

## Economic Analysis of Edible Land Snail (*Archachatina marginata*) Production in Jos North Local Government Area of Plateau State, Nigeria

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### ABSTRACT

*This study analyzed the economics of snail production in Jos, Plateau state. A multistage random sampling procedure was used to select sixty snail farmers from Jos North local Government Area of Plateau State. Data were collected through structured questionnaires. The data were analyzed using descriptive statistics (frequency counts, means percentages, etc) as well as budgetary technique and stepwise regression analysis. The findings showed that most of the snail farms were owned by individuals who were part-time snail farmers (87.4%), who financed their snail production (94.3%) through personal savings. Financial analyses showed that snail production is profitable with farmers earning average profit of ₦24,978.02 per year. The results of regression analyses revealed that years of education, years of experience in snail farming and farm size were statistically significant and explained 73.8% of the total variation in the profit made by the snail farmers. Due to its profitability and low capital investment nature, snail rearing is recommended for farmers who do not have substantial capital, for the unemployed and those aspiring to augment their income.*

**Key words:** Snail production, gross margin, profitability ratio, stepwise regression, Plateau State

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### INTRODUCTION

In recent time, snail production by rural household is becoming popular due to the fact that the households have realized the need to diversify their source of income, thereby reducing the risk involved in depending on crop production as the only source. There is need to bridge the gap between protein requirement and actual protein consumed by the people which are not sufficiently supplied by crop production (Ajibefun, 2000). This gap can be bridged using the protein provided by snail meat.

Snail, which is one of the Non-Timber Forest Products (NTFPs), has recently attracted attention among farmers in Nigerians as an aftermath of the alarm raised by FAO on animal protein deficiency among Nigerians (Adebayo, 2012; Akinnusi, 2013). It has been reported by FAO (2006) that the average animal protein intake in Nigeria is low, calling for concerted effort towards alleviating this crisis of protein shortage. Unfortunately, the conventional and regular sources of animal protein supply in the country like beef, pork, goat meat and poultry are getting out of the reach of the common populace due to the economic downturn. There is therefore the need to look inward and integrate some non-conventional meat sources into our farming systems (Ebenebe, 2013). This will complement the conventional proteins supplied by animal sources. The challenge thus falls on NTFPs in which Nigeria is richly

endowed. Snail meat is socially well accepted in many parts of Nigeria. It is commonly known as “Congo meat” and it is one of the most loved delicacies in Nigeria. Many species of edible land snails are recognized in Nigeria but the popular species of economic interest is the West Africa giant snails *Archachatina marginata*.

Snail farming has numerous advantages which are highlighted below: it can be cheaply managed in terms of housing, feeding, healthcare etc; it is highly adaptable to a variety of conditions (villages, farms backyard, shed, cities etc); snails reproduce rapidly; they are efficient producers of meat; they have high medicinal value (they are used in the prevention and care of diseases like hypertension (Efarmspro, 2016). Due to the fact that snails are small, noiseless and easy to handle, they can be reared in the urban areas without infringing on the peace of the neighbours (Odunnaiya, 2011).

In spite of the considerable external and local demand, commercial snail farms such as those in Europe, South-East Asia and the Americas, do not exist in West Africa Raheem (2001). In Nigeria and Ghana, where snail meat is particularly popular, snails are gathered from the forest. However, wild snail population is declining rapidly due to indiscriminate hunting of snails before they reach maturity,

bush burning, use of agro chemicals, deforestation and change in weather (Efarmspro, 2016). From the above observations, it is therefore important that snail farming (heliculture) should be encouraged, because it is only through conscious efforts made by man to farm snails that the conservation of this species of animal would be made possible. In view of the above problems, there is the need to analyse the economics of snail production in Jos North Local Government Area of Plateau State, Nigeria. Specifically, this study seeks to examine the socio-economic characteristic of the snail farmers, determine the cost and returns of snail production, identify the factors influencing snail production and examine the problems faced by snail farmers in the study area.

