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# Assessment of Farmer's Technologies on Integrated Fish Farming and Non – Integrated Fish Farming in Ogun State, Nigeria

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*Keywords :* *Assessment, Technologies and Integration.*

*GJSFR-D Classification:* *FOR Code: 070406, 070403*


*Strictly as per the compliance and regulations of:*

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*Abstract -* The study assessed farmers' technologies on integrated and non integrated fish farming in Ogun State Nigeria. Multi stage Random sampling techniques was used to select **133** non - integrated fish farmers **(NIFF)** and **216** integrated fish farmers **(IFF) (n = 349)** from the study area. Data were analysed using chi-square, T-test and Pearson Product moment correlation. Results showed that **92.5%** of **NIFF** were male compared to **IFF (90.7%).** Also, **96.8%** of **IFF** and **79.7%** of **NIFF** were married. The mean ages of sampled farmers were **44** years **(NIFF)** and **46** years **(IFF)** while the mean fish farming experiences were **4** years **(NIFF)** and **5** years **(IFF).** More so, **99.1%** of **IFF** identified pond site selection as one of the key technologies used in integrated fish farming compared to **95.5%** recorded for **NIFF.** The chi-square analyses showed that knowledge of fish farming had significant association with respondents sex ($\chi^2$ **= 9.44, df = 2, p < 0.05),** marital status ($\chi^2$ **= 23.2, df = 4, p < 0.05),** occupation ($\chi^2$ **= 25.5, df = 8, p < 0.05),** interaction with friend and relatives ($\chi^2$**= 14.0, df = 2, p < 0.05),** radio/television ($\chi^2$ **= 21.7, df = 2, p < 0.05)** and internet usage ($\chi^2$ **= 6.40, df = 2, p < 0.05).** Bivariate correlation analyses showed significant relationship between farmers knowledge and age **(r = 0.20, p < 0.05),** fish farming experience **(r = 0.17, p < 0.05),** Significant differences exist between integrated and non - integrated fish farming, sources of information **(t = 40.1, χ = 48.09, p < 0.05)** and knowledge of fish farming **(t = 21.5, χ = 43.01, p < 0.05).**

*Keywords : Assessment, Technologies and Integration.*

## I. Introduction

In Nigeria, Integrated fish farming has been reported in many states of the federation in which 50% of fish farmers integrate, poultry, piggery or livestock with fish production, while integrated fish cum crop production is on the rise also in several states (AIFP, 2005). According to Asala (1994) the essence of integrated system is productivity of fish as to meet the challenges of food shortage and reducing the unemployment rate in Nigeria. Socio-economic conditions should be considered when developing integrated fish- farming systems. The development of a diversified economy depends on the harmonious interactions between socio-economic conditions, agricultural productions and regional environmental conditions (Huazhu and Boatang, 1989). In any part of the country, the type and level of integration depends on the prevalent environmental conditions, social norms, cultural values and religious factors (Ayinla, 2003). For example in the northern part of the country, fish cum pig integration is not advisable because of religions factors. The agricultural enterprise to be combined and their level of intensity determine the type of integration fish culture can be extensive, semi-intensive or intensive. The semi-intensive earthen pond fish culture is the most suitable integrated aquaculture system because of the natural ecosystem that can conveniently accommodate both crop and livestock production (Ayinla, 2003). Apart from market forces, demands for agricultural products should be put into consideration before establishing any integrated farming enterprise in any area (Pullin and Shehadeh, 1980). As such, this study seeks to assess various technologies in integrated and non integrated fish farming in Ogun State, Nigeria.

## II. Objectives of The Study

1. Identify various technologies available in integrated and non – integrated fish farming in Study area.
2. Describes the socio economic factors of the respondents in the study area
3. Ascertain farmers sources of information in the study area
4. Assess farmers' knowledge of fish farming technologies in the study area.

*Hypotheses tested :*

$HO_1$ *:* There is no significant relationship between socio economic characteristics of the respondents and their knowledge of fish farming.

$HO_2$ *:* There is no significant difference between integrated and non - integrated fish farming as regards constraints, sources of information and knowledge of fish farming.

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## III. Methodology

This study was carried out in Ogun State (Figure 2). The state came into being in February, 1976. Ogun Sate is bounded in the West by Republic of Benin, in the South by Lagos state and Atlantic Ocean, in the North by both Oyo and Osun states, and in the East by Ondo state (Ogun State of Nigeria, 1998).

