S. Afr. J. Agric. Ext. Agbugba, Agbagwa, Kau & Ugwuegbulem
Vol. 51 No. 3, 2023: 1-16
10.17159/2413-3221/2023/v51n3a14826

Cost and Returns Analysis of Snail Production in Obio-Akpor Local Government Area, Rivers State, Nigeria

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ABSTRACT

The study examined snail production cost and return analysis in Obio-Akpor Local Government Area of Rivers State, Nigeria. The study draws its essence from the fact that the supply of protein to the increasing population of Nigeria is inadequate. Given its profitability level, snail farming can serve as an important protein supplement to bridge the food insecurity gap. Through field surveys, copies of structured questionnaires were employed for collecting data from 40 snail farmers, who were randomly sampled. The analytical tools include frequencies, percentages, budgetary techniques, multiple regression, and mean scores. The results showed that snail farming was dominated by males (65%). The farmers were predominantly aged between 21 and 59, with a 67.5% score. Budgetary analysis showed that the farmers received a monthly net farm income of ₦113,000 (275.494 USD) and a gross margin of ₦1 345 000 (3279.11 USD), thus entailing the enterprise's profitability. Results of the multiple regression showed that variables

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like marital status and the purpose for farming were significant in determining the profitability status of snail farmers. Lack of collateral to secure loans to support farming and the problem of disease infected from contamination were some of the critical factors which constrained snail production, both jointly having a mean score of 3.35. It is recommended that the government give surety to registered farmers who do not have collateral to secure loans.

Keywords: Snail Production, Snail Farmers, Profitability Determinants

1. INTRODUCTION

Snails are bilaterally symmetrical invertebrates with soft, segmented exoskeletons in calcareous shells (Agbogidi & Okonta, 2011). They belong to the phylum *Mollusca* and have a singular spiral shell into which the whole body can be withdrawn. Many species of edible land snails are recognised, but the popular species of economic interest in Nigeria is the West African giant snail (*Archachatina marginata*). Snail meat has traditionally been a significant ingredient in the diet of people living in high forest zones. However, Baruwa and Tijani (2018) mentioned Nigeria's meat supply remains critical despite its relatively large animal population. Nigeria has a huge animal population of over 13 million cattle, 1.7 million domestic rabbits, 34 million pigs, 104 million local poultry, and about 20 million exotic poultry. The contributions made by domestic animals to the protein need of the nation has been insufficient. Red meat laced with high cholesterol from conventional sources of animal protein in the nation has unfortunately been identified as the major cause of cardiovascular diseases. This is especially so among older people; hence, there is a need to look at some unconventional sources of protein to meet the animal protein needs of the nation (Agbugba *et al.*, 2021[a]).

According to Afolabi (2013), snails could serve as a ready meat for most of the populace in the tropics. After the Food and Agriculture Organisation (FAO) of the United States raised the alarm on animal protein deficiency among Nigerians, snail farming has recently attracted attention among farmers. Snail meat is high in protein (37 - 51%) as compared to that of guinea pig (20.3%), poultry (18.3%), fish (18%), cattle (17.5%), sheep (16.4%) and swine (14.5%). Studies have shown that snail meat contains iron (45 — 59mg/kg), relatively low-fat content (0.05 - 0.08%) and also contains all the amino acids needed for human health (Boateng *et al.*, 2016).

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Many agricultural strategies have been adopted in Nigeria. However, daily per capita animal protein intake (estimated at less than l0g) remains far from the FAO recommended minimum requirement of 35g. To bridge this gap, it has been suggested that it is necessary to explore other animal protein sources in addition to conventional sources such as ruminants and poultry (Olayide & Heady, 1982). Snail farming is one of the important alternative animal protein sources that has received relatively scanty attention in Nigeria. For instance, snail breeding started as far back as the beginning of the 20th century (Ayodele & Asimalowo, 1991). The Romans raised snails on farms and fed them with special herbs to improve their taste and increase overall snail availability. Commercial snail production is still important in several countries (Odiabo, 1997).

