Marketing of African Giant Snail (*Achatina Achatina*) in Anambra State, Nigeria

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Abstract: *This study on the marketing of African giant snail in Anambra State, Nigeria established socio-economic characteristics of the marketers, distribution channels, market structure, profitability, marketing efficiency levels, determinants of net marketing income; and constraints to snail marketing. Purposive and random sampling methods were used to select 180 respondents. Data were collected using pre-tested questionnaire and analyzed using descriptive and inferential statistics. Findings indicated mean age, household size, educational level, and marketing experience of 48.8 years, 5 persons, 10 years and 15 years respectively. Females (75%) dominated the business and 85% of the respondents purchased snails sourced from the wild. Peak and lean seasons' inter market and Agricultural zone mean marketing margins realized by the wholesalers and retailers were highest in Aguata zone and lowest in Onitsha zone. Gini coefficients were 0.256, 0.248 and 0.155 for producer/supplier, wholesaler and retailer respectively. The enterprise proved profitable with net marketing incomes of ₦823,660 for wholesalers and ₦2,411,900 for retailers. The retailers were more efficient than the wholesalers in the business. Significant determinants of profit were age, marketing experience, product price, seasonal supply and marketing cost. Serious constraints to marketing were scarcity of snail due to seasonal supply, high price of product, poor storage facilities, high cost of transportation, poor sales and lack of capital. Encouraging massive production of the snail through the broadening of extension services, provision of low-cost credit and storage facilities and formation of thrift and cooperative societies would mitigate the identified problems and increase the benefits accruing to players in the snail value chain.*
Keywords: *Marketing, Efficiency, Determinants, African giant snail, Nigeria.*

I.   Introduction

Animal proteins are sourced from both macro-livestock such as cattle, sheep and goats and micro-livestock including grass cutters and snails as well as fisheries. Livestock and livestock products are estimated to make up over half of the total value of agricultural output in the industrialized countries and about a third of the total in the developing countries (Njoku, 2005). Livestock provides about 58.8% of the meat consumed in Nigeria. The major sources of animal protein for the Nigerian populace come mainly from livestock in the form of chicken, beef, mutton and pork (Ramalingam, 2005). These major sources are being decreased by persistent drought, diseases, high cost of feed, primitive animal husbandry techniques and low productivity of local animal breeds. The increasing growth of human population together with the rising standard of living has also exerted great pressure on the existing sources of animal protein (Ugwumba *et al.,* 2012).

Several efforts are being made to ensure that animal protein supply to Nigerians does not decrease irrespective of the fact that population size is increasing without a commensurate increase in food production especially meat. One way of ensuring adequate meat supply to Nigerians is to divert attention to the production of micro livestock such as grass cutter, rabbit, snail and others which have long been neglected. These micro livestock sources will complement the conventional animal protein sources (cattle, sheep, goats, e.t.c.) and ensure increased protein intake by the citizenry.

Snails are bilaterally symmetrical invertebrates with soft segmented exoskeleton in the form of calcareous shells (Adinya, 2006). The popular species of economic interest are the West African giant snails - *Achatina achatina* and *Archachatina marginata* (Chinaka and Wilson, 1995; Delta State Ministry of Agriculture and Natural Resources (DSMAR), 2011). Other species not mentioned by D.S.M.A.R. are Helix spp, Eobama spp, Otala spp, Erema spp and Limicolaria spp. Snails are the largest group of molluscs constituting the largest animal group after arthropods (Adinya, 2006).

In West Africa, likewise in Anambra State, snails dwell mostly in humid forest areas from where they are gathered by villagers for consumption, marketing and other uses. Snail farming is gradually gaining ground and supply from this source is growing to complement catches from the wild (Nwadukwe, 2000). Snail meat, which is popularly referred to as "congo" meat is nutritious and can be a viable supplement to the protein requirement of the people (Adinya, 2006). Cobbinah (1993) opines that snail meat is high in protein (12-16%),

low in fat (0.05-0.80%), has iron content between 45-50mg/kg and contains almost all the amino acids needed by humans. On dry matter basis, the protein content of snail is about 60% (Ebenso, 2002). According to Efarmspro (2008), the ash from burnt shells of snail is very rich in minerals like iron, potassium and other trace elements like magnesium, manganese, zinc and copper. The shell is highly valued for decorations of homes and sitting rooms. The shells are equally good sources of calcium for livestock feed production. Snail is a cheap and a choice source of protein for aged ones not only because of its "easy to chew" tissues but, because of its low cholesterol level.

