Economic Analysis of Snail Production in Oyo State

Bolaji, K. A, Adebayo D. O., Kabir, G. B, Akanni, O. F, Arowolo, O. V. and Olawale, O. O.
Forestry Research Institute of Nigeria, P.M.B. 5054, Jericho Hill, Ibadan, Nigeria
Correspondent: tunjikofoworola@yahoo.com

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Abstract
This study is on the economics analysis of snail production in Oyo State of Nigeria. Snail is among the many Non Timber Forest Products, endangered wildlife species of the tropical rainforest ecosystem of southwest Nigeria. This was achieved by examining the socio-economic characteristics of the snail farmers, cost and returns, and socioeconomic factors influencing snail rearing. Data for the study were collected by means of a well-structured questionnaire administered purposively in six local government areas in Oyo state. They were purposively selected due to prior information of snail rearers in the areas. These were Akinyele (15), Egbeda (21), Afijio (23), Ibarapa North (29), Iseyin (22) and Ogbomosho (15) North Local Government Areas, making a total of 125 Snail farmers. The results indicated that majority (68%) of the producers were males, 72% of them were married with 48% having family sizes of less than 5. About 40% of them had a family size of between 6 and 10. The results further indicated that production was highly profitable with a gross margin of ₦134,060 realized on ₦24,980 investment. The rate of return on investment implied that for every naira invested in the business ₦4.89 was generated. The regression analysis shows that 79% of the independent variables (R^2) explained the dependent variable, total income. The positive signs and various significant levels on feeding schedule (0.15), stock size (0.31) and labour cost (0.16) implied that increase in these inputs will add to the total income of snail production. It was concluded that snail production required low capital investment therefore low income earners could comfortably embark on it. Also in view of the high profit level of the business, it could be a veritable enterprise for uplifting the living standard of its producers and advance the economy of the nation.

Key words: Biodiversity, Cost, Economics, Preserve, Production, Profitability, Rearing, Snail

Introduction

In spite of the various agricultural development strategies adopted in Nigeria to boost agricultural production, including livestock, daily per capita animal protein intake is still less than 10 g. This is not up to the daily intake of 35g and the minimum requirement that was recommended by Food and Agriculture Organization (FAO) (Usman *et al*, 2003). The problem of animal protein intake in Nigeria has encouraged research into other sources of protein from animal which are reared with little or no capital. Micro livestock such as snail, grasscutter and rabbit have been domesticated and a lot of work is going on aimed to increase their availability at a reduced price (Nkoima, 2018). The importance of snail to man is enormous. Snail meat has been consumed by humans throughout the world since pre-historic times. Omole (2002) reported that the consumption of animal protein in Nigeria is 5.5g per head per day which is absolutely below the Food and Agriculture Organization recommendation of 35g per head per day. In addition to the nutritional value of snail meat, it plays an important role in folk medicine. Snail is considered important in the treatment of anemia. The bluish liquid obtained from its shell when the flesh has been removed is believed to be good for infant development. The low fat content in the meat makes it a good antidote for fat-related diseases such as hypertension (Ogogo *et al,* 2011). Presently, the bulk of snails sold in African markets (including Nigeria) are procured from the wild, which makes it difficult for the sellers to meet up with the demand (Babatunde *et al*., 2019).

Consequently, the price of snail increases particularly during dry season. Irrespective of the cost of snail, consumption of snail meat is continuously increasing because many Nigerians are consuming snails for various reasons. Among the Yoruba speaking people of the South Western Nigeria, snail is a requirement in several preparations in traditional medicine (Ayodele and Ashimolowo, 1999). Such as using snail mucus for treating wounds from the umbilical cords. Snails are believed to enhance youthfulness among the Yorubas. The Zinc obtained from snail is a valuable factor in the maintenance of healthy prostate gland. The edible glandular substances could cause the agglutination of certain bacteria which could be of value against a variety of ailments including whooping cough (Babatunde, 2019).

Domestication of Non-Timber Forest Products among which snail belong, is a major challenge in biodiversity conservation. This study therefore examined the rearing profitability, rate of return on investment and the influences of the socioeconomic factors on the production of snail.

