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Small-Scale Fish Farming and Poverty Reduction in Some Selected States in Southeast, Nigeria

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Abstract

Despite the implementation of numerous poverty reduction programmes by successive governments, poverty remains endemic and pervades every geo-political zone in Nigeria. The poverty situation, coupled with the low uptake of fish farming technology in the south-east zone necessitated the need to examine the impact of small-scale fish farming on poverty reduction in selected states of the south-east geo-political zone of Nigeria. The dependent variable of the study is poverty reduction, proxy by household expenditure, while the independent variable is the small-scale fish farming, proxy by income, employment, food security, and consumption multiplier. The mixed-method research design comprising of quantitative (questionnaire) and qualitative (focus group discussion and in-depth interview) were used for data collection, while descriptive and inferential statistics were used in data analysis. A total of two hundred and seventy (270) small-scale fish farming households were selected from Anambra, Ebonyi, and Imo State as the population sample, using the multi-stage cluster sampling technique. Four hypotheses were tested using the Kolmogorov-Smirnov (K-S) method of non-parametric test. The study findings suggest that small-scale fish farming in the study area has a significant positive impact on poverty reduction, as increase in each of the independent variables tends to increase the dependent variable. The paper recommended the establishment of fish farm settlements; granting of credit facilities to fish farmers as input factor's promotion and enhancement of local content for fish farming among other policy prescriptions. These measures would promote small-scale fish farming for poverty reduction in the southeast geo-political zone of Nigeria.

Keywords: Kolmogorov-Smirnov method, poverty reduction, small-scale fish farming, southeast geo-political zone,

JEL Codes: C44, C83, I32,Q22

Introduction

There is hardly a universal way of defining poverty because it affects many aspects of human condition. However, the conventional concept of poverty depicts it as a condition in which people live below a specified minimum income level and are unable to provide the basic necessities of life needed for an acceptable standard of living (Taiwo & Agwu, 2016). Poverty has been defined variously to include: lack of

[1]Being a PhD Dissertation extract of the corresponding author

command over basic consumption needs (Ravallion & Bidani, 1994); having inadequate level of consumption (Aluko, 1973); and inability of a person to attain a minimum standard of living and high status in a society (World Bank, 1990). Further in the definition, the United Nations (2011), defined poverty to include: inability of having choices and opportunities; a violation of human dignity; lack of basic capacity to participate effectively in society; not having a school or clinic to go to, and not having the land on which to grow one's food or a job to earn one's living. It also includes not having access to credit; insecurity, powerlessness and exclusion of individuals, households and communities; and susceptibility to violence, and living in marginal or fragile environment without access to clean water or sanitation.

Poverty is measured in different ways, depending on the context. Most of the times, quantitative measures such as household expenditure (Grocteri, 1994) and the poverty count index (Foster, Greer, & Thorbecke, 1984) are adopted in measuring poverty. The household expenditure measure focuses on the state of living of a household and attempts to differentiate who is poor from who is not poor by comparing household expenditure budget (Lipton, 1996). The poverty headcount index is a three-pronged measure that seeks to classify people into poverty levels using what is referred to as poverty-gap index (Lipton, 1996). The poverty measure adopted for the purpose of this study is the household expenditure measure.

Fish farming, which is synonymous with aquaculture, involves growing fish artificially in tanks, earthen ponds, and ocean enclosures, usually for food (Stickney, 2009). Fish farming or aquaculture used interchangeably refers to a system, commonly characterized by the intensity of feed use, which divides the system into: integrated, extensive, semi-intensive and intensive (Edward, 1999). Extensive aquaculture relies on natural food such as plankton, without human intervention in feeding, semi-intensive system supplement natural food with organic or inorganic fertilizers and low-cost supplementary feed. Intensive system depends on relatively high-cost feed such as small wild fish or formulated feed(pellet), while integrated system is the combination of fish farming and other animal or crop farming (Edward, 1999). Although classification is based on feed, increasing intensification of feed is supported with other inputs such as fingerlings (seed), labour, capital and management. Semi-intensive system has favourable characteristics for poor households as they rely largely on natural food, which can be increased by using on-farm by-products like manure and crop residues, produce is affordable for poor consumers, and intensification can be achieved using relatively cheap inorganic fertilizers (Edward & Demaine, 1997).