It lies within latitudes $7^{o01}$ N and $7^{o18}$N and longitudes $2^{o45}$E and $5^{o55}$E (Oyesiku, 1992). The state is situated within the tropics covering 16,409.29 square kilometers with a population of about 4,054,272(National Population Commission 2006).

Multistage and simple random sampling (SRS) technique was used in this study. The first stage involved selection of all Ogun State Agricultural Development Programme (ADP) operational zones (Abeokuta, Ilaro, Ijebu-ode and Ikenne). Fifty percent (50%) of the blocks was selected which is equivalent to two and three blocks respectively from each of the zone. Furthermore, sixty percent (60%) of the cells in each of the selected blocks were also selected which amounted to 13, 9, 9 and 8 making a total of 39 extension cells. Thereafter, 56% of registered fish farmers were selected from the chosen cells. Thus 349 respondents were interviewed for the study.

The data for the study were obtained with the aid of a well structured interview guide. The interview was structured into sections to generated information about socio economic characteristics of the respondents and areas where their knowledge was assessed. Farmers knowledge was assessed using the following scale: Very well (3), Fairly well (2), Have idea(1) and not at all(0). Sources of information was measured using Yes(1) and No(2). Descriptive and inferential statistics were used for data analysis. T-test was also used to compare the means among the categories of farmers.

## IV. Results and Discussion

Table 1 shows the mean age of the respondents between the two categories of fish farming (Non - integrated fish farming and integrated fish farming) to be 44, and 46 years, indicating that majority of the respondents were within economically active age category (FAO, 1997; Yunusa, 1999). In support of this result, Fakoya and Daramola (2005) observed that respondents within this age bracket are more innovative, motivated and adaptable individuals who can with wisdom cope with farming challenges. Respondents in the age bracket 40 – 50 years are more involved in integrated fish farming (38.0 percent) while non - integrated fish farming recorded (NIFF) 36.1 percent. The percentage range between the two categories under study is a pointer to the fact that much commitment either in terms of finances or experience is needed to cope with farm operations especially with integrated fish farming (IFF) with multiple enterprises which recorded the highest value (38.0 percent). The age bracket 30-40 years is another important age category with strength for mobility to tackle some of the task on the farm. In this age bracket, integrated fish farmers (IFF) dominated with 27.8 percent compared to non - integrated fish farmers (NIFF) (19.5 percent). It could be recalled that, the above age category are youth who have the capacity to explore and withstand farm stress. However, this may be one of the reasons why those who are into integrated fish farming dominated this age category. Financial requirements of the farm operations in all categories may also be the reason for lower values recorded for other age groups (< 30, 30-40, 50-60 and >60 years) as compared to age 40-50 group.

*Table 1:* Distribution of respondents by their socio economic characteristics

| Variables | Non integrated fish farming n=133 | | Integrated fish farming n = 216 | | Total response n = 349 | |
|---|---|---|---|---|---|---|
| **Age(years)** | Freq | % | Freq | % | Freq | % |
| Below 30 years | 15 | 11.3 | 4 | 1.9 | 19 | 5.4 |
| 30 - <40 | 26 | 19.5 | 60 | 27.8 | 86 | 24.6 |
| 40 - <50 | 48 | 36.1 | 82 | 38.0 | 130 | 37.2 |
| 50 - <60 | 32 | 24.1 | 52 | 24.1 | 84 | 24.1 |
| 60 and above | 12 | 9.0 | 18 | 8.3 | 30 | 8.6 |
| **Mean age** | **44** | | **46** | | | |
| **Sex** | | | | | | |
| Male | 123 | 92.5 | 196 | 90.7 | 319 | 91.4 |
| Female | 10 | 7.5 | 20 | 9.2 | 30 | 8.6 |
| **Educational status** | | | | | | |
| No formal education | 4 | 3.0 | 12 | 5.6 | 16 | 4.6 |
| Primary education | 15 | 11.3 | 28 | 13.0 | 43 | 12.3 |
| Secondary education | 51 | 38.3 | 103 | 47.7 | 154 | 44.1 |
| Tertiary education | 63 | 47.4 | 73 | 33.8 | 136 | 39.0 |
| **Marital status** | | | | | | |
| Single | 16 | 12.0 | 4 | 1.9 | 20 | 5.7 |
| Married | 106 | 79.7 | 209 | 96.8 | 315 | 90.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Others | 11 | 8.3 | 3 | 1.4 | 14 | 4.0 |
| **Occupation** | | | | | | |
| Artsianship and craft | 15 | 11.3 | 9 | 4.2 | 24 | 6.9 |
| Farming | 62 | 46.6 | 126 | 58.3 | 188 | 53.9 |
| Paid employment | 29 | 26.4 | 57 | 21.8 | 86 | 24.6 |
| Trading | 12 | 9.0 | 20 | 9.3 | 32 | 9.2 |
| Others | 15 | 11.3 | 4 | 1.9 | 19 | 5.4 |
| **Mode of involvement** | | | | | 190 | 54.4 |
| Full time | 62 | 46.6 | 128 | 59.3 | | |
| Part time | 71 | 53.4 | 88 | 40.7 | 159 | 45.6 |
| **Fish farming experience(years)** | | | | | | |
| 1 -5 | 103 | 77.4 | 130 | 60.2 | 233 | 66.8 |
| 6 – 10 | 20 | 15.0 | 62 | 28.7 | 82 | 23.5 |
| Above 10 | 10 | 7.5 | 24 | 11.1 | 34 | 9.7 |

