Journal of Agriculture and Food Sciences 147
Volume 4, Number 2, Oct., 2006. pp.147-155 ISSN 1597-1074

PROFITABILITY OF SNAIL PRODUCTION IN OSUN STATE, NIGERIA

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ABSTRACT

The study determined the features and profitability of snail farming in Osun State. To achieve the study objectives, 20 snail farmers each were randomly selected from Osogbo, Iwo and Ife-Ijesa townships, where majority of snail farmers in the State were located. Data collected from the farmers were analysed using descriptive statistics, farm budgeting and regression analysis. Results of the study revealed that snail production was undertaken on a small scale with an average stock size of 650 per farmer. Only 45% of the farmers were in snail farming for earning income. The snails were housed in pens (36.7% of the farmers), baskets (35%), drums (18.3%) and used tyres (10%). The costs and returns analysis revealed that variable costs accounted for 96% of the production costs. Labour was the most costly single item in snail production in the area. The results further showed that snail farming was highly profitable, with the average farmer earning a net return of 40 naira per snail. There was a profit of 1.39 naira on every naira invested in snail production. The results of the regression analysis showed that stock size was the most important factor determining profitability of snail enterprises. Given the high returns to snail farming in the area, it was concluded that its popularisation, in addition to contributing to animal protein availability, has the potential for raising farm incomes. To fully realise this potential, attention was drawn to the need for more active research and extension aimed at generating and disseminating appropriate information on improved snail farming.

INTRODUCTION

In spite of the various agricultural development strategies adopted in Nigeria, daily per capita animal protein intake (estimated at less than 10g) remains a far cry from the Food and Agriculture Organization (FAO) recommended minimum requirement of 35g (Usman *et al*., 2003). In order to bridge this gap, it has been suggested that there is the need to explore other sources of animal protein in addition to the conventional sources such as ruminants and poultry (Olayide and Heady, 1981). One of the important alternative sources of animal protein, which has received relatively scanty attention in Nigeria, is the snail. Elsewhere, the potential of snail as source of high quality protein has long been recognised. For instance, snail breeding started as far back as the beginning of the 20th century (Ayodele and Asimalowo, 1991) and the Romans raised snails on farms and fed them with special herbs to improve their taste and increase overall snail meat availability (Odiabo, 1997). Even today, commercial snail production continues to be an important economic activity in several countries, including Italy and France.

The interest in snail farming around the world stems from its high quality protein and medicinal value. For instance, protein from snail meat is said to be very rich in essential amino acids such as lysine, leucine, arginine and trytophan (Imevbore and Ademosun, 1988), while

being low in sodium, fats and cholesterol (Akinnusi, 1996). Furthermore, the bluish liquid obtained from snail has high iron content and is used for the treatment of anaemia, asthma, hypertension and poor eyesight (Imevbore and Ademosun, 1988). The advantages of snail farming over most other livestock include low capital requirement for its establishment and operation, less demand for professional knowledge, very high fecundity and low mortality, less labour requirement, the animal's noiselessness, and availability of ready domestic and international markets, among others (Akinbile, 2000).

In spite of the potentials and advantages of snail farming, widespread participation in its production by farmers has not been achieved in Nigeria. Much of the snails marketed in Nigeria are collected from the wild. Few farms exist for commercial breeding and production of snail. This is probably attributable to a lack of awareness of the economic potentials of this microlivestock. Using Osun State in south-western Nigeria as a case study, this study aims at generating empirical information on the profitability of snail production. The specific objectives of the study are: (1) to describe the features of snail farming in the area (2) to determine the costs and returns associated with snail production (3) to ascertain the factors affecting profitability of snail production and (4) to derive policy implications from the findings of the study.

METHODOLOGY

The study was conducted in Osun State, Nigeria. The State was carved out of the old Oyo State in 1991. It is bounded in the north, by Kwara State and by Ogun and Ondo States in the south. It also shares boundaries with Oyo and Ekiti States in the west and east, respectively. The State is located in the Rain Forest zone and farming is the major economic activity of its people. The major crops grown include cassava, yam, maize, cocoa, kolanut, and sorghum, while the livestock reared are goats, pigs, poultry and to a lesser extent, snails.

The Osun State Agricultural Development Project (OSSADEP) has zoned the State into three, with headquarters at Osogbo, Iwo and Ife-Ijesa. These towns were purposively selected for the study because snail farmers were available in reasonable numbers in the locations. Using a sampling frame of snail farmers obtained from OSSADEP, 20 farmers were randomly selected in each town, bringing the total sample size to 60. Data were collected from the selected farmers between August and October, 2004 in single-visit interviews using a questionnaire. Data were collected on socio-demographic characteristics of the respondents, stock sizes (number of snails reared), initial capital investments, feed input and cost, labour input, sales, farming practices and constraints. Data were collected with respect to one cycle of snail production.

