Economic Analysis of Crayfish Marketing in Anambra State, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The study examined the economics of crayfish marketing in Anambra State, Nigeria, Its specifically described the socio-economic characteristics of crayfish marketers: Identified the marketing channels of crayfish in the area; estimated the profitability of crayfish marketing by the intermediaries; estimated the marketing efficiency level attained .by the intermediaries; established the determinants of net marketing income realized by the marketers and identified constraints to crayfish marketing in the area. The multistage sampling procedure was used to select two agricultural zones (Onitsha and Awka), 12 daily markets and 120 respondents (60 wholesalers and 60 retailers) for the study. Well, a structured questionnaire was administered to the respondents for the cross-sectional data collection on the marketing variables. Data were analyzed using descriptive statistics, budgetary technique, Shephard-Futrell technique and multiple regression analysis. Findings on the socio-economic characteristics of the respondents revealed that there were more female than male in crayfish marketing and the majority (91%) of the respondents had no access to credit facilities. The study revealed three level marketing channels where the majority (78%) of the respondents identified channels one (fishermen/supplier wholesalers retailers consumers) as the

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most frequently patronized. The second channel was (fishermen retailers consumers), while the third was (fishermen wholesalers -restaurants/hotels). The report also indicated that the retailers realized more profit than the wholesalers and there was a high level of inefficiency among the wholesalers (95.12%) than the retailers (81.67%). Findings on the effects of socio-economic factors of the respondents on net marketing income showed that marital status, marketing cost, access to credit and product price had significant influences on net marketing income while age, gender, educational level and marketer's years of experience were not significant. The wholesalers identified inadequate storage facilities as the highest constraint to crayfish marketing in the area; followed by high transportation cost, high market fees, unstable price, lack of access to loan and inadequate capital. While the retailers implicated high market fees as their major constraint, followed by inadequate capital, unstable price, lack of access to loan, inadequate storage facility and high cost of transportation as the least problem.

1. INTRODUCTION

1.1 Background of the Study

The economies of most countries of the world, especially developing countries such as Nigeria, depends on agriculture for the provision of raw materials for the agro-based industries and food for the citizens. In Nigeria, the agricultural sector contributes about 30% of the gross domestic product (G.D.P), provides employment for over 70% of the labour force, food for the people and source of export revenue earnings (Central Bank of Nigeria [1]. The sector is made up of the crop, livestock, forestry and wildlife, as well as fisheries (i.e. aquatic and non-aquatic) sub-sectors.

Crayfish is an aquatic food harvested from flowing water bodies especially in the South-South geographical zone of Nigeria. The Nigerian artisanal, coastal and marine fisheries sector is characterized by a rich resource base with a water area of 140,000 square kilometres and about 42.000 square kilometres continental shelf area, adjacent to the country's 853 kilometres coastline [2].

According to Israel, Inana, Adindu and Akande [3], crayfish *(Procambarus clarkif)* is a crustacean that forms a greater proportion of shellfish, abundant in the fresh waters of the Delta region of Nigeria. Artificial rearing of crayfish is not popular compared to fish but the production level in Nigeria is conservatively estimated at about 12,000 metric tonnes per annum. Crayfish is economically valuable in many riverine countries particularly in countries where fish production account for more than 75% of the total value of their commodity trade. Many Nigerian riverine Delta region women source their livelihood from the marketing of smoke-dried crayfish [3]. The commodity is processed and packaged in woven polythene or hessian bags or woven baskets and transported in dugout wooden boats from processing centres in creeks to onshore markets. Crayfish as a source of animal protein holds the promise of' reducing protein deficiency in the human diet since all food nutrients except carbohydrates are known to be present in crayfish [4]. It is a rich source of lysine, sulphur and amino acids and is therefore suitable for complementing high carbohydrate based food. It is a good source of thiamine, riboflavin, vitamin D and A, phosphorus, calcium and iron. It is high in polysaturated fatty acids, which are important in lowering blood cholesterol level [5]. Crayfish are classified as animal polypeptide consisting of about 36 - 45% protein [6]. Like most og sea foods, it contributes immensely to the nutrition of consumers because the protein is relatively cheaper than other animal protein and possesses high nutritional value [7]. Crayfish is highly medicinal because they reduce heart related problems, goiter, etc. especially when consumed in large quantities [8].

