Analysis of Income Distribution Within Aquaculture Value Chain In Afikpo North L.G.A., Ebonyi State

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Abstract
This study was carried out to examine income distribution within aquaculture value chain in Ebonyi State. The aim of the study was to determine the nature of income distribution among participants in aquaculture value chain and to identify factors limiting the income of respondents. Data for the study was obtained from a cross section of one hundred and fifty (150) respondents who were purposively selected. Data were analyzed using Gini coefficient and Lorenz curve. Results revealed that majority of respondents were females while the rest were males. The study further shows aquaculture value chain in the area was dominated by fish sellers, followed by fish farmers, only a few percentage of the respondents engaged in fingerlings production due to the high level of skill and expertise required. The Lorenz curve at its furthest point from the line of equal distribution (OP) shows that 52% of the respondents account for 32% of annual income, so that the rest 48% account for 68% of total annual income. Few number of the respondents in the annual income range of 0-216,000 accounted for 7.58% of total annual income compared with 5.3% of those (in the annual income range of 600,000 – 10,800,000) accounting for 14% of total annual income. This result shows that there is inequality of income among participants in aquaculture value chain in Afikpo North L.G.A. of Ebonyi State. Factors promoting inequality of income among the actors can be attributed to differences in access to capital, credit facilities and entrepreneurial ability of individual actors which may have given some respondents advantage over the others. Factors which limited the income of respondents included inadequate access to capital, high transportation costs, bad roads, and stiff competition from others, emergency situations involving family/relations and natural disasters, high cost of rent, high interest rate on loans, high market dues and short loan repayment term. The study recommends that value chain participants form cooperatives, as this will enable resource poor actors not only to have access to credit but also to pool their resources together to overcome the problem of inadequacy of capital. The problem of inadequate transport facilities should be remedied by construction of accessible rural feeder roads by government. This will help to ameliorate challenges associated with logistics in the marketing component of the value chain. Extension should embark on intensive training programmes for participants in aquaculture value chain and should focus on improved techniques in fish breeding, production, processing and marketing

Keywords: income distribution, inequality, value chain, aquaculture, Lorenz curve

Introduction

Value-addition is critical to the sustainable development of aquaculture. Consequently, several actors namely; fish farmers, fish breeders, fish processors and fish marketers have been found to be actively involved in the value-addition in aquaculture. Experiences over time have proved that

value addition in agricultural products is a lucrative venture irrespective of the activities of the actors.

The role of income in boosting the productivity of participants in aquaculture value chain is well recognized. This is against the fact that poverty is a common feature of those involved in the fishery sub-sector of Nigeria's economy. Therefore, any intervention programme to boost their productivity must of necessity be rooted in empowering them economically coupled with putting in place the necessary economic and social structures in rural areas. This is hoped will boost welfare and economic development while at the same time improving their economic opportunities and raising living standards in the long run. (Tomek, and Robinson, 1981).

The income of participants along aquaculture value chain is to a great extent determined by the available economic opportunities open to them in the fishery sub-sector. Their pattern of savings and expenditure is highly conditioned by their present level of income. This is because most often than not, investments are usually geared towards the provision of necessary food and other basic necessities. The socio-cultural background of participants is another factor, which appears to seriously affect their savings and investment habits. All these have serious implication on the welfare of those in aquaculture value chain (USAID, 2014). Better understanding of the savings, income, and investment relationship will contribute to the formulation of appropriate policies for savings mobilization, thereby improving upon local capital formation capacity. Moreover, a good knowledge gained from the savings- income phenomenon particularly along aquaculture value chain in Nigeria will give the monetary authorities a fair idea of how the fish economy operates and how to make improvements in their livelihood to enable its integration into the mainstream financial system (Nwaru, 2005).

Most participants in the aquaculture value chain earn meagre incomes which can barely afford them a standard of living at the subsistence level. Their low level of income apart from limiting their economic opportunities keeps them permanently entwined in the vicious cycle of poverty. Notwithstanding their low standards of living, the investment pattern of actors in aquaculture value chain are influenced to a great degree by their socio-cultural backgrounds.