According to World Bank (2019) report, Nigeria had one of the world's highest economic growth rates, averaging 7.4% in 2013. Following the oil price collapse in 2015, combined with negative production shocks, the gross domestic product (GDP) growth rate dropped to 2.7% in 2015. In 2016, during its first recession in 25years, the economy contracted by 1.6%. Nationally, 43 percent of Nigerians (89 million people) live below the poverty line, while another 25 per4cent (53 million) are vulnerable (World Bank, 2018).However, there are more rural poor than the urban poor, which is correlated with differential access to infrastructure and amenities (Oni, 2013). This is as a result of the composition of Nigeria's economy, especially the energy (oil) and agricultural sectors. Oil exports contributes significantly (about 90%) to government revenues; contributes 97% to the GDP and employs only a fraction of the population, while agriculture contributes about 17% of GDP and employs about 30% of the population (NBS, 2021).

Moreover, the process of oil extraction has resulted in significant pollution in the oil producing delta region, which further harms the agricultural sector. Additionally, agricultural growth has also slowed down because of farmers-herders clashes, Boko-Haram insurgency in the north, and climate change, food (Onuche, Ahmed & Ebenechi, 2020). All these factors mentioned have further deepened the level of poverty in Nigeria.

Fish farming has attracted considerable interest as a vehicle for reducing poverty and food insecurity, and a variety of pathways through which the poor might gain from the growth of aquaculture. Kassam (2013) elaborated on typology of aquaculture's potential to impact on poverty, drawing on the work of De Janvry and Sadoulet (2002) on direct and indirect agriculture – poverty linkages. The main potential benefits stem from improved food supply, increased income, and increased employment. Benefits may be accessed directly by a fish farmer or indirectly through employment in aquaculture value chains, or through increased availability of low-cost fish in local markets (Edward, 1999). Similarly, Stevenson and Irz (2009) identify entry into aquaculture by new producers, employment on fish farms and in associated value chains, and increased supply of fish for consumption by the poor as pathways through which aquaculture may contribute to poverty reduction. A final indirect pathway relates to consumption linkages generated by re-spending income from sales of farmed fish on locally produced non-tradable goods and services in the form of multiplier effect (Delggedo, Wada, & Rosegrant, 2003).

The selected states in the south-east geo-political zone for this study are Anambra State, Ebonyi and Imo State respectively. According to NBS (2020), the south-east states among others, performed below expectations on poverty indicators. While Ebonyi state was the worst hit with about 80 percent of her citizens described as poor, Enugu State took the second position with about 60 percent, Abia state has about 31 percent while Imo State recorded about 29 percent, and Anambra state at about 15 percent. On the average, the poverty level in the south-east was about 43 percent. Furthermore, there has been a low up-take of aquaculture technology in the south-east zone. Comparatively, the share of household's participation in aquaculture in the south-south zone was 7.3 percent in 2015, while that of the south-east zone was 0.3 percent (LSMS – ISA, 2015). Incidentally, the south-east zone is one of the most fish consuming zones in Nigeria (LSMS – ISA, 2015), showing that most of the consumptions are being imported.

The general objective of this study is to examine the impact of small-scale fish farming on poverty reduction in the selected states of the south-east geo-political zone of Nigeria. Specifically, to assess the impact of income, employment, food security, and consumption multiplier from small-scale fish farming on household expenditure in the selected states.