Crayfish marketing is a common feature in most daily and non-daily markets in Anambra State. The business has provided employment opportunities and income to the marketers, though actual production takes place in the Niger Delta region of the country. Considering the distance between the farm gate and the consumers in the study area, crayfish marketing in the State involves most of the marketing stages such as assemblage, storage, transportation, grading, packaging and financing. This development affects the marketing cost of the product as well as the efficiency of product marketing by the agents (FAO, 2004).

Again, the profitability of any marketing enterprise depends on the marketing efficiency levels attained by the intermediaries, the socio-economic factors of the marketers that exert significant and positive influence on net marketing income realized by them as well as the afore-mentioned marketing constraints. Availability of credit for crayfish marketers would ensure efficient marketing and facilitate proper utilization of marketing resources and the adoption of crayfish marketing innovations. Studies such as Bassey, Okon, and Ibok, [9]; Tura, Jonathan, and Lawal [10]; Oladapo, Momoh, Yusuf, and Awoyinka, [11] lend credence to the importance of efficient marketing system.

What is the current situation of profitability, determinants of profit and constraints to crayfish marketing by the marketers in Anambra State, since there is the scarcity of information on the subject in the State. This is the research gap which this study intended to close. The study was guided by the following research questions:

i. What are the socioeconomic characteristics of crayfish marketers (wholesalers and retailers) in the area?
ii. What are the marketing channels of crayfish?
iii. What is the profitability of crayfish marketing by the intermediaries?
iv. What is the marketing efficiency level attained by the intermediaries?
v. What are the determinants of net marketing income realized by the marketers?
vi. What are the problems being encountered by the marketers?

1.2 Objectives of the Study

The broad objective of the study was to examine the marketing of crayfish in Anambra State, Nigeria. The specific objectives are to:

i. Describe the socioeconomic characteristics of crayfish marketers (wholesalers and retailers) in the study area;
ii. Identify the marketing channels of crayfish;
iii. Estimate the profitability of crayfish marketing by the intermediaries;
iv. Estimate the crayfish marketing efficiency levels attained by the intermediaries;
v. Establish the determinants of net marketing income realized by the marketers; and

vi. Identify constraints to crayfish marketing in the area.

1.3 Research Hypotheses

The following hypotheses will be tested;

i. Socioeconomic factors of the respondents do not significantly influence the net marketing income realized by the intermediaries.
ii. There is no significant difference between the net marketing income realized by wholesalers and retailers of crayfish
iii. There is no significant difference between the marketing efficiency levels attained by the wholesalers and retailers of crayfish.

1.4 Justification for the Study

The findings of this study on socio-economic characteristics of the marketers and their influence on net marketing income as well as constraints to crayfish marketing in the area will assist the marketers in taking decisions that will ensure the minimization of marketing cost, maximization of revenue, improvement in supply of product, stabilization of price and availability of product in all seasons.

The finding of this study will guide the government and policy makers in formulating policies on marketing issues, and assist development institutions in the packaging of programmes that will address the needs of the marketers. In addition, findings of the study will enrich existing literature on crayfish marketing and avail researchers' areas and equally fine-tune their studies.

2. RESEARCH METHODOLOGY

2.1 The Study Area

The study was carried out in Anambra State, which is one of the 36 States of the Federal Republic of Nigeria. The State has 21 local government areas (LGAs) spread across the four agricultural zones namely Aguata, Anambra, Awka and Onitsha. The State is located between latitude 6°42' and 5°44'N and longitude 6°36' and 7°29'E. It has an estimated population of 4,182,032, with the male population of 50.9% and female 49.1% (National Population Commission (NPC), 2006). The area has a mean temperature of 30°C during the hottest period of February to April and 21°C during the coldest

period of December to January. The state has two distinct seasons of dry and rainy seasons. The annual average rainfall is between 2000 mm to 2300 mm and distributed through March to November. The main annual relative sunshine intensity is 5.2 hours. It occupies an area of 4,416 km^2; 70% of which is arable land [12]. Agriculture is the predominant occupation in rural areas engaging more than 70% of the rural population.