**METHODOLOGY**

**The Study Area**

The study was carried out in Jos North Local Government Area of Plateau state. The local government is located in the tropical zone, lying between latitudes 9° 5' and 11° 15' N of the equator and longitudes 8° 53' and 9° 45' E of the Greenwich Meridian. The mean daily maximum temperature of 10°C to 32°C is experienced in August when there is dense cloud cover. An annual rainfall of 11317 to 1500mm per annum (James, 2005). According to 2006 census, a population of 429,300 peoples was recorded in the study area out of which 48.38% were male and 51.42% were female (NPC, 2006). The major occupation of the people in the study area is trading. Crops such as maize, cassava, vegetables, etc are grown in the study area while livestock such as sheep, goat, local poultry (chicken and duck), swine and micro-livestock (snails, honeybees and rabbits) are raised in the local government.

**Sampling Technique**

A multi-stage sampling technique was used to select the respondents. In the first stage, the Local Government Area was stratified into four strata based on the availability of snail farmers. In the second stage, one community was randomly selected from each stratum. The last stage involved random selection of 45 respondents from each community making a total of 180 snail farmers. The information collected was subjected to reliability test and due to outlier and inconsistency; the respondents were reduced to 159.

**Method of Data Collection**

The data in this research work are mainly primary data that were obtained using structured questionnaire that sought information on the socio-economic characteristics of snail farmers, the management practices employed in snail production, the cost incurred on and return accrued to snail farmers, factors affecting snail production, problems encountered in snail farming, possible solutions for the

problem and likely areas of improvement in snail production activity in the study area.

**Method of Data Analysis**

The analytical techniques employed include descriptive statistics, budgetary techniques and stepwise regression analysis. Descriptive Statistics such as frequency counts, percentage and mean were used to summarize the socio-economic characteristics of the respondents and other variables.

Budgetary techniques were used to determine the gross margin and net farm income obtained from snail production in the study, using equations 1 to 3.

GM = TR – TVC ..... (1)

NFI = GM – TFC ..... (2)

Profit = TR – TC ..... (3)

Where GM = Gross Margin

TR = Total revenue

TVC = Total Variable Cost

NFI = Net Farm Income

TFC = Total Fixed Cost

TC = Total Cost

The mean values of snail farmers were used to compute the cost of the various inputs such as cost of land, feedstock, equipment and labour employed, cost of water and cost of hatchlings used in the production process. All equipment used were depreciated using straight line method of depreciation in order to guide against over valuation of the cost incurred in each production year.

Profitability ratio analysis such as Benefit Cost Ratio (BCR), Gross Revenue Ratio (GRR), Expense Structure Ratio (ESR)s and rate of Returns (ROR) were used to measure the profitability of the snail farms and also to ascertain that snail production is a worthwhile venture.

Stepwise regression analysis was used to analyze the relationship between the profit made by the snail farmers (N) and the inputs used in snail production. The functional form used was Cobb- Douglas production function. The model form for the regression analysis is given below (4):

Y = f (X1, X2, X3, X4, X5, X6, μ) ..... (4)

Where

Y = Profit made by snail farmers (N)

X1 = Level of education (years)

X2 = Years of experience

X3 = Cost of Equipment (N)

X4 = Cost of Feed (N)

X5 = Family labour (Man days)

X6 = Farm size (acre)

μ = Error term.