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When in a year planned investment is larger than planned saving, the level of income rises. At a higher level of income more is saved and therefore intended saving becomes equal to intended investment. On the other hand, when planned savings is greater than planned investment in a period, the level of farmer's income will fall. Capital accumulation is promoted by competition, which compels farmers to invest and accumulate capital in order to survive. In addition, the production level of farmers will grow faster, increase returns through expansion of their market share and subsequent higher profit. (Ugwumba, 2010).

Food insecurity is a general problem among aquaculture value chain actors and is occasioned by their inability to produce enough for the consumption of the entire populace owing to low level of per capita, income, lack of social infrastructure, high cost of inputs and so on. This phenomenon has brought about malnutrition, which is a signpost of poverty (Obamiro et al, 2003).

Low level of income is generally associated with participants in agricultural value chain because they consume a large proportion of their farm products with little surplus for market. This situation brings about low level of savings, investment, output, deficiency in demand for basic quality food, hence farmers continue to live in vicious cycle of poverty. This phenomenon will continue unabated until a deliberate attempt at intervention is made to halt this ugly trend. With this type of scenario, the fish sector cannot be relied upon to produce sufficient food for rapidly growing populace (Nwabueze, 2013).

The performance of the fish subsector of the Nigerian economy, which is dominated by small scale fish farmers, is expected to improve as our population continues to rise in geometric proportions. This increased demand on fish farmers to produce enough fish to feed an expanding urban population will require their being economically empowered. This can greatly affect long-run agricultural development in the country by re-enforcing agricultural expansion (Spore, 2012).

In attempting to determine likely feasible policy measure to be adopted to boost income and welfare of participants in aquaculture value chain, it becomes imperative to conduct a study of this nature. This is against the fact that measures taken in the past could not improve farmers welfare to a sustainable level, as it did not take into cognizance their income distribution and investment habits. This study aims to ascertain the sources of finance for participants in aquaculture value chain, determine the nature of income distribution as well as identify factors

limiting the income of respondents. This study is expected to provide insights on possible measures that could help participants in aquaculture value chain ameliorate themselves from the vicious cycle of poverty.

Methodology

Study Area

The study was conducted in Afikpo North L.G.A of Ebonyi State because it is one of the States where aquaculture activities is high.. The state was created on 6th of October, 1996. Its capital is Abakaliki and has thirteen (13) Local Government Area with a population of 2, 176, 947 (NPC, 2006). Ebonyi State is one of the 36 states of Nigeria and lies in the South East of Nigeria with Abakaliki as its capital and largest city. It occupies a density of 390/km^2. The state is bordered by Abia State and Enugu State. Prior to the creation of Ebonyi State, Abakaliki Division was formerly under Enugu State while Afikpo Division was under Abia State respectively. The State has a total land area of 5,533km^2, the main cities of Ebonyi State are Abakaliki, Afikpo, Onueke, Effium, Aba Omege, Ezzsor Mgbo, Edda, Amasiri, Unwana, Echara Ikwo, Egu-Ubia, Uburu, Onicha, etc. the rainy season begins in April and lasts until November with annual rain fall varying from 1500mm to 220mm (60+080 inches) an average annual temperature about 18^0_c (60^0F) creates an annual relative humidity of 68% with humidity reaching 85% in the raining season. The dry season experience two months of harmathan from late December to late February. The hottest month are between December and January with high population density and over farming, the soil has been degraded and much of the native vegetation has disappeared many crops like cassava, rice maize, vegetables etc. are cultivated in the state.

Sampling Technique

A multi-stage sampling procedure was adopted in this study. The first stage involved the use of cluster sampling to select 5 autonomous communities in Afikpo North L.G.A. The second stage involved the use of simple random sampling to select 3 communities from each of the 5 autonomous communities. This brings the total number of participating communities to 15.

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The third stage involved the use of purposive sampling to select 10 respondents from each of the 15 communities based on the activity they perform in the aquaculture value chain. This brings the total number of respondents to 150.

Data Collection

Primary data was collected with the use of a structured questionnaire for the study. Secondary data

collection was obtained with the use of journals, textbooks, and other literature relevant to this study.