Summary of Empirical Literature Reviewed

Empirical literature reviewed show that most studies agree on the profitability of fish farming enterprise. However, what is contentious is the pathways through which this profit impacts on the poor in the society. Thematically, the studies that have direct positive relationship between small-scale fish farming and increase in income of the poor includes (Rahman & Hague, 2011; Naldi, 2015; Abbas, 2015; Nwaihu *et al*, 2016; Nguyen *et al*., 2016; Iruo *et al* 2018; Rashid *et al* 2018; Filipski & Belton, 2018; Edet *et al*

2018; Adepoju 2019; Mondal *et al.,* 2019; Mulokozi *et al.*, 2020). Studies like Oyinbo and Rekwot (2013), and Ifejika *et al* (2008) do not show any significant impact of fish farming on the income of the poor. Some other studies show a direct positive relationship between small-scale fish farming and employment of the poor (Shava & Gunhidziral, 2017; Phosa, 2018; Wuyep & Rampedi, 2018; Nzavu *et al.*, 2018; Onyeneke *et al*., 2020; Nasr-Allah *et al* 2020; Chan *et al* 2020). Furthermore, a number of studies also suggested a direct positive relationship between small-scale fish farming and food security (Mangunyi & Ngota 2018; Orharhe *et al*, 2020; Musuka & Musonda 2013; Ogello & Munguti, 2016; Aung, 2021). However, studies such as Roos *et al*. (2003), Brumett *et al*., (2008), and Harohau *et al*. (2020), shows no significant positive impact of small-scale fish farming on food security. A positive relationship between small-scale fish farming and consumption multiplier effect is also shown by studies such as Hazel and Haggblade (1989), Hahhblade and Hazel (1991), Delgado *et al.* (1998), and Kassam (2013).

From the empirical literature reviewed, it can be concluded that results of previous related studies are mixed; some showed positive relationship and others showed negative relationship between fish farming and poverty reduction. Some are at most inconclusive. These outcomes could be as a result explanatory variables of interest used, techniques utilized and country specific structural challenges. Ultimately, these outcomes have serious impact on policy making and formulation for improving agriculture production through the mechanism of fish farming and poverty reduction. This paper was motivated to fill-up these empirical vacuums and suggest policy measures to promote small-scale fish farming for poverty reduction.

Methodology

Description of Study Area: This study was conducted in the south-east states of Anambra, Ebonyi and Imo. The south-east is one of the six geo-political zones in Nigeria, and is made up of five states, namely; Abia, Anambra, Ebonyi, Enugu, and Imo. It is located within latitudes 5^0N to 6^0N and longitudes 6^0E to 8^0E (Microsoft corporation, 2009). The southeast geo-political zone has eighty-five local government areas with a total population of about 22 million people. It received between 2,000 and 3,000 of rainfall per year (NIMET, 2022), making it a more suitable environment for fish farming. The zone, which has 99.9 percent Igbo speaking population, is recognized as the most densely populated zone in Nigeria. Apart from agriculture as a major economic activity, the zone is also known for its trading and other commercial activities with small and medium indigenous industries producing goods and services. Therefore, the population of this study is Nine Hundred and Twenty (920) registered fish farmers in Anambra, Ebonyi and Imo states (CAFAN, 2022). Thus, using Andrew Fisher's formular for sample size, this study arrived at a sample size of 270 households.

Sampling Technique and Data Collection. Using the multi-stage sampling technique, three states (Anambra, Ebonyi, Imo) were purposively selected due to their representation of the old state order in the southeast. Three out of six agricultural zones according to State Agricultural Development Programmes (ADPs) delineation were selected from each state. Two out of four extension blocks were selected from each agricultural zone. Three out of six circles were selected from each extension block, and five farmers were selected from each circle. This technique produced a total of 270 (3 x 3 x 2 x 3 x 5) farmers as sample size.

Data collection was done through the instrumentation of structured questionnaire, open ended in-depth interview (IDI) and focus group discussion (FGO). The first phase in the process of data collection was the formation of focus group discussion comprising of 8 discussants each in Okigwe local government headquarters in Imo state, Ogbaru local government headquarters in Anambra state, and Ohaukwu local government headquarters in Ebonyi state. The recordings of the discussions were subjected to content analysis and the themes or category of responses formed the basis on which the questionnaire was drafted. The questions in the questionnaire were thematically drafted based on the following: household socio-economics, income generation, employment, food security, consumption multiplier, and household expenditures. The questionnaire was distributed to 270 respondents with the aid of 3 research assistants and cooperative society officials in the respective states. The final phase of data collection was done through open-ended in-depth interview (IDI). This instrument was chosen to allow the respondents express themselves in their own words without limitations. A total of 30 interviewees were purposively selected from the 3 states for the interview. The purposive selection was based on convenience to the research, and ensuring that the participants were not part of the questionnaire respondents. This was done so as to obtain independent, revealing, and possibly critical views on the subject being investigated.

