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Gender analysis of fish farming technologies adoption by farmers in Ondo State

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The study was conducted with the purpose to unveil the gender gap in the adoption of fish farming technologies in Ilaje and Ese-Odo Local Government Areas of Ondo State. The study investigated the involvement of men and women at different stages of fish production, the level of adoption of available fishery technologies and their socio- economic characteristics. Two hundred respondents were interviewed for the study via structured and pre-tested interview schedule, in the two purposively selected Local Government Areas using a multi stage sampling technique. Majority (80.0%) of the respondents were male and majority (76.3%) of male and (52.5%) of female farmers were found within the productive age of 31 to 60 years. Both male and female farmers (63.5 and 67.6%), respectively had low adoption level due to the characteristics of the technologies. However, men were found to be more involved at different stages of fish production except in processing and marketing where majority were found to be women. Moreso, the findings revealed that at $p<0.01$, there were significant differences in the level of involvement of men and women in all the stages of fish production except in processing of fish. In addition, at $p<0.05$, significant differences existed between men and women level of adoption of race-way method, water management techniques while at $p< 0.01$, there was a significant difference in fish feeding techniques between men and women fish farmers. The study concludes that fish farming in Ondo state is dominanted by male with low adoption of fish farming technologies. Gender equality principles should be mainstreamed into clear and effective technology development and dissemination to fish farmers in Ondo State with a view to enhancing fish production and sustainable socio-economic livelihood among fish farmers in Nigeria.

Key words: Gender, adoption, technologies, fish farming.

INTRODUCTION

Artisanal fisheries have been very important as major food sources and for trade in most countries of Sub-Saharan Africa (SSA). However, aquaculture (farming of aquatic organisms) has only been introduced in the last fifty years (CTA, 2001). Fish farming, a branch of aquaculture is defined as the raising of fish for personal use or profit (FAO, 2002). International Centre for Living Aquatic Resources Management (ICLARM, 2002) describes fish farming as the rearing of fish in a controlled volume of water or enclosure.

Globally, 142 million tonnes of captures fisheries and aquaculture were produced in year 2008 (State of World Fisheries and Aquaculture Report, 2008). China, India, Japan, South Korea and the Philippines produced 80.0% of the 21.6 million tones world fish production from fish farming. However, world fish production estimation was 145.1 million tonnes (World Fisheries Report, 2010). The quality of fish protein is high because it contains amino acids in the amount and proportions required for good nutrition and provides a good source of vitamins, minerals and iodine (Edward and Damaine, 2002). The fat in fish is poly-unsaturated which can keep the level of

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cholesterol low to reduce the risk of coronary heart disease and alleviate some other diseases such as migraines, arthritis and tumor formation due to the unique omega-3-fatty acid they contain (Edward and Damaine, 2002). Fish meats are tender, light and easily digestible because they contain very little connective tissues. Therefore, liver can digest them easily without any difficulty. Fish bone is also beneficial as they supply calcium and phosphorus essential for bone and teeth formation (Edward and Damaine, 2002).

Despite an abundant endowment of human and natural resources, Nigeria depends largely on importation to meet its fish consumption needs. Nigeria is a maritime state of about 140 million people, with a coastline measuring approximately 853 km. Of the 36 states of the federation, nine are located on the coast where the waves of the Atlantic Ocean lap against the land (The Fish Site News, 2010). With this scenario, the natural expectation is that Nigeria should not only be self-sufficient in fish production but should also be an exporter of aquatic foods. Sadly, however, Nigeria imports between 700,000 and 900, 000 metric tons of fish annually to partially meet a shortfall of 1,800,000 metric tons spending ₦97 billion yearly in fish importation (World Review of Fisheries and Aquaculture, 2010). Fish is a good source of animal protein, which is essential for healthy human growth. In fact, to many Nigerians on the coastal areas, creeks and rivers, fish is their only source of protein. The shortfall has resulted in a low annual per capita consumption rate of 7.5 kg as against the 13 kg recommended by the Food and Agriculture Organization (FAO, 2010).

FAO (2006) states that Nigeria has become one of the largest importers of fish in the developing world, importing some 304,413 metric tones annually. The inventory of fish farm in Nigeria indicated that Ondo State has the least number of fish ponds in the south-western Nigeria and that some of the ponds are lying fallow while the rest are not operating at full capacity. This has resulted into a decrease in the level of fish produce over the years with concomitant increase in the population growth (The Fish Site, February, 2009).