2.2 Population and Sampling Procedure

The study population is made up of crayfish marketers in Anambra State, Nigeria. Multistage, purposive and random sampling techniques were used to select one agricultural zone. About 120 actors along the crayfish marketing channels were randomly selected and interviewed. They included 60 wholesalers and 60 retailers. It is noteworthy that the majority of the marketing respondents especially the wholesalers (60) and retailers (60) were selected from the Onitsha zone. This is because the zone houses most of the major daily crayfish markets in the State.

2.3 Methods of Data Analysis

The following data analysis techniques were used to achieve the study objectives. Descriptive statistics such as means, frequencies, percentages, flow charts and ratios were used to achieve the objective (i), socio-economic characteristics of the marketers, objective (ii), marketing channels of crayfish, and parts of objectives (iii), (iv), and (v). Cost and return of crayfish marketing (objective iii) were realized using the budgetary technique. Objective (iv), price efficiency of crayfish marketing by the marketers was achieved using Shepherd's formula and determinants Shepherd-Futrell method. Multiple regression analysis was used to realize objective (v), of net marketing income. Ranking of the means of constraining variables to crayfish marketing in the area was used to arrange the constraints according to the degree of seriousness and it best achieves the objective (vi).

2.4 Model Specification

The budgetary technique was used to estimate enterprise profitability as:

GM = TR-TVC

NMI = TR - TC (GM-TFC)

$$NROI = \frac{NMI}{TC}$$

Where:

GM = Gross margin
TR = Total revenue
TVC = Total variable cost
NMI = Net marketing income
TC = Total cost
TFC = Total fixed cost
NROI = Net return on investment

The price efficiency of crayfish marketing was determined by means of Sherphard-Futrell method [12]:

$$ME = \frac{TC}{TR} x \frac{100}{1}$$

Where,

ME = Coefficient of marketing efficiency (number)
TC = Total cost incurred by the marketers (N)
TR = Total revenue of product sold (N)

The multiple regression model used to examine the determinants of net marketing income is implicitly given as:

NMI = f (AGE, GEN, MAS, EXP, EDU, MKC, ACC, PDP, e_1)

Where:

NMI = Net marketing income (N4)

AGE = Age of marketer (years)

GEN = Gender of the marketer (dummy: male = 1, female = 0)

MAS = Marital status of the marketer (dummy: married = 1, single = 0)

EXP = marketing experience of the marketer (years spent in the business)

EDU = Educational level of the marketer (respondent's years of formal education)

MKC = Marketing cost (N)

ACC = Access to credit (dummy: accessed credit =1, otherwise=0)

PDP = Product price/kg (N)

$a_1, a_2 …. a_8$ = Parameters to be determined

e_1 - Stochastic error term

Four functional forms of regression model (linear, exponential, semi-log and double-log) were tried and the model that best fits the data was adopted as the lead equation. The functional forms are:

Linear: $NMI = a_0 + a_1 AGE + a_2 GEN + a_3 MAS + a_4 EXP + a_5 EDU + a_6 MKC + a_7 ACC + a_8 PDP + e$

Exponential: $\ln NMI = a_o + a_i AGE + a_2 GEN + a_3 MAS + a_4 EXP + a_5 EDU + a_6 MKC + a_7 ACC + a_8 PDP + e_i$

Semi-log: $NMI = a_o + a_i \ln AGE + a_2 \ln GEN + a_3 \ln MAS + a_4 \ln EXP + a_5 \ln EDU + a_6 \ln MKC + a_7 \ln ACC + a_8 \ln PDP + e_i$

Double-log: $\ln NMI = a_0 + a_i \ln AGE + a_2 \ln GEN + a_3 \ln MAS + a_4 \ln EXP + a_5 \ln EDU + a_6 \ln MKC + a_7 \ln ACC + a_8 \ln PDP + e$

2.5 Hypothesis Testing

The study hypothesis was tested using the test criteria (t-statistic, F-statistic, R^2, Adjusted R^2 and Durbin Watson statistic) in multiple regression analysis.