In Nigeria, Ghana and Cote d'Ivoire, where snail meat is popular, snails are gathered from the forest during the wet season. The Rivers State Agricultural Development Programme (RSADEP) (2009) observed that the wild snail population has declined recently. Reasons cited for the decline include the impact of human activities such as deforestation, pesticide use, slash-and-burn agriculture, spontaneous bushfires, and snail collection before maturity. This necessitates the encouragement of heliciculture (snail farming) as a means of conserving this important resource. More specially, Owolabi (2006) pointed out that the existing conventional agricultural practices known today would not be able to keep pace with the expected rise in the population from 42.2 million in 1960 to 170 million in 2013 (RSADSP, 2009). Therefore, the need to look for new resources has never been greater than now. As was observed by Amao, Adesiyan and Salako (2007), it is important that snail farming (*Heliciculture*) should be encouraged because it is only through conscious effort made by man to farm snails that the conservation of these species of animals is possible. Snail hunting is no longer a sufficient source of snails (Olukayode, 2005). Baba and Adeleke (2006) noted that snail is one of the important alternative sources of animal protein that has received relatively scanty attention in Nigeria. Snail farming should be encouraged as a new branch of sustainable animal production. Despite the potential and advantages of snail farming, widespread participation in its production by farmers is yet to be achieved in Nigeria (Baba & Adeleke, 2006). Much of the snails marketed in Nigeria, particularly Rivers State, are collected from the wild. Few farms exist for commercial breeding and production of snails. This is probably attributed to a lack of awareness of the economic

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potentials of this micro livestock (ENADEP, 2009; Baba & Adeleke, 2006). This study, therefore, estimated the economics of snail production in Obio-Akpor Local Government Area (LGA).

The study's main objective was to examine the economics of snail production in Obio-Akpor Local Government of Rivers State, Nigeria. Specifically, the objectives were to:

i. Describe the demographic factors of the snail farmers in the study area.
ii. Estimate the cost and returns analysis from snail farming.
iii. Determine the factors influencing the profitability status of the snail farmers.
iv. Identify the constraints militating against snail farming.

2. MATERIALS AND METHODS

The study was conducted in the Obio Akpo local government area in the metropolis of Port Harcourt, Rivers State. It has a population of 426,350 (NPC, 2006). Obio-Akpor is bounded by Port Harcourt (local government area) to the south, Oyigbo and Eleme to the east, Ikwerre and Etche to the north, and Emohua to the west. It is located between latitudes 4°45'N and 4°60'N and longitudes 6°50'E and 8°00'E. Covering around 90 sq mi, Obio-Akpor is generally a lowland area with an average elevation below 30 metres above sea level (Falilat, 2022). The study adopted a survey research design in the conduct of the research. In another light, according to the snail farmers association in the study area (Obio-Akpor LGA), there are forty (40) registered snail farmers in the location distributed across the four clans of the study area in the following order: Obio (10 snail farmers), Akpor (12 snail farmers), Akpara (8 snail farmers), and Evo (10 snail farmers) this gave a total of 40 snail farmers. Owing to the small size of the population, the study worked with the entire population. However, a simple random sampling technique was used to contact the farmers across the various clans.

Data was obtained through a structured questionnaire and analysed using statistical tools such as SPSS and Excel. The techniques used for analysing the objectives were as follows: Objective (i) was analysed using percentages and frequency distribution; Objective (ii) was analysed using budgetary technique; Objective (iii) was analysed using multiple regressions; and Objective (iv) was analysed using mean scores.

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2.1. Budgetary Technique

This is an important tool in farm planning analysis. It was used to estimate the overall performance of an enterprise. The gross margin and net farm income were used to assess the profitability of snail production in the study area.

GM=TVP-TVC

NFI=GM-TFC

Where

GM =Gross Margin

TVP=Total Variable Product

TVC =Total Variable Cost

NFI=Net Farm Income

TFC = Total Fixed Cost

Decision Rule: If GM >0. Then, the business is said to be profitable.