The collected data were analysed using descriptive statistics, farm budgeting and multiple regression procedure. The farm budgeting model, which was used to determine costs and returns of snail farming, is of the form:

$\Pi = TR - VC - FC$ …… (1)

Where: Π = profit, TR = total revenue, VC = variable cost and FC = fixed cost (obtained by depreciating the fixed capital items in snail farming using the straight-line method). The costs and returns were computed for the average snail. To obtain the returns per naira invested in producing a snail, the profit was divided by the total cost.

The multiple regression model used to determine factors affecting snail farming profitability was specified as:

$\Pi = f(AGE, SEX, EDU, SSZ, FAE)$ …… (2)

Where:

Π = profit (□)

AGE = farmer's age (years)

SEX = farmer's sex (male = 1; female = 0)

EDU = farmer's education level (years)

SSZ = stock size (number of snails reared)

FAE = snail farming experience (years)

Equation (2) was estimated in the linear, semi-log and double-log functional forms. Thereafter, the model with the best fit in terms of R^2, significance and appropriate "signing" of the coefficients was chosen for further analysis.

RESULTS AND DISCUSSION

Features of Snail Farming in the Area: The distribution of snail farmers according to stock size (number of snails reared) shown in Table 1, reveals that about 8% of the farmers reared 200 snails or less. However, majority (60%) reared between 201 and 800 snails with only about 17% rearing more than 1,000. The mean number reared was 650, showing that snail farming was largely on small-scale in the area. It was a backyard affair with only 45% practising snail farming as a business. The remaining, as can be seen in Table 1, reared snails mainly to provide protein food for the family (50%) or as a hobby (5%). Further analysis reveals that all the respondents had other major occupations (Table 1) and snail farming was only a minor occupation.

The distribution of the farmers according to sources of snail foundation stocks (juvenile snails) also presented in Table 1, shows that majority (53%) of them purchased young snails from other farmers for rearing, while 33% captured young snails form the wild. Snails usually move about in the night, especially during the rainy season and some farmers take advantage of this to capture them for rearing. Although this is not as reliable as purchasing, it remains quite popular probably because it is less expensive.

The species of snail reared were the *Archachatina marginata* and *Achatina achatina* raised by 68% and 60% of the farmers, respectively. This agrees with Stanislaus *et al*. (1989) who noted

that these are the species found in Nigeria. The *Archachatina marginata* is characterised by bulbous shell with brown stripes and a wide apex. The foot is usually brown to black in colour although white coloured foot has also been observed. The *Achatina achatina*, on the other hand, has a brown shell with conspicuous zigzag streaks and a narrow apex. The foot is usually grey in colour (Akinnusi, 1996). It should be noted that some farmers reared both species together.

Table 1: Features of snail farming in Osun State*

Item	Frequency	Percentage
Stock sizes		
< 200	5	8.33
201 – 400	7	11.67
401 – 600	14	23.33
601 – 800	15	25.00
801 – 1000	9	15.00
> 1000	10	16.67
Species of snail**		
Archachatina marginata	41	68.33
Achatina achatina	36	60.00
Sources of foundation stock		
Purchase	32	53.33
Hunting	20	33.33
Gift	8	13.33
Housing systems		
Baskets	11	18.33
Drums	21	35.00
Used tyres	6	10.00
Constructed pens	22	36.67
Major production motives		
For food	30	50.00
To earn income	27	45.00
As hobby	3	5.00
Primary occupations		
Trading	18	30.00
Civil service	13	21.67
Crop farming	16	26.67
Livestock farming	8	13.33
Others	5	8.33

* N = 60 in all cases; ** Multiple responses
Source: Survey data, 2004

As can be seen in Table 1, the snail housing system varied among the respondents. However, a major proportion (nearly 37%) constructed pens for housing the snails. The pen construction involves fencing an area of land and rearing the snails inside. In other words, it is a semi-intensive system of snail production. Another popular housing system is the drum method, which was reported by 35% of the respondents. The drum is usually filled up to some level with soil and perforated for water drainage. To prevent escape and keep out enemies, the drums are sometimes surrounded with wire nets. Baskets and used tyres are other less important housing systems in the area.