Theoretical framework

Farm Budget Model: The farm budget, as a tool of analysis, is one of the oldest and simplest, used in farm management and production studies. It has been used economic studies for analyzing the profitability of farm production practice. This method of analysis was used to achieve the objective of this study. Different methods of budgeting exist. However, these methods can be subdivided into two major categories: (a) total or complete budgeting and (b) partial budgeting. A total budgeting is used when contemplating a complete reorganization of the entire farm business, while partial farm budget is used when the action intend to be implemented does not affect the whole farm, for example, the introduction of a new business or purchase of new equipment for the farm. The choice of any type of budgeting tool depends on the circumstance under which the farm business is taking place, goal achievement objective and convenience. This study used partial budget as an analytical tool. Basically, it involves operations leading to estimates of net revenue and total cost for the same production period. The differences between two parameters are measure of profit or loss or net farm income for that period (Adinya *et al.,* 2008).The purpose of the model is to identify the costs, returns, profitability or loss per hectare. The total revenue represents the value of the output from the farm (i.e. physical quantity of snail multiplied by the unit price). The total cost on the other hand, is made up of the variables and fixed components. Variables costs also called specific costs vary directly with the level of production and include expenditure on labour and transportation cost. Fixed cost, known as overhead costs, do not vary with the level of output and consists of cash expenses (on repairs and maintenance, interest on loan) and non-cash adjustment like depreciation of farm tools, and equipment. The computed returns and costs were used to derive various measures of profitability including net return and return on capital invested in snail enterprise.

Brief History of Snail

The African giant snail (*Achatina achatina*) has coiled shells in their adult stage. They are hermaphrodite and so, they do not require a partner to copulate. They are oviparous and can lay eggs between 10 and 30days after mating. Eggs laying takes place during the rainy season or when provided with the required food, which are mostly juicy vegetables, constant water, a favourable weather condition of an average of 250C to 300C and humidity of 80%. The species lays about 200 to 400 eggs in one batch 2 to 3 times a year. It takes about 11 days for its egg to be hatched in the humus-rich soil. All species of snail get matured for harvesting by the 5th to 7th months and are actually ready for consumption or marketing. Snails could live as long as 7 to 10 years in their natural habitat. Snails produce enzymes zymolyse used industrially to lyse the cell wall of organisms, thereby breaking the genetic barrier and allowing mating and fusion of otherwise two non-compatible organisms. One interesting things about snails is that they have no noise, no odour, no irritation and hardly fall sick. Snail business is therefore a GEM in the kingdom livestock and the risks of production are low.

Methodology

The study area

The study was conducted in Oyo State, Southwestern part of Nigeria between Latitudes $2^{o}\ 38^{1}$ and $4^{0}\ 35^{1}$ east and has a total population of 5,591,589 (NPC, 2012). There are 33 local government areas in the state. It is bordered in the north by Kwara State, east by Osun State and the south by Ogun states. In the west, it is bordered by Ogun state and by the Republic of Benin. The state has an annual rainfall of between 1000 mm and 1400 mm and has a vast area of fertile land that is suitable for the production of arable crops such as the vegetables, yam, cassava, cowpea, tomatoes, maize and perennial crops such as cocoa, locust bean, Sheanut, Cashew etc. Farming in the state is largely traditional and small scale relying on manual labours that involve the use of cutlasses and hoes (Ademola *et al.,* 2012).

Data Collection

Data for the study were collected by means of a well-structured and pretested questionnaire in purposively selected six Local Government areas in Oyo state. They were purposively selected due to prior information of snail rearers in the areas. These were Akinyele (15), Egbeda (21), Afijio (23), Ibarapa North (29), Iseyin (22) and Ogbomosho (15) North Local Government Areas, making a total of 125 Snail farmers. The sample size was low because snails are commonly picked by rural people about in the forest. Until recent time that awareness on snail production and other Non-Timber Forest Products are being created in order to conserve the biodiversity of Nigeria

forest. The questionnaire was designed to collect data on the socio-economic characteristics of the respondents, spices of snails reared, and the inputs and output quantities as well as their unit prices.

Data Analysis

The data obtained were analysed using descriptive statistics, budgetary and regression analyses.