*Source: Field survey, 2009 .*

### *Ability to use the technologies involved in integrated and non - integrated fish farming*

Ability of the respondents to use the technology involved in integrated and non – integrated fish farming is one of the very important indicators in assessing farmer's knowledge in fish farming. Based on this, ability of the respondents to select fertile land for pond construction was investigated. It was recorded that 66.2 percent of integrated fish farmers can handle this particular technology very well on their farms compared to non - integrated fish farmers. Considering other technologies (ranging from lime application to artificial production of fingerling), larger percentages were recorded for integrated fish farmers on the ability to handle almost all the technologies in their respective farms compared to non - integrated fish farmers.

Farmers knowledge was also examined based on the technology of maggot production from livestock waste, it was found that 40.7 percent of the integrated fish farmers can use this technology very well compared to 9.8 percent of non - integrated fish farmers, while 71.4 percent of non - integrated fish farmers cannot use this technology compared to 76.9 percent accounted for integrated fish farmers.

So also, 19.9 percent of integrated fish farmers had the ability to harvest insect to feed their fishes compared to 4.5 percent of non - integrated fish farmers. On the contrary, 88.7 percent of non - integrated fish farmers cannot use this technology which was higher compared to their counterpart. The technology that involved the use of pond water for crop irrigation was sampled. It was gathered that 65.3 percent of integrated fish farmers can use this technology very well compared to non - integrated fish farmers with 24.1 percent.

Furthermore, 74.5 percent of integrated fish farmers had the ability to use the technology that involved production of fish meal from fish waste as compared to non - integrated fish farmers with 25.6 percent. It was also gathered that 29.3 percent of non integrated fish farmers had fair idea of how to use this technology compared to their counterpart.

The study further sampled the opinion of the respondents to handle fish feed production and pelleting as another technology. It was shown that most of the respondents have the ability to use this technology very well. Values recorded were 62.5 and 46.6 percent for integrated and non - integrated fish farmers. It is worthy to note that both categories of farmers cannot handle post-harvest preservation and storage together with adding value to fish after harvesting. More so, the level of farmers' knowledge fall into medium level (41.2) while 31.2 percent of the respondents fall into high knowledge level of ability to use different technologies on their farms and finally 28.6 percent of the respondents falls to the low level of knowledge.(table 2b)

*Table 2 :* Distribution of respondents by ability to handle /use integrated fish farming technologies n = 349.