Costs and Returns in Snail Farming: Table 2 shows that variable costs dominated the production cost accounting for 96% of total cost. It further shows that labour was the most costly item, constituting about 64% of the total cost. The proportion of cost attributable to feed was relatively low. This is in contrast to other categories of livestock (e.g poultry) where feed is usually identified as the most costly item. This difference could be accounted for by the fact that most respondents fed snails with vegetative materials (such as papaw leaves and peels as well as cassava leaves) obtained directly from their farms and backyards. These materials were not directly costed but the labour used in obtaining them was, and this further contributed to the high cost of labour.

The low fixed costs, as shown in Table 2, could be attributed to the relatively low fixed capital investment in snail farming in the area. The low fixed capital investment, in turn, shows that snail farming could be undertaken with little capital as pointed out by Akinbile (2000).

Table 2 also shows that an average profit of □40.84/snail was obtained by the respondents. This indicates a return of □1.39 per naira invested. This exceeds by far, the returns reported for other categories of livestock such as poultry. For instance, a return of □0.59 per naira invested was reported for table egg production in Abia State, Nigeria (Njoku and Adaeze, 2003). Similarly, Sanni and Ogundipe (2003) reported returns per naira invested ranging from □0.12 – □0.75 for egg production in northern Nigeria. The relatively high return to snail production is an indication of high demand for snail meat in the study area. Therefore, there seems to be ready market for snails in the area. In fact, the high demand for snails in the study area is a reflection of the situation at the national level where demand is said to outstrip supply (Kehinde *et al*., 2002).

Table 2: Costs and returns of one cycle of snail production

Item	Cost/return (□/snail)	% of total cost
Variable costs		
Feed	7.23	24.68
Calcium supplement	2.24	7.65
Labour	18.71	63.86
Total Variable cost	28.18	96.18
Fixed costs		
Depreciation on housing structure	0.78	2.66
Depreciation on watering can	0.24	0.82
Depreciation on feeder	0.10	0.34
Total fixed cost	1.12	3.82
Total cost	29.30	100
Total revenue	70.14	
Profit	40.84	

Source: Survey data, 2004

Factors Affecting Snail Farming Profitability: Out of the three models estimated, the linear function was chosen as the lead equation because it gave the best fit. The adjusted R^2 in Table 3 shows that about 89% of the variation in profit was explained by variation in the socio-economic variables included in the model. The high explanatory power of the variables is further confirmed by the highly significant ($P<0.01$) F-value. The results in the table further show that all the explanatory variables, except age, had positive relationships with profit. However, only the coefficient with respect to stock size was statistically significant, suggesting that profit in the area was largely determined by this variable. Hence snail farmers in the area could substantially increase profits by increasing their farm sizes. In fact, an increase in stock size by one snail, other factors remaining constant, would increase profit by about 40.

Table 3: Results of linear regression on socio-economic factors affecting snail farming profitability

Variable	Coefficient	T-value	
Intercept	-4831.60	-0.94^{ns}	
Age	-33.31	-0.28^{ns}	
Sex	1557.56	0.76^{ns}	
Education level	503.39	0.50^{ns}	
Stock size	40.04	14.96^{***}	
Farming experience	676.67	1.28^{ns}	
R^2			0.8968
Adjusted R^2			0.8872
F – value			93.83^{***}

*** = significant at $P<0.01$; ^{ns} = not significant

Source: Survey data, 2004

Presently, farmers in the area operate on small-scale basis. This does not only deny them the opportunity of obtaining higher incomes, but also the possibility of substantially increasing the availability of snails to consumers, in order to narrow the supply-demand gap. Operating on a larger scale could even reduce the unit production cost as a result of scale economies that farmers could enjoy.

Problems Faced by Snail Farmers: The distribution of farmers according to problems encountered in Table 4 shows that slow growth of snails was the most important problem. The farmers complained that unlike poultry, snails took too long (sometimes up to six months) to reach table size. The next most important problem was lack of adequate funds for investment in snail farming. None of the farmers indicated obtaining credit for snail farming. A major proportion of the farmers also indicated price fluctuation as a problem. According to the farmers, prices are usually low during the rainy season when snails are available for hunting in the wild, but rise sharply in the dry season. Many respondents also reported high snail mortality as a major problem. This seems to contradict the notion that mortality is low in snail production (Akinbile, 2000). But perhaps farmers have not provided the optimum environment for the survival and development of the snails. Other less important problems include theft, feed shortage and low demand for the product.