Analysis of Cost and Returns of snail production

The budgetary analysis was used to determine the cost and re-turns to snail production in the study area. This involves determining the profitability of the snail production in the short-run when fixed costs are considered negligible using gross margin; and the net profit in the long-run by incorporating fixed costs into the analysis. The gross margin [11] is given as:

GM = GI – TVC ---------- (1)

Where: GM = Gross margin (N), GI = Gross income (N) and TVC = Total Variable cost (N)

The net profit is given as:

π = GM – TFC ---------- (2)

Where: π = Net profit, TFC = Total fixed cost and GM is as previously defined

Costs-returns analysis was used to ascertain the profitability of snail farming. The equation used in ascertaining the net farm income is as follows:

Rate of Return on Investment (RRI) = NFI/TC x 100 . . . . Equation (iii)

Rate of Return on Variable Cost (RRVC) = (TR – TC)/ TVC x 100… Equation (iv)

Where:

NFI = Net farm income

TR = Total revenue

TFC = Total fixed cost

TVC = Total variable cost

TC = Total Cost

Regression Analysis

This was used to examine the factors affecting the revenue from snail production. The relationship, according to Doll and Orazem, (1978) is implicitly expressed as

$Y = f(X_1, X_2, X_3, ….., X_{10}, \varepsilon_i)$----------(3)

Model specification:

$LogY = \beta_0 + \beta_1 LogX_1 + \beta_2 LogX_2 + \beta_3 LogX_3 + \beta_4 LogX_4 + \beta 5 LogX_5 + \beta_6 LogX_6 + \beta_7 LogX_7 + + +$

$B_{10} LogX_{10} + \varepsilon_i$ …… (1)

where:

Y = Total income/ Revenue (₦)

X_1 = Education (year)

X_2 = Production experience (year)

X_3 = Feeding Schedule

X_4 = Housing type

X_5 = Stock size

x_6 = Labour cost(₦)

X_7 = Basin/basket cost (₦)

X_8 = Cost of pesticide (₦)

X_9 = Cost of housing (₦)

X_{10} = cost of feeding (₦)

β_1, ….β_{10} = Parameters to be estimated

ε = Random error

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RESULTS AND DISCUSSION

The results of the socio-economic characteristics of the producer presented in table 1 showed the dominance of males (85%) in the snail production industry while females were just few (15%). This is corroborated by Aiyeloja and Ogunjinmi (2010) and Ahmadu and Ojogho (2012), also reporting the dominance of males in snail production. This is contrary to the expectation that a simple, less tedious and low capital intensive business like snail production would be dominated by women. Nevertheless females were more involved in the marketing aspect (Babatunde *et al*., 2019). There is need to encourage women to be involved in a production of this nature. The majority of the producers were between age group of 41 and 60 years old. This implied that they were relatively not too old and in their economic active age (Miegoue *et al.,* 2019)

The majority (72%) of them were married with 48% of them having family sizes that is less than 5 in number, about 40% having family number between 6 and 10 and 12% having household size of 12%. The dominance of the married farmers among the respondents might be due to the desire to cater for their families. The implication of high family size is the large number of persons to cater for and this might have negative effect on the business. On the contrary, the family members might contribute significantly to labor operation thereby influencing the business positively.

The results further showed that snail production in Oyo state was a business for the literate farmers. This is evidenced by 84% of the respondents that had at least primary or adult education with the majority (40%) having tertiary education. This corroborates the findings of Ogunniyi (2009) and Ahmadu and Ojogho (2012) that most of snail farmers were educated. The high level of literacy of

the respondents might be responsible for their managerial level and performance in snail production enterprise. The species of snails reared are shown in Table 1. Most of the respondents reared *Achatina achtina* species of snail. This might not be unconnected with its wide distribution in Africa in addition to the fact that it is meatier and tenderer than other species.

About 72% of the respondents were rearing snails at the back of their houses while 28% were rearing them on separate farmlands. Considering the housing type of for the snail, about 16% were rearing them in baskets or buckets, 68% were using automobile tyres while 16% were using brick pen. Those using tyres claimed that the tyres are cheaper to get and easier to use.