| Variables | Non integrated | | | | Integrated | | | | Total response | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Technologies | NT | HI | FW | VW | NT | HI | FW | VW | NT | HI | FW | VW |
| Pond site selection | 14(10.5) | 17(12.8) | 34(25.6) | 68(51.1) | 15(6.9) | 30(13.9) | 28(13.0) | 143(66.2 | 29(8.3) | 47(13.5) | 62(17.8 | 211(60.5 |
| Pond construction | 4(3.0) | 8(6.0) | 34(25.6) | 87(65.4 | 18(8.3) | 4(1.9) | 45(20.8) | 149(69.0) | 22(6.3) | 12(3.4) | 79(22.6) | 236(67.6) |
| Application of lime | - | 2(1.5) | 15(11.3) | 116(872) | 8(3.7) | 2(0.9) | 13(6.0) | 193(89.4 | 8(2.3) | 4(1.1) | 28(8.0) | 309(88.5) |
| Fertilizer application | 1(0.8) | 1(0.8) | 11(8.3) | 120(90.2) | - | - | 6(2.8 | 210(97.2) | 1(0.3) | 1(0.3) | 17(4.9) | 33(94.6) |
| Fish pond netting to control predators | 7(5.3) | 4(3.0) | 13(9.8) | 111(83.5) | - | 6(2.8) | 4(1.9) | 206(95.4) | 7(2.0) | 10(2.9) | 15(4.3) | 317(90.8) |
| Fish feed formulation | 5(3.8) | 17(12.8) | 40(30.1) | 71(53.4) | 4(1.9) | 9(4.2) | 81(37.5) | 122(56.5) | 9(2.6) | 26(7.4) | 121(34.9) | 193(55.2) |
| Test and control of pond water acidity | 2(1.5) | 4(3.0) | 13(9.8) | 114(85.7) | - | 8(3.7) | 4(1.9) | 204(94.4) | 2(0.6) | 12(3.4) | 17(4.9) | 330(94.6) |
| Test and control of pond water fertility | 1(0.8) | 5(3.8) | 12(9.0) | 115(86.5) | - | 8(3.7) | 3(1.4) | 205(94.4) | 2(0.6) | 12(3.4) | 17(4.9) | 318(91.1) |
| Test and control of oxygen in pond water | 7(5.3) | 4(3.0) | 13(9.8) | 111(83.5) | - | 6(2.8) | 4(1.9) | 206(95.4) | 7(2.0) | 10(2.9) | 15(4.3) | 317(90.8) |
| Artificial production of fingerling | 86(64.7) | 18(13.5) | 4(3.0) | 25(18.8) | 98(45.4) | 17(7.9) | 11(5.1) | 90(41.7) | 184(52.7) | 35(10.0) | 15(4.3) | 115(33.0) |
| Production of maggot from livestock waste | 95(71.4) | 18(13.5) | 7(5.3) | 13(9.8) | 68(31.5) | 40(18.5) | 20(9.3 | 88(40.7) | 163(46.7) | 58(16.6) | 27(7.7) | 101(28.9) |
| Harvesting of insect to feed fish | 118(88.7) | 8(6.0) | 1(0.8) | 6(4.5) | 166(76.9) | 7(3.2) | - | 43(19.9) | 284(81.4) | 15(4.3) | 1(0.3) | 49(14.0) |
| Uses of pond silt for cultivation | 7(5.3) | 4(3.0) | 13(9.8) | 111(83.5) | - | 6(2.8) | 4(1.9) | 206(95.4) | 7(2.0) | 10(2.9) | 15(4.3) | 317(90.8) |
| Uses of pond water to irrigate crop | 70(52.6) | 19(14.3) | 12(9.0) | 32(24.1) | 38(17.6) | 2(0.9) | 35(16.2) | 141(65.3) | 108(30.9) | 21(6.0) | 47(13.5) | 173(49.6) |
| Production of fish meal from fish waste | 42(31.6) | 18(13.5) | 39(29.3) | 34(25.6) | 15(6.9) | 5(2.3) | 35(16.2) | 161(74.4) | 57(16.3) | 23(6.6) | 74(21.2) | 195(55.9) |
| Processing of poultry dropping into manure | 19(14.3) | 5(3.8) | 13(9.8) | 96(72.2) | 9(4.2) | 2(0.9) | 4(1.9) | 201(93.1) | 28(8.0) | 7(2.0) | 17(4.9) | 297(85.1) |
| Fish feed production and pelleting | 11(8.3) | 26(19.5) | 34(25.6) | 62(46.6) | 12(5.6) | 26(12.0) | 43(19.9) | 135(62.5) | 23(6.6) | 52(14.9) | 77(22.1) | 197(56.4) |
| Post harvest preservation and storage | 105(78.9) | 16(12.0) | 1(0.8) | 11(8.3) | 192(88.9) | 11(5.1) | 2(0.9) | 11(5.1) | 297(85.1) | 27(7.7) | 3(0.9) | 22(6.3) |
| Adding value to harvested fish by processing | 103(77.4) | 18(13.5) | 4(3.0) | 8(6.0) | 150(69.40 | 22(10.2) | 21(9.7) | 23(10.6) | 253(72.5) | 40(11.5) | 25(7.2) | 31(8.9) |