Data Analysis

Descriptive statistics like means, tables, and frequency distribution and percentages was employed in analyzing data.

The factors limiting the income of respondents was analyzed using a 5 point Likert Scale. The 5 point Likert rating scale was graded viz; Strongly Agree(SA)=5, Agree (A) =4, Undecided (U)=3, Disagree (D)=2, and Strongly Disagree (SD)=5. The mean score of respondents based on the five (5) point Likert rating scale was computed; the mean was calculated by adding the nominal values of response mode and dividing by five (five) to get the cut- off point. A theoretical mean value of 3.00 (cut-off mark/point) was taken as a basis to judge the means for the items in the questionnaire. Items with a mean equal to or higher than 3.00 was regarded as "Accepted" while items with mean less than 3.00 was regarded as "Rejected".

Income Distribution was analyzed using the Gini Coefficient and Lorenz curve. The total value of income from aquaculture value chain actors was obtained from a sample of 150 respondents as an index of measurement. Lorenz curve was obtained by plotting the cumulative percentage of each category of value chain actors arranged in order, from the smallest number to the largest, against the cumulative percentage of their income. The extent to which the Lorenz curve deviated from the diagonal line is an indicator of relative concentration as the area between the Lorenz curve and line of equal distribution (OP) is usually termed the area of concentration (Morgan, 1965 and Needham, 1977). The degree of inequality in sales revenue was estimated by reading the curve at the point where it lies farthest from the OP. The Gini Coefficient is a more precise measure for measuring inequality of incomes and it represents the proportion of the area

under the diagonal (line of equal distribution) which lies between the diagonal and the Lorenz curve. Computation was done by finding the sum of the product of the percentage of value chain actors and the cumulative percentage of their incomes and subtracting it from 1. The difference represented the Gini Coefficient and it ranges from 0 to 1. A Gini Coefficient of 0 implies perfect equality in distribution while a coefficient of 1 means perfect inequality. In practice, the actual value of the Gini coefficient lies between these 2 extremes. The closer the value is to unity, the greater is the degree of inequality of incomes.

Results and Discussion

Result in Table 1 revealed that 45.8% of the respondents were males while 54.7% of the respondents were females. Although farm lands are controlled by men being household heads according to traditional customs in the study area, fish production is becoming a sub-sector that is gender friendly in favor of the female folks. This supports the view of Ogunbameru and Okeowo (2013) that women are key players in Africa's agricultural sector and their participation is critical to achieving food security and economic wellbeing of households. Women dominating the sub-sector, and expanding the value chain for participants is a welcome development. For the economic growth of the sampled areas, the activities of women in maximizing land, capital and labor in aquaculture value chain cannot be overemphasized. Women as home makers would feel the nutritional impulse of members of their households and of the society more than any other group. Little wonder they seem to dominate in the fishery sub-sector in the study area and would play the most significant roles in the development of its value chain.

Table 1: Socio-Economic Characteristics of Respondents

Variable	Frequency	Percentage
Sex		
Males	68	45.8%
Females	82	54.7%
Total	**150**	**100%**
Marital Status		

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Singles	46	30.7%
Married	60	40%
Divorced/Separated	10	6.7%
Widow/Widower	34	22.6%
Total	**150**	**100%**
Age Bracket (Years)		
< 20	6	4%
21-30	38	25.3%
31-40	46	30.6%
41-50	30	20%
51-60	30	20%
Total	**150**	**100%**
Educational Level		
No formal education	8	5.3%
Adult education	24	16%
Primary School	30	20%
Secondary School	58	38.7%
Tertiary Education	30	20%
Total	**150**	**100%**
Household Size (No. of people)		
1-3	42	28%
4-6	74	49.7%
7-10	32	21.3%

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>10	2	1.3%
Total	**150**	**100%**
Years of Experience		
1-3	28	18.6%
4-6	74	49.3%
7-10	40	26.6%
>13	8	5.3%
Total	**150**	**100%**

Source: Field Survey, 2021

30.7% of the respondents were singles while 40% of the respondents were married, 6.7% of the respondents were divorced/separated and 22.6% of the respondents were widows/widowers. This indicates that most participants in aquaculture value chain in the study area were married. This would imply the expected support from the spouse(s) and children of these participants with a view to improve and increase activities in aquaculture value chain and improve management of its resources. Family members would mostly likely see aquaculture activities/business as one that directly or indirectly contributes to the economy of the home and so, would not work against the enterprise. Participants being married are themselves assumed to be responsible. It therefore suggests that unmarried people may rarely engage in farming as they may not have domestic responsibilities to shoulder (Nwosu et al; 2012).