## RESULTS AND DISCUSSIONS

### Socio-economic Characteristics of the Respondents

The results of the socio-economic characteristics of the snail farmers such as gender, age, marital status, educational status, social organization, years of experience in snail production, major occupation and source of capital is presented in Table 1. Table 1 shows that 75.5% of the snail farmers are male while 24.5% were female. This shows that snail farming is a male dominated venture in the study area. This result agrees with the findings by Raheem (2001) that majority of the snail farmers in Ogbomosho

**Table 1:** Socio-economic Characteristics of snail farmers in Jos North LGA

Social-economic Characteristics	Frequency	Percentage
<b>Gender</b>		
Male	120	75.5
Female	39	24.5
<b>Age</b>		
20-29	30	18.9
30-39	66	41.5
40-49	51	32.1
50-59	6	3.8
60 and above	6	3.8
<b>Marital Status</b>		
Single	33	20.8
Married	126	79.2
<b>Educational Status</b>		
No-formal Education	3	1.9
Primary Education	36	22.6
Secondary Education	90	56.6
Tertiary Education	30	18.9
<b>Member of Social Organization</b>		
Yes	129	81.1
No	30	18.9
<b>Years of experience</b>		
1-2	49	30.8
3-4	68	42.8
5-6	42	26.3
<b>Mode of Practicing</b>		
Full time	20	12.6
Part time	139	87.4
<b>Major Occupation</b>		
Civil service	99	62.3
Trading	41	25.8
Student	11	6.9
Contracting		5
<b>Source of Capital</b>		
Personal saving	150	94.3
Relations and friends	9	5.7

Source: Field survey, 2016

North and South Local Government Areas of Oyo State Nigeria are males (76%). Table 1 also shows that about 41.5% of the respondents are within the age bracket of 30-39 years with a mean age of 38 years. This implies that most of the snail farmers are within the active age group. The reason for this is that snail farming is a new business in the study area and as such older people are yet to be involved in the rearing of snail on commercial basis. Majority of the snail farmers (79.2%) are married while 20.8% of the farmers were single. This indicates that married people are more involved in snail farming in the study area probably to increase household income. This study is in line with findings by Yahya (2012). That in Jos Metropolis majority of the snail farmers (81.5%) is married while 18.5% of the farmers were single.

Majority (98.1%) of the snail farmers were education (Secondary 56.6%, primary 22.6% and tertiary 18.9% while just 1.9% had No formal education. Education is vital to snail rearing especially in the area of record keeping and proper management. Also, commercial snail rearing being new in agroforestry production activity is seen to be embraced by the educated people Hamzat (2014). About 81.1% of the respondents belong to social organization such as cooperative society, farmers' development union, farmers' congress and community development associations. This implies that apart from snail rearing activities, they still have other activities they attend to and this is possible since snail rearing is not time consuming.

Results in Table 1 also reveal that 42.8% of the respondents have years of experience in snail production between three to four years, with a mean year of experience of 4 years. The result suggests that the farmers may not have much experience in snail farming given the low years of snail farming experience in the study area. About 87.4% of the respondents practice snail farming on part-time basis while the remaining 12.6% practice snail farming on full-time basis. This implies that snail farming does not deprive the respondents of the time for other productive activities. Of the part time farmers, majority (62.3%) were civil servant, 25.8% were traders while 6.9% and 5% were students and contractors, respectively. This implies that they are involved in snail rearing as a source of increasing household income and for household consumption.

Also, the results in Table 1 indicated that 94.3% of the initial source of capital used in setting up a snailery in the study area is from personal savings while the remaining 5.7% is from relatives and friends. Raheem (2001) had reported that 96% of the snail farmers in Ogbomosho North and South Local Government Areas of Oyo State Nigeria used their personal saving as a source of initial capital.

### Management Practice in Snail Production in Jos North LGA

The result in Table 2 shows that 94.3% of the breed of snail reared in Jos North LGA is *Archachatina marginata*. This is probably due to the fact that *A. marginata* has more meat than other snail species (Efarmspro, 2016) and thus command higher price thereby giving more revenue to the snail farmer. This study agrees with findings by Hamzat (2014) that *A. marginata* is common in Nigeria, it is an excellent source of animal protein, having large body size and it is easy to manage. Majority of the farmers (44.7%) reared their snail in fenced pen, followed by Drums or pots rearing (30.8%), while the least used mode of snail rearing in the study area was the use of tyres. This implies that fenced pens are the most preferred among the breeding location.