*Table 2 b :* Level of farmers knowledge in fish farming .

| Level of knowledge | Frequency | Percentage |
|---|---|---|
| High knowledge (46 – 57) | 108 | 31.2 |
| Moderate knowledge(33 – 45) | 143 | 41.2 |
| Low knowledge (19 – 32) | 99 | 28.6 |

*Source: Field survey, 2009 .*

### *Farmers' sources of information*

Access to information is one of the most valuable resources in agricultural development. Agricultural extension services therefore need to be armed with adequate and essential information in other to make good impact on the target groups (Fabusoro, 2000). In other word, farmers' sources of information have been reported to be influential in their decision to accept or reject a technology (Atala, 1980).

This study identified various sources of information available to respondents in the study area. Table 3 illustrates that; the most popular sources of information available to respondents was interaction with friends and relatives, it was very obvious that all categories of farmers rely on this source. As indicated from this study, 96.3 percent of integrated fish farmers, and 90.2 percent of non - integrated fish farmers used this source. This finding corroborates the assertion of Nwabude (1995), who said that farmers mainly source for information from fellow farmers and neighbours. It was also recorded that 9.8 percent of non - integrated fish farmers did not rely on this source which had higher percentage compared to other farmers. This was closely followed by extension agent as information source. It is worthy of note that integrated fish farmers identified with this source better (91.2 percent) compared to non - integrated fish farmers (72.2 percent).

Another source which featured significantly is radio and television programme, it could be recalled from Table 12 that integrated fish farmers (84.3 percent) had the highest percentages followed by non - integrated fish farmers which accounted for 60.2 percent. This finding is in agreement with the report of Ajayi (2003) who pointed it out that the use of radio was the most popular among farmers in South West Nigeria. Higher percentage recorded for integrated fish farmers may be as a result of search for facts which can greatly assist them in their practices since they combine more than one activity in their farming operations.

Short courses, seminar and workshop were also reported as one of the sources that has added values to the practice of integrated and non – integrated fish farming in the study area. It was reported that most of the respondents rely on this source. There was an appreciable response among the two categories of farmers in this respect. Better still, integrated fish farmers (75.9 percent) featured well in this option compared to non - integrated fish farmers (65.4 percent) The interest of farmers in their various operations may be responsible for this result.

Furthermore, other sources reported were formal training, apprentices/work experience on other farms, newspaper, magazines and fliers and finally internet. It was found that integrated fish farmers had higher response compared to non - integrated fish farmers.

*Table 3 :* Respondents sources of information used on integrated fish farming n = 349.

| Variables | Non integrated fish farming | | Integrated fish farming | | Total response | |
|---|---|---|---|---|---|---|
| Sources of information | Freq | % | Freq | % | Freq | % |
| **Formal training in school** | | | | | | |
| Yes | 25 | 18.8 | 35 | 16.2 | 60 | 17.2 |
| No | 108 | 81.2 | 181 | 83.8 | 289 | 82.8 |
| **Short courses, seminar and workshop** | | | | | | |
| Yes | | | | | | |
| No | 87 | 65.4 | 164 | 75.9 | 251 | 71.9 |
| | 46 | 34.6 | 52 | 24.1 | 98 | 28.1 |
| **Extension agent** | | | | | | |
| Yes | 96 | 72.2 | 197 | 91.2 | 293 | 84.0 |
| No | 37 | 27.8 | 19 | 8.8 | 56 | 16.0 |
| **Interaction with friends and relatives** | | | | | | |
| Yes | | | | | | |
| No | 120 | 90.2 | 208 | 96.3 | 328 | 94.0 |
| | 13 | 9.8 | 8 | 3.7 | 21 | 6.0 |
| **Apprenticeship/work experience on other farms** | | | | | | |
| Yes | 23 | 17.3 | 21 | 9.7 | 44 | 12.6 |
| No | 110 | 82.7 | 195 | 90.3 | 305 | 87.4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Radio/Tv programme** | | | | | | |
| Yes | 80 | 60.2 | 182 | 84.3 | 262 | 75.1 |
| No | 53 | 39.8 | 34 | 15.7 | 87 | 24.9 |
| **Internet** | | | | | | |
| Yes | 16 | 12.0 | 28 | 13.0 | 44 | 12.6 |
| No | 117 | 88.0 | 188 | 87.0 | 305 | 87.4 |
| **Newspaper, magazine and fliers** | | | | | | |
| Yes | 23 | 17.3 | 38 | 17.6 | 61 | 17.5 |
| No | 110 | 82.7 | 178 | 82.4 | 288 | 82.5 |