Snail meat has medicinal values. A recent study has shown that a glandular substance from the edible land snails cause agglutination of certain bacteria. This could be of value against a variety of ailments including whooping cough. The high iron content of snail meat is considered important in the treatment of anemia and also for combating ulcer and asthma (Efarmspro, 2008). In Ghana, the bluish liquid obtained in the shell when the meat has been removed is believed to be good for infants' development. Slime from snail can be collected and used to cure eczema, skin rashes, swells, burns and insect bites. Also, it is used as an antihypertensive agent especially slime of Achatina species.

Marketing has been defined in several ways by different authors. It is a matter of getting the right goods and services in the right place at the right time with the right communication promotion (Kotler, 1995); a management process responsible for the identification, anticipation and satisfaction of consumer requirement (Bamigboye,1995); all those legal, physical and economic services which are necessary to make produce from the farm available to the consumer (Olukosi and Isitor, 1990), thus leading to the creation of form, place, time and possession utilities (Okoh *et al.,* 2008;); it enables producers such as farmers as well as middlemen to earn income with which they purchase other useful goods and services (Ebe, 2007). In all, marketing involves all activities engaged for the movement of goods that consumers need from points of production to points of purchase by the consumers (Crammer *et al.,* 2000; Adeleye, 2008; Nnabuife *et al.,* 2012).

Marketing efficiency refers to the effectiveness with which the marketing agents utilize the available resources to achieve maximum revenue (Nnabuife *et al.,* 2012). It can be economic efficiency, otherwise referred to as productive or overall efficiency (which is a combination of technical and allocative efficiencies), when profit maximization is considered (Ugwumba, 2011). It can be technical efficiency which entails the production of maximum output given the level of inputs employed (Ugwumba, 2011). Or input allocative efficiency, which is using the available inputs in optimal proportion giving their respective prices and available production/marketing technology (Ugwumba, 2010).

There is dearth of information on annual demand and consumption figures of snails in Nigeria, however, snails are reported to have high protein content and medicinal values, and for these reasons, the demand for snail meat has increased over the years in both domestic and foreign markets, thereby leaving behind lagging supply of the produce which is mostly sourced from the wild, amidst threats to extinction by rising rates of urbanization, and unwholesome snail farming system practices (Ijioma, 2012). In local markets in the study area, market price per snail is rising due probably to rising population, increasing demand and decreasing supply, hence widening demand-supply gap. This widening demand-supply gap can also be attributed to the existence of inefficiency in the marketing system due to marketing problems such as lack of marketing information, poor market structure, high cost of transportation, lack of capital, poor storage facilities, limited markets and large number of intermediaries (Ugwumba and Obiekezie, 2008; Ebe, 2007; Ugwumba and Okoh, 2010).

Seasonal variation in price of snail meat also could result from lack of storage, processing and preservation facilities. Again, differences in intra and inter market margin realized by the agents could be due to product scarcity resulting from lack of modern snail farms and overdependence on supplies from the wild. Based on this backdrop, the study examined the marketing of African giant snail in Anambra State, Nigeria, based on the following specific objectives: i. describe the socio-economic characteristics of African giant snail marketers; ii. describe the marketing channels of African giant snail; iii. ascertain the market margins market structure of African giant snail; iv. estimate the profitability of African giant snail marketing by the intermediaries; v. estimate the marketing efficiency levels of the intermediaries; vi. determine the influence of respondents' socio-economic factors on net marketing income realized from the business; and vii. identify problems being experienced by the marketers.

II.   Materials And Methods

The study was carried out in Anambra State, Nigeria. There are 21 Local Government Areas (L.G.A.s) in the State and four Agricultural Zones. Anambra State is located at longitude $7^{o}00'00''$ East and latitude $6^{o}20'00''$ North. The 2006 estimated population of over 4 million for Anambra State (National Population Commission (N.P.C.), 2006) makes it one of the most populous states in the South Eastern geo-political zone. The male population of 50.9% is slightly above that of the female (49.1%). It occupies an area of 4,416 square kilometers. Seventy percent is arable land which is under cultivation. The number of farm families is 338,721

with an average size of 8 persons per farm family or household (ASADEP, 2003). Agriculture is the predominant occupation in rural areas engaging more than 70% of the rural population. The rainy season begins in April and ends in November with mean annual rainfall of between 1,162mm – 1,226mm and a relative humidity of 43%. Annual temperatures range between 30°C to 34°C. The favorable climate of the area encourages agricultural activities. Both arable crops (yam, maize, cocoyam, rice vegetables, e.t.c.) and permanent crops (oil palm, cashew, mango, breadfruit, e.t.c.) thrive in the area. Husbandry of livestock such as goats and sheep is common while farming of micro livestock like grasscutters, rabbits, snails and fish is gaining grounds.