Olawunmi (2002) shows that fish farming could easily be established in the area such as Ile Ife due to relatively low cost of establishment. Fapohunda and Godstates (2007) carried out a study on Biometry and composition of fish species in Owena reservoir in Ondo State, Nigeria. The study concluded that there were fourteen fish species belonging to nine families. Two of these families - characidae and clariidae were the dominant fish families in the reservoir. George (2005) reported that fish is an important component in the human diet especially for the poor. His study revealed that though, they consume less, many low income people depend on fish as a major source of animal protein in Bangladesh. Yusuf et al. (2002) carried out a study on the economics of fish farming in Ibadan metropolis; the gross margin analysis revealed that medium scale farmers derived the highest return of N1.55 for every N1.00 spent on production. This was followed by large scale farmers with a gross marking of N1.34. They however, stated that fixed inputs, labour, fertilizer, feeds and fingerlings significantly affected the value of fish produced.

Lakra and Ayyappan (2002) carried out a research on the recent advances in technologies application to aquaculture. The study revealed that the subject has assumed greater importance in recent years in the development of agriculture and human health. The study concluded that the increased application of technological tools could certainly revolutionise our fish farming besides its roles in biodiversity conservation. Also, Deji et al. (2005) reported in the study on the influence of demographic and socio-economic characteristics of women farmers on their adoption of improved cassava varieties that years of schooling, numbers of children assisting in farm activities, source of credit, income and source of farm land were positive but not significantly related to the adoption of improved cassava varieties in the study area. The study concluded that demographic and socio-economic characteristics of respondents had no significant influence on their decision to adopt agricultural innovation.

However, literatures revealed quite a number of studies conducted on fish farming in Nigeria and Ondo state in particular but none seems to have been done in relation to gender and given the significance of fish as a guarantor of livelihood, a means of hunger and poverty reduction as well as a means of food and nutrition security to people of Ondo State, an empirical study of the type of resource used and the level of utilisation of these resources is of practical value on account of the insights that such a study will provide for the understanding of the technologies used in fish production.

Therefore, the study aimed to unveil the gender gap in the adoption of fish farming technologies in Ilaje and Ese-Odo Local Government Areas of Ondo State. More so, the specific objectives were to gender disaggregate the socio-economic characteristics of the respondents; analyze the involvement of men and women in fish farming at different stages of fish production; and identify level of adoption of available fishery technologies by men and women farmers. The study hypothesized that there was no significant difference between men and women fish farmers' level of involvement in fish farming process and that there was no significant difference between men and women fish farmers' level of adoption of fishing technologies.

METHODOLOGY

The study was carried out in Ilaje and Ese-Odo Local Government Areas of Ondo State. The state is presently made up of 18 Local Government Councils. Ondo State is located in the humid forest

Table 1. Selected social economic characteristics of respondents.

Variables stages	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Age				
30 and below	22	13.8	14	35.2
31-60	122	76.3	21	52.5
61 and above	16	10.0	5	12.5
Religion				
Christianity	149	93.1	39	97.5
Islam	10	6.3	1	2.5
Traditional	1	0.6	-	-
Sex	120	80.0	40	20.0
Marital status				
Single	13	8.1	11	27.5
Married	131	81.9	23	52.5
Divorced	3	1.9	6	15.0
Separated	8	5.0	-	-
Widower/Widow	5	3.1	2	5.0
Income level (₦)				
200,000 and below	41	25.7	16	40.0
200,000-400,000	72	45.0	7	17.5
400,000 and above	29	28.1	4	10.0
No response	34	21.3	13	32.5
Level of education				
No formal Education	50	31.3	16	40.0
Primary Education	7	4.4	6	15.0
Secondary Education	21	13.1	11	27.5
Tertiary Education	8	51.3	7	17.5

Source: Field Survey, 2011.

region of South-Western Nigeria. Temperature ranges from 21°C during the rainy season to 35°C during the dry season, while humidity is relatively high. The state has about 180 km of coastlines, the longest among the coastal states in the country. The coastline exists in Ilaje and Ese-Odo Local Government Areas, which harbour three fishing communities which are: Ilaje, Apoi and the Arogbo-Ijaw. The major occupation of the people is fishing with other minor occupation related to fishing in addition to lumbering. The fishermen still depend on traditional methods of fishing using hooks and line and nets but in recent times, some use motorised canoes and outboard engines (Fagbenro et al., 2004).

A multi-stage Sampling is the method of sampling populations that occur naturally in groups and is common in ecological field studies. This sampling method requires special statistical analysis that account for this sample structure. We present and compare several analytical methods for comparing means from two stage sampling (1) ANOVA, (2) CENTRAL TENDENCY AND DISPERSION MEASURES were used for the analysis.