Table 1 further reveal that about 79% of participants in aquaculture value chain in the area were at most between 20 to 50 years of age. This gives an insight into the prospects of the value chain since it is predominantly in the hands of people in their productive age and of youthful vigor. The Table further shows that activities in the value chain is not performed by those less than 21 years of age. Aquaculture value chain has prospects of being an enterprise that if well-developed could become a tool in dealing with youth unemployment in the study area. Age is an important factor in determining the productivity and adoption of an innovation by participants (Kebede, 2001). At the youthful age, decision making for improved production, profitability and ability to take risks for expansion of production would not be too difficult for these participants to adjust.

This agrees with the findings of Kudi et al (2008) which observed that active age of participants is a positive factor for decision making. Nwaru (2004) also had opined that the ability of the participants to bear risk, do manual work and be innovative decreases with increase in age.

5.3% of the respondents had no formal education, as it had the lowest percentage while 16% of respondents had adult literacy education. 20% of the respondents had primary education. 58.7% of respondents had obtained between secondary and tertiary education. It can be summarized that few people among rural farmers are illiterates and this may affect their income, saving habits and expenditure patterns. The level of education of rural farmers affects the type of economic opportunities open to them and their ability to recognize and take advantage of such opportunities.

This is the type of education which increases the productivity of the individual receiving it by making him acquire new skills and techniques. According to Kasika (2015) the higher the education level, the more are the effect of education and skill on job performance. As such people's ability to understand and use advanced technology is determined by the level of their education. Educated workers tend to be more responsive in receiving instructions and doing new tasks and easily adopt new technology which increases their ability to innovate and improve job performance (Effiong,2021).

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 From the table above, the modal household size is 4-6 as it had the highest frequency and percentage of 49.7%. 28% of respondents had a household size of 1-3, 21.5% had a household size of 7-10, which will thus influence the amount of hired labor employed and increase productivity whole 1.3% had household size above 10. It is typical for household members to be relied upon in supplying cheap unremunerated family labor in an attempt to trim down operational cost along the value chain.

 Majority of the respondents (80%), had between 4-6 years' experience in aquaculture value chain. These category of participants are well versed in the intricacies and activities involved and therefore stand at a vantage position to do better than new entrants because they might have understood and mastered all complexities involved in the value chain.

New entrants constituted 18.6% with 1-3 years of experience. The relatively low percentage of new entrants may be due to the stress, rigor and relatively low profitability associated with aquaculture value chain in the study area. According to Effiong (1998), the number of years an individual had spent in a job gives an indication of the practical knowledge and skill acquired over the years and which makes it possible to observe an improvement in performance. Although experience may not count in terms of risk taking, it may have some considerable influence on efficiency.

Table 2: Participants in Aquaculture Value Chain

Value Chain Activity	Frequency	Percentage
Fish breeding(Production of fingerlings	8	10.6%
Fish farming	17	22.9%
Fish processing	20	26.6%
Fish selling	30	40%
Total	**75**	**100%**

Source: Field Survey, 2021.

Table 2 shows that participants in aquaculture value chain in Afikpo North L.G.A of Ebonyi State from the study was highly dominated by fish sellers with 40% of total respondents, which involves marketing of various fish types both dried, fresh and smoked fish. This implies that those selling fish outnumber the people producing fish. This underscores the need for fish farmers to produce on a large scale in order to be able to sustain fish sellers in business. Fish breeding/production of of fingerlings had the lowest percentage of 10.6%. This can be attributed to the high level of skill and expertise required in the activity. 22.9% of the respondents were fish farmers involved in raising of fish in enclosures. While 26.6% of the respondents were fish processors. Who mainly smoke their fish using smoking kiln.