3. RESULTS AND DISCUSSION

This result is divided into five sections: socio-economic characteristics of crayfish marketers; marketing channels of crayfish; costs and returns of crayfish marketing, determinants of net marketing income realized by the marketers and constraints to crayfish marketing.

3.1 Socio-economic Characteristics of Crayfish Marketers

The socio-economic characteristics of the crayfish marketers presented and discussed under this sub-section are; gender, age, marital status, level of education, years of experience and access to credit.

3.2 Gender of the Respondents

The distribution of the respondents according to gender is presented in Table 1. The Table revealed that majority (57.7%) and (60%) of the wholesalers and retailers respectively were female while the rest (42.3%) of the wholesalers and (40%) of the retailers were males. This implied that women dominated crayfish marketing in the area. This finding is in tandem with Kainga and Kingdom [13] and Bassey et al. [14] that reported more women (93%) and (55%) respectively than men in the marketing of crayfish. This result proved that women are more active in crayfish marketing.

3.3 Age of the Respondents

The distribution of respondents by age is shown in Table 1. It showed that both the wholesalers and retailers had a mean age of 42 years. This implied that the marketers were in their active marketing age. This finding also agrees with Kainga and Kingdom [13] who reported that majority (55%) of their respondents were within the active age range of 30-50 years and Bassey et al. [14] also reported that (50%) of their respondents were within 41-50 years of age. From this finding, it can be said that age is of the essence in crayfish marketing and cannot be managed by elderly persons.

3.4 Marital Status of the Respondents

Table 1 shows the distribution of the respondents based on marital status. The Table revealed that majority (65.0%) and (66.7%) of both the wholesalers and retailers respectively were married. This finding implied that crayfish marketing in the area is dominated by married men and women with less single persons. This report agreed with Kainga and Kingdom [13]

Bassey et al. [14] and Okayi et al. [15] they all reported that greater percentages of the respondents in their different marketing studies were married.

3.4.1 Level of education of the respondents

The respondent's level of education was shown in Table 1, which reported that the wholesalers had 10 years as their mean years of acquiring education while the mean years of acquiring formal education by the retailers were 17.5 years. The Table, however, reported that (55%) of the wholesalers spent 1-10 years acquiring formal education, (45%) spent 10-20 years. (50%) of the retailers spent 1-10 years acquiring formal education, while (50%) of them spent 10-20 years acquiring education. This implied that there was a high level of literacy among crayfish marketers in the area. This finding agreed with that of Kainga and Kingdom [13] who reported that (79, 2%) of their respondents attained primary and secondary education; and Bassey et al. [14] who reported that majority of their

respondents were literate (i.e. (50%) attained secondary education and (26.7%) attained only primary education).

3.4.2 Years of experience of respondents

The distribution of the respondents according to their number of years spent in the business is presented in Table 1. The Table showed that majority (56.7%) of the wholesalers has spent 1-10 years in the business, while (43.3%) spent 11-20 years in the business. It revealed that the mean number of years spent by the wholesalers was 9.8 years. However, (45%) of the retailers spent 1- 10 years in the business while the majority (55%) spent 11-20 years in crayfish marketing. The retailers spent an average of 10 years in crayfish marketing. This implied that both the wholesalers and retailers have approximately 10 years of marketing experience, meaning that they had acquired ample experience in the crayfish marketing business. This finding agrees with Bassey et al. [14] who reported that (50%) of their respondents acquired 10 years of marketing experience.

3.4.3 Respondents access to credit

The respondent's access to credit was presented in Table 1. The Table revealed that (75.8%) of the respondents had no access to any credit facilities, (24.2%) of them had access to credit. This implied that the marketers may be hampered by little capital to turn over with the marketing season.