2.2. Model Specification

The implicit function for the regression model for objective (iii) is given as:

$Y_S = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$

$Y_S = a_0 + a_1X_I + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_5X_6 + a_7X_7 + a_8X_8 + e$

Where

Y_S = Profit

X_1 = Age of the farmer; X_2 = Sex; X_3=Marital Status; X_4= Household size; X_5 = Educational qualification; X_6 = Farming experience; X_7 = Purpose for farming; X_8 = Mode of farming; e = Error Term; a_0 = Intercept; $a_1 – a_8$ = Regression coefficient.

2.3. Likert Scale

To identify the major constraints facing snail farmers in the study area, mean and standard deviation were employed using a 4-point rating scale technique. The 4-point rating scale was graded as Strongly Agree (SA) = 4; Agree (A) = 3; Disagree (D) = 2; and Strongly Disagree (SD) = 1. The mean score of respondents based on the 4-point rating scale was computed thus,

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$$\frac{4+3+2+1}{4} = \frac{10}{4} = 2.50 \text{ Cut-off point}$$

Using the cut-off point of 2.50 for decision-making, items with mean values of 2.50 and above were considered constraints for snail farmers in the study area. On the other hand, items with mean values less than the cut-off point value of 2.50 were considered not constraints to snail farming in the study area.

3. RESULTS AND DISCUSSION

3.1. Demographic Characteristics of the Respondents

From Table 1, entries on age showed that the majority (67.5%) of the respondents fell within the ages of 21-59 years; 22.5% fell within the ages of 1 and 20 years, while 10% were above 60. Most (65%) respondents were males, while the rest (35%) were females. This shows that snail production is usually used by females in the Obio-Akpor LGA. Entries on marital status disclosed that the majority (32.5%) of the respondents were married, 27.5% were widows/widowers, 22.5% were single, and the remaining 17.5% were divorced. The result in Table 1 further shows that most (32.5%) of the respondents had tertiary education, 27.5% had secondary school education, 22.5% had Nigeria Certificate in Education (NCE), while the rest (17.5%) had First School Leaving Certificate (FSLC). Furthermore, the majority (67.5%) of the respondents had the experience of 1-5 years in snail farming, 22.5% had 6-11 years, and 10% had 11 years of experience in snail production. Results presented in Table 1 showed that the majority (50%) of the respondents had household sizes of about 1-5 persons, 30% had household sizes of 11 and above, while the rest (20%) had household sizes of 6-10 persons. On the mode of farming, most (65%) of the respondents are part-time farmers, while the rest (35%) are full-time farmers. Table 1 further indicated that most (77.5%) of the respondents are subsistent farmers, while 22.5% are commercial farmers.

TABLE 1: Demographic Features of Snail Farmers in the Study Area (n = 40)

Variables	Frequency	Percentage
Age		
1 – 20	9	22.5
21 – 59	27	67.5
60 and above	4	10
Total	**40**	**100**
Sex		
Male	26	65
Female	14	35
Total	**40**	**100**
Marital status		
Married	13	32.5
Single	9	22.5
Widow/Widower	11	27.5
Divorced	7	17.5
Total	**40**	**100**
Educational Qualification		
FSLC	7	17.5
SSCE	11	27.5
NCE	9	22.5
B.SC	13	32.5
Total	**40**	**100**
Years of farming		
1-5	27	67.5
6- 10	9	22.5
11 and above	4	10
Total	**40**	**100**
Size of Household		

1-5	20	50
6- 10	8	20
11 and above	12	30
Total	**40**	**100**
Mode of farming		
Full time	14	35
Part time	26	65
Purpose of farming		
Subsistent	31	77.5
Commercial	9	22.5

Key: First School Leaving Certificate (FLSC), Senior School Certificate Examination (SSCE), Nigeria Certificate in Education (NCE), Bachelor of Science (B.Sc.).

3.2. Costs and Returns Analysis

Table 2 shows the monthly costs and returns in snail farming in Obio-Akpor LGA. Table 2 demonstrates that the total variable cost value (₦87,000) exceeds the total fixed cost value of ₦21,500**.** Agbagwa *et al.* (2021) made a similar observation in their study on marketing bananas and plantain.

