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*Original Research Article*

# Economic analysis of two giant land snail marketing in Ibadan, Oyo State, Nigeria

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## Abstract

The study examined the marketing and uses of two species of Giant African Land Snails (*Archachatina marginata* and *Achatina achatina*) in four (4) different market locations in Ibadan Oyo state, Nigeria. The data were collected using a structured and validated questionnaire administered interpersonally to 160 snail marketers in four randomly selected markets in selected Local Government Area (LGA) situated in Ibadan. Data collected were analysed using descriptive and inferential statistical tools; these include frequencies, mean, median, mode and multiple regression. Findings from the socioeconomic characteristics revealed that majority (98.1%) of the respondents were female and only 1.9% were male. Majority (91.9%) of marketers were married with 27.5% in the 31–40 years age group. Majority (89.4%) raised their capital through personal savings and had over 16 years of marketing experience. All respondents (100%) were involved in wholesale marketing of different species of snail whereas 65% of them were into both wholesale and retail marketing. Also, 88.8% were engaged in marketing of both species only. Most (70%) of the respondents' generated income per year was between ₦10,000–₦49,999 ($26–$130). All marketers ascertained that the major purpose of snail is for consumption. Also, the budgetary analysis (costs and returns) revealed that marketing of *Archachatina marginata* and *Achatina achatina* is a profitable business among the marketers with a high rate of return on investment. The most efficient market for both snail species was Sango market with efficiency values 1.77 and 1.82 for *A. achatina* and *A. marginata,* respectively. The coefficient of multiple determination, $R^2$ value of 0.689 indicated that 68.9% of the variation in the marketing price of snail is explained by transportation cost, cost price of snail and market tariff. The marketing efficiency was greater than one in all markets which showed that the markets were efficient in the marketing of *Archachatina marginata* and *Achatina achatina*. The study concluded that snail marketing is profitable given the market efficiencies and rate of returns on investment. Policy recommendation towards reduction in cost of transportation and market tariff is suggested as this would bring about improved market efficiencies and more returns.

**Keywords:** marketing efficiency; profitability; *Archachatina marginata; Achatina achatina*

## INTRODUCTION

Snails are bilaterally symmetrical invertebrates with soft-segmented exoskeleton in the form of calcareous shells. In West Africa, snails dwell mostly in humid forest areas from where these are gathered by villagers for consumption and other uses (Onuigbo, 2015). Snail meat has been consumed by humans throughout the world especially in the rural communities (Ahaotu, 2016). It is a major traditional ingredient in the diet of people living in high forest zone and high in protein, iron and low in fat (Agbogidi et al., 2008). Furthermore, snails contain almost all the amino acids required by humans (Ahaotu et al., 2015). Snail meat also contains several minerals such as calcium, phosphorus,

potassium, iron and zinc (Engmann et al., 2013; Babalola and Akinsoyinu, 2009). Snails belong to a division of the animal kingdom called Mollusca constituting one of the major divisions of the animal kingdom (Ademosun and Omidigi, 1999).

Furthermore, in some part of Africa, snails also play a major role in native medicine in the preparation of remedies against whooping cough, asthma, hypertension, diabetes, etc. Some people also believe that the glandular substances from edible snail cause agglutination of certain bacteria (Offiong, 2013). Snail have also been recommended for the treatment of anaemia, asthma, high blood pressure, and other related ailments due to their relatively low cholesterol concentration as reported by Kalio and Etela (2011). Snails are huge part of the diet in many parts of Africa, although they are not always affordable and available all year round. Their high protein, low fat and cholesterol content make them a nutritional favourite (Iwuoha, 2013).

In Nigeria, there are different species of giant African land snails and they vary in size, colour, adaptability and performance (Okon et al., 2012). These species include *Archachatina marginata, Achatina achatina, Achatina fulica, Limicolaria* species and *Thapsia* species. Within a snail species, there exist varietal differences in foot pigment, length of whorls, aperture size (length and width) and egg clutch size (Okon and Ibom, 2012). *Archachatina marginata* is the largest known species of snail in Africa (Okon et al., 2012). In Nigeria, it was observed that animal protein intake was generally low, leading to acute malnutrition amongst the poor and illiterate. The consumption of non-conventional species such as snails was previously reserved for certain ethnic groups, particularly those from the south-west region (Ndah et al., 2017; Ngenwi et al., 2010).