Method of Data Analysis. The analysis of the interview responses was done manually; the researcher thoroughly edited and transcribed the recorded responses. The transcripts were read and coded thematically. Illustrative quotes, statements and ideas were established and organized under different themes, which provided the bases for further interpretation of results. Of the 245 returned questionnaire, 16 were invalidated after cleaning, leaving a balance of 238 completed questionnaires to work with. The questionnaire responses were quantified using the measuring scales. The descriptive analysis of the questionnaire responses was done using frequency and percentages, while the Kolmogorov-Smirror (K-S) test was used in testing goodness of fit, as well as the hypotheses.

Results and Analysis

Socioeconomic Characteristics: Table 4.1 showed the socioeconomic characteristics of 238 small-scale fish farmers in the selected states of the south-east geo-political zone of Nigeria. The result indicated that there were more male farmers (86%) than female (14%). The result also showed that small-scale fish farming in the study area is dominated by farmers in the age bracket 50 – 59 years. Most of farmers were married (76.9%), and had completed either secondary education (64.3%) or tertiary education (35.7%). All the farmers surveyed were Christians (100%), while majority of them (68.9%) had farming as their primary occupation. Majority of the farmers (66%) had between 5 and 15 years' experience in fish farming, while most of them (52.5%) had an average of 6 – 8 members in their household.

Table 4.1: DISTRIBUTION OF SMALL-SCALE FISH FARMERS' SOCIO-ECONOMIC CHARACTERISTICS

Socioeconomic characteristic	Frequency	Percentage
Gender:		
Male	204	86.00
Female	34	14.00
Age (year):		
Less than 40	13	5.50
40 – 49	46	19.30
50 – 59	89	37.40
60 – 69	75	31.50
70 and above	15	6.30
Marital Status:		
Single	11	4.60
Married	183	76.90
Widowed	30	12.60
Separated	14	5.90
Educational level:		
No formal education	0	0.00
Primary education	0	0.00
Secondary education	153	64.30
Tertiary education	85	35.70
Religion:		
Christianity	238	100.00
Islam	0	0.00
Traditional	0	0.00
Atheist	0	0.00
Primary occupation:		
Farming	164	68.90
Trading	25	10.50
Civil service	30	12.60
Artisan	19	8.00
Years of experience:		
1 – 3 years	9	3.80
3 – 5 years	35	14.70
5 – 10 years	74	31.10
10 – 15 years	83	34.90
More than 15years	37	15.50
Number of household members:		
Less than 3	11	4.60
3 – 5	68	28.60
6 – 8	125	52.50
9 and above	34	14.30

Source: Field survey, 2022

Table 4.2: MANAGEMENT SYSTEM AND PRACTICE OF SMALL-SCALE FISH FARMING IN THE SELECTED STATES OF THE SOUTHEAST GEO-POLITICAL ZONE

Variable	Frequency	Percentage
Farming system:		
Extensive	2	0.80
Semi-intensive	170	71.40
Intensive	49	20.60
Integrated	17	7.20
Types of ponds:		
Earthen pond	133	55.90
Concrete pond	68	28.60
Tarpaulin pond	31	13.00
Plastic tank	6	2.50
Farm space:		
Less than 50m^2	3	1.30
50 – 100m^2	81	34.00
100 - 300m^2	122	51.30
300 – 600m^2	30	12.60
More than 600m^2	2	0.80
Stocking capacity:		
Less than 1000	3	1.30
1000 – 2000	80	34.00
2001 – 3000	145	61.00
3001 – 5000	8	3.30
More than 5000	2	0.80
Profitability of harvest:	66	27.70
Very profitable	125	52.50
Just profitable	22	9.20
Break-even	18	7.60
Unprofitable	7	3.00
Very unprofitable		

Source: Field survey, 2022

Table 4.2 showed the management system and practice of small-scale fish farming in selected states of the southeast geo-political zone of Nigeria. The result showed that majority of the fish farmers (71.4%) practiced semi-intensive system of fish farming. Also, most of them (55.9%) used earthen pond, while 51.3% of them used between 100 and 300m^2 band areas as their farm space. Furthermore, as most of the fish farmers (61%) stocked between 2001 and 3000 fingerlings (seed), 80.2% respondents agreed that small-scale fish farming was profitable.

