / broodstock	***2.0417**	**0.85178**
Control of predator/pest in farm	***2.1389**	**0.84961**
Facility for changing/shower/toilet	***2.1458**	**0.80182**
Use of fish health specialists	***2.1597**	**0.76335**
Routinely cleaning/disinfection of equipment	***2.1667**	**0.81077**
Use of foot bath/ hand-wash facilities, protective clothing and boot	***2.1806**	**0.79906**
Regular sampling of fish and water for laboratory analysis	***2.2708**	**0.78641**

Footnote: The score mean is 2; those measures with value less than 2 are seen as being affordable, however, those with values greater than 2 are the ones that are being perceived as being expensive for the fish farmers.

Table4: Perception of the respondents on gender roles in aquaculture biosecurity

Variables	Option		
	Male	Female	Male and Female
Egg/fry disinfection	76 (54.9%)	41 (28.5%)	22 (15.3%)

Quarantine	77 (53.5%)	40 (27.8%)	27 (18.8%)
Water quality	79 (54.9%)	33 (22.9%)	32 (22.2%)
Daily observation	42 (29.2%)	65 (45.1%)	37 (25.7%)
Pond maintenance	61 (42.4%)	59 (41.0%)	21 (14.6%)
Visitor/vehicle control	49 (34.0%)	58 (40.3%)	37 (25.7%)
Effluent treatment/Discharge	29 (20.1%)	42 (29.2%)	73 (50.7%)
Farm/facility/Equipment sanitation/disinfection	38 (26.4%)	50 (34.7%)	56 (38.9%)
Disposal of dead fish	22 (15.3%)	69 (47.9%)	53 (36.8%)
Record keeping	16 (11.1%)	82 (56.9%)	46 (31.9%)
Vector/Predator control	46 (31.9%)	36 (25.0%)	62 (43.1%)
Use of protective clothing and boot	12 (8.3)	55 (38.2%)	77 (53.5%)
Treatment of fish	4 (2.8%)	72 (50.0%)	68 (47.2%)
Proper feed storage	75 (52.1%)	39 (27.1%)	30 (20.8%)
Proper feeding of fish	33 (22.9%)	72 (50.0%)	39 (27.1%)

Table 5: T-test result on gender roles and constraints in aquaculture biosecurity

Gender	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**T**	**F**	**Df**	**Sig.**
G**ender roles in aquaculture biosecurity**								
Male	124	2.0691	.44438	.03991				
Female	20	1.9235	.53270	.11912				
					1.159	0.331	23.459	0.566
D**ifference between the mean constraints faced by gender in adopting biosecurity measures**								
Male	124	2.3968	.56780	.05099				
Female	20	2.2667	.54131	.12104				
					0.991	0.019	26.214	0.890

Discussion

Based on the farmers' response during the field survey, majority (56.9%) of the respondents are not a member of any social association, while only 43.1% of them belongs to a different social association, (31.1%) belong to the fish farmers association, (fish farmer association is a gathering of individual fish farmers and/or fish farming groups joined to achieve more effective coordination of activities, and establishment of capacity to address several constraints and limitations faced by members and to rub minds together to proffer solution to them) (Stutzman *et al.,* 2017). Most (24.3%) of those with membership reported that they have access to loans from the government or financial institutions. Yet, some (16.7%) of those that were not in any association declined because of previous failures at accessing government loans. It can be deduced from the result of this work that the majority (86.1%) are male which pointed out the fact that fish farming in Ekiti State is male-dominated, this aligned with the work of Adeoye *et al.,* (2020) who opined that male dominance of fish farming could be as a result of the laborious nature of fish farming which is very tedious for

females to handle. Inoni *et al.* (2017) state that fish farming is male-dominated because women have limited access to productive resources, external inputs, and information that could facilitate proper production. The result further revealed that a high population of them has access to credit facilities than women (i.e., 20.8% out of 24.4% that have access to loans). Ugwuja and Nweze (2018) reported that available statistics show that men have access to credit more than women in Nigeria because men have assets that serve as collateral for accessing credit, the same result was also reported by Adejo *et al.* (2018). This work was not in line with the work of Olaoye *et al.*, (2013) who noted that the majority of fish farmers were members of cooperative societies. FAO (2016) stated that developing and encouraging adherence to better management practices such as proper biosecurity measures, provision of credit to members, provision or enlightenment on technical services, facilitation of market access, aiding in aquaculture research programs, provision of extension services, and facilitating knowledge-sharing are some of the beneficial roles that can be enjoyed within fish farmers' associations. The farmers, most especially the women need to be encouraged and also allow to join a social association and there should not be gender bias in the disbursement of loans and other resources to encourage women to fully partake in fish production.