RESULTS AND DISCUSSION

Socio-demographics of respondents

Results in Table 1 reveal that (13.8%) of male fish farmers were within the age group of 30 year and below, (76.3%) of male respondents were found within the age bracket of 31 to 60 years while (10.0%) of male farmers were found within the age group of 61 years and above. The mean age of the farmers was 52.70 and standard deviation of 9.26. In addition, in the female category, (35.0%) were found within the age group of 30 and below, (52.5%) were within the age bracket of 31 to 60 while (12.5%) were within the age group of 61 and above. This implies that majority of the farmers in the study areas were found within the productive age of 31 to 60 years of age. Hence, they contribute significantly towards agriculture. More so, Table 1 also reveals that majority (93.1%) of male respondents practiced Christianity, (6.3%) percent practiced Islam and very few (0.6%) practiced traditional religion while in the female category 97.5%) of respondents interviewed for the study practised Christianity while only 2.5% practiced Islam. This implies that Christianity is the dominant religion practiced in the study area. In addition the study revealed that majority (80%) of respondents were male while 20.0% were

Table 2. Distribution of respondents' level of involvement at the various stages of fish production.

Variables/ Stages	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Land preparation	110(50)	68.8(31.2)	14(26)	35.0(65.0)
Pond construction	106(54)	66.3(33.7)	16(24)	40.0(60.0)
Pond stocking	110(50)	68.8(31.2)	26(14)	65.0(35.0)
Pond management	112(48)	70.0(30)	14(26)	35.0(65.0)
Fish cropping	109(51)	68.1(31.9)	16(24)	40.0(60.0)
Fish processing	4(154)	2.5(97.5)	36(4)	90.0(10.0)
Marketing	15(145)	9.4(90.6)	36(4)	80.0(20.0)

Source: Field Survey (2011). *Figures in brackets represent those that were not engaged in the fish production activities.

female. It implies that women in the study areas engaged in open water fishing which usually is the predominant occupation of the people in the study areas.

Results in Table 1 reveal that (81.9%) of male respondents were married, (8.1%) were single, (5.0%) were separated, (1.9%) were divorced while (3.1%) of male respondents were widowers. In the female category (52.5%) were married, (15.0%) were divorced, (27.5%) were single and (5.0%) were widowed respectively. This implies that majority of the respondents were married. Also Table 1 shows that (25.5%) of male respondents earned an annual income of ₦200,000 and below from fish production, (45.0%) earned income of between ₦200,000 to ₦400,000 while (28.1%) earned income within the range of ₦400,000 and above annually from fish production. However, in the female category, (40.0%) earned an annual income of ₦200,000 and below, (17.5%) got between ₦200,000 to ₦400,000 while (10.0%) earned ₦400,000 and above from fish production This means that male farmers in the study areas generated much capital from fish production than the female. The rationale behind the variability in income was due to land fragmentation that prevail in the study area and the findings is in line with (Oladipo et al., 2011).

In addition, Table 1 also shows that (31.3%) of male respondents did not attain any formal education, (4.4%) spent 1 to 6 years on education, (13.1%) spent between 6 to 13 years on education while (51.3%) spent between 14 to 25 years in formal education. However, in the female category, (40.0%) of respondents did not have formal education, (15.0%) spent between 1 to 6 years on education, (27.5%) of respondents spent between 6 to 13 years on education while (17.5%) spent between 14 to 25 years on education. This implies that (31.3%) of male respondents did not have formal education, (4.4%) had primary education, (13.1%) had secondary education while (51.3%) had post secondary education respectively. It can therefore be deduced from the study that literacy level among male farmers is relatively high. This could be due to the fact that parents chirish male education than the female education in most parts of the country. However, (40.0%) of the female respondents did not have formal education, 15.0% had primary education, (27.5%) had secondary education while (17.5%) have post secondary education. Gender discrimination in education among rural dwellers is a common phenomenon among the female respondents in the study.

Involvement of men and women in fish farming at different stages of fish production

Land preparation

Results shown in Table 2 revealed that (68.8%) of male were involved in the various techniques in land preparation compared to (35.0%) female. This may be due to the difficulty involved in land preparation which few female can actually do.

Pond construction

Results presented in Table 2 show that majority (66.3%) of those involved in pond construction were male while female (40.0%) were involved. This may also be due to the nature of of the operations involved in fish production.

