



Skills Required by Snail Farmers for Increase Protein Production in Enugu State

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Abstract

The general purpose of the study was to determine the skills required by snail farmers for increase protein production in Enugu State. Three research questions and three null hypotheses guided the study. The study was carried out in Enugu State using a descriptive survey research design. The population for the study was 310 respondents, comprising 180 registered snail farmers and 130 agricultural extension workers in the six agricultural zones in Enugu State. There was no sampling because the population was manageable. The instrument used for data collection was a 30 item structured questionnaire developed by the researcher. The instrument was structured using a four point rating scale for data collection and was validated by three experts. Cronbach Alpha was used to determine the liability coefficient and the overall coefficient was 0.81 indicating that the instrument was reliable for use in data collection. Out of 310 copies of the questionnaire distributed, 308 copies were properly filled and used for the study representing 98.6% return rate. Mean and standard deviation were used to answer the research questions and t-test was used to test the null hypothesis at .5 level of significance at 308 degree of freedom. The result revealed that all the items under site selection, stocking and feed management skills are required by snail farmers for increase protein production in Enugu State. The study therefore, concludes that the identified skills in site selection, stocking and feed management should be used to equip farmers in snail rearing for increase protein production. Based on the findings, the following recommendations among others were made: workshops/ seminars on snail rearing skills should be organized for snail farmers for increase protein production in Enugu State and agricultural extension workers should utilize the identified snail rearing skills in the extension services to snail farmers in Enugu State.

Keywords Protein Production; Enugu State; Snail Farmers; Feed Management

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Introduction

Human population and related environmental factors exert fundamental influences on resources of the earth. High rate of population growth characterizes almost every country in sub-Saharan Africa. This creates an urgent need for increased food production especially in protein source, because of the vital role it plays in human diet. Inadequate protein supply is felt more in the tropical regions of the world, including Nigeria (Okoye, 2015). In order to satisfy this protein need, two main sources, via plants and animals readily come to mind. Plant protein is deficient in certain essential amino-acids, notably Methionine, tryptophan and lysine which are necessary for healthy growth (Nnoka and Ndupu, 2018). In contrast, animal protein which is obtained from fish, livestock and wild animals (bush meat) is rich in these amino-acids, hence its being described as first class protein (Moses, 2013).

In Nigeria, particularly Enugu State, protein obtained from livestock (cattle, sheep, goat, poultry, pig) and bush meat is generally expensive, probably due to high level of skills, poor management, pest infestation, among others. In view of this, Nnoka and Ndupu (2018) affirmed that live adult goat, sheep and pig are sold at ₦60,000, ₦70,000 and ₦80,000.00 respectively, whereas broiler, rabbit and cow cost ₦8,000.00, ₦5,000.00 and ₦200,000 respectively, except for fish which was noted by Ezeja (2015), to be moderately cheap and affordable but could not solve the problem of acute protein shortage of the people of Enugu state. Based on this fact, the habitant of Enugu state need more protein source. It was the need for good quality but cheap sources of animal protein as a measure to bridge the gap between protein demand and supply in the state that led to increased demand and consumption of snail meat. Okoye (2015) noted that snail is highly untapped protein source in Enugu state, particularly in Enugu urban. The population of snail in the wild is high and should not be wasted.

Snails are animals that consist of shell and soft body found usually in many forest. In Nigeria, particularly Enugu state, snails are usually combed and picked from the wild forest. Snails are found more in southern forest belts especially during the rainy season because of the natural environment further enhanced by the rains that favours their existence. Wosu (2019) noted that southern forest belts are characterized by prolonged wet season, high relative humidity, damp environment and thick vegetation, all providing suitable habitat for snail production. Joshua, Torunana and Chude (2016) noted that species of snail which abound in Africa, include the African giant land snail (*Achatinaachatina*), *Achatinfulica* and *Archchatinamarginata*. They are more dominate in the southern forest zones because they are more hardy with high adaptability/survival capacity. The three species have more fleshier and are highly prolific (Akinyemi, Ojoand Akintomide 2013). Two of these species are less preferred because of their changing flesh colour and textures during processing which affects taste while *Archchatinamarginata* is not beset with these short falls and is the most numerous of the edible land snails in the southern Nigeria, hence Nnoka and Ndupu (2018) advised farmers to rear it in preference to other species. Most snail farmers in Enugu state therefore rear the *Archchatinamarginata* because the meats have a good market value and table preference.

However, the nutritional and therapeutic values of snail meat are high and should be harnessed for human benefits in the face of the acute shortages of protein food from other animal sources (Okoye, 2018). Ezeja (2015) noted that snails are considered as a natural and dietary therapy. Ezeja (2015) highlighted that *Achatinaachatina* can be used to treat hypertension, conductivities, Iron deficiency and anaemia. The orthocalcium phosphate and slimming mucus secretion from snails are used as therapy for kidney diseases, tuberculosis, rashes, swells, burns, insect bites, heart palpitation and whooping cough. The shells are used in compounding livestock feeds, as well as in making earring, badges, toys, whistles, necklaces, bracelets and home decorations. Nowadays, sales of snail meat, shells and greenish liquid contained in snail earns income to farmers (Ezeja, 2015).

According to Abowei and Sikoki (2017), snails are fast becoming an endangered species in Enugu state, occasioned by the increasing encroachment in the natural habitat due to development projects such as roads, housing estates, towns, and bush burning. Consequently, giant land snails are becoming less available and, therefore, more costly in Enugu. Also, Otobo (2014), commented that snail meat was once popular and cheap animal protein source but recently the price has become unaffordable for low income earners. Otobo (2014), warned that if no special concern and interest are shown on how to farm snails they may no longer be available to the point of extinction in near future. The farmers need to work closely with the extension workers who visit them regularly to expose the required skills to be used for increase production.

Skills as described by Ifeanyi Eze (2016), is the ability of doing something well. Ifeanyi Eze stressed that skills is the ability to carry out a task in an acceptable way, especially when gained through training or experience. Any person that is productive in a given work is skilled because such a person is believed to have acquired the skills of performing the task in an acceptable manner. Skills in the context of this study is the ability of the farmer to utilize required activities for site selection, stocking of snail and feed management to increase protein production.

Production was defined by Aneke (2015) as the use of factors of production such as land, capital, labour and management to produce output needed to satisfy consumers. Iwena (2018) described production as the process of changing or transforming input into output (useful product). This study defined production as the use of relevant factors such as land, labour, capital and management to transform young or small snail into matured and edible ones. Production would be experienced when the required skills are utilized by farmers in snail farming for increased production. The skills involved in snail farming could be taught to farmers by extension workers who are trained to expose and educate farmers in the farming skills. Extension workers were described by Aneke (2015) as personnels who are specifically trained to teach farmers modern skills in all farming aspect including in snail production. The extension workers are expected to teach farmers various skills such as site selection, stocking of snail, feed management, pest and disease control among others. For instance, snails can be kept almost anywhere in dark shaded quiet cool corners in the field