**Table 2:** Management Practices of snail production in Jos North LGA

Management Practices	Frequency	Percentage
<b>Method of snail rearing</b>		
Fenced pen	71	44.7
Drums or Pots	49	30.8
Trench Pens	24	15.1
Tyres	6	3.8
Others	9	5.7
<b>Record Keeping</b>		
Yes	147	92.5
No	12	7.5
<b>Types of Feed Consumed by snail</b>		
1. Green feed	34	21.4
2. Compound Ratio	17	11.9
3. Industrial by-product	1	0.6
4. Domestic waste	41	25.8
1and 2	26	16.4
1and 4	26	16.4
2and 3	6	3.8
2and 4	6	3.8
<b>Frequency of Feeding per day</b>		
Once	153	96.2
Twice	3	1.9
Thrice	3	1.9
<b>Source of Water</b>		
Well	132	83
Stream	3	1.9
Water	18	11.3
1and 3	3	1.9
2 and	3	1.9
<b>Family Labour (Mandays)</b>		
20-Jan	69	43.4
21-40	54	34
41-60	21	13.2
61-80	8	5
81-100	7	4.4

Source: Field survey, 2016

Farm record is very important in agroforestry business because it shows the overall performance of that particular enterprise at any point in time. As a result of the importance of record keeping, result in Table 2 shows that greater number of the respondents (92.5%) keep record of their snail production activity. About 25.8% of the feed consumed by the snails in the study area came from domestic waste, 21.4% came from green feed while 16.4% each came from green feed and compound ration and green feed and domestic waste. This implies that the costs of feeding and sustaining snails are minimal and affordable since snail is able to convert low quality feed such as green feed and domestic waste into high quality animal protein thereby reducing the cost of feeding.

The result in Table 2 also reveals that majority of the farmers (96.2%) fed their snails once a day (mean frequency of feeding being 1.06). This implies that snails do not require much feed since it is able to convert low quality feed to high quality animal protein and meat. More than three quarters (83%) of the respondents used well water in their snailery. This implies that the farmer would not be spending much on water since a well can be dug in the snailery to ease management activity thereby reducing the cost of snail production in the long run. The mean family labour used was found to be 24 mandays which implies that majority of the snail farmers are still practicing on a small scale.

**Table 3:** Gross Margin and Net Farm Income Analysis

Items	Cost (₦)
<b>Total Revenue</b>	42,053.58
<b>Variable cost</b>	
Hatching cost	12,739.77
Water cost	103.56
Feed cost	449.5
Transport	255.86
Total Variable cost	<b>13,548.69</b>
Gross Margin	<b>28,504.89</b>
<b>Fixed Cost</b>	
Land	658.18
Cost of equipment	2,898.69
Total fixed cost	<b>3,556.87</b>
Net farm Income	<b>24,978.02</b>

Source: Field survey, 2016

**Table 4:** Profitability Ratio of Snail production in Jos North LGA

Ratios	Variables
Benefit Cost Ratio	2.46
Gross Revenue Ratio	0.38
Expense Structure Ratio	0.26
Rate of Returns	1.46

Source: Field survey, 2016

**Table 5:** Statistics of Regression equation for profitability of snail production in the study area

Model	Coefficient	Standard Error	t-ratio	R <sup>2</sup>	F
1.Constant	3.863	0.29	13.216***	0.118	6.001**
L <sub>N</sub> X <sub>1</sub>	0.178	0.079	2.483**		
2. Constant	3.352	0.363	9.496***		
L <sub>N</sub> X <sub>1</sub>	0.195	0.077	2.790***	0.188	5.385***
L <sub>N</sub> X <sub>2</sub>	0.303	0.135	2.072		
3. Constant	2.352	0.571	4.233***		
L <sub>N</sub> X <sub>1</sub>	0.192	0.075	2.846***	0.262	5.477**
L <sub>N</sub> X <sub>2</sub>	0.419	0.157	2.797***		
L <sub>N</sub> X <sub>3</sub>	0.764	0.354	2.208**		

\*\*\* - Significant at 1% level of Significance, \*\* - Significant at 5% level of significance

**Gross Margin and Net Farm Income Analysis**

Snail farmers made profits from their production with gross margin of ₦28,534.89 and Net farm income of ₦24,978.02 per farming season. This shows that snail production in the study area is a profitable business. This result is in line with previous studies conducted by Mba (2008) who found out that Snail farming in Edo State is profitable with a gross margin of ₦32,534.19 and Net farm income of ₦28,943.72 per farming season.