The result of this research implies that male fish farmers have sources of income that are very lucrative, which may lead to increased chances of adopting better techniques for fish production than their female counterparts. The reason behind the variability in income may be because the males are more energetic and can maximize profit and reduce the cause of production than females, as attested to in Oladipo *et al.,* (2011). Also, male fish farmers have better access to land and assets than the female and this is in alignment with the work of Ankrah *et al.* (2020) who reported that men in a region of West District in Ghana have incomparable easy access to land than the women who are cheated because they are considered to be weak. Ayanboye *et al.,* (2014) stated that female fish farmers had little or no access to credit facilities and land compared to other resources. It is well known that ownership affects land use, farming systems, institutional structures, ecological conditions, adoption and use of technology, food production and self-sufficiency, and overall wellbeing of the rural and urban population (Adedeji and Okocha, 2011), therefore, those that own their land will adopt efficient biosecurity measures than those who are using leased or rented land for culturing of fish. Those that own their farmlands will not be limited in using enough space for proper disposal of dead fish, construction of extra ponds to ensure proper stocking or building of different farm structures to serve different purposes that will minimize cross usage of facilities/spaces that could cause the spread of diseases.

Most of the fish farmers in the study area had between 7-9 years of fish farming experience, this is not in alignment with the work of Omotesho *et al.* (2021) who reported that the young farmers in Ekiti State have mean years of farming experience of over 12 years because most of them has been working on their family farms even as children. Most of the women however have less than 5 years of farming experience, which means that they are less experienced than the men. Since good experience will culminate into good mastery, the fish farmers with good numbers of experience will have good skills and better approaches to fish farming activities such as biosecurity measures, whereas, those with fewer years of experience, especially with less than 5 years might face many risks in the early years of their fish farming business (Olaoye *et al.*, 2013). It shows that the women in this state are just being exposed to fish farming and will therefore need to be trained specially to know how to carry out proper biosecurity measures.

This present study shows that some biosecurity measures are too expensive for these farmers to adopt, meaning that finances could be a hindrance to the adoption of biosecurity. Laboratory analysis, use of foot bath/ hand-wash facilities, protective clothing

and boot routine disinfection of equipment, use of fish health specialists, facility for changing/shower/toilet, control of predator/pest in the farm, purchase of disease-free seeds for stocking/broodstock, quarantine (isolation of incoming fish) and use of signs/maps for restricted areas/instruction are most of the biosecurity measures that the fish farmers in this study locale find too expensive to be carried out. Payment of medical services will not be available at an affordable fee since medical personnel is not readily available to attend to fish farmers. A lot will be spent to construct extra farm buildings and signposts/maps for the sake of biosecurity and also purchase high-quality fingerlings that are disease-resistant and also to purchase PPE and disinfectants. A similar challenge was reported by Dione *et al.,* 2020 who reported that farmers female pig farmers complained that they are unable to afford the required disinfectants protective wear is equally expensive for them and that the men complained that it is expensive to reach veterinarians due to limited transportation facilities while some of them will turn them down partly because they are poorly facilitated. It was also identified by Omitoyin and Osakuade (2021a) that sky-scraping cost of facilities, lack of financial assistance and costly laboratory charges were major constraints of biosecurity.

It is generally known that men are involved in laborious task which is not always performed daily while women take part in routine nurturing tasks. This is confirmed by different researchers (Akter *et al.,* 2017; Luqman *et al.,* 2012; Martiningsih, 2019). FAO (2014) and Mroto *et al.* (2018) opined that cultural traditions control the observed gender discrepancies in the distribution of roles and responsibilities, ownership of production and processing assets, resource use and allotment of income amassed from sales in agricultural practices. These later resulted in women and men having differences in knowledge, expertise, experiences, needs and limitations. This work revealed that disinfection, quarantine, water quality monitoring and pond maintenance which are considered to be laborious and not usually daily work are biosecurity roles that men are usually get involved in while women are usually saddled with biosecurity roles that need to be carried out daily such as movement control, disposal of dead fish record keeping (56.9%) as well as fish treatment and proper feeding of fish (50.0%) with a daily observation of fish (45.1%) which are perceived as lighter" but more labor-intensive tasks that require a high time investment. Although effluent discharge, sanitation, vector/predator control and the use of protective clothing and boot are equally being carried by both gender. This work agreed with the work carried out on some pig farms in Uganda by Dione *et al.,* 2020 who reported that women are believed to be well-placed to perform specific tasks and responsibilities, such as cleaning of the pigsties and feeding, given their experience, dedication and availability in the home. While men are known to be knowledgeable in pigsty construction, spraying, administering drugs, and reporting disease outbreaks and also have a close association with their ability to contact veterinarians easily through their networks; especially since it is more socially acceptable for a man to contact a man than for a woman to do so. Perey (2017) also reported from research carried out in the Philippines that the participation of women in livestock production tended to be related to feeding animals, cleaning pens and cages, and water provision.

In this present study, sex did not significantly influence biosecurity roles performed. This implies that biosecurity is not dictated by gender. Yet, there is a discrepancy in the means of accessing the resources that will be needed to carry out some of these practices. Also, female is always limited by their reproductive activities which impact their strength in productive activities, unlike their male counterparts. This is in agreement with the study of Gali`e *et al.*(2015) in their study in the dairy sector in Tanzania who discovered that both genders were involved in animal health management and had comparable awareness of diseases. Nevertheless, females were found to face more constrictions than men

in acquiring veterinary services, information on diseases, and animal medicines. It can be deduced from his study that male and female counterparts are not being constrained at the same level, however, women are known to be disadvantaged most of the time. Access to and control over land is a vital factor in the proper disposal of dead animals and this study showed that men have more access to land ownership than female. The power to allocate resources also conveys the capacity to support the application of biosecurity on the farm, for instance, money needs to be allocated to the purchase of required materials such as disinfectants and PPE and the women are not being given equal access to fund like their male counterparts and will contend with their ability to properly carry out necessary biosecurity measures on their various fish farms than the men, Married women might need to seek permission from their husbands before they could seek medical assistance from male veterinarians to avoid conflict on infidelity.

However, men can face many challenges too, they may not have enough money for medical consultation since they have other financial responsibilities at home. Dione *et al*. (2020) reported that women in urban areas face financial constraints, lack information on how to properly treat their animals and require permission from their husbands to attend training, while others are constrained by too many household chores, while men complained that they are being constrained by a lack of support from government authorities. Mensah-Bonsu *et al*. (2019) reported from their study that the key pressing constraints of farmers are high cost of production, high rate of diseases, and lack of credit facilities and are more applicable to men than women, who are mainly overburdened with many activities both at home and on the farm.

Conclusion

Men and women are known to carry out distinctive but harmonizing roles in fish rearing. Different biosecurity measures effectively adopted by each gender differ as a result of different roles being shared between them because of a social norm that existed in our culture. This has challenged their capability to efficiently employ biosecurity measures by restraining their options and chances, with the female gender being the most disadvantaged. This study revealed that women are playing a key responsibility in aquaculture biosecurity. They are more or less equally involved in all farm activities but are limited by society which has spelled out some roles as women roles and some as men roles; moreover, they have limited access to funds to their male counterparts.

Recommendation

Women are known to be caring in nature, if they are well equipped financially, they will take biosecurity measures more seriously than men. They need to be given adequate help so that they can be able to adopt efficient biosecurity measures to promote sustainable fish production that could guarantee food security. Furthermore, training on biosecurity should equally target both men and women in households, and interventions to improve access to essential resources that will promote easy adoption of proper biosecurity measures should also be the main concern in promoting fish production and welfare of the farmers by policymakers, NGOs and financial institutions. Likewise, the farmers should be encouraged to join social associations such as farmers' associations for easy access to information and fund for easy adoption of biosecurity.

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