



## **Farmers' Participation in Homestead Fish Production: Implications for Poverty Alleviation in Bayelsa and Delta States, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the  
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### **ABSTRACT**

The study examined participation of farmers in homestead fish production and its implications for poverty alleviation in Bayelsa and Delta States, Nigeria. Primary data were sourced from one hundred and ninety two (192) respondents, spread across eight local government areas in Bayelsa and Delta States. Data from respondents were analyzed using percentages and means. Multiple regression was used to analyze the hypotheses of the study. Results showed that most (64.6%) of the farmers were part-time fish farmers, majority of the farmers (34.4%) primary occupation was civil service jobs and the mean number of years of being fish farmers was 12 years, indicating that they are experienced in the business. It was also revealed that the mean fish farm output and income was 164.60kg and ₦167,200 (\$1,045) respectively. Result as well showed that such socio-economic characteristics like years of residence in community (b = 3463.453), age (b = 2436.231), education (b = -12198.565), farm size (b = 32989.126), fish farmers membership experience (b = 2947.564) and participation of farmers in groups activities (b = 321.423) were significant

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variables ( $P < 0.05$ ) affecting farm income of the fish farmers. Also, sex ( $b = 22721.453$ ), age ( $b = 610.257$ ), farming status ( $b = 21743.221$ ), farm size ( $b = 4235.216$ ) and farming experience ( $b = 2945.212$ ) were found to be significant variables influencing fish farm revenue. Based on findings, the study recommends that security personnel should be employed by the farmers to curb the menace of theft, there is a need for the government through special programmes to ensure a good availability of inputs like fingerlings, fish feeds at affordable prices and the home stead fish farmers need to be trained on integrated pest and disease management method as this will help reduce the losses of the farm.

*Keywords: Agricultural production; agricultural output; farm income; farm revenue; increased productivity; participation; farmers characteristics; group characteristics; small scale farmers; communities; occupation; poverty.*

## 1. INTRODUCTION

Poverty is a dilemma in rural communities all over the world. It is a problem that needs urgent attention and solution if sustained and balanced economic growth and development is to be maintained. Tokunbo [1] spelt out that the most pathetic feature of Nigeria society today is that relatively insignificant minority of her citizens are living in affluence while the remaining majority are living in state of destitute or poverty. Poverty defies objective definition because of its multi-dimensional nature. There is no up to date universally accepted definition of poverty due to the difficulty in deciding where to draw the line between the poor and the "non-poor". Tokunbo [1] refers to poverty as a lack of command over basic consumption needs which means in other words that there is an inadequate level of consumption giving rise to insufficient food, clothing and or shelter, and moreover the lack of certain capacities, such as being able to participate with dignity in society. Poverty has been conceptualized in both "relative" and "absolute" sense. Imodu [2] stated that relative poverty indicates that people are poor in relation to other people, while absolute poverty suggests living below a certain "minimum standard" quality of life. The author reiterated that the concept of poverty derives from long protracted inability to generate productive resources for the purpose of generating desired level of output in other to enhance the realization of an appreciable income. Imodu [2] emphasized that to be able to graduate from this (poverty) situation, income generated has to be reasonable enough to meet daily needs and must be sustainable. The unfortunate scenario points to the fact that the rural areas where most of the nations (Nigeria) food is produced is most hit. Tokunbo [1] summed that the incidence of poverty in Nigeria is much higher in the rural areas than in the

urban centres, the urban slums-dwellers form one of the more deprived groups.

Poverty alleviation has become synonymous with sustainable income and sustainable human development in recent years [2]. He stressed that poverty alleviation has become necessary due to the continuous imbalance in the farmers economic growth and development. It is assumed that most of the farmers of our time are far less able to create wealth and sustain it. They (farmers) inevitably have to depend and participate on one type of agricultural production or the other like homestead fish production that will help them make some money, therefore reduce and possibly overcome poverty with time.