The result in Table 4 shows that BCR is greater than one. Judging from investment decision criteria, this implies that snail farming is profitable. The gross revenue ratio was found to be 0.38, which implies that from every N1.00 returns to the snail industry, 38 kobo is spent This finding corroborates Mba (2008) who reported BCR of Snail farmers in Edo State Nigeria is greater than one has a gross ratio was 0.63 which revealed that a profit of 63 kobo is made in every one naira invested. The expense structure ratio was found to be 0.26, which also implies that 26% of the total cost of production is made up of fixed cost component, thus making the business worthwhile to invest in. Also, the rate of returns was found to be 1.46 which shows that for every one naira invested in snail production 14.6 kobo is gained. From all these profitability ratios snail production is a profitability business in the study area.

**Regression Analysis**

Stepwise regression was carried out and the variables that have low contribution to the research work were excluded from the model. The Cobb-Douglass function was specified for the regression analysis. The model obtained is shown in Table 5. The third model is chosen because of the number of significant variables, R<sup>2</sup> and F-value. The result of the analysis shows that level of education (X<sub>1</sub>); years of experience in snail farming (X<sub>2</sub>) and farm size (X<sub>6</sub>) are significant factors influencing the profit made by the snail farmers in the study area. These variables are significant at various levels of significance indicated. This implies that farmers with more years of experience in snail farming tend to earn more profit in snail production than farmers with less years of experience. Also, profit increases with

increase in farm size and levels of education. The R<sup>2</sup> for the estimated regression showed that 73.8% of the total variation in the profit made by the snail farmers was explained by the explanatory variables while the remaining 74% unexplained was due to the variables not included in the model is the error term. The F-value of 5.477 is statistically significant at 5% level of significance. This implies that all the variables (X<sub>1</sub>, X<sub>2</sub>, and X<sub>6</sub>) significantly influence the profit made by the snail farmers.

**Problems Encountered in Snail Production in Jos North LGA**

The major problems faced by the snail farmers in the study area are Predators such as rats, lizard, snake, frog, bird, ants, termites and cockroaches (44.7%), lack of finance (13.2%), theft (17.6%), lack of space (8.2%) and inexperience (5%). This implies that the major problem faced by the snail farmers in the study area is that of predators (Table 6). This is in conformation with the findings of Boni (2014) who stated that predators, lack of finance, lack of theft and inexperience are the major factors affecting the production of Snails in Edo State, Nigeria.

**Table 6:** Problems of Snails Production in Jos North LGA

Problems	Frequency	Percentage
Lack of Finance	39	24.5
Lack of space	13	8.2
Theft	28	17.6
Predators	71	44.7
Inexperience	8	5
Total	159	100

Source: Field survey, 2016

**CONCLUSION AND RECOMMENDATION**

Based on the major findings of this research, the following conclusions were drawn. Snail farming is a profitable venture if carried out with adequate management and the right type of breed, it can be handled as a part-time business

because it is not time consuming. A large number of feed consumed by the snails come from domestic waste and green feed which made the cost of feeding to be low, Profit made in snail production is being influenced by levels of education, years of experience and farm size while the main problems of snail production is predators. In view of this, this study therefore recommends that more people should venture into snail production while current snail farmers should enlarge their production. Due to the profitability of snail production and its low capital investment nature, snail production is recommended for farmers without substantial capital, unemployed and those aspiring to augment their income.

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