All the African giant snail marketers in the study area constituted the study's population. Purposive sampling method were used to select three markets – Awka, Amawbia and Nimo markets – from the Awka agricultural zone; three markets – Awkuzu, Otuocha and Nteje – from Anambra agricultural zone; three markets – Nnewi, Ekwulobia and Umunze – from Aguata agricultural zone; and three markets- Ose, Nkpor, and Ihiala – from Onitsha zone to arrive at 12 daily markets for the study. The markets were identified by a reconnaissance survey on the size, strategic location, daily nature and number of intermediaries selling snails in the area. Subsequently, simple random sampling method was used to select five wholesalers and 10 retailers from each of the selected markets to arrive at a sample frame of 180 respondents. The selections were facilitated by lists compiled by the market masters overseeing each of the markets as well as the snail markets' association leaders. Information given by the wholesalers on sources of their supplies led to confirmatory producer/supplier prices, while the consumers available in the markets during the interview period provided confirmatory consumer prices from producers, wholesalers and retailers.

Pre-tested questionnaire was used to collect primary data for the study. Data were collected on socioeconomic characteristics of the famers such as age, gender, marital status, household size, educational level, marketing experience e.t.c.. Additional data were collected on revenue and costs variables, product price, as well as constraints to African giant snail marketing. A 4-point Likert-type scale was used to obtain data on the constraints. The response indicating the most serious constrain was given the highest score. Responses on constraints to African giant snail marketing were disaggregated as follows: Very serious = 4, Serious = 3, Moderately serious = 2, Not serious = 1. Determination of cut-off point, $\overline{X} = \dfrac{\sum f}{n} = \dfrac{4+3+2+1}{4} = \dfrac{10}{4} = 2.50$ To make inferential statement, the mean score was compared with the critical mean of 2.50. If the calculated mean of a problem was greater than the standard critical value, then that problem was regarded as very serious.

Descriptive statistics such as means, frequency distributions, percentages, flow chart and mean ranking were used to achieve objectives (i), socio-economic characteristics of the snail marketers, objective (ii), marketing channels of African giant snail, part of objective (iii), the market margins and objective (vii), constraints to land snail marketing. Gini coefficient (G.C.) was used to realize part of objective (iii), the market structure. Objective (iv), profitability and (v), economic efficiency of African giant snail marketing were realized using budgetary method and Sherpherd-Futrell technique respectively. Finally, objective (vi), determinants of net marketing income was achieved by means of ordinary least squares (O.L.S.) regression.
The economic efficiency of African giant snail marketing was determined by means of Sherpherd-Futrell (1982), which considers as an accurate measure of marketing efficiency the coefficient of total cost of marketing to total revenue expressed in percentage term. The model is specified as:
ME = $\underline{TC}$ X $\underline{100}$
      TR   1
Where:
 ME = Coefficient of marketing efficiency.
 TC = Total cost incurred.
 TR = Total value of products sold.

The budgetary method deployed for profitability assessment for the agents (producers, wholesalers and retailers) is given as:
NP = TR-TC

Where:
NP = Net profit
TR = Total revenue
TC = Total cost.

The Gini coefficient technique was used to measure the degree of inequality in the volume of trade by the agents as:

$$G = \left| 1 - \sum_{K=0}^{K=n-1} (\partial Y_{K-1} + Y_K)(\partial X_{K-1} - X_K) \right|$$

Where:

G = Gini coefficient (number)

X = Marketing agents (number)

Y = Volume of trade (₦)

∂X = Cumulated proportion of marketing agents (population variable)

∂Y = Cumulated proportion of sales (volume of trade)

n = number of observations

K = n-1

      In order for the Gini coefficient not to become an unbiased estimator for the population coefficient, it was multiplied by n/n-1 (McGrath, 1999). Sales volume was determined by adding all the revenue generated by each level market participants.