Homestead fish production play important role in alleviating the condition of food insecurity, malnutrition and poverty status of the people [3]. They noted further that homestead fisheries involve aqua-cultural production system based on the rearing of fishes in a man-made enclosure. It involves farming of fishes in an enclosed water body which could be in the form of concrete, fiberglass or plastic material called pond. The importance of fishes produced cannot be over emphasized because they are used to generate income to the farmers (when sold) thus helping to reduce the poverty level of the people, most household depend on fish as their main source of animal protein, they as well provide employment opportunities to the people [4]. Through personal communication and observation, the author found that some of the types of fishes reared were Tilapia species and cat fish (*heterobranchus spp*). The reason for the farmers focusing on these types of fishes is that they are the types liked and eaten by the people of the area. The farmers also advanced that the speedy growth of these types of fishes makes it economically viable to them (farmers). The major

problem confronting many aspects of fish production is how to increase the quantity and quality of fish production, poor sales of fish products and so deepening poverty level of the people. In a bid to ensure sustainable fish production, some form of participation of the fish farmers in homestead fish production becomes necessary. FAO [5] defined participation as a process of equitable and active involvement of all stakeholders in the formulation of development policies and strategies and in the analysis, planning, implementation, monitoring and evaluation of development activities. FAO [5] also see participation in development as an organized effort within institutions and organizations to increase stakeholders' access and control over resources and related decision making that contributes to sustainable livelihoods. In this light, participation is seen as a ground that allows for a more equitable distribution of opportunities for development to take place. It (participation) thus provides an environment where the disadvantaged among stakeholders are empowered to increase their level of knowledge, influence and control over their own livelihoods, including development initiatives affecting them.

Participation of the farmers in fish farmers organization would involve farmers themselves to initiate a critical reflection process focused on their activities. Participation involves people who are on the receiving end and this makes them to ensure the most efficient allocation of scarce resources and the early identification of wasteful use of resources [6]. He emphasized that participation encourages the development of human capacities among farmers. Participation of stakeholders in their group leads to the rejection of authoritarian style of leadership and also to strengthen the means of articulating genuine needs and proffering solutions to them through self-reliance and mass mobilization [7]. Agboola [8] pointed that participation of community people in their local organization is an effective strategy in articulation, prioritization, implementation, and financing of project needs of the poor. He acknowledged that participation prevents a dependency culture which may likely inhibit their lives and status in society. Tannenbaum [9] pointed out that the participation of people in high quality community based organization will bring about the following benefits: It makes the people gain access to the range of supports and opportunities that are available within the community, it helps to increase in the farmers sense of self-efficacy, in

handling challenges, problems and needs, it brings in them higher academic achievement and interest in furthering their education, it helps to enhance problem solving skills, ability to work in terms and planning abilities, and it also enhances civic engagement attitudes, skills and behaviours.

Participation on homestead fish production (in particular) or in groups (in general) makes it possible through an organized effort, to increase stake holders access and control over resources and related decision making that contributes to sustainable livelihoods. This will ensure that resources are adequately managed and hijacking of affairs of the organization is guided against [9]. Many of our fish farmers are still impoverished by poverty despite their participation in homestead fish production. The poverty level have arose due to recent high population growth rates and rural-urban migration, which has made the quality of life in the urban slums worse and urban services over stretched [1]. In line with reducing or eliminating poverty amongst the people through the fish production programme, it is therefore important to study the participation of farmers in homestead fish production in order to provide information which will help the government and other stake holders develop more positive policies and actions towards the rural poor and other farmers engaged in fresh fish production. The study will as well aid in knowing the living standard of the rural poor and also facilitate comparism of their living standard within the areas of study. It is against this background that the study was carried out.

## **2. OBJECTIVES AND HYPOTHESES OF THE STUDY**

The overall objective of the study was to determine farmers' participation in homestead fish production and its implication for poverty alleviation in Bayelsa and Delta States, Nigeria.

To achieve this objective, the following specific objectives were looked into:

- i. Examine the socio-economic characteristics of homestead fish farmers in Bayelsa and Delta States.
- ii. Determine the output (kg) of homestead fish farmers in the study area.
- iii. Determine the effect of farmers' participation in fish rearing on poverty alleviation in the study area, and

- iv. Identify the factors perceived as constraints to farmers' participation in homestead fish production in the States.

Hypotheses of the study were stated in their null forms:

H<sub>01</sub>: Farmers socio-economic characteristics and participation in fish rearing have no significant influence on farm revenue.

H<sub>02</sub>: There is no significant relationship between socio-economic characteristics of fish farmers and the income generated from their fish farming activities.

### 3. METHODOLOGY

#### 3.1 Study Area

The study was carried out in Bayelsa and Delta States of Nigeria.