Table 3: Source of Finance of Respondents

Source of Finance	Frequency	Percentage
Personal savings	35	34.8%
Friends/relations	20	12.6%
Esusu	49	30.6%
Money lenders	15	7.4%
Betting, online investment, forex trading etc.	11	6.9%
Total	**158***	**100%**

Source: Field survey, 2021.   * Multiple responses

Table 3 indicates the different sources of financing for participants in aquaculture value chain. 34.8% of the respondents depended on their personal savings. 12.6% of the respondents were financed through friends/relations, 30.6% of respondents finance their business through Esusu, clubs, and weekly/daily contributions as most respondents are members, 7.4% of the respondents finance their business through money lenders. Capital from these sources are usually dismally low to make any meaningful impact in investment. This finding underscores the need for microcredit institutions in the study area to be empowered in order to serve the credit needs of rural entrepreneurs. 6.9% of the respondents were financed through other sources respectively such as betting, online investment, forex trading etc. 5.0% of the respondents got their finance from banks. The percentage of respondents who acquire capital from bank form the study was low due to high interest rate and stringent conditionalities attached to obtaining bank loan.

Table 4: Factors that Limit Income of Respondents.

Limiting Factor	Mean	Decision
Lack of access to capital	4.82	Accepted
High transportation cost	4.8	Accepted

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Bad Roads	4.75	Accepted
Stiff Competition from others	4.72	Accepted
Emergency situations involving family, relations and natural disasters	4.67	Accepted
High cost of rent	4.21	Accepted
High interest rate of loans	3.8	Accepted
High market dues	3.75	Accepted
Short loan repayment term	3.5	Accepted
High rate of fish mortality	2.95	Rejected
Low patronage	2.8	Rejected
Irregular supply of inputs	2.53	Rejected
Product deterioration due to lack of proper storage facilities	2.04	Rejected

- **Source: Field Survey, 2021.   * Mean (cut-off point) for 5-point Likert scale =3.00**

Table 4 shows the constraints faced by participants in aquaculture value chain which seriously limits their income. In the study the major problem faced was lack of access to capital (4.82). Investment in any of the value chains in aquaculture requires some reasonable amount of capital. Ugwumba (2010) identified access to capital as one of the major problems facing participants in aquaculture value chain in Nigeria. Similarly, Adeogun et al; (2007) also reported lack of capital as one of the constraints affecting aquaculture in Lagos State Nigeria.   High cost of transportation occasioned by bad roads was the next factor that that limits incomes of the respondents. High cost of transportation pushes up running costs along the value chain thereby depressing profits and income. This finding strongly suggests the need for construction of accessible rural feeder roads, as it will help to ameliorate challenges associated with logistics in the marketing component of the value chain. Stiff competition from other actors in the value chain also limited the income of respondents (4.72). This makes respondents to lose their market

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share by a reasonable margin. Consequently, to remain in business some respondents have to lower their prices in order to retain or attract patronage and this correspondingly impacts negatively on their income. Emergency situations involving family/relations, health challenges and natural hazards usually results in unplanned spending of limited income. Other factors which limit the incomes of actors in aquaculture value chain include high cost of rent, high interest rate on loans, high market dues and short loan repayment term. Factors such as high rate of fish mortality, low patronage, irregular supply of inputs and product deterioration due to lack of proper storage facilities were however rejected as factors limiting the income of participants in aquaculture value chain in the study area.