      The multiple regression model used to ascertain the determinants of net marketing income realized by the marketers is implicitly specified as:

NMI = f (AGE, EDU, HOS, MKE, MAS, GEN, PDP, SES, MKC; e)

Where:

NMI =   Net marketing income (₦)

AGE =   Marketers 'age (years)

EDU =   Marketers' education (years of schooling obtained)

HOS =   Household size (number of persons in the household)

MKE =   Marketers' experience (years already spent in the business)

MAS =   Marketers' marital status (dummy: married =1; otherwise = 0)

GEN =   Marketers' gender (dummy: male =1; female = 0)

PDP =   Product price (₦)

SES =   Seasonal supply (dummy: peak season = 1, lean season = 0)

MKC = Marketing cost (₦)

e = Stochastic error term.

      The regression model was fitted with the data and tried in four functional forms (linear, exponential, semi-log and double-log); and output of the form with the best result in terms of economic, statistical and econometric *a priori* criteria was chosen as the lead equation. The explicit versions of the functional forms are given as:

Linear: $NMI = \beta_0 + \beta_1 AGE, \beta_2 EDU, \beta_3 HOS, \beta_4 MKE, \beta_5 MAS, \beta_6 GEN, \beta_7 PDP, \beta_8 SES, \beta_9 MKC + e$

Exponential: $lnNMI = \beta_0 + \beta_1 AGE, \beta_2 EDU, \beta_3 HOS, \beta_4 MKE, \beta_5 MAS, \beta_6 GEN, \beta_7 PDP, \beta_8 SES, \beta_9 MKC + e$

Semi-log: $NMI = \beta_0 + \beta_1 lnAGE, \beta_2 lnEDU, \beta_3 lnHOS, \beta_4 lnMKE, \beta_5 lnMAS, \beta_6 lnGEN, \beta_7 lnPDP, \beta_8 lnSES, \beta_9 lnMKC + e$

Double-log: $lnNMI = \beta_0 + \beta_1 lnAGE, \beta_2 lnEDU, \beta_3 lnHOS, \beta_4 lnMKE, \beta_5 lnMAS, \beta_6 lnGEN, \beta_7 lnPDP, \beta_8 lnSES, \beta_9 lnMKC + e$

Results And Discussions

Socio-Economic Statistics Of The Marketers

      The socio-economic statistics of the marketer, as summarized in Table 1, showed that the marketers were on the average 48.8years. A minimum age of 21years and maximum of 70years were recorded. The enterprise was dominated by women (75%). About 68% of the marketers were married with an average household size of five persons, minimum of two and maximum of 10 persons. A maximum formal educational attainment of 22years, minimum of zero year and mean of 10years were computed for the marketers. On the average, the marketers acquired marketing experience of 15years with the least and most experienced marketers gaining years of experience of four and 35years respectively. Majority (74%) of the marketers used personal savings to fund the business while the marketers, especially the wholesalers, confirmed that the producer/supplier obtained 85% of their supplies from the wild. These results, apart from that on sources of snail, implied that most of the marketers were young, fairly educated and experienced women who depended mainly on their personal saving to fund the business. This result corroborates Jatau and Shidiki (2012); Ugwumba *et al.* (2012); and Ugwumba *et al.* 2014 that marketing of snails and crop products were dominated by young, energetic and self-sponsored female marketers.

Marketing Channels Of African Giant Snail In The Area

      The distribution channels of African giant snail in the area (Figure 1) shows four flows/channels. The first channel indicated the movement of product from producer/supplier direct to the consumer. In channel two,

the producer/supplier sold to the retailer and the retailer to the consumer. The next channel was producer/supplier selling to the wholesaler who could sell directly to the consumer. Finally, the fourth channel, which was the longest, involved the product's sales flow from producer/supplier to wholesaler to retailer and the final consumer.
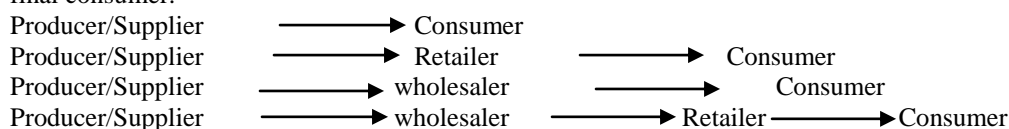
Producer/Supplier   ⟶ Consumer
Producer/Supplier   ⟶ Retailer   ⟶ Consumer
Producer/Supplier   ⟶ wholesaler   ⟶ Consumer
Producer/Supplier   ⟶ wholesaler   ⟶ Retailer ⟶ Consumer