##### 3.1.1 Bayelsa State

Bayelsa State is an oil rich state with its capital city at Yenagoa and it is one of the nine States of the Niger delta region of Nigeria. It is a young State (19 years) and geographically located at Lat 4° 15' and 5° 23'N and Longitudes 5° 15' and 6° 45'E. The State is respectively bounded to the North and East by delta and Rivers States, while in the South and West by the Atlantic Ocean [10]. The report indicated that the State has a population size of 1.7 million people and occupies a land area of 21,000 km<sup>2</sup>. Bayelsa State has eight (8) local government areas, with Ijaw as the predominant language of the people and most of them into fishing activities. Although other agricultural crops grown include oil palm, rubber, coconut, cane sugar, pine apple, banana, plantain, yam and cassava. The State is endowed with a variety of customs, festivals, music, arts, crafts, museums and monuments and it has a lot of tourist attraction [10].

##### 3.1.2 Delta State

The state is one of the six states in the South – South geopolitical zone of Nigeria, it was created from the defunct Bendel State on 27<sup>th</sup> August, 1991 and it has a population of 4,170,214 based on the 2006 census figure [11]. It has 25 Local Government Areas with the capital city at Asaba. The report noted that the people's predominant occupation is farming (cropping, fishing and

animal rearing), oil prospecting, civil service, trading and commerce [10]. The State is divided into three senatorial zones, namely Delta North, Delta Central and Delta South. The population of the study was farmers who produce fresh fish both for commercial and home use.

#### 3.2 Sampling Technique and Sample Size

A multi stage sampling technique was adopted for selecting the respondents. The study was carried out in Bayelsa and Delta States. They both belong to the Niger Delta region of Nigeria. The States have three (3) senatorial districts each, from which two (2) senatorial districts per state were purposely selected for the study, thus making a total of four (4) senatorial zones. The zones were purposely selected because they are the senatorial zones where fresh fish is adequately reared and produced in the states. From the zones, two (2) local government areas were randomly selected, thus bringing the number used for the study to eight (8). This was followed by the purposive selection of two (2) towns in each of the LGAs and this adds up to sixteen (16) towns that were used for the study. The purposive selection was as a result of the fact that fish farmers were not evenly distributed across the LGAs, rather they are more concentrated in some communities/towns than others (see Table 1 for the communities/towns selected for the study). From each of the selected communities/towns, fifteen (15) research instruments (interview schedule and questionnaire for illiterate and literate farmers respectively) were distributed. From these, twelve (12) of the instruments were suitable for analysis were selected and this brought the total instrument used for the study to one hundred and ninety two (192).

The content or face validity was used to validate the instrument while the Cronbach Alpha method was used to test the instrument's reliability. The technique yields a value of 0.81 indicating a good reliability of the instrument [12].

#### 3.3 Method of Data Collection and Measurement of Variables

Data for the study were collected from the respondents via well structured interview schedules and questionnaire through personal contact of the researcher with the respondents.

**Table 1. Towns/communities used for the study**

State	Senatorial Zones	LGAs	Communities
Bayelsa	Bayelsa East	Nembe Ogbia	Ogbolomabiri and Okoroma Oloibiri and Opume
	Bayelsa West	Ekeremor Sagbama	Tarakiri and Oyiakiri Ebedebiri and Agoro
Delta	Delta South	Isoko North	Owhellogbo and Oyede
		Isoko South	Emede and Olomoro
	Delta Central	Ughelli North Ethiope West	Ughelli and Abgara Oghara and Mosogar

**3.4 Method of Data Analysis**

Descriptive statistics such as frequency distribution, percentages and mean was used to analyze the socio-economic and farm characteristics of the respondents. On the other hand inferential statistics (multiple regression and standard deviation) were used to analyze the hypotheses of the study.

The research instrument consists of four main parts – socio-economic characteristics, farm characteristics, participation of farmers and constraints limiting farmers participation in homestead fish production. Constraints of farmers’ participation in homestead fish production were measured on a four-point Likert scale. A weighted mean of 2.50 and above were considered as constraints limiting homestead fish production, while those with values less than 2.50 were regarded as not limiting.