Table 4.3: RESULT OF K-S TEST FOR HYPOTHESIS 1

Response Options	Observed Frequency	Observed Proportion	Observed Cumulative Proportion Sn(x)	Expected Proportion	Expected Cumulative Proportion $F_0(x)$	$\lvert F_0(x) - Sn(x) \rvert$
Very true	128	0.538	0.538	0.200	0.200	0.338
True	84	0.353	0.891	0.200	0.400	0.491
Undecided	6	0.025	0.916	0.200	0.600	0.316
Untrue	12	0.050	0.966	0.200	0.800	0.166
Very untrue	8	0.034	1.000	0.200	1.000	0.000

Source: Field survey(2022) Computed D = Max $\lvert F_0(x) - Sn(x) \rvert$ = 0.4910Critical D at α = 0.05 is 1.36 / √238 = 0.088

Table 4.3 showed the result of K-S test on fish farmers' responses when asked if it is true that increase in their farm income increases their household expenditure. The result showed that the computed D (0.4910) is higher than the critical D (0.088) at 5% level of significance. This indicates a rejection of null hypothesis, suggesting that there may be a significant impact of income generated from small-scale fish farming on household expenditure, as the respondents agreed that household expenditure increases with increase in income.

Table 4.4: RESULT OF K-S TEST FOR HYPOTHESIS 2

Response Options	Observed Frequency	Observed Proportion	Observed Cumulative Proportion Sn(x)	Expected Proportion	Expected Cumulative Proportion $F_0(x)$	$\lvert F_0(x) - Sn(x) \rvert$
Strongly agree	114	0.479	0.479	0.200	0.200	0.279
Agree	93	0.391	0.870	0.200	0.400	0.470
Undecided	5	0.021	0.891	0.200	0.600	0.291
Disagree	18	0.075	0.966	0.200	0.800	0.166
Strongly disagree	8	0.034	1.000	0.200	1.000	0.000

Source: Field survey, 2022
Computed D = Max $\lvert F_0(x) - Sn(x) \rvert$ = 0.470
Critical D at α = 0.05 is 1.36 / √238 = 0.088

Table 4.4 showed the result of K-S test on fish farmers' responses when asked if they agreed that increase in wages of fish farm employees increases their household expenditure. The result shows that the computed D (0.470) is higher than the critical D (0.088) at 5% level of significance, which signifies a rejection of the null hypothesis. The result equally suggested that there may be a significant impact of employment in small-scale fish farm on household expenditure, as the respondents agreed that the employee's household expenditure increases with increase in wage-income.

Table 4.5: RESULT OF K-S TEST FOR HYPOTHESIS 3

Response Options	Observed Frequency	Observed Proportion	Observed Cumulative Proportion Sn(x)	Expected Proportion	Expected Cumulative Proportion $F_0(x)$	$\lvert F_0(x) - Sn(x) \rvert$
Strongly agree	138	0.580	0.580	0.200	0.200	0.380
Agree	64	0.269	0.849	0.200	0.400	0.449
Undecided	8	0.034	0.883	0.200	0.600	0.283
Disagree	22	0.092	0.975	0.200	0.800	0.175
Strongly disagree	6	0.025	1.000	0.200	1.000	0.000

Source: Field survey, 2022
Computed D = Max $\lvert F_0(x) - Sn(x) \rvert = 0.449$
Critical D at $\alpha = 0.05$ is $1.36 / \sqrt{238} = 0.088$

Table 4.5 showed the result of K – S test on small-scale fish farmer's responses when asked if they agreed that ensuring availability of food with proceeds from fish harvest increases their household expenditure. The result showed that the computed D (0.449) is higher than the critical D (0.088) at 5% level of significance, indicating a rejection of the null hypothesis. The result suggests that there may be a significant impact of food security due to small-scale fish farming on household expenditure, as the respondents agreed that ensuring availability of food with proceeds from fish harvest increases their household expenditure.