Table 5: Aggregate Income Distribution among Respondents within Aquaculture Value Chain in Afikpo North LGA, Ebonyi State

Income Range	Frequency	Relative Frequency	Cumulative Relative Frequency (X)	Total Value of Annual Income	Relative Frequency of Total Annual Income	Cumulative Relative Frequency of Total Annual Income (Y)	XY
120,000-216,000	24	0.16	0.16	1,989,000	0.0758	0.0758	0.012
216,001-312,000	50	0.333	0.493	6,684,000	0.2549	0.03307	0.110
312,001-408,000	30	0.2	0.693	5,412,000	0.2064	0.5371	0.107
408,001-504,000	32	0.213	0.906	6,744,000	0.257	0.7941	0.169
504,001-600,000	6	0.04	0.944	1,644,000	0.0627	0.8458	0.0342
600,001-1,080,000	8	0.053	1	3,740,000	0.14	1	0.053
Total	150	1		266213000	1		0.485

Source: Computed from Survey Data, 2021

Mean Value of Annual Income=N349, 506.7

Gini Coefficient = 1-0.485

Gini Coefficient = 0.515

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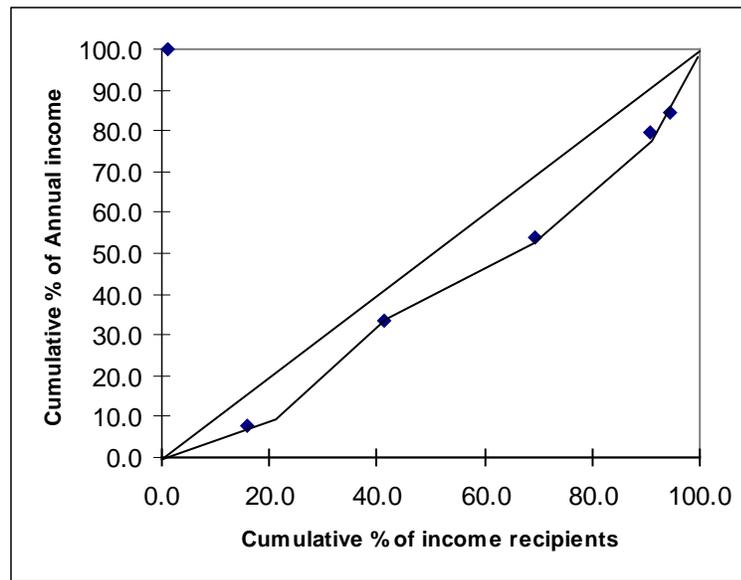
Source: Computed from Table 5

Figure 1: Lorenz curve showing Distribution of Respondents by Size of Average Annual Income

Figure 1 illustrates the observed level of income distribution among participants in aquaculture value chain. The Lorenz Curve at its furthest point from the line of equal distribution (OP) shows that 52% of respondents account for 32% of annual income, so that the rest 48% account for 68% of total annual income. Table 4.10 reveals that 16% of the respondents in the annual income range of 0-216000) handled 7.58% of total annual income; compared with 5.3% of those (in the annual income range of 600,000-10,800,000) accounting for 14% of total annual income. These results show that there is income inequality among participants in aquaculture value chain in Afikpo North Local Government Area. It is slightly skewed in favor of the 48% respondents who account for 68% of total annual income. This fact is further confirmed in table 5 where a Gini Coefficient of 0.51% was obtained. Factors promoting income inequality could be attributed to participant's relative access to capital, credit facilities and entrepreneurial ability which may have given some respondents advantage over the others. According to Birdsong (2015), a widening income inequality tends to increase predatory market behaviours which can hinder growth of low income competitors. Income inequality implies a higher level of poverty. And poverty is associated with increased crime and poor public health which can retard economic

progress. Inequality of income makes physical capital to become increasingly scarce as fewer participants in the value chain have funds to invest in business expansion. These findings strongly suggests the need for the liberalization of credit and training in entrepreneurship for actors in aquaculture value chain as a first step in improving the income of low earners in the value chain

Conclusion and Recommendations

Farmers should form themselves into cooperative groupings as it will enable resource poor participants not only to get loans but also to pool their resources together and overcome the inadequacy of capital.

The problem of inadequate transport facilities (especially poor rural road network) should be given priority attention by both Local and State governments, there is need to provide accessible roads in rural communities of Afikpo North L.G.A. of Ebonyi State. This will help to tackle challenges associated with logistics in the marketing component of the value chain.

Extension should embark on intensive enterpreneurship training programmes for participants in aquaculture value chain and should focus on improved techniques in fish breeding, production, processing and marketing

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