Figure 1: Distribution channels of African giant snail in the area

Marketing Margins Of The Enterprise

Table 2 shows peak season wholesale marketing margins of African giant snail among the Agricultural zones and selected daily markets in the zones. Per kilogramme mean marketing margin realized by the wholesalers was highest in Aguata Agricultural zone with a zonal mean margin of ₦123/kg, followed by Anambra zone (₦112), Awka zone (₦107) and Onitsha zone (₦93). Among markets in the zones, mean marketing margin was lowest at Ose, Ihiala and Amawbia markets (₦90 each) and highest at Umunze market in Orumber South Local Government Area (₦160). Table 3 contains information on the inter market and inter zonal marketing margins realized by the retailers of African giant snail in the study area. It could be seen from the table that peak season retail marketing margin was highest (₦320) at Umunze market in Orumber South L.G.A. of the State and least (₦230) at Ihiala market in Ihiala L.G.A. Across the zones, marketing margin was highest (₦307) in Aguata Agricultural zone, followed by Anambra zone (₦277), Awka zone (₦260) and lastly, Onitsha zone with margin of ₦247. Lean season marketing margin realized by the wholesalers operating in markets across the four Agricutural zones of the State are shown in Table 4. Inter market mean marketing margin, according to figures in the table, was highest (₦600) at Ekwulobia market in Aguata L.G.A. and least (₦450) at Amawbia market in Awka South L.G.A. Again, the highest intra zonal marketing margin of ₦550 was recorded by the wholesalers operating in markets in the Aguata Agricultural zone while the least margin of ₦477 went to the wholesalers in Onitsha Agricultural zone markets of the area. Retail mean marketing margins for the lean season are shown in Table 5. Nnewi market in Nnewi North L.G.A. of the Aguata Agricultural zone recorded the highest mean marketing margin of ₦700 while the least mean marketing margin of ₦500for the retailers was recorded in Nimo Market in Njikoka L.G.A. of the State. For the inter zonal mean marketing margins, Aguata Agricultural zone once more had the highest mean margin of ₦667, followed by inter market mean margins of ₦593, ₦577, and ₦567 computed for Anambra, Awka and Onitsha Agricultural zones respectively.

Market Structure Of African Giant Snail Marketing Enterprise

Market structure depicts the degree of product concentration among the marketing agents. It also shows the level of competition among the marketing agent of a commodity. Result in Table 6 shows the estimated Gini coefficients of the African giant snail marketing agents. The findings indicated Gini coefficients of 0.256, 0.248, and 0.155 for the producer/supplier, wholesaler and retailer respectively. This implied the existence of minimal restrictions as to the entry and exit of firms in the business; that is, there was high level of competition among the agents to the extent that none of them had absolute control over the supplies or sales volume of the product. Ugwumba *et al.* (2011) reported Gini coefficient indices of 0.26 for producers/suppliers, 0.34 for wholesalers and 0.19 for retailers to establish the existence of high level of competition in the market. This reflects the existence of many small scale producers/suppliers of the product to the markets with the result that none of them could influence supplies either by increasing or decreasing the quantity being supplied in order to influence price.

Profitability Of The Marketing Of African Giant Snail In The Area

The estimated monthly profitability of African giant snail is shown in Table 7. Out of the total cost of marketing African giant snail, purchases constituted 83.4% to become the most important cost item in the business, followed by miscellaneous costs (security, middlemen upkeep etc) 5.1%, loading 4.1%, transportation 3.8%, off-loading 2.3% and fixed cost 1.3%. A total revenue of ₦6,750,800 was realized by the intermediaries (wholesalers & retailers together) after spending ₦3,515,240 to make a profit of ₦3,235,560. Separately, the wholesalers and retailers realized net marketing incomes, mean net marketing incomes, return on investment and net return on investment figures of ₦823,660 & ₦2,411,900; ₦13,728 & ₦20,099; 2.19 & 1.95; and 0.84 & 0.95 respectively. The net return on investment figures implied that the wholesalers realized 84 kobo and 95 kobo respectively on every 100 kobo expended on the enterprise in a month. The result also implied that the enterprise was profitable. Jatau and Shidiki (2012), Ugwumba *et al.* (2012a), and Ugwumba & Onwuemeodo

(2014) confirmed the profitability of the marketing of agricultural commodities such as snail, goat and fermented cassava flour respectively.

Marketing Efficiency Of The Intermediaries

Marketing efficiency, in this case the economic/price efficiency of African giant snail marketing by the intermediaries, denotes the percentage of total revenue realized from the enterprise expended on total cost of marketing. It is an accurate method of determining marketing efficiency (Sherpherd-Futrell, 1982). Higher the percentage, higher the proportion of sales revenue expended of total cost of marketing and lower the marketing efficiency.