Table 4.6: RESULT OF K-S TEST FOR HYPOTHESIS 4

Response Options	Observed Frequency	Observed Proportion	Observed Cumulative Proportion Sn(x)	Expected Proportion	Expected Cumulative Proportion $F_0(x)$	$\lvert F_0(x) - Sn(x) \rvert$
Strongly agree	83	0.349	0.349	0.200	0.200	0.149
Agree	97	0.408	0.757	0.200	0.400	0.357
Undecided	8	0.034	0.791	0.200	0.600	0.191
Disagree	28	0.117	0.908	0.200	0.800	0.108
Strongly disagree	22	0.092	1.000	0.200	1.000	0.000

Source: Field survey, 2022
Computed D = Max $\lvert F_0(x) - Sn(x) \rvert = 0.357$
Critical D at $\alpha = 0.05$ is $1.36 / \sqrt{238} = 0.088$

Table 4.6 showed the result of K-S test on fish farmer's responses when asked if they agreed that re-spending income from small-scale fish farming on goods and services produced in their community increases household expenditure. The result shows that the computed D (0.357) is higher than the critical D (0.088) at 5% significant level, which signifies a rejection of the null hypothesis. The result therefore suggested that there may be a significant impact of consumption multiplier of re-spending income from small-scale fish farming on household expenditure, as the respondents

agreed that re-spending such income on local goods and services, increases household expenditure.

Consumption Multiplier

Table 4.7: Responses on the proportion of increased income from small-scale fish farming spent on local household goods and services in 2021

Proportion	Frequency	Percentage
Less than 50%	14	5.90
50% - 60%	58	24.40
60% - 70%	102	42.90
70% - 80%	42	17.60
More than 80%	22	9.20

Source: Field survey, 2022

Table 4.7 shows that majority of the respondents spent between 50% and 70% of their increased income on locally produced goods and services in 2021. Assuming the average to be 60% means that the marginal propensity to consume is 0.60

$$\text{Consumption Multiplier} = \frac{1}{1 - \text{MPC}}$$

$$= \frac{1}{1 - 0.60} \qquad \frac{1}{0.40} \qquad = 2.5$$

Discussion The small-scale fish farming enterprise in the south-east is dominated by men. This may not be unconnected with the physical and rigorous nature of its activities. This finding agrees with the works of Nwaihu, Egbuche, Osuguri, and Anyanwu (2016), Ifejika, Akinbile, Olajide, and Ifejika (2008), and Okoye (2009). These researchers observed that fish farming is a male dominated enterprise, while the women serve as intermediaries in the resulting trade. The result on respondent's age bracket suggested that most of the respondents were middle-aged, meaning that youths are less involved in small-scale fish farming in the study area. This result is in line with the works of Yunusa (1999) and Onyeneke (2017). Okoye (2009) also reported a mean age of fish farmers in Anambra State to be 49 years. The result also showed a high percentage of married fish farmers in the study area, which may be as a result of the importance attached to being married as a sign of maturity, trust and responsibility in the society. This finding agrees with that of Ovharhe, Ofuoku, Nwachi and Osekete (2020). Onyeneke, Iruo and Eze (2020) observed a predominance of married fish farmers in the Niger Delta region of Nigeria. It could be deduced from this study that the small-scale fish farmers in the study area are literate. This is evidenced by each of the respondents obtaining at least a secondary school education. This result is in

agreement with the work of Nwaihu *et al* (2016). Filipski and Belton (2018) observed that being a literate fish farmer is an added advantage in fish farming technology adoption in Myanmar.