Presently, the major sources of meat protein for the Nigerians come mainly from livestock in the form of poultry, beef, mutton and pork. The availability of these major sources is, however, decreasing by persistent drought, high feed cost, ancient animal husbandry techniques, diseases, and low productivity of local animal breeds (Fagbuaro et al., 2016). However, there are other sources which are yet to be recognised but have great potentials for nutritional development such as snail meat in Nigeria (Fatai, 2018). This is probably attributed to lack of awareness of the economic potentials and marketing efficiency of these species (Ahaotu et al., 2014; Anyalebechi, 2015).

Snails serve as food for people, as a source of income to a large number of stakeholders and so efficiency in marketing activities will enhance returns to these people to boost their standard of living. Marketing efficiency refers to the effectiveness with which the marketing agents utilise 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 maximisation 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 allocative efficiency, which is using available inputs in optimal proportion giving the respective prices in production (Ugwumba, 2010)

There is paucity of information on economic usage, marketing and uses of snails especially in southwest Nigeria where the study was carried out, however, snails have been 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 urbanisation, and unwholesome snail farming system practices (Ijioma, 2012). This study is therefore essential in order to provide information that will help producers, market intermediaries to frame an active development policy on giant land snails such as *Archachatina marginata* and *Achatina achatina*. This is important to determine whether marketing and use of snails is sustainable or not, depending on the available market system. This study therefore analyses the marketing and uses of snails in four selected Local Government Areas of Ibadan, Oyo State, Nigeria. The specific objectives are to:

- describe the socioeconomic characteristics of the snail marketers in the study area
- identify the socioeconomic uses of snails in the study area
- determine the profitability of marketing in snails in the study area
- analyse the factors that influence the marketing price of *Archachatina marginata* and *Achatina achatina*
- determine its marketing efficiency in the selected markets.

## MATERIALS AND METHODS

The study was carried out in Ibadan the capital city of Oyo State. It is the largest, most populous city in Nigeria and the third in Africa after Cairo and Johannesburg. The state situated in South-western Nigeria was created on February 3, 1976 from the former Western region. It covers approximately a land area of 28,454 square

km. This state is inhabited mostly by the Yoruba ethnic group (Adekunle et al., 2013).

Four Local Governments were randomly selected in Ibadan metropolis; in each Local Government, one market was purposively selected. In each of those markets forty (40) respondents (snail marketers) were randomly selected. Further details are shown in Table 1 below.

**Table 1.** Sampling procedures of the study area

| Local Government Area | Markets | Number of respondents |
|---|---|---|
| **Ibadan North east** | Oje | 40 |
| **Ibadan South west** | Foko | 40 |
| **Ibadan North** | Sango | 40 |
| **Ona-Ara** | Akanran | 40 |
| **Total** | | **160** |

The data were collected primarily through the administration of a well-structured and validated questionnaire that covers information on the socioeconomic characteristics of snail marketers, the management practices employed in snail marketing, the cost incurred or accrued to snail marketing, problems encountered in snail marketing and likely area of improvement in marketing of snails in the study area. The questionnaire was validated with a reconnaissance survey. The analytical techniques employed include descriptive statistics, budgetary technique (analysis of cost and returns), Profitability ratio, the multiple regression to examine factors that contribute to the selling price of *A. marginata* and *A. achatina* in the study area and analysis of marketing efficiency.

Descriptive statistics: This involved the use of frequencies, modes and percentages.

Budgetary technique: was used to assess the cost and returns to *A. marginata* and *A. achatina* and profitability of marketing the commodity.

Variable costs (VC) are made up of transportation costs, labour costs, costs of wares (snails) and market tariffs.