*Source: Field survey, 2009.*

### *Test of hypothesis*

To test for the relationship between the variables in hypothesis one, Pearson Product Moment Correlation (PPMC) and Chi-square ($\chi^2$) analyses were used. PPMC was used where the variables were measured at the interval level, while for chi-square variables were measured at nominal level. The correlation coefficient obtained from the statistical analysis in Table 16 shows that, there was a significant relationship between knowledge of the farmers (integrated fish and non integrated fish farming) and age ($r = 0.20$, $p < 0.02$) and fish farming experience ($r = 0.17$, $p < 0.00$). This result is in agreement with the report of Adeniji (2005) who reported a similar significant relationship between age and knowledge among farmers. The implication of this result is that, the prominent age category of the respondents between the two different types of farming categories may be responsible for the trend of this result. In other words, as the age of the respondents increases, their knowledge in fish farming also increase which further shows their interest in fish farming. Furthermore, there were significant relationship between knowledge and cosmopoliteness, fish production capacity, livestock population capacity and area of crop land cultivated ($r = -0.16$, $p < 0.01$), ($r = 0.21$, $p < 0.00$), ($r = 0.36$, $p < 0.00$) and ($r = 0.55$, $p = < 0.00$) .

The result of chi-square analysis shows that, there were significant relationship between knowledge of fish farming and marital status ($\chi^2 = 23.2$, $p < 0.05$), occupation ($\chi^2 = 25.5$, $p < 0.05$), mode of involvement ($\chi^2 = 17.1$, $p < 0.05$) land acquisition ($\chi^2 = 26.4$, $p < 0.05$) and extent of group participation ($\chi^2 = 12.5$, $p < 0.05$), while no significant relationship was recorded between educational level ($\chi^2 = 10.79$, $p > 0.05$), religion ($\chi^2 = 1.20$, $p > 0.05$), nativity($\chi^2 = 2.51$, $p > 0.05$) and knowledge of fish farming.

From the data collected, there were more male farmers in integrated fish farming (91.4 percent) than their fellow female counterpart; this observation may be due to the energy and physical exertions required for farming activities. However, the significance value recorded is an indication that sex is a barrier to this type of farming. The significant relationship observed between farmer's educational status and their knowledge of integrated fish farming is a clear attestation to the fact that education is important to the success of any innovation. This finding is supported by assertion of Islam and Dewan (1987), that education is an important factors in changing attitude, adoption of new technologies and ability of the respondents to handle different technologies.

Similarly, the significance of mode of involvement may be due to time demanded for fish farming, especially more for those in integrated category. So also, for cosmopoliteness, the significance implies that, farmers tend to pursue one or two things outside their native communities that can be of help in their farming enterprise.

*Table 4 :* Chi –square analysis of respondents socio economic characteristics and their knowledge of integrated fish farming.

| Variables | $\chi^2$ | Df | CC | Decision |
|---|---|---|---|---|
| Sex | 9.44 | 2 | 0.00 | S |
| Educational status | 10.79 | 6 | 0.09 | NS |
| Marital status | 23.2 | 4 | 0.00 | S |
| Occupation | 25.5 | 8 | 0.01 | S |
| Mode of involvement | 17.1 | 2 | 0.00 | S |
| Religion | 1.20 | 2 | 0.54 | NS |
| Nativity | 2.51 | 2 | 0.28 | Ns |
| Extent of group participation | 12.5 | 4 | 0.01 | S |

*Source: Field survey, 2009.*

*Note: S = Significant at 0.05 level.*

*NS = Not Significant at 0.05 level.*

*Table 5 :* Correlation analysis of the respondents socio economic characteriscs and their knowledge of integrated fish farming.