Pond stocking

Among the respondents interviewed, it was observed that (68.8%) of men were involved in pond stocking techniques introduced through the ADP and (35.0%) of female respondents were involved in pond stocking technique as shown in Table 2. This analysis shows that pond stocking was gender unbalanced in the study area.

Management of pond

Results Table 2 reveal that (70.0%) of male respondents

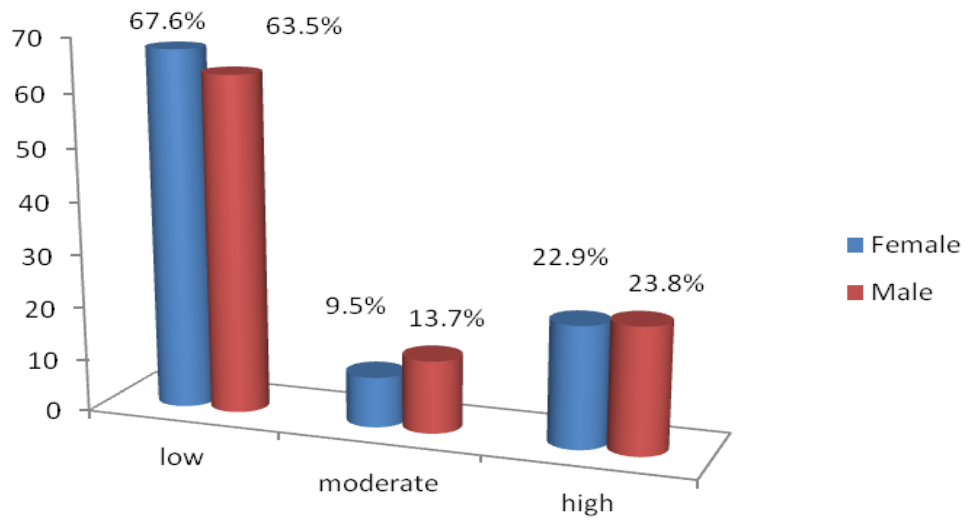

Figure 1. Level of adoption of available fish farming technologies.

were involved in pond management techniques which involves activities such as fertilizer application, changing of water, liming etc, while (65.0%) of the female respondents involved at this stage of fish production.

Cropping of fish

Results presented in Table 2 show that harvesting of fish is a tedious operation that required more energy that is the reasons (68.1%) of male respondents were found to be involved in it as against (40.0%) of female respondents.

Processing of fish

Table 2 revealed that processing of fish is mainly done by female respondents (90.0%) while only 2.5% men respondents were involved.

Marketing of fish

Results gathered in Table 2 also show that majority (80.0%) of female were found to be involved at this stage of fish production, while only (9.4%) of male were involved at this stage of fish production. This shows that women were more involved in marketing of fish like any other agricultural produce. This findings conform with Oseni (1995) assertions that women were highly involved in fish marketing in Lagos state.

Level of adoption of available fish farming technologies

Results in Figure 1 revealed that 63.5% of male and 67.6% of female had low level of adoption in fish farming technologies while few (13.7 and 9.5%) of male and female respondents, respectively scored high in adoption level. The findings indicated that there was a very low level of adoption of the various technologies in fish production. This could be due to the complexity and high cost of the technology as well as adopters' characteristics as supported by (Rogers (1962), Clark and Akinbode (1998), Alao (1980), Lionberger (1960) and Jibowo (2000) (Table 3).

Result of tested hypotheses

Hypothesis 1

There is no significant difference between men and women fish farmers' level of involvement in fish farming activities: Results in Table 4 show that at both 0.05 and 0.01 levels of significance, there was significant difference in the level of involvement in land preparation ($F= 25.975$, $p< 0.05$ and 0.01) between men and women fish farmers. This statistical variation could be as a result of the difficulty of the task involved in pond management. This makes more men to be involved than female like every other farming activity except in processing and marketing of agricultural produce.

Similarly, Table 4 also shows that at 0.01 level of significance, there was significant gender difference in the level of involvement of men and women in pond construction ($F= 36.190$, $p<0.01$). This disparity could also be traced to the nature of the activity. Also, at 0.01 level of significance, it was observed that there was significant difference in pond stocking ($F= 28.315$) between men and women fish farmers as shown in Table 5. This significant difference indicates that men were

Table 3. Distribution of respondents' level of adoption of selected fish farming technologies.