Fixed cost (FC) the fixed costs incurred by the marketers were the cost of baskets used for storage, bags, trays and tables.

$$\text{Total cost (TC)} = \text{TVC} + \text{TFC} \quad (1)$$

where:
TVC = Total variable cost in naira
TFC = Total fixed cost in naira

$$\text{Gross profit (GP)} = \text{TR} - \text{TVC} \quad (2)$$

where:
TR = Total revenue in naira

$$\text{Net profit (NP)} = \text{GP} - \text{TFC} \quad (3)$$

Profitability Ratio:

$$\text{Rate of return (ROR \%)} = \frac{TR}{TC} \times \frac{100}{1} \quad (4)$$

$$\text{Rate of return on investment (RORI \%)} = \frac{TR - TC}{TC} \times \frac{100}{1} \quad (5)$$

Multiple regression was used to determine some of the factors that contributed to the marketing price of snails in the study area, the model specification was given as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + ei \quad (6)$$

where:
Y = marketing price of snail in naira
$X_1$ = Transportation cost in naira
$X_2$ = Cost price of snail in naira
$X_3$ = Labour cost in naira
$X_4$ = Tariff (money paid by marketers on snails) in naira
ei = error term
a, $b_1$, $b_2$ ..... are parameters to be estimated

$$\text{Marketing Efficiency} = \frac{\text{Total sales}}{\text{Total Marketing cost}} \times \frac{100}{1} \quad (7)$$

## RESULTS AND DISCUSSION

The results of socioeconomic characteristics of respondents in the study area as shown in Table 2 revealed that majority (98.1%) of the respondents were female and only 1.9% were male. This finding agrees with that of (Adekunle et al., 2013) who reported that women are more involved in marketing activities especially in south-western region of Nigeria whereas men are involved in farming activities. Also, most of respondents were in the age group 31–40 years representing 27.5%; this revealed that agile women are mostly involved in marketing of snail. 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. Majority (91.9%) of the marketers were married; this implies that married women are involved in snail marketing perhaps to supplement household income. This is in agreement with the findings of Ebewore and Achoja (2013), who reported that there were more married people involved in snail marketing in Delta State, Nigeria. About 49.4% of the respondents had between

**Table 2.** Socioeconomic characteristics of respondents in the study area

| Variables | Frequency | Percentage(%) | Mode |
|---|---|---|---|
| **Gender** | | | Female |
| Male | 3 | 1.9 | |
| Female | 157 | 98.1 | |
| Total | 160 | 100 | |
| **Age** | | | 31–40 |
| 11–20 | 2 | 1.3 | |
| 21–30 | 28 | 17.5 | |
| 31–40 | 44 | 27.5 | |
| 41–50 | 32 | 20.0 | |
| 51–60 | 29 | 16.9 | |
| 61 and above | 29 | 16.9 | |
| Total | 160 | 100 | |
| **Marital status** | | | Married |
| Single | 10 | 6.3 | |
| Married | 143 | 91.9 | |
| Divorced | 3 | 1.9 | |
| Total | 160 | 100 | |
| **Level of education (years)** | | | Primary |
| None | 13 | 8.1 | |
| Primary | 84 | 52.5 | |
| Secondary | 53 | 33.1 | |
| Tertiary | 10 | 6.3 | |
| Total | 160 | 100 | |
| **Source of capital** | | | Personalsavings |
| Bank loan | 3 | 1.9 | |
| Cooperative | 14 | 8.8 | |
| Personal savings | 143 | 89.3 | |
| Total | 160 | 100 | |
| **Marketing experience (years)** | | | 16 |
| <5 | 50 | 31.3 | |
| 6–10 | 46 | 28.8 | |
| 11–15 | 11 | 6.9 | |
| 16 and above | 53 | 33.1 | |
| Total | 160 | 100 | |
| **Income (naira per year)** | | | ₦10,000–₦49,999 |
| <10,000 | 8 | 5.0 | |
| 10,000–49,999 | 112 | 70.0 | |
| 50,000–99,999 | 40 | 25.0 | |
| Total | 160 | 100 | |
| **Form of snail marketing** | | | Wholesale |
| Wholesale only | 160 | 100 | |
| Wholesale and retail | 104* | 65 | |
| Retail only | – | – | |
| **Species of snail sold** | | | Two |
| Two | 142 | 88.8 | |
| More than two | 18 | 11.2 | |
| Total | 160 | 100 | |
| **Method of snail acquisition** | | | Wild |
| Wild | 138 | 86.2 | |
| Other sources | 22 | 13.8 | |
| Total | 160 | 100 | |
| **Knowledge of snail marketing** | | | Inheritance |
| Inheritance | 144 | 90 | |
| Training | 16 | 10 | |
| Total | 160 | 100 | |