Table 1. Socio Economic Characteristics of Snail Producers in the study area

VARIABLES	VARIABLE	FREQUENCY	PERCENTAGE
GENDER	Male	85	68
	Female	40	32
	Total	125	100
AGE (year)			
	20-40	55	44
	41-60	65	52
	61-above	5	4
	Total	125	100
MARITAL STATUS			
	Married	90	72
	Unmarried	35	28
	Total	125	100
EDUCATION STATUS		0	
	No formal education	10	16
	Primary	45	8
	Secondary	50	36
	Tertiary	125	40
	Total		100
HOUSEHOLD SIZE			
	0-5	60	48
	6-10	50	40
	10- above	15	12
	Total	125	100
HOUSING TYPE			
	Bucket	20	16
	Tyre	85	68
	Brick pen	20	16
	Total	125	100
SPECIES OF SNAIL			
	Archachatina achatina	50	40
	Achatina marginata Archachatina	30	24
	marginata and Archachatina	30	24
	achatinaAchatina fulica	15	12
	Total	125	100
NUMBER OF LABOUR			
	0-3	90	72
	4-7	25	20
	8-12	10	8
	Total	125	100
LOCATION OF FARM			
	Backyard		
	Land Separate farm from home	90	72
	Total	35	28
		125	100

The total fixed cost (₦12,260) and variable cost (₦12,720) are almost the same indicating that cost of maintaining snail is very low because they feed on waste, vegetative materials such as pawpaw fruits, leaf, plantain leaf and cassava leaf. Thus, snail production is a business which low income earners as well as the uneducated could comfortably embark upon. Enlightenment of the public in this direction is very vital. The results further indicated that snail production was highly profitable with Gross Margin of ₦134,060 realised on ₦24,980 investment. The rate of return on investment was 4.89, implying that for every naira invested in the business, ₦4.89 was generated as profit. In confirmation of the profitability of snail production, the returns on investment in snail production exceed those of other livestock categories such as poultry. For instance, the return per naira invested of N0.59 was reported for table egg production (Njoku and Adeze, 2003). This indicates high economic potential in snail industry for uplifting the living standard of the rural poor and advancing the economy of the nation.

Results of the Regression Analysis

The results of the regression analysis showing the relationship between the revenue from snail production and the factors influencing the revenue are presented in Table 3. The analysis shows that 79% of the independent variables (R^2) explained the dependent variable total income and it is significant at 1% level of significance, indicating a good fit for the model used. The positive signs and significance at various significant levels on feeding schedule (0.15), stock size (0.31) and labour cost (0.16) implied that increase in any of these inputs could add to the total income of snail production. Positive sign of labour cost could be that better management of snail production would bring better results and increase in total income, while as expected increase in cost of pesticide (-0.45), housing (-0.23) feeding (-0.10) and basin/ basket (-0.15) cause decrease in total income.

Table 2: Budgetary

Cost and Return	Mean ₦
Total variable cost, TVC	₦12,720
Total Fixed cost, TFC	₦12,260
Total Cost, TC	₦24,980
Total Revenue, TR	₦146,780
Gross Margin, GM	₦134,060
Net Farm Income, NFI	₦121,800
Rate of Return, IRR	4.87

Table 3: Regression Analysis of Determinant of Income in Snail Production

TOTAL INCOME	COEFFICIENT	STANDARD ERROR	P> |t|
Education	0.4844	0.5866	0.423
Production experience	0.2138	0.5023	0.677
Feeding Schedule	0.1532	0.7948	0.452*
Housing type	-0.3591	0.1136	0.757
Stock size	0.31483	0.3825	0.000***
Labour cost	0,1602	0.9736	0.122**
Basin cost	-0.1598	0.9584	0.118**
Cost of pesticide	-0.4565	0.3753	0.244*
Cost of housing	-0.2304	1.7049	0.212*
Cost of Feeding	-0.10828	8.9357	0.246*
Constant	70490.73	70909.38	0.337

significant at 10%, **significant at 5%, ***significant at 1%, R^2 = 0.79, Adjusted R^2 = 0.65, P > 0.0024

Conclusion

This study established that snail production required low capital investment and hence it is a business that low income earners could comfortably embark upon. The study found that increase in labour, high stock and right feeding schedule will increase the income generated while the high cost of pesticide and housing will reduce total income. It was also found that the business of snail production was highly profitable and so could serve as a veritable enterprise for uplifting the living standard of its producers and consequently advanced the economy of the nation.

Recommendation

Base on the findings of this study, sensitization of both the low income earners, unemployed, retirees, youths and women through extension services should be intensified. Furthermore, in view of the low level of snail production and the high profit generated from it, investors should embark on large-scale snail production. Research should be geared towards improving the breeds stocks and Policy thrust of the government should be geared specifically towards achieving large-scale snail production in the country.

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