The regression equation is specified as:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3, \dots, + b_nX_n + e$$

Where:

- Y = dependent variable (level of participation)
- a = the coefficient of the constant term
- b<sub>i</sub> = the coefficient of the independent variables
- X<sub>i</sub> = the independent variables
- e = error term

The variables in the equation are defined below as:

- Y = Farm revenue (N, \$)
- X<sub>1</sub> = Years of residence (years)
- X<sub>2</sub> = Gender (male = 1; female = 0)
- X<sub>3</sub> = Age (years)
- X<sub>4</sub> = Educational status (years)

- X<sub>5</sub> = Household size (number of people living and feeding together)
- X<sub>6</sub> = Farming status (dummy: full time = 1; part time = 0)
- X<sub>7</sub> = Farm size (i.e. fish pond size)
- X<sub>8</sub> = Farming experience (years).
- X<sub>9</sub> = Participation index score (measured in percentage)

The variables in the equation for hypothesis two (2) are specified as:

- Y = Farm revenue (N, \$)
- X<sub>1</sub> = Gender (male = 1; female = 0)
- X<sub>2</sub> = Age (years)
- X<sub>3</sub> = Educational status (years)
- X<sub>4</sub> = Household size (number of people living and feeding together)
- X<sub>5</sub> = Farming status (dummy: full time = 1; part time = 0)
- X<sub>6</sub> = Farm size (i.e. fish pond size)
- X<sub>7</sub> = Farming experience (years).

Linear, exponential, Cobb-Douglas and semi-log functions were used to run the models. Amongst all, the linear regression function was selected as the best fit model based on number of significant variables, highest coefficients of determination (R<sup>2</sup>) level of significance of the variables been tested and signs of the estimated coefficients of the independent variables [13].

**4. RESULTS AND DISCUSSION**

**4.1 Socio-economic Characteristics of the Respondents**

The socio-economic characteristics of the respondents are shown in Table 2. It showed that male dominated (92.7%) homestead fish production. The dominance of male in homestead fish production activity may be because such production process requires much time and energy which can mostly be met by the

**Table 2. Socio-economic characteristics of respondents**

Characteristics	Categories	Frequency	Percentage	Mean
Sex	Male	178	92.7	
	Female	14	7.3	
	Total	192	100.0	
Age	< 30	-	-	
	30 – 39	18	9.4	
	40 – 49	54	28.1	
	50 – 59	98	51.0	
	60 and above	22	11.5	
	Total	192	100.0	51.5
Marital status	Married	157	81.8	
	Divorced	19	9.9	
	Widow(er)	16	8.3	
	Total	192	100.0	
Education	Primary education	24	12.5	
	Secondary education	96	50.0	
	Post secondary edu	72	37.5	
	Total	192	100.0	
Household size range	1 – 3	22	11.5	
	4 – 6	102	53.1	
	7 – 9	52	27.1	
	10 – 12	16	8.3	
	Total	192	100.0	6.0
Religious affiliation	Christian	134	69.8	
	Muslim	-	-	
	Traditional	36	18.8	
	Others	22	11.5	
	Total	192	100.0	
Years of residence In community	< 5	08	4.2	
	5 – 9	42	21.9	
	10 – 14	84	43.8	
	15 – 19	38	19.8	
	20 and above	20	10.4	
	Total	192	100.0	13
Tenancy status	Land lord	162	84.4	
	Tenant on rent	30	15.6	
	Total	192	100.0	

Source: Field survey, 2015

males. Akinbile et al. [14] agreed with this assertion as they noted that males tend to have more physical energy than their female counterparts and this they use to carry out their farm activities. In addition, going by the tedious nature and many activities involved in homestead fish production, it can only in most cases be carried out by landlords (84.4%) who incidentally happened to be mostly males.

The average age of the respondents is 51.5 years with the majority (51%) between 50 – 59 years. Homestead fish production is dominated by older individuals. It is possible that these groups are landlords and so can practice fish production around their abodes. Also, older

people are likely to be married and have larger household who may assist them in the operations. The findings of [15] complied with this assertion. They stressed that agricultural activities (fish farming inclusive) are mostly carried out by married people and who also have family responsibilities. Most (81.8%) of the respondents are married. The proceeds from the fishing activities may be used to be meeting up with the economic demands of their families, hence the dominance of married people. Reports of [3] support this assertion as they noted that proceeds from fishing activity are used for taking care of their families economic needs. The educational level of the respondents showed that most (87.5%) of them schooled beyond primary

school level. The results suggest that the farmers were averagely educated and this suggests that they will be able to carry out their fishing activities without much need for external assistance. The report of [16] confirmed that most agricultural products producers (fish inclusive) are educated and so have the ability to manage and improve their finances from their agricultural activities.