Source: computed from field survey

six and ten individuals in their household and this could probably be a result of polygamy. According to Ahmadu and Ojogho (2012), large household will result to high number of available labour that could be used by marketers in their daily marketing activities. Also, 89.4% raised their capital through personal savings. Most (70%) of the respondents' generated income per year was between ₦10,000–₦49,999 ($26–$130) and 75% of the respondents were full-time marketers whereas others had other occupation. All respondents (100%) were involved in wholesale marketing of different species of snail, whereas 65% of them were into wholesale and retail marketing. Also, 88.8% were engaged in marketing of both species only. Most (86.2%) of respondents got their product from the wild whereas 90% came about this marketing by inheritance. Also 39.3% respondents indicated inadequate finance as the major problem faced in the marketing of snails. This

**Table 3.** Socioeconomic uses of snails *Archachatina marginata* and *Achatina achatina*

| S/N | Parts | Frequency | Uses | Mode of use | Mode of application | Remarks |
|---|---|---|---|---|---|---|
| 1. | Shell | 25 | It is used for the preparation of calcium for Medicinal purpose. It serves as muscle attachment and protection from predators | It is added in powdery form into livestock feed. | Grinding of the shell and mixing it with other livestock feeds | More than average traders are aware of the uses of snail shell |
| 2. | Flesh | 40 | It is edible and it is very useful for those who suffer from atherosclerosis and liver diseases | It is removed from the shell with the use of hot water, seasoned and fried or smoked depending on the taste of the consumer | Consumption | The research shows that snail flesh is mainly for consumption |
| 3. | Gel Water | 18 | It is used as moisturiser and skin brightener. It is also used to prevent and treat stroke | This is done by eating snails due to its low calories, no carbohydrate and very rich in protein | Consumption or it can be added to cream | Traders that are aware of snail gel are not up to average in the study area |
| 4. | Slime | 15 | It is used in cosmetology and medicine. It is used in the production of collagen and elastin to smooth fine lines and wrinkles. It helps fade acne scars and dark spots. | It is mixed with facial cream. | Facial application | Traders that are aware of snail slime are not up to average in the study area |

Source: computed from field survey

study also revealed that 33.1% of the respondents have more than 16 years of experience whereas others were less experienced; this implies that more people are now going into snail marketing due to importance attached to snail production (Ogunniyi, 2009).

The result of socioeconomic uses of the two species of snails in the study area as shown in Table 3 revealed that 62.5% of marketers in Oje market agreed that snail shell is used in the preparation of calcium for medicinal purposes and all the marketers ascertained that the major purpose of snail is for flesh consumption. In the Foko market, 100% of the marketers confirmed that snail flesh is edible and it is also useful in the treatment of liver diseases. In the Sango market, 45% of marketers were aware of snail gel which is used as a moisturiser and skin brightener but other marketers knew nothing about it. In the Akanran market, 37.5% of marketers were aware of snail slime which is used in cosmetology and medicine. This result revealed that snails are used for consumption, medicine, moisturiser and cosmetology, which showed the diversity in the usage of snail.