Table 4: Distribution of snail farmers according to major problems in snail farming

Problem	Frequency	Percentage
High mortality	32	53.33
Slow growth	58	96.67
Theft	15	25.00
Low demand for snail	2	3.33
Price fluctuation	40	66.67
Feed shortage	9	15.00
Lack of funds	57	95.00

Conclusion and Policy Implications

The study has shown that snail farming in the area was carried out on small-scale with many farmers producing for home consumption or as a hobby. Nevertheless, snail farming was highly profitable. Given this finding, it could be concluded that snail farming has the potential for increasing farm incomes. The most important determinant of snail farming profitability was stock size. This implies that farmers stand to earn even more profit if they increase their sizes of holding. There is the need, therefore, for extension services providers in the area to encourage existing snail producers to increase stock sizes by demonstrating the profits that

farmers could earn through such expansion. Such efforts may even encourage more people in the area to engage in snail farming which would further increase overall production.

To alleviate the problem of slow growth of snails reported by most farmers, there is the need for research on the feed types and feed levels that would promote fast growth at minimum cost. Research attention is also needed in order to breed snails with high genetic potentials in terms of growth rate, disease resistance and other desirable traits. Furthermore, to minimise the problem of high mortality, snail farmers should be trained on how to provide the most suitable environment for snails and on appropriate medications. Snail farmers also require easy access to credit in order to solve the problem of shortage of funds reported. Such credit would particularly enable farmers to increase their stock sizes, which is necessary for higher profit and production levels. Farmers could address the problem of price fluctuation if they explore markets outside the area, including the possibility of exporting snail meat which has a good international market. To achieve this, farmers need to form associations which could assist them in marketing their produce domestically and/or internationally.

REFERENCES

Akinbile, S.M. (2000). *Teach Yourself Farming (Snail Rearing)*. 2nd edition. Ikire: Erodise Ventures. Pp.1-14.

Akinnusi, O. (1996). "Developing microlivestock potential for increased animal protein supply". Invited paper presented at the 21st Annual Conference of the Nigerian Society for Animal Production (NSAP), Uyo, Akwa Ibom State, Nigeria, 24th – 28th March.

Ayodele, I.A. and A.A. Asimalowo (1991). *Essentials of Snail Farming*. Ibadan: Lovemost Publications. Pp.33-37.

Imevbore, E.A. and A.A. Ademosun (1988). "The nutritive value of the African Giant Snail, *Archachatina marginata"*. *J. Animal Production Research*, 8(2): 76-87.

Kehinde, A.S., O. Adebayo, J.M. Usman, S.E. Odidi and O. Akinyemi (2002). "Effects of the incorporation of cassava and papaw plant parts in the ration of growing snails (*Archachatina marginata*)". In: Famino, A.O. and J.A. Olanike (eds) *Contributory Role of Animal Production in National Development*. Proceedings of the 7th Annual Conference of Animal Science Association of Nigeria. Pp.281-284.

Njoku, M-S. and E. Adaeze (2003). "Profitability and market structure analysis for table eggs production and marketing in Abia State, Nigeria". In: Taiwo, A.A., A.M. Raji, J.U. Ogbonna and E.A. Adebowale (eds) *Nigerian Livestock: A Goldmine for Economic Growth and Food Security*. Proceedings of the 28th Annual Conference of the Nigerian Society for Animal Production. Pp.413-415.

Odiabo, A.B. (1997). *Snail and Snail Farming*. Port Harcourt: Stirling Horden Publishers. Pp.79-80.

Olayide, S.O. and E.O. Heady (1981). *Introduction to Agricultural Production Economics*. Ibadan: University Press Ltd. Pp.80-89.

Sanni, S.A. and S.O. Ogundipe (2003). "Economics of four modules of poultry production in Northern Nigeria". In: Taiwo, A.A., A.M. Raji, J.U. Ogbonna and E.A. Adebowale (eds) *Nigerian Livestock: A Goldmine for Economic Growth and Food Security*. Proceedings of the 28th Annual Conference of the Nigerian Society for Animal Production. Pp.436-439.

Stanislaus, V.K., M. Gustan, J.P. Kurt and W. Eki (1989). "Opportunities for utilizing the African Giant Snail". *Animal Resource, 29: 60-71*.

Usman, J.S., A.S. Kehinde, M.O. Ojo, O. Akinyemi and O. Adebayo (2003). "Some aspects of marketing grasscutter (*Thryonomy swinderianus*)". In: Taiwo, A.A., A.M. Raji, J.U.

Ogbonna and E.A. Adebowale (eds) *Nigerian Livestock: A Goldmine for Economic Growth and Food Security*. Proceedings of the 28th Annual Conference of the Nigerian Society for Animal Production. Pp.411-412.