The average household size was six (6) persons with most (53.1%) of them having between 4 – 6 members. This indicates that the farmers have large household size. Large household size may serve as an important source of labour in assisting the homestead fish farmers in carrying out some of the farming activities like stocking, bailing/drainage of water, pumping water into the pond, harvesting and sorting. The use of family labour will go a long way in lowering cost of production. Ojo and Ajibefun [17] findings support this assertion. They acknowledged that the use of family labour will go a long way in lowering cost of farming activities and therefore increasing their income. Religion practiced by most (69.8%) of the respondents is Christianity. Few of them practiced other religions (exclusive of Islam). The result shows that though all religions practiced by the respondents (apart from Islam) support homestead fish production. The dominance of Christ worshippers suggests that the study area is largely a Christian area. Findings of [3] confirm that most participants in homestead fish production belong to the Christian faith.

The average length of residence of the respondents was 13 years. Precisely, most

(74%) of them had resided for more than 9 years in their communities. The result shows that most of the respondents have been residing in their community for a long period of time and this has a way of encouraging them to owe their own houses where homestead fish farming can be practiced. This is in line with the results of [18]. The author acknowledged that the longer people reside in a particular locality, the more willing they would want to indulge in agricultural activity such as fish farming.

#### 4.2 Primary Occupation of Respondents

Tables 3 and 4 respectively showed that the primary occupation and farming status of the respondents. Where respondents occupation is concerned, most (76%) of them indicated that they engage in other jobs in addition to the homestead fish farming activity. In precise terms, most (76%) of them have other jobs they do in addition to the fish farming activity.

Results showed that most (34.4%) of the fish farmers are civil servants, this number is closely followed by a proportion (24%) who indicated that they are primarily farmers. Having most of the respondents in civil service jobs accounts for why majority (about 65%) are part-time operators of homestead fish production (see Table 4). Since most of the fish farmers are into civil service jobs, it implies that they participate in homestead fish farming business just to help support their economic activities, increase and to meet food security of their household. Findings of [3] support this result. They reiterated that people take part in most agricultural production to help meet up with the food security of their household.

**Table 3. Primary occupation of respondents**

Characteristics	Categories	Frequency	Percentage
Primary occupation	Farming	46	24.0
	Trading	14	7.3
	Civil servant	66	34.4
	Company employee	24	12.5
	Self employed	42	21.9
	Total	192	100.0

Source: Field survey, 2015

**Table 4. Farming status of the respondents**

Characteristics	Categories	Frequency	Percentage
Farming status	Full - time	68	35.4
	Part-time	124	64.6
	Total	192	100.0

Source: Field survey, 2015

### 4.3 Respondents' Level of Fish Output (kg) Produced

The weight (kg) and income realized from fish produced by the respondents during the last season or harvest is showed in Tables 5 and 6 respectively. The average weight of fish produced is about 165 kg. Majority (35.4%) of the respondents produced between 200 – 249 kg of fishes, about 7% produced more than 149 kg of fishes while about 57% produced less than 150 kg. Through personal communication, the respondents noted that the weight (kg) of the harvested fishes is what determines the selling price and consequently the farm income.

Results showed that the homestead fish farmers made an average income of ₦167,200 (\$1,045). Most (25%) earned an income of between ₦200,000 (\$1,250) – ₦249,000 (\$1,556.25) from fish sales. About 14% and 61% earned more than ₦249,000 (\$1,556.25) and less than ₦200,000 (\$1,250) respectively. The result implies that homestead fish production is a highly profitable business. This accounts for why some of the respondents see homestead fish production as a major source of livelihood, others welcome it as a source of support to meeting their food protein intake and economic lives.

Reports regarding high profitability level of fish production has been reported by [19], thus supports this findings.

### 4.4 Farming Experience of Respondents

The average years spent by the respondents as homestead fish farmers is 12.6 years with the majority (35.4%) between 10 – 14 years (see Table 7). Result revealed that about 34% and 30% had more than 14 years and less than 10 years fish farming experience respectively.