Costs and returns analysis as shown in Table 4 revealed that the highest total revenue were ₦15,427.50 and ₦16,597.50 for *A. marginata* and *A. achatina,* respectively. The Total cost ranged from ₦5,372.95 to ₦8,468.50 for both species while the Gross profit (GP) ranged from ₦10,807.10 to ₦12,407.65 for *A. marginata* whereas it ranged from ₦10,832.50 to ₦13,734.15 for *A. achatina*. The Net profit (NP) ranged from ₦6,959.00 to ₦8,994.15 for *A. marginata* whereas it ranged from ₦6,555.25 to ₦10,320.65 for *A. achatina*. The Rate of return (ROR) ranged from 1.82 to 2.67 for *A. marginata* whereas it ranged from 1.77 to 2.65 for *A. achatina* whereas *A. marginata* ranged from 1.82 to 2.67. Furthermore, the Rate of Return on Investment (RORI) ranged from 0.82 to 1.67 for *A. marginata* whereas it ranged from 0.77 to 1.65 for *A. achatina*. The above result implies that for every one naira invested in the marketing of *A. marginata* in the study area, a net profit of ₦0.82 was obtained whereas a net profit of ₦0.77 was obtained for every one naira invested in *A. achatina* marketing in the study area.

This result showed that total variable cost relative to total fixed cost was large due to low fixed capital inputs involved; indicating that snail marketing requires little capital investment. The results further indicated that snail marketing was profitable with high rate of return on investment among marketers in the study area. This indicated a high economic potential of snail marketing enterprise for increasing the household income and enhancing the standard of living of the marketers. However, snail enterprise is sustainable, since inability to make profit will result in an unsustainable enterprise (Onyeagocha et al., 2012).

**Table 4.** Summary of the range of Profitability Analysis of *A. marginata* and *A. achatina* across the four markets

| Variables | *Archachatina marginata* | | *Achatina achatina* | |
|---|---|---|---|---|
| | Lowest (₦) | Highest (₦) | Lowest (₦) | Highest (₦) |
| **Total revenue (TR)** | 14,185.75 | 15,427.50 | 14,281.25 | 16,597.50 |
| **Total variable cost (TVC)** | 2,863.35 | 4,191.25 | 2,863.35 | 4,191.25 |
| **Total fixed cost (TFC)** | 2,487.50 | 4,277.25 | 2,487.50 | 4,277.25 |
| **Total Cost (TVC + TFC)** | 5,372.95 | 8,468.50 | 5,372.95 | 8,468.50 |
| **Gross Profit (TR – TVC)** | 10.807.10 | 12,407.65 | 10,832.50 | 13,734.15 |
| **Net Profit (TR – TC)** | 6,959.00 | 8,999.25 | 6.555.25 | 10,320.65 |
| **Rate of Return (ROR) = $\frac{TR}{TC}$** | 1.82 | 2.67 | 1.77 | 2.65 |
| **RORI = $\frac{Netprofit}{TC}$** | 0.82 | 1.67 | 0.77 | 1.65 |

Source: computed from field survey

**Table 5.** Summary of the regression analysis of the factors that influenced the marketing price in the entire study area

| Variables | Regression Coefficient | Beta values | Standard error | t-value | Sig. |
|---|---|---|---|---|---|
| **Constant** | 4859.912 | 7351.580 | | –0.701 | 0.981 |
| **Transportation cost X1** | 2.197*** | 3.643 | 0.098 | 22.418 | 0.000 |
| **Cost price of snail X2** | 3.911*** | 6.626 | 0.876 | 4.465 | 0.000 |
| **Labour cost X3** | 1.341 | 0.981 | 0.915 | 1.466 | 0.139 |
| **Tariff X4** | 2.150*** | 9.435 | 0.243 | 8.848 | 0.000 |

Source: computed from field survey
***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.
$R^2$ = 0.689
Adjusted R = 0.378
F cal = 2.215

The regression analysis of the factors that influenced the marketing price of snail in the study area is shown in Table 5. The lead equation was chosen as the lead equation based on number of statistically significant variables, the magnitude of F-ratio and $R^2$ value. The result showed that transportation cost, cost price of snails and market tariff were significant at different probability levels.