3.5 Marketing Channels of Crayfish Marketing

Marketing channel of crayfish in the study area is presented in fig. 1. The figure revealed that majority (78%) of the respondents identified channel one as the most frequently used (fishermen/supplier wholesalers retailers consumers); (15%) of them identified channel two (fishermen retailers consumers) as their most used channel while (7%) of them identified channel three (fishermen wholesalers restaurants/hotel).

3.6 Costs and Return of Crayfish Marketing

The estimated profitability of crayfish marketing is presented in Table 2. The Table revealed the gross margin, net marketing income, net return on investments and marketing efficiencies of both the wholesalers and the retailers. The wholesalers realized a gross margin of N2,288.150, net marketing income $41,838,150, the net return on investment of 0.1 and marketing efficiency 95.12%. Also, the retailers realized a gross margin of N1,479,300, net marketing income Nl,371,300, the net return on investment of 0.22 and marketing efficiency 81.67%. Net return on investment figure (0.05) implied that the wholesalers returned 10 kobo for every 100 kobo invested in the business while the retailers returned 22 kobo for every 100 kobo invested. This report indicated that the retailers realized more profit than the wholesalers. There is a high level of inefficiency among the wholesalers than the retailers. This may be as a result of the expenses incurred by the wholesales from the point of purchase to the point of sale. More so, the wholesalers pay certain rent to store their good while the retailers pay little or no rent as most of them acquire what they can sell in a day and buy another the next day.

3.7 Estimated Determinants of Net Marketing Income Realize by the Marketers

The multiple regression analysis was used to predict the effects of wholesalers' and retailers socioeconomic factors on net marketing income realized by them. The independent variables were age represented by (AGE), gender (GEN), marital status (MAS), marketing cost (MKC), educational level (EDU), years of experience (EXP), access to credit (ACC) and product price (PDP). The data on net marketing income and socioeconomic factors were fitted to the four functional forms (linear, exponential, semi-log and double-log) of the regression model and ran with MINITAB statistical software. Results of the analyses are presented in Table 3.

The double-log output of the regression form in Table 3 was best in terms of number and the sizes of significant variables, R^2, R^2 (adjusted), F-statistic and D-W statistic and was chosen as a lead equation. Out of the eight predictors included in the model, four (marital status, marketing cost, access to credit and product price) had significant influences on net marketing income, while others age, gender, educational level and marketers years of experience were not significant.

The coefficient of marital status was significant at (5%) level and negatively related to net marketing income. The finding is in line with *a*

priori expectation, that married marketers were not likely to realize higher marketing income. This could be as a result of the tedious marketing activities involved in the business which includes going to the water banks, transporting the crayfish and its marketing processes. It otherwise meant that single marketers were likely to earn more profits in crayfish marketing. This finding disagreed with Ugwumba and Okoh [12], who reported a positive and significant

relationship between net marketing income and marital status.

The coefficient of marketing cost was positive and statistically significant at (1%) level. This implied that the higher the marketing cost incurred by the marketers, the higher their net marketing income. This result is contrary to *a priori* expectation of negative relationship between net marketing income and marketing