Results indicated that snail production was profitable, with a monthly net farm income of ₦113,000 ($244.85). These results suggest that snail production has high economic potential for increasing household incomes and enhancing the farmer's living standards.

TABLE 2: Average Monthly Cost and Returns on Snail Production in the Study Area

Items	Cost
Variable cost	
Feed	35,000
Labour	3,500
Disinfectant	27,000
Total Variable Cost (TVC)	**65,500**

Cost of Production	15,000
Transportation	6,500
Total Fixed Cost (TFC)	**21,500**
Total Cost (TVC+TFC)	**87,000**
Revenue	
Output	1,000
Selling price/snail	200
Total Revenue (TR)	**200,000**
Net Farm Income (NFI)	
NFI (TR-TC)	**113,000**
Gross Margin (TR-TVC)	**134,5000**

3.3. Effect of Demographic Features on Snail Farmers' Productivity

Table 3 shows that the multiple correlation coefficient (R) was 0.771. This is high and indicates a strong positive correlation between the independent and dependent variables, whose coefficient of determination (R^2) = 0.448. This implies that variations in Age, Sex, Marital status, Household Size, Educational Qualification and Years of farming experience in snail production explain 44.8% of the variation in snail production. While others were explained by variables not included in the model. The calculated value 1.987 had a corresponding significant F value of 0.01 < 0.05 significance level; therefore, the researcher concludes that the model is good. The level of significance, as presented in Table 3, showed that age had a P-value of 0.160.> 0.05. Hence, the null hypothesis was accepted, concluding that the respondents' age does not significantly influence snail production. Respondents' sex had a P-value = 0.189> 0.05. Hence, the null hypothesis was accepted, thereby concluding that the sex of the farmer does not significantly affect snail production. Marital status had a P-value = -0.000< 0.05, which indicates that the marital status of the farmer is insignificant, thereby rejecting the null hypothesis. Household size had a P-value of 0.254> 0.05, indicating that household size significantly affects snail farming; therefore, the null hypothesis was accepted. Educational qualification had a P-value = 0.054> 0.05; hence, the null hypothesis is accepted because the educational level of the farmer is insignificant as it does not affect snail production. Farming experience had a P-value =

0.991> 0.05, the null hypothesis was accepted. The farmer's farming experience significantly affects snail production in the study area. The purpose of farming had a P-value = 0.012< 0.05; we reject the null hypothesis because the purpose of farming is insignificant. Mode of farming had a P-value = 0.008< 0.05; we thereby reject the null hypothesis because the purpose of farming is insignificant. In their study on snail production, Agbugba and Nwachukwu (2021) made a similar observation.

TABLE 3: Multiple Regression on Determinants of Snail Farmer's Profitability Status

Variables	Coefficients	T. cal	P-Value
Age	0.087	1.462	0.160
Sex	0.114	1.361	0.189
Marital Status	0.210	0.156	0.000
Household Size	1.713	4.815	0.254
Educational Qualification	0.147	2.702	0.054
Farming experience	0.010	0.012	0.991
Purpose for farming	0.217	-2.770	0.012
Mode of farming	0.651	0.424	0.198
R=0.771			
R^2=0.448			
F= 1.987			

Sig. (p-value < 0.05)

3.4. Constraints to Snail Production

Results from the mean ratings of the farmers' response on the actors' constraints to snail production in the study area indicate that 14 out of the 19 factors had means values ranging between 2.5 and 3.5 (see Table 4). These mean values are greater than the criterion mean value of 2.50. This indicates that the farmers agreed that the 14 items in the table are constraints to snail production in the study area. The identified constraints with their respective mean values include the educational level of the farmers (3.07), poor access to information relating to snail

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farming (3.12), problem of disease infected from contamination (3.35), effect of harsh weather conditions (2.65), lack of stable market for snail produced (2.50), low/lack of financial capacity for business expansion (3.07), low technical know-how in handling snail products (3.30), poor transportation network for distributing snails (2.50), lack of access to support in programmes such as cooperative, education. (3.23), insufficient knowledge of credit sources by the farmers (3.12), lack of collateral to secure a loan to support farming (3.35), inadequate input such as juveniles and other essential materials in the snail farm (2.65), insufficient extension visits or contacts (3.07) and involvement of the farmers in some off-farm jobs (2.50).