The regression coefficients conformed to the *a priori* expectation. The coefficient of multiple determination, $R^2$ value of 0.689 indicated that 68.9% of the variation in the marketing price of snail is explained by transportation cost, cost price of snail and market tariff while 31.1% of the variation in the marketing price were determined by other factors not considered in the model.

Specifically, the coefficient for transportation cost ($X_1$) was positive and statistically significant at 1% probability level. The sign of the coefficient is consistent with the *a priori* expectation. This means that as the cost of transportation increases, so also the marketing price for snail also increases. This further implies that a unit increase in transportation cost will increase marketing price of snails by 219.7% in the study area. The coefficient of cost price of snail ($X_2$) was positive and significant at 1%. This implies that the more the cost price of snails, the higher the marketing price in the study area. Specifically, a unit increase in cost price will increase marketing price by 391.1%. Tariff coefficient ($X_4$) was positive and statistically significant at 1%. The positive sign implies that increase in this variable will increase marketing price of snails in the study area by 215%. These findings conformed with Adaigho and Nwadiolu (2016) who reported that an increase in the positively significant variables in the model would lead to an increase in revenue of respondents.

The reduced model of the linear equation is as shown in equation 6

$$Y = 4859.912 + 2.197X_1^{***} + 3.911X_2^{***} + \\ + 1.341X_3 + 2.150X_4^{***}$$

**Table 6.** Marketing efficiencies of *A. marginata* and *A. achatina* in the four markets

| *Archachatina marginata* | | | | *Achatina achatina* | | | |
|---|---|---|---|---|---|---|---|
| **Market name** | **TR(₦)** | **TC(₦)** | **ME = $\frac{TR}{TC}$** | **Market name** | **TR(₦)** | **TC(₦)** | **ME = $\frac{TR}{TC}$** |
| **Oje** | 15,271.00 | 6,276.85 | 2.43 | **Oje** | 16,597.50 | 6,276.85 | 2.64 |
| **Foko** | 14,185.75 | 6,763.40 | 2.09 | **Foko** | 15, 232.50 | 6,763.90 | 2.25 |
| **Sango** | 15,427.50 | 8,468.50 | 1.82 | **Sango** | 15,023.75 | 8,468.50 | 1.77 |
| **Akanran** | 14,372.50 | 5,372.95 | 2.67 | **Akanran** | 14,281.25 | 5,372.95 | 2.65 |

Source: computed from field survey

Market efficiency measures market performance which refers to the degree in which market prices reflect all available and relevant information. It is unitless because it is a ratio of total cost to total value of products marketed. The higher the market value, the lower the efficiency and vice versa. This implies that for a market to be efficient, commodities or products must get to the consumers at the least cost possible to meet their satisfaction.

The marketing efficiencies across the selected market are summarised in Table 6. For both species of snails, Sango market was the most efficient market given the efficiency values of 1.82 and 1.77 for *A. marginata* and *A. achatina,* respectively, whereas Akanran market was the least efficient given the efficiency values of 2.67 and 2.65 for *A. marginata* and *A. achatina,* respectively.

The result of marketing efficiency in all markets in the study area was found to be greater than 1 which showed that the markets were efficient in the sale of both *A. marginata* and *A. achatina*. This result agreed with the findings of Oladejo (2015) who reported a marketing efficiency of 1.17 for goat in Oyo State as profitable and therefore suggesting that snail marketing is profitable in the study area. Mafimisebi et al. (2013) also reported a similar result as being profitable.

## CONCLUSION

Based on the findings of this study, it can be concluded that snail marketing is profitable and is female-dominated. Snail marketing according to this study is a profitable agribusiness in the area assessed since the marketing efficiency is greater than one across all markets. The contribution to knowledge in this study is that it showed that even within the same location (Ibadan) efficiency of the markets were not the same. That is, some markets were more efficient than others in terms of cost minimisation and profit maximisation. The study recommended that government should implement policies that will bring about a reduction in the cost of transportation and market tariff, so as to bring about improved market efficiencies and more returns.

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