For the wholesalers: Marketing Efficiency (M.E) = TC / TR * 100

That is;   ME = 976,840 / 1,800,500 * 100 = 54.3%

For the Retailers: ME = 2,538,400/4,950,300 *100 = 51.2%

For Wholesalers & Retailers : ME = 3,515,240 / 1,88,800 * 100 = 52.1%.

The results above indicated that none of the intermediaries attained optimal efficiency of 100% in the marketing of African giant snail, implying the existence of good levels of inefficiencies among the intermediaries. The level of inefficiency was higher (54.3%) among the wholesalers than the retailers (51.2%) since the retailers spent less of their total revenue on total cost of marketing than the wholesalers, implying that the retailers were more efficient in the marketing of African giant snail than the wholesalers. This result is in consonance with Ugwumba *et al.* (2012) who noted that the retailers of water melon were more efficient than the wholesalers in the business.

Determinants Of Net Marketing Income Of The Enterprise

Table 8 profiles output of the four functional forms (linear, exponential, semi-log and double-log) of the regression model on estimated determinants of net marketing income realized by the intermediaries from the marketing of African giant snail. The MINITAB Statistical software was used to run the regression. As indicated in the table, the linear regression output produced the best result in terms of number, signs and sizes of the parameter estimates and was chosen as the lead equation.

The R^2 value of 67.97% implied that 67.97% of variations in net farm income realized by the marketers from the business was due to variations in the exogenous variables while the rest 32.03% was as a result of stochastic noise. The F-statistic value was significant, an indication that all the exogenous variables exerted joint and significant effect net marketing income and that the model was a good fit for the data.

Out of the nine exogenous variables inputted in the model, five (age, marketing experience, product price, seasonal supply and marketing cost) exerted significant influences on net marketing income while the remaining four (education, household size, marital status, and gender) had positive but not significant effects on net marketing income. The coefficient of age and marketing experience were significant and positively related to net marketing income at 5% level. This is according to *a priori* expectations and implied that the older marketers who might have accumulated more capital and skills over the years were more likely to perform better and realize higher net marketing income.

Seasonal supply had negative and statistically significant influences on net marketing income at 10% probability level in accordance with *a priori* expectations. The implied that hikes in the purchases and sales, especially sales, prices of the product during the lean season due to scarcity seemingly led to higher net marketing incomes for the agents. This development relates to higher product prices and marketing margins recorded for the middlemen in the lean season than the peak season. This result is in agreement with the finding of Adakaren and Chidebelu (2012) that wholesalers and retailers of palm oil in Edo State, Nigeria realized higher marketing margins during the lean season, as a result of scarcity of product occasioned by hoarding and seasonal variations in product prices.

The coefficients of product price and marketing cost were significant at 5% level in accordance with *a priori* expectations, however, product price and marketing cost exerted positive and negative influences on net marketing income respectively. This meant that increases in product price and decreases in marketing cost would lead to increases in net marketing income earned by the marketers and *vis versa*. Ugwumba *et al.* (2012) posited similar positive and negative relationships between net marketing income realized by watermelon marketers and product price and marketing cost respectively in Port harcourt Metropolis of Rivers State, Nigeria.

Constraints To The Marketing Of African Giant Snail In The Area

The marketing of African giant snail in Anambra State was affected by some problems. Data on these problems were obtained by means of a 4-point Liker-type scale and examined using the arithmetic means which were compared with the critical mean of 2.5 to determine the seriousness of the problems. The mean scores of the problems were ranked in descending order of seriousness as shown in Table 9. It could be seen from the

table that scarcity of snail due to seasonal nature of supply was the most serious constraint to African giant snail marketing in the area with a mean score of 3.75. This was followed by high and unstable price of product (2nd, M=3.51), poor storage facilities (3rd, M=3.34), high cost of transportation (4th, M=3.03), poor sales (5th, M=2.65), lack of capital (6th, M= 2.55), too many other traders (7th, M=2.38) and the least of the problems with a mean score of 2.15 was lack of market information.

III.   Conclusion

The nutritional, medicinal and economic importance of African giant snail meat has encouraged its marketing in Anambra State. The enterprise proved profitable due to the estimated positive values of net marketing income and net returns on investment recorded by the wholesalers and retailers. About 45% inefficiency levels exist among the wholesalers and retailers, hence finding solutions to the problems identified to constrain the marketing process would ensure the realization of better intra market and intra agricultural zone mean marketing margins by the middlemen.