The result indicates that the farmers are experienced in the homestead fish production activity and so they are capable of knowing how best to carry out the production exercise. Such knowledge will go a long way in reducing chances of risks that are capable of increasing costs, rather it will help in improving on their output, sales and consequently income. This finding is supported by results of [20]. They asserted that the more years acquired by producers, the more they know about the activities carried out. Such knowledge also translates to lowering cost, which consequently increase income generated from production and sales.

**Table 5. Distribution of respondents based on the level of fish production**

Characteristics	Categories	Frequency	Percentage	Mean
Weight of fish (kg) (Semi-annual basis)	< 50	18	9.4	
	50 – 99	24	12.5	
	100 – 149	32	16.7	
	150 – 199	36	18.8	
	200 – 249	68	35.4	
	250 and above	14	7.3	
	Total	192	100.0	164.60

Source: Field survey, 2015

**Table 6. Distribution of respondents on the level of fish income**

Characteristics	Categories	Frequency	Percentage	Mean
Income range (₦/\$) (semi – annual basis)	< 50,000	18	9.4	
	50,000 – 99,000	24	12.5	
	100,000 – 149,000	36	18.8	
	150,000 – 199,000	40	20.8	
	200,000 – 249,000	48	25.0	
	250,000 – 299,000	16	8.3	
	300,000 and above	10	5.2	
	Total	192	100.0	167,200/\$1,045

Source: Field survey, 2015



#### 4.5 Perceived Constraints Associated with Homestead Fish Production

Some challenges in homestead fish production in the study area are showed in Table 8. The constraints perceived as serious are theft from neighbourhood ( $\bar{x} = 3.70$ ), difficulty in getting loans for expansion ( $\bar{x} = 3.08$ ), and Insufficient capital for production activities ( $\bar{x} = 3.05$ ). Other serious constraints include poor pricing of harvested fishes ( $\bar{x} = 3.02$ ), harassment from L.G.A. health workers ( $\bar{x} = 2.97$ ), lack of government support ( $\bar{x} = 2.94$ ) and poor power supply ( $\bar{x} = 2.88$ ).

Also identified as serious constraints are pest and disease outbreak ( $\bar{x} = 2.75$ ), difficulty in accessing farm inputs ( $\bar{x} = 2.56$ ) and lack of storage facilities ( $\bar{x} = 2.21$ ). Some of the constraints like theft, pests (frogs, snakes, etc.), and diseases outbreak are in agreement with the findings of [3]. They acknowledged these mentioned factors as some of the most important factors affecting fish farming in most of our communities. Other constraints like insufficient capital and difficulty in loan collection were in agreement with the findings of [21] who noted that fish farming business would have been doing better if not for the constraints faced by the

farmers in the homestead fish production. Difficulty in accessing farm inputs, lack of government support and poor pricing of agricultural products have been supported by the findings of [22] as major constraints facing fish farming business in our localities.

#### 4.6 Influence of Participation in Fish Farmers' Organization and Socio-economic Characteristics of Farmers' on Farm Revenue (Multiple Regression)

Hypothesis one states that: Fish farmers' socio-economic characteristics and participation in fish farmers' organization have no significant influence on their farm income. This hypothesis was analyzed using multiple regression. Table 9 shows the estimated parameters of the fish farmers' socio-economic characteristics and participation in group activities as they affect their farm income level. The computed F statistic (7.474) was significant at the 5% level (critical F = 3.94), denoting that the collective influence of the variables on respondents farm income was significant at the 5% level hence the rejection of the null hypothesis and the acceptance of the alternative hypothesis.

**Table 7. Farm experience of respondents**

Characteristics	Categories	Frequency	Percentage	Mean
Farming experience (years)	< 5	16	8.3	
	5 – 9	42	21.9	
	10 – 14	68	35.4	
	15 – 19	36	18.8	
	20 and above	30	15.6	
	Total	192	100.0	12.6

Source: Field survey, 2015

**Table 8: Perceived constraints associated with homestead fish production**

Constraints	Mean ( $\bar{x}$ )	Standard deviation	Rank
Theft from neighbourhood	3.70	0.65	1
Difficulty in getting loans for expansion	3.08	0.73	2
Insufficient capital for production activities	3.05	0.57	3
Poor pricing of harvested fishes	3.02	0.60	4
Harassment from L.G.A. health workers	2.97	0.59	5
Lack of government support	2.94	0.53	6
Poor power supply	2.88	0.71	7
Pest and disease outbreak	2.75	0.79	8
Difficulty in accessing farm inputs	2.56	0.62	9
Lack of storage facilities	2.21	0.70	10