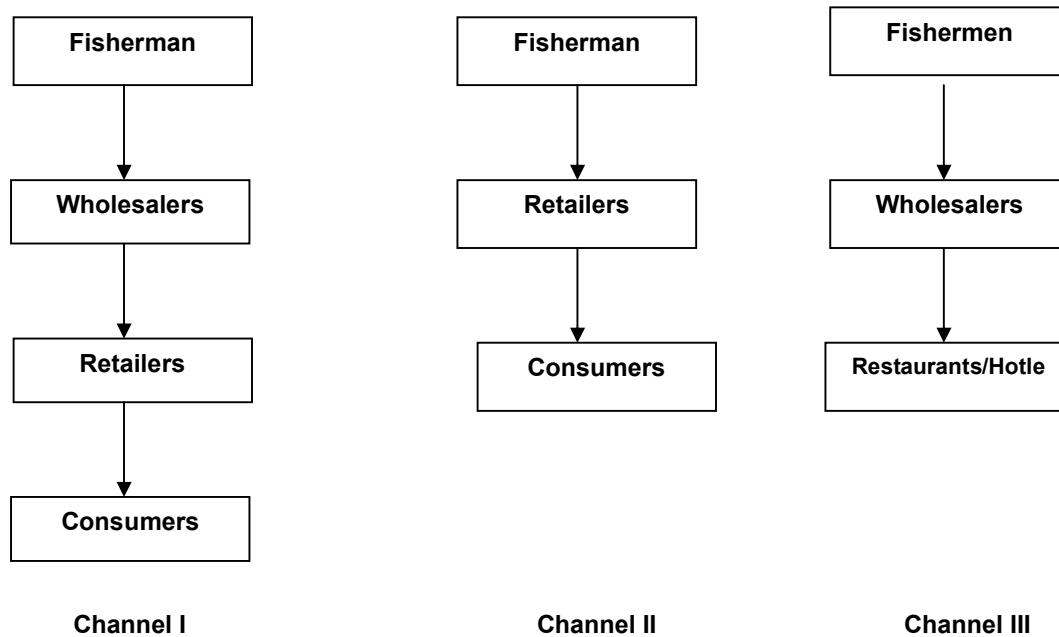**Table 1. Socio-economic characteristics of the marketers**

Variables	Wholesalers			Retailers			W & R		
	F	%	Mean	F	%	Mean	F	%	Mean
Age									
20-40	26	43.3		27	45.0		53	44.2	
41-60	33	55.0	41.8	31	51.7	41.6	64	53.3	41.7
Above 60	01	01.7		02	03.3		03	02.5	
Gen									
Male	29	48.3		24	40.0		53	44.2	
Female	31	57.7	Female	36	60.0	Female	67	55.8	Female
MAS									
Married	39	65.0		40	66.7		79	65.8	
Single	21	35.0	Married	20	33.3	Married	41	34.2	Married
Edu									
1-10	33	55.0		30	50.0		63	52.5	
11-20	27	45.0	10.0	30	50.0	17.5	57	47.5	09.8
EXP									
1-10	34	56.7		27	45.0		61	50.8	
11-20	26	43.3	09.8	33	55.0	10.0	59	49.2	08.7
ACC									
Accessed	17	28.3		12	20.0		29	24.2	
No access	43	71.7	No Ace	48	80.0	No Ace	91	75.8	No Access

Source: Field survey, 2017. Note: F = Frequency. % = Percentage

Table 2. Estimated costs and returns of crayfish marketing by the intermediaries

Variables	Wholesales	% of TC	Retailers	of TC	W & R	% of TC
Total Revenue(TR)	37,682,100		7,479,600		45,161,700	
Variable cost						
Cost of Crayfish	29865000	83.32	5660000	92.66	35,525,000	84.68
Expenses	1701450	4.75	194500	3.18	1895950	4.52
Market charges	3827500	10.68	145800	2.39	3973300	9.47
Total variable cost (TVC)	35393950	98.74	6000300	98.29	41394250	98.67
Fixed cost						
Rent	450000	1.26	108000	1.77	558000	1.33
Total fixed cost (TFC)	450000	1.26	108000	1.77	558000	1.33
Total cost (TC=TVC+TFC)	35843950		6108300		41952250	
Gross margin(GM=TR-TVC)	2288150		1479300		3767450	
Net marketing income (NMI==TR-TC)	1838150		1371300		3209450	
Net return on Investment (NROI=NMI/TC) Marketing Efficiency (ME=TC/ TRx lOO /l)	0.05 95.12%		0.22 81.67%		0.08 92.89%	

Source: Field Survey, 2017

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Fisherman          Fisherman          Fishermen
    │                  │                  │
    ▼                  ▼                  ▼
Wholesalers         Retailers         Wholesalers
    │                  │                  │
    ▼                  ▼                  ▼
 Retailers          Consumers       Restaurants/Hotle
    │
    ▼
 Consumers

  Channel I          Channel II         Channel III
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Fig. 1. Channels of crayfish marketing

cost. However, it also implied that the marketers who invested more money in crayfish marketing were likely to realize more profits. This finding contradicts Ugwumba and Okoh [12] who reported a negative and significant relationship between marketing cost and catfish marketing income.