IV.   Recommendations

i.   Government must encourage massive African giant snail production through incentive-based agricultural extension services that would provide the needed modern technologies and skills to drive the task. This would increase supply, make the product available all year round, reduce marketing costs and stabilize price and marketing margins realized by the intermediaries.

ii.   Government should make credit facilities available to the marketers through the financial institutions, especially the Bank of Agriculture, to enable the marketers who depended mainly on personal savings in funding the business invest more, realize better profit and experience enhanced living standards.

iii. The marketers should utilize the advantages of forming thrift and cooperative societies to raise more capital, transact their business at reduced costs and consequently make more profit.

iv.   The provision of modern storage and value-adding/processing facilities by government and/or the cooperative societies would drastically reduce post harvest losses, make the product available and curtail sharp inter seasonal variations in supply due to scarcity especially during the lean season.

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Table 1: Socio-economic statistics of African giant snail marketers

Variable	Mean/Mode	Minimum	Maximum	%
Age	48.8years	21years	70years	-
Gender	female	-	-	75
Marital status	married	-	-	68
Household size	5	2	10	-
Educational level	10	0	22	-
Marketing experience	15	4	35	-
Source of finance	personal savings	-	-	74
Source of snail	wild	-	-	85

Source: Computed from survey data, 2015.

Table 2:   Peak season wholesale marketing margins of African giant snail (₦/kg)

Zone	L.G.A	Market	Wholesale Marketing Margin			
			Mean purchase price	Mean selling price	Mean marketing margin	Zonal mean margin
Awka	Awka South	Awka	210	330	120	107
	Awka South	Amawbia	220	310	90	
	Njikoka	Nimo	170	280	110	
Anambra	Oyi I	Awkuzu	205	300	95	112
	Oyi II	Nteje	190	290	100	
	Anambra East	Otuocha	170	310	140	
Aguata	Nnewi North	Nnewi	106	205	99	123
	Aguata	Ekwulobia	150	260	110	
	Orumber South	Umunze	200	360	160	
Onitsha	Onitsha North	Ose	150	240	90	93
	Idemili North	Nkpor	200	300	100	
	Ihiala	Ihiala	180	270	90	

Source: Computed from survey data, 2015.

Table 3:   Peak season retail marketing margins of African giant snail (₦/kg)

Zone	L.G.A	Market	Wholesale Marketing Margin			
			Mean purchase price	Mean selling price	Mean marketing margin	Zonal mean margin
Awka	Awka South	Awka	330	580	250	260
	Awka South	Amawbia	310	600	290	
	Njikoka	Nimo	280	520	240	
Anambra	Oyi I	Awkuzu	300	550	250	277
	Oyi II	Nteje	290	570	280	
	Anambra East	Otuocha	310	610	300	
Aguata	Nnewi North	Nnewi	205	505	300	307
	Aguata	Ekwulobia	260	560	300	
	Orumber South	Umunze	360	680	320	
Onitsha	Onitsha North	Ose	240	500	260	247
	Idemili North	Nkpor	300	550	250	
	Ihiala	Ihiala	270	500	230	

Source: Computed from survey data, 2015.

Table 4:   Lean season wholesale marketing margins of African giant snail (₦/kg)

Zone	L.G.A	Market	Wholesale Marketing Margin			
			Mean purchase price	Mean selling price	Mean marketing margin	Zonal mean margin
Awka	Awka South	Awka	490	1000	510	493
	Awka South	Amawbia	600	1050	450	
	Njikoka	Nimo	480	1000	520	
Anambra	Oyi I	Awkuzu	500	1050	550	530
	Oyi II	Nteje	520	1000	480	
	Anambra East	Otuocha	540	1100	560	
Aguata	Nnewi North	Nnewi	500	1000	500	550
	Aguata	Ekwulobia	550	1150	600	
	Orumber South	Umunze	600	1150	550	
Onitsha	Onitsha North	Ose	520	1000	480	477
	Idemili North	Nkpor	530	1000	470	
	Ihiala	Ihiala	520	1000	480	

Source: Computed from survey data, 2015.