Source: Field survey, 2015

**Table 9. Influence of fish farmers' socio-economic characteristics and participation in fishing activities on farm income**

Independent variables	Coefficient (b)	t	Prob. Level
Constant	98661.453	1.430	0.124
Years of residence in community	3463.453*	0.664	0.005
Sex	124576.121	1.342	0.054
Age (years)	2436.231*	3.241	0.021
Education	-12198.565*	-1.310	0.003
Household size	8165.211	2.211	0.211
Farming status	12122.312	2.100	0.211
Farm size	32989.126*	32.231	0.002
Farming experience	3767.028	0.040	0.821
Fish farmers' membership experience	2947.564*	0.197	0.001
Participation Index score	321.423*	2.021	0.211

$F = 7.474$  ( $p < 0.050$ ) Adjusted  $R^2 = 0.682$ , \*Significant at the 5% level (critical  $t$  – value = 1.645)

The explanatory variables in the model jointly accounted for about 68% variation in farm income of the respondents (adjusted  $R^2 = 57.3\%$ ). Six (6), out of the ten (10) explanatory variables were significant at the 5% level. The variables were years of residence in community, age, education, farm size, fish farmers' membership experience and participation in fish farmers' organization. The results are further discussed below:

**Years of residence in community:** Years of residence in community ( $b = 3463.453$ ) by the respondents was positive and significantly correlated with the respondents farm income. This implies that the more years farmers' spend in their various communities, the better their farm performance. Ofuoku and Urang [23] stressed that the more number of years people stay in their community, the more willing they are to participate in group's activities which may likely result to higher income.

**Age:** Age of the respondents ( $b = 2436.231$ ) was also positively and significantly related to farm income. The result implies that older farmers are likely to engage in higher farming activities in order to earn higher farm income. Results of [24] are in line with these findings. They expressed that age of farmers correlates with level of participation in farm organizations which translates to higher farm income.

**Education:** Education of the respondents shows a negative and significant relationship ( $b = -12198.565$ ) between respondents' formal educational level and farm income. The result suggests that farmers with formal education may earn lower farm income from their farming

activities. It may be adduced that many of the educated ones may want to carry out farming activities in their own ways and not want to follow agricultural recommended practices. Having high formal education has been proved by [25] to be detrimental to increased farming activities and consequently lowering farm income.

**Farm size:** Farm size was positively correlated ( $b = 32989.126$ ) and significant with respondents farm income. This means that farmers with larger fish ponds tend to produce and earn more income than farmers with smaller pond size. With larger farms, respondents can rear more fishes, realize more output and earn higher income. The result is supported by [26] who acknowledged that total output of agricultural products will increase at an increasing rate as farm sizes increase.

**Fish farmers' membership experience:** Fish farmers' membership experience ( $b = 2947.564$ ) showed a positive and significant relationship with fish farm income. The implication of this is that farmers who have stayed or spent more number of years in their groups are more likely to make higher income from their farming activities. The reports of [27] confirms this finding that farmers who participate more in years in groups are likely to learn and adopt modern farm technology and this helps to improve their productivity and income.

**Participation of farmers in groups:** Participation index score ( $b = 321.423$ ) of the respondents as well revealed a positive and significant relationship with the farmers farm income. What this implies is that, when farmers participate in groups they are bound to benefit

through getting farm inputs, share experience/knowledge and all of these would result to higher farm output and income.

**Influence of farmers' socio-economic characteristics on fish farm revenue:** Farmers' socio-economic characteristics on farm revenue were analyzed using multiple regression and the results presented in Table 10. The computed F statistic was 84.56 which was significant at the 5% level (critical F = 2.62). This implies that the regression model is significant or acceptable, indicating that the collective influence of these independent variables on respondents' farm revenue was significant. The adjusted coefficient of determination ( $R^2 = 0.758$ ) implies that about 76% of the variation in farm revenue of the respondents was accounted for by the independent variables in the model. Five (5) of the seven (7) independent variables were significant at the 5% level (critical t-value = 1.645). The variables were sex, age, farming status, farm size and farming experience.