The results of this study also indicate that all the respondents practiced Christianity. This is in line with the predominance of Christianity among the Igbo population in the south-east geo-political zone of Nigeria. This is supported by the works of Ikejika *et al* (2008) and Nwaihu *et al.* (2016). Farming was found to be the primary occupation of most of the respondents, as some of them were also engaged in other economic activities. This finding agrees with the works of Edet, Udoe, and Uwah (2018), Adepoju (2019), and Mangunyi and Ngota (2018). Phosa (2018) observed that most small-scale fish farmers in South Africa also engaged themselves in some other income generating activities to boost their income. This study result also revealed that majority of the respondents have been into fish farming for more than 5 years, indicating that the small-scale fish farmers in the south east are experienced in the business. This confirmed the findings of Adepoju (2019), Abbas (2015), and Kassam (2013). Emokaro, Ekunwe and Achile (2011) showed that less than 5 years of fish farming experience for a fish farmer means inexperience. Majority of the respondents had between 6 and 8 members in their households. The high number of household members may not be unconnected with the culture of using apprentices and close relatives agrees with the work of Okoye (2009) who showed a mean household size of 9 persons in Anambra State.

Small-scale fish farmers in the study area mostly practiced semi-intensive fish farming system requires less starting capital when compared to the intensive system. This result agrees with Ifejiaka *et al.* (2008), Nwaihu *et al.* (2016), and Onyeneke *et al.* (2020). This study result also revealed that majority of the respondents were using earthen pond. The use of earthen pond by the majority is in line with the semi-intensive family system, where fish feed on natural plankton that grows in earthen pond in addition to organic fertilizers. This finding agrees with the works of Edet *et al.* (2018), Abbas (2015), and Okoye (2009). Adikwe (1999) reported that earthen pond constitute the most common type of fish production ponds in Nigeria. The result of this study also indicates that majority of the respondents were using between $100m^2$ and $300m^2$ of land space for their small-scale fish farming. This result depicts the small-scale nature of respondent's fish farming enterprise, and agrees with the work of Mangunyi and Ngota (2018), which reported an average land space of $200m^2$ for small-scale fish farmers in Cameroon. Stocking capacity of respondents was also investigated in this study. The result indicated that majority of the respondents stocked between 2001 and 3000 fingerlings in a production period. This result further laid credence to the small-scale nature of the respondent's fish farming enterprise. The result equally agrees with the work of Omitoyin (2007), which reported small-scale fish farming stocking capacity to be less than 3000 fingerlings. The findings of this study also revealed that small-scale fish farming in the study area was profitable. Majority of the respondents attested to this fact, which agrees with the works of Edet *et al.* (2018), Iruo *et al*. (2018), and Abbas (2015).

The impact of income generated from small-scale fish farming on household expenditure has been identified in this study. The findings further revealed that increase in income of the small-scale fish farmers leads to an increase in their household

expenditure, resulting in gradual reduction in the poverty profile. This finding is supported by the result of the hypothesis test, which suggests that there is a significant impact of income generated from small-scale fish farming on household expenditure in the study area at 0.05 level of significance. Similar findings have been reported by Kassam (2013), as well as Ogello and Munguti (2016). Onyeneke et al (2020) found that small-scale fish farmers used the income realized from fish farming to acquire household facilities and provision of education to their children in the Niger Delta region of Nigeria. Furthermore, result from this study indicated that employment in small-scale fish farm has a positive impact on household expenditure in the study area. This is corroborated by the result of the hypothesis test, which suggested that there is a significant impact of employment in small-scale fish farm on household expenditure in the study area at 0.05 level of significance. Similar findings have also been shown by Phosa (2018), Belton *et al.* (2012), and Mangunyi and Ngota (2018). Shava and Gunhidzirai (2017) showed that small-scale fish farming led to improvements in employment regeneration and household expenditure in Zimbabwe.

Moreover, our findings also reveal the impact of food security occasioned by small-scale fish farming on household expenditure in the study area. The result indicated that ensuring availability of food with proceeds from fish farm increases the adopting household's consumption expenditure. This finding is supported by the outcome of the hypothesis test, which implied a significant impact of food security on household expenditure in the study area. This result is in agreement with Musuka and Musonda (2013), Toufique and Belton (2014), and Orharhe *et al* (2020). Wuyep and Rampedi (2018) showed that small-scale fish farming was a viable source of food, resulting to food security and poverty reduction for the adopters in Jos, Nigeria. The impact of re-spending income from small-scale fish farms on household expenditure in the study area has equally been identified.