Access to credit had a negative and significant effect on net marketing income realized by the marketers at (5%) level. This is contrary to *a priori* expectation and implied that the marketers who had limited access to credits had more turn over as well as the net marketing income realized by them. The finding is in tandem with Agbo and Usoroh (2015) who recognized that access to credit exerted a negative but significant effect on the profit realized by shrimp marketers.

Product price also exerted a negative and statistically significant effect on the net marketing income realized by the marketers at (1%) level of probability. This result disagrees with *a priori* expectation and implied that the higher the selling price of crayfish, the lower the quantity purchased by the consumers as well as the net marketing income realized by the marketers. The reason could be attributed to the seasonality of product because consumers purchase more crayfish during the peak season of supply when

the price is lower while the marketers make more turnover and profit even at low prices.

The coefficient of multiple determinants (R^2) of 0.70 implied that (70%) variation in the net marketing income of the crayfish marketers was accounted for by the predictor variables. Hence, the remaining (30%) was due to random disturbance. The Durbin-Watson statistical value of 2.00 which lies within the benchmark of *2.0'.* signifies the absence of autocorrelation among abbreviations of the same variable. The F-statistic value of (32.79%) was significant, an indication of the overall significance of the regression.

3.8 Constraints to Crayfish Marketing in the Area

The marketing of crayfish was constrained by a number of factors both at wholesale and retail levels. A 4-point Likert-type scale was used to collect data on the constraints. The findings in Table 4 shows that 43% (1st) of the wholesalers implicated inadequate storage facility as the major problem they encountered. This was followed by high transportation cost (22%) which is the 2nd for the wholesalers, high market fees (13%) is the 3rd constraint, unstable price (10%), is the 4th, lack of access to loan (8%) is the 5th constraint and inadequate capital (4%) is the 6th constraint.

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Table 3. Estimated determinants of profit realized by pooled wholesalers and retailers

Predator	Linear	Exponential	Semi-log	Double-log
Constant AGE	31565 (1.39) 228.4	4.4550 (32.66) -0.000518	-400568 (-5.30) 97913	1.6665 (4,44) 0.2661
GEN	(0.55) -1109	(-0.21) -0.04452	(2.33)** 623	(1.28)-0.00443
MAS	(-0.16) -696	(-1.05) -0.03828	(0.25) -2646	(-0.36) -0.02608
MKC	(-0.09) 3.6674	(-0.84) 0.00002069	(-0.98) 117795	(-1.94)*1.02018
EDU	(8.98)*** -1897.5	(8.40)*** -0.005878	(6.03)*** -20625	(10.53)*** -0.01711
EXP	(-2.07)** -201.1	(-1.06) -0.001293	(-3.53)*** -7015	(-0.59) -0.05815
ACC	(-0.31) -12167	(-0.33) -0.06433	(-0.58) -5688	(-0.96) -0.03178
PDP	(-1.55) -0.6019	(-1.36) -0.00000163	(-2.04) ** -38933	(-2.30) ** -0.38801
R- square R-sq.	(.3.04)*** 58.7%	(-1.37) 61.2%	(-2 73)*** 53.3%	(-5.49)*** 70.3%
(adjusted) F-stat.	55.8% 19.75	58.4% 21.92	49.9% 15.82	68.1%32.79
D-W stat.	1.78	2.20	1.76	2.00

*Source: Survey data, 2017. F-stat = F statistics, D-W Stat. = Durbin Watson statistics. Figures in ( ) are t-statistic values. *** = significant at 1% alpha. ** = significant at $p \le 0.10$*

Table 4. Constraints of crayfish marketing in the study area

Variables	%	Wholesalers		%	Retailers	
		Mean score	Rank		Mean score	Rank
Inadequate storage facilities	43	3.26	1st	5	2.59	5th
Unstable price	10	3.15	4th	13	3.12	3rd
High transportation cost	22	3.21	2nd	1	2.74	6th
High market fees	13	3.04	3rd	50	3.48	1st
Inadequate capital	4	2.55	6th	23	3.33	2nd
Lack of access to a loan	8	2.89	5th	8	3.13	4th

Source: Survey Data, 2017

On the part of the retailers, the higher market fee is the 1st constraint with (50%) of the respondents followed by inadequate capital with (23%) as the 2nd and unstable price as the 3rd constraint with (13%). Other constraints are the lack of access to the loan (8%) as the 4th, inadequate storage facility as the 5th constraint with (5%) of the respondents and high transport cost as the 6th constraint with 1% of the correspondents.