**Table 10. Influence of socio-economic characteristics of farmers' on farm revenue (Multiple regression)**

Independent variables	Coefficient (b)	t	Prob. Level
Constant	21542.597	0.554	0.565
Sex	22721.453*	1.502	0.008
Age	610.257*	1.452	0.053
Education	-4354.215	-0.195	0.210
Household size	3137.221	1.183	0.268
Farming status	21743.221*	1.212	0.003
Farm size	4235.216*	2.237	0.005
Farming experience	2945.212*	2.017	0.002

$F = 84.56$  ( $p < 0.050$ ) (Critical  $F = 2.62$ );  
Adjusted  $R^2 = 0.758$ , \*Significant at the 5% level  
(critical t – value = 1.645)

The results are discussed below:

**Sex:** Sex of respondents ( $b = 22721.453$ ) was positively and significantly related to farm revenue. The positive result suggests that male farmers earned higher income than female. Similar finding has been reported by [14]. The authors asserted that males tend to have more physical energy than their female counterparts and this probably explains their higher revenue.

**Age:** Age of farmers ( $b = 610.257$ ) was positive and significantly correlated with their farm revenue. The positive relationship implies that

the older farmers are more likely to have larger farms which lead to having higher farm revenue in order to cater for their large household size. This finding is in line with that of [28]. He stressed that older farmers tend to be more experienced in their farming activities with possible impact on their farm revenue.

**Farming Status:** A positive and significant relationship ( $b = 21743.221$ ) exist between respondents' farming status and farm revenue. The positive result implies that persons engaged on full-time basis earned higher revenue than those involved on part-time basis. Full-time farmers have more time at their disposal to be fully committed and to supervise the activities of farm labourers which part-time farmers may not have.

**Farm size:** Farm size ( $b = 4235.216$ ) showed a positive and significant relationship with farm revenue. This means that farmers with large farm size tend to realized higher income than those with lower farm holdings. This report is supported by [26], who found that total output of crop will increase at an increasing rate as farm sizes increase. He explained that farmers with larger farms can carry out farm activities taking advantage of economies of scale and so save some farm cost thereby increasing their output and revenue.

**Farming experience:** Farming experience ( $b = 2945.212$ ) was also positively and significantly related to farmers' farm revenue. The positive result implies that farmers with longer experience of farming earned higher income than those with shorter experience, thus suggesting that higher farm experience will lead to higher farm revenue. The positive relationship between farming experience and farm revenue was reported by [29]. He asserted that high farming experience will result to increased training and indoctrination of the farmers and from which they would learn certain skills that would enable them increase their farm productivity and revenue.

## 5. CONCLUSION AND RECOMMENDATIONS

Based on findings of the study, the study concludes that though most of the fish farmers' were part – time farmers, their participation in fish farmers association had a positive effect on their productivity and farm income and this have helped in improving their standard of living. Results showed that output and income would

have been further enhanced if not for the constraints that plagued fish farming at homestead level some of the constraints were theft from neighbourhood, insufficient capital for production activities, difficulty in getting loans for expansion, poor pricing problem of the fishes, poor power supply, pests and diseases and difficulty in accessing farm inputs. Also, farm income was influenced by sex, age, farm size and experience of farmers in association. Based on findings, the research came out with the following recommendations:

- Security personnel should be employed by the farmers to curb the menace of theft. This is necessary so that money lost through theft can add to the farmers' income.
- There is a need for the government through special programmes to ensure adequate availability of inputs like fingerlings, fish feeds at affordable prices.
- The home stead fish farmers need to be trained on integrated pest and disease management method as this will help reduce the losses of the farm arising from pest and disease attack which was found to be a major production constraint.
- Efforts should be made by the government to improve on power generation capacity. This will go a long way in improving the storage capacity of the fishes produced by the farmers. Also, much money used in running generators/plants will be saved. Thus, the income of farmers will then be enhanced.
- The LGA leadership should discourage its workers (health workers) from harassing the farmers on sanitary matters. A more effective sanitary management method should be developed.
- Effort should be made by the government to reach out and give loans to genuine qualified homestead fish farmers. Also the loans should be enough to enable them meet up with cost of producing fishes, and
- To curb the issue of poor pricing, fish farmers should adopt price fixing according to weight of fishes and so ensure the use of scaling machine in the marketing process.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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