The result indicated that re-spending income from small-scale fish farming on local goods and services, increases household consumption expenditure. This is confirmed by the result of hypothesis test, which suggested that there is a significant impact of the consumption multiplier of re-spending income from small-scale fish farming on household expenditure in the study area at 0.05 level of significance. In addition, the study suggested that on the average, 60 percent of increased income from small-scale fish farming was spent on household consumption expenditure in 2021, resulting to a consumption multiplier of 2.5. Similar findings have also been shown by Haggblade *et al.* (1991); Al-Hassan and Jatoe (2007), and Kassam and Dorward (2017). Result from Kassam (2013) suggested that the regional multiplier within Ashanti region of Ghana, generated by growth of small-scale pond aquaculture was estimated to be between 2.3 and 2.6.

Policy Implications of Findings The policy implications of this paper finding are as follows: (a)Any activity that can increase the income of small-scale fish farmers' would result to increase in their household expenditure, hence reducing their poverty level.(b)Incentivizing more employment in small-scale fish farming would generate more wage-income, which in turn would increase employee's household expenditure thus reducing poverty.(c) Stakeholder strategies geared towards increasing harvest proceeds of small-scale fish farmers, would increase their purchasing power for other nutritious foods in

the market, hence increasing their household expenditure and reducing poverty.(d) Increasing the consumption multiplier of re-spending small-scale fish farmers' income on local goods and services would increase household expenditure of community members, thus reducing poverty in households.

Conclusion and Policy Recommendations

Small-scale fish farming is considered as one of the crucial entrepreneurial activities in agricultural development. Therefore, considering the importance of small-scale fish farming, this paper examined the subject for poverty reduction via income, employment generation, enhancing food security, and consumption multiplier. The findings of this study showed that household expenditure has a direct positive relationship with each of these small-scale fish channels, as increase in household expenditure, by implication is a reduction in the level of poverty. The hypotheses tested also suggest to the fact that income, employment, food security, and consumption multiplier, have a significant impact on household expenditure in the study area. The implication of these findings is that positive changes in these explanatory variables could be used to enhance variations in household expenditure and therefore poverty reduction in the selected states of the south-east geo-political zone of Nigeria.

For economic policy options, increase in the provision of farm settlements and granting of credit facilities to small-scale fish farmers by the Government, policy makers and stakeholders would attract more people into the business, thus reducing poverty. Equally of importance is the establishment of agricultural skill acquisition centers, where potential fish farm employees would be trained in relevant areas of fish farming. To ensure food security from small-scale fish farming, there should be an improvement in road network, power supply, a reduction in duties paid on imported raw materials, and increase in local production of relevant grains to ensure lower cost of production. In other words, local content of fish farming inputs are advocated for immediate attention by the Government and other stakeholders. Furthermore, the merits of consumption multipliers in small-scale fish farming could only be maximized when there are strong forward and backward consumption linkages between farmers, employees, suppliers and their derivatives.

Contributions to KnowledgeThis paper contributes to the existing knowledge in three ways: (a)Theoretically, the paper reinforces the applicability of the different theories of poverty, especially the Keynesian theory, and its application to fish farming; an entrepreneurial activity that can reduce poverty in the selected states and the south-east economy at large. (b)Empirically, this paper used household expenditure as a proxy measuring poverty reduction. The previous studies in the literature used poverty headcount ratio to measure poverty. Again, the inclusion of consumption multiplier to the variables under examination is a value addition in the literature.(c)Methodologically, the application of mixed-method (triangulation) approach to the empirical literature on small-scale fishing farming and poverty reduction is a contribution to knowledge.(d)The recommendations from the paper in terms

of policy would be a blueprint to policy makers and investors in small-scale fish farming.

Agenda for Further Studies. The paper suggests a more detailed investigation on the consumption multiplier of small scale fishing farming to poverty reduction. The paper also suggests a scenario analysis of small scale fish farming for poverty reduction in other geo-political zones in Nigeria. In that manner, the topic will be given a national coverage.

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