On the other hand, as indicated in Table 4, the mean ratings on the remaining five constraining items ranged from 1.61- 2.30, which is below the criterion mean value of 2.50; this indicates that the snail farmers disagreed with the five items as being part of the factors influencing constraints to snail production in the study. Here are the five items and their corresponding mean values: lack of proper farmland ownership (2.3), tedious nature of snail farming business (1.96), age of the respondents as either too young or old (1.73), religion or cultural beliefs against snail consumption (1.96) and low patronage or acceptance of snail in the vicinity (1.84).

The findings of this study on the actors' constraints to snail production in the study area are most in line with the results of Onuigbo (2013), who identified factors such as poor access to information, problems of disease infection, harsh weather conditions, inadequate financial capacity, low technical know-how, poor transportation network, low access to support programmes, inadequate extension visit, and insufficient knowledge of credit source amongst others.

TABLE 4: Mean Ratings of Farmers' Constraints to Snail Production

S/N	Constraints	Mean	SD	Remark
1	Level of education of the farmer	3.07	0.94	Serious
2	Poor access to information relating to snail farming	3.12	0.74	Serious
3	The problem of disease infected from contamination	3.35	1.28	Serious
4	Effect of harsh weather conditions	2.65	0.94	Serious
5	Lack of proper farmland ownership	2.30	0.75	Less serious

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6	Lack of a stable market for snail-produced	2.50	0.78	Serious
7	Low/lack of financial capacity for business expansion	3.07	0.86	Serious
8	Tedious nature of snail farming business	3.12	0.85	Not serious
9	Age of the respondents as either too young or too old	3.35.	0.76	Disagreed
10	Low technical know-how in handling snail products	2.65	1.04	Serious
11	Religion or cultural beliefs against snail consumption	2.50	1.05	Not serious
12	Poor transportation network for distributing snails	3.07	0.88	Serious
13	Low patronage or acceptance for snails in your area or vicinity	1.84	0.87	Less serious
14	Lack of access to support programmes such as cooperatives, education	3.23	0.7	Serious
15	Lack of inadequate extension visits or contacts	3.07	0.92	Serious
16	Insufficient knowledge of credit sources by the farmers	3.12	0.64	Serious
17	Lack of collateral to secure a loan to support farming	3.35.	0.68	Serious
18	Inadequate input, such as juveniles and other important materials in the snail farm	2.65	0.92	Serious
19	Involvement of the farmers in some off-farm jobs affecting snail farming, such as trading artisans.	2.50	0.84	Serious

4. CONCLUSION

The four objectives set out in the study have been addressed. For the objective regarding the demographic factors affecting snail production, the results show that snail farming was dominated by males (65%). The farmers were predominantly aged between 21 and 59, with a 67.5% score. This finding has policy implications because women are responsible for providing food to the family. Nigerian governments must introduce programmes encouraging women to venture into snail farming. The return per naira invested, net income, gross margin, and profit function analysis showed that the farmers profited from snail farming. Poor visits by extension agents, lack of space and finance, the problem of disease infected from contamination, the problem of predators, and lack of collateral were adjudged significant constraints to snail production by farmers in the study area.

5. RECOMMENDATIONS

Based on the findings, the study recommends that:

i. Snail farmers should be proactive in cleaning, disinfecting, and managing the pens, as this would help control contamination cases that lead to mortality.

ii. The return per naira invested in snail production is very high. Hence, it is recommended that unemployed persons should be encouraged by the government to go into snail production.

iii. The government should give surety to registered farmers who do not have collateral to secure loans from financial institutions.

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