| Variable | R | P | D |
|---|---|---|---|
| Age | 0.20 | 0.00 | S |
| Fish farming experience | 0.17 | 0.00 | S |
| Level of cosmopoliteness | 0.16 | 0.01 | S |
| Livestock population | 0.21 | 0.00 | S |
| Fish production capacity | 0.36 | 0.00 | S |
| Area of crop land cultivated | 0.55 | 0.00 | S |

*Source: Field survey, 2009.*

*Note: S = Significant at 0.05 level.*

*NS = Not Significant at 0.05 level.*

**Chi square result of respondents sources of information and their knowledge of integrated fish farming**

Table 6 shows the chi square analysis between the respondent's sources of information and knowledge in fish farming (IFF & NIFF). Significant association was found between some information sources (extension agent, Radio/television programme, interaction with friends and relatives and internet) and knowledge in fish farming ($\chi^2$=14.8, p < 0.05, $\chi^2$ = 21.7, P < 0.05, $\chi^2$ = 14.0, P < 0.05,) and ($\chi^2$ = 6.40, p< 0.05)). This observation is expected since farmers attached their ties with friends and neighbour as a source of information and also have greater influence on respondent's knowledge of fish farming. Finding of Ajayi (2005) supported the significant of radio and television as the most popular media among farmers in south west, Nigeria.

*Table 6 :* Chi square analysis of respondents sources of information and knowledge of in fish farming

| Variables | $\chi^2$ | Df | CC | Decision |
|---|---|---|---|---|
| Formal training in school | 3.25 | 2 | 0.19 | NS |
| Short courses, seminar and workshop | 8.43 | 2 | 0.15 | NS |
| Extension agent | 14.8 | 2 | 0.00 | S |
| Interaction with friends and relative | 14.0 | 2 | 0.00 | S |
| Apprentice/work experience | 0.24 | 2 | 0.88 | NS |
| Radio/Tv programme | 21.7 | 2 | 0.00 | S |
| Newspaper, magazine and fliers | 0.33 | 2 | 0.84 | NS |
| Internet | 6.40 | 2 | 0.04 | S |

*Source : Feild survey, 2009.*

*Note : S = Significant at 0.05 level.*

*NS = Not Significant at 0.05 level.*

Difference in constraints, sources of information and knowledge level scores between two categories of fish farmers (IFF & NIFF).

Table 7 present results of t-test of significant difference between mean level of constraints, sources of information and knowledge level score by the two categories of fish farmers (IFF &NIFF) in Ogun State. The results shows that significant difference exists in the level of constraints faced by the farmers (t = 1.018, P < 0.05), sources of information (t = 0.48, p < 0.05) and knowledge (t = 3.58, p < 0.05). An average integrated fish farmers was revealed as facing significantly higher level of constraints (constraints = 14.09) than non - integrated fish farmers (constraints = 13.02). Also with reference to knowledge, integrated fish farmers (t = 43.01) are more knowledgeable than non - integrated fish farmer in most of the technologies identified by sampled respondents. The notable reason for this observation may be as a result of enterprise mix in which integrated fish farmers are involved in, since each unit has its own distinct constraints. Combination of several of these units may tend to increase the number of constraints faced compared to non-integrated fish farming.

*Table 7 :* Result of t-test of significant difference between mean level of constraints, sources of information and knowledge for non - integrated and integrated fish farming.

| Variables | Farm types | N | Means | Std error of means | t- values | Decision |
|---|---|---|---|---|---|---|
| Sources of information | NIFF | 133 | 32.00 | 0.48 | 0.00 | S |
| | IFF | 216 | 48.09 | 0.56 | | |
| Knowledge scores | NIFF | 133 | 40.08 | 3.58 | 0.00 | S |
| | IFF | 216 | 43.01 | 9.87 | | |

*Source: Computed from survey data 2009 .*

*S = Significant at 0.01 level.*

## V. Conclusion and Recommendations

The study has shown that harvesting of insect to feed fish, post harvest preservation and storage and adding values to harvested fish by processing have not been given proper attention. The study has also confirmed that farmers relied solely on information gotten from friends and relatives. Based on the findings of the study the following recommendations are suggested.

1. There is need to ensure that respondents are exposed to most of the technologies in fish farming through various training at local, state and at national level so as to enhance their knowledge of fish farming.
2. Effort should be made in assisting the farmers on how to preserve fish after harvesting through provision of cold room at strategic places where farmers can have access to it.
3. The technologies should be more gender sensitive in favour of women so that they will be able to handle the so call technologies in fish farming.

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