4. SUMMARY, CONCLUSION AND RECOMMENDATIONS

4.1 Summary

The study examined the economics of crayfish marketing in Anambra State, Nigeria, Its specifically described the socio-economic characteristics of crayfish marketers; identified the marketing channels of crayfish in the area; estimated the profitability of crayfish marketing by the intermediaries; estimated the marketing efficiency level attained by the intermediaries; established the determinants of net marketing income realized by the marketers; and identified constraints to crayfish marketing in the area.

The multistage sampling procedure was used to select two agricultural zones (Onitsha and Awka). 12 daily markets and 120 respondents (60 wholesalers and 60 retailers) for the study. Well, a structured questionnaire was administered to the respondents for the cross-sectional data collection on the marketing variables. Data were analyzed using descriptive statistics, budgetary technique, Shephard-Futrell technique and multiple regression analysis.

Findings on the socio-economic characteristics of the respondents revealed that there were more female than male in crayfish marketing; mean age of the respondents was 42 years; majority (65.8%) of them were married; mean number of years spent in acquiring formal education was 10 years; mean years of marketing experience was 9 years; and majority (75.8%) of the respondents had no access to credit facilities. The study revealed three level marketing channels where the majority (78%) of the respondents identified channel one (fishermen/supplier wholesalers retailers consumers) as the most frequently patronized. The second channel was (fishermen retailers consumers), while the third was (fishermen wholesalers -restaurants/hotels).

Findings on the profitability of the business revealed that the wholesalers realized a gross marginof N2,288,150, net marketing income N141,838,150, net return on investment of 0.1 and marketing the efficiency of *95,12%,* while the retailers realized a gross margin of N 141,479.300, net marketing income N41,371,300, the net return on investment of 0.22 and marketing efficiency of 81.67%. Net return on investment of (0.10) implied that the wholesalers returned 10 kobo for every 100 kobo invested in the business while the retailers returned 22 kobo for every 100 kobo invested. The report also indicated that the retailers realized more profit than the wholesalers and there was a high level of inefficiency among the wholesalers (95.12%) than the retailers (81.67%). It means that the retailers were more efficient in pricing than the wholesalers.

Findings on the effects of socio-economic factors of the respondents on net marketing income showed that marital status, marketing cost, access to credit and product price had significant influences on net marketing income while ageing. Gender, educational level and marketer's years of experience were not significant.

The wholesalers identified inadequate storage facilities as the highest constraint to crayfish marketing in the area; followed by high transportation cost, high market fees, unstable price, lack of access to loan and inadequate capital. While the retailers implicated high market fees as their major constraint, followed by inadequate capital, unstable price, lack of access to loan, inadequate storage facility and high cost of transportation as the least problem.

4.2 Conclusion

Crayfish marketing in Anambra State, Nigeria proved a profitable enterprise both at the retail and wholesale levels given the positive values of the net marketing income and net return on investment. The retailers were more efficient than the wholesalers in the business.

4.3 Recommendations

Based on the findings of the study, the following recommendations were made;

i.   Governments through banks should make accessing loans easier to marketers to help address the issues of scarcity of funds.

ii.   The marketers through their Union should make modern storage facilities readily available and at a cheaper rate to enable them to add value to the product and make more profit.

iii.   The marketers should pressurize their union's executives to reduce/maintain the various fees charged, especially daily fees, at minimal levels so as to earn a better profit.

iv.   The union's executives members should recognize with the respective L.G.A officials in charge of markets to arrive at affordable Local Government charges for their members.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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