Table 5:   Lean season retail marketing margins of African giant snail (₦/kg)

Zone	L.G.A	Market	Wholesale Marketing Margin			
			Mean purchase price	Mean selling price	Mean marketing margin	Zonal mean margin
Awka	Awka South	Awka	1000	1630	630	577
	Awka South	Amawbia	1000	1600	600	
	Njikoka	Nimo	1150	1650	500	
Anambra	Oyi I	Awkuzu	1000	1580	580	593
	Oyi II	Nteje	1000	1600	600	
	Anambra East	Otuocha	1150	1750	600	
Aguata	Nnewi North	Nnewi	1000	1700	700	667
	Aguata	Ekwulobia	1150	1750	600	
	Orumber South	Umunze	1150	1750	600	
Onitsha	Onitsha North	Ose	1000	1650	550	567
	Idemili North	Nkpor	1000	1600	600	
	Ihiala	Ihiala	1000	1550	550	

Source: Computed from survey data, 2015.

Table 6: Gini coefficients of the marketing agents

Marketing agent	Gini coefficient	STD	Minimum	Maximum
Producer/Supplier	0.256	0.018	0.203	0.277
Wholesaler	0.248	0.038	0.189	0.298
Retailer	0.155	0.021	0.144	0.179

Source: Computed from survey data, 2015. Note: STD = Standard deviation.

Table 7: Estimated monthly profitability of the enterprise

Variable	Wholesaler	Retailer	WH & RT (Pooled)	% of TC
Total Revenue:				
Sales	1,800,500	4,950,300	6,750,800	-
Variable Cost:				
Purchases	750,300	2,180,500	2,930,800	83.4
Loading	45,000	100,700	147,700	4.1
Offloading	23,500	57,400	80,900	2.3
Transportation	70,000	65,000	135,000	3.8
Miscellaneous	80,000	98,000	178,000	5.1
TVC	968,800	2,501,600	3,470,400	98.7
GM (TR-TVC)	831,700	2,448,700	3,280,400	-
Fixed Cost:				
Depreciation on				
wheel barrow, etc	2,640	6,800	9,440	0.3
Stallage fee	5,400	30,000	35,400	1.0
Interest on loan	-	-	-	-
TFC	8,040	36,800	44,840	1.3
TC (TFC+TVC)	976,840	2,538,400	3,515,240	100
NMI/Profit	823,660	2,411,900	3,235,560	
MNMI(NMI/n)	13,728	20,099	17,955	
ROI (TR/TC)	2.19	1.95	1.92	
NROI (NMI/TC)	0.84	0.95	0.92	

Source: Computed from survey data, 2015. Note: WH = Wholesaler. RT = Retailer. n = Number of respondents.

Table 8: Estimated determinants of net marketing

Predictor	Linear	Exponential	Semi-log	Double-log
Constant	2143(0.98)	2,956 (7.33)	1365 (0.63)	2.443 (2.84)
AGE	1348 (2.21)**	0.0044 (1.94)**	1436(1.59)	0.786(2.11)**
EDU	1016(1.43)	0.1378 (1.37)	2662(1.44)	0.434(1.19)
HHS	895(0.18)	0.0761 (0.76)	2296(0.88)	0.035(1.09)
MKE	439(3.26)**	0.0006 (2.64)**	1738(2.56)**	0.6071(2.22)**
MRS	96.7(0.68)	0.0493 (1.04)	3522(1.32)	0.245(1.06)
GEN	2641(0.76)	0.0331(0.76)	5961(0.88)	0.013(0.82)
PDP	41.13(2.48)**	0.0002(1.96)**	3131(2.45)**	1.083(2.34)**
SES	-38.14(-1.87)***	-0.0039(-1.75)***	-2376(-0.96)	-0.096(-1.80)***
MKC	-3.362(-2.51)**	-0.00019(-2.48)**	-2759(-2.12)**	-1.091(-1.93)**
R²	67.97%	68.12%	62.44%	60.38%
R² (adjusted)	65.73%	65.82%	58.66%	-57.94%
F-statistic	34.72	34.87	30.49	28.81
D-W stat.	2.14	1.96	1.88	2.04

Source: Computed from survey data, 2015. Note: Figures in parentheses are t-statistic values. D-W stat. = Durbin-Watson statistic. **& *** = Significant at 5% & 10 alpha levels respectively.

Table 9: Ranking of constraints to the marketing of African giant snail

Constraint	Mean Score	Rank
Scarcity of snail due to seasonal nature of supply	3.75	1st
High and unstable price of product	3.51	2nd
Poor storage facilities	3.34	3rd
High cost of transportation	3.03	4th
Poor sales	2.65	5th
Lack of capital	2.55	6th
Too many other traders	2.38	7th
Lack of market information	2.15	8th

Source: Computed from survey data, 2015.