Variables	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Pond construction	50(110)	31.3(68.7)	15(25)	37.5(62.5)
Pond stocking	44(116)	27.5(72.5)	3(37)	7.5(92.5)
Water management	44(116)	27.5(72.5)	12(28)	30.0(70)
Integrated farming	7(153)	4.4(95.6)	2(38)	5.0(95)
Weed control	45(115)	28.1(71.9)	9(31)	22.5(77.5)
Race-way method	40(120)	25.0(75)	6(34)	15.0(85)
Re-circulatory method	5(155)	3.1(96.9)	-(40)	- (100)
Transportation of fish	13(147)	8.1(91.9)	3(37)	7.5(92.5)
Stocking density	22(138)	13.8(86.2)	3(37)	7.5(92.5)

Source: Field Survey, 2011. *Figures in bracket represent those that did not adopt the technologies.

Table 4. Summary of ANOVA on the level of involvement of men and women in fish farming activities.

Variable	F-value	P-value
Land preparation	25.975	0.000**
Pond construction	36.190	0.000**
Pond stocking	28.315	0.000**
Pond management	25.975	0.000**
Cropping of fish	40.752	0.000**
Processing of fish	0.474	0.492
Fish marketing	4.481	0.010**

Source: Field Survey (2011). ** Signifies that F is significant at p= < 0.01.

Table 5. Summary of ANOVA on the level of adoption of available fish farming technologies.

Variable	F-value	P-value
Pond construction	1.277	0.260
Pond stocking	0.028	0.868
Water management	8.288	0.050*
Integrated fish farming	0.029	0.865
Weed control	1.238	0.267
Race-way method	4.839	0.050*
Water recycle method	1.072	0.302
Transportation of fish	0.607	0.437
Socking density	0.283	0.595
Fertilizer application	1.915	0.168
Liming	1.610	0.206
Cropping methods	0.243	0.623
Feeding of fish	10.309	0.473*

Source: Field Survey (2008). * Signifies that F is significant at p=< 0.05 level while **F significant at 0.01.

more engaged in pond stocking than women.

Furthermore, there was significant difference in water quality management of pond at 0.01 level of significance (F=25.975) between men and women fish farmers. This disparity was due to gender discrimination in the study area. More so, there was significant difference (F=40.752) between men and women fish farmers level of involvement in cropping of fish at the significant level of 0.01. This statistical difference could also be explained from the point that male were more involved in fish farming activities than female.

Lastly, Table 4 reveals that at 0.01 level of significance a significant gender difference (F= 4.481) was observed in marketing of fish between men and women fish farmers. This disparity could be due to the fact that women engage more in marketing of agricultural produce than their men counterparts. However, processing of fish was not significant at either 0.01 or 0.05 significant level. This indicates that is a secondary operation that can be carried out irrespective of gender.

Hypothesis 2

There was no significant difference between men and women fish farmers' level of adoption of fish farming technologies: Results in Table 5 show that at 0.05 level of significance, there was significant difference (F= 10.309, p<0.05) between men and women level of adoption of fish feeding technology. This could be due to the factors associated with the embodies and unembodies technology involved in fish production.

However, pond construction, pond stocking, integrated fish farming, weed control techniques, water recycle method, transportation of fingerlings techniques, stocking density techniques, fertilizer application techniques, liming techniques and cropping methods were not significant at either 0.05 and .0.1 level of significant as shown in Table 5. This could be due to the fact that not too many farmers adopted fish farming technologies in the study area.

Conclusions

Fish farmers in Ilaje and Ese-Odo Local Government

Areas of Ondo State were characterized by older aged, with Christianity as major religion and dominated by male. Relatively high proportion of both male and female fish farmers did not have formal education with low annual income from fish production. Males were more involved at the various stages of fish production except in marketing of fish where majority were found to be women. This was further buttressed with the test of hypotheses where there were significant differences in almost all the stages of fish production at p=<0.01 except in marketing. This shows that gender differences exist in fish production. Also, the study revealed that there was a low level of adoption in almost all the available technologies across gender. This could be due to poor motivations and low ratio of extension staff to farmers which is one of the problems facing extension service in Nigeria.

RECOMMENDATIONS

In view of the above analysis, enlightenment campaigns aiming at improving fish production for improved socio-economic livelihood of the farmers through adoption of fish farming technologies should be organised at the local, State and National levels. Efforts at increasing the number of extension visits should be made so as to enhance gender balance in the level of adoption of fishery technologies especially among female farmers as women play significant roles in agricultural production in Nigeria. In addition, gender equality principles should be mainstreamed into technology development through effective programmes, clear linkage and active gender participation in fish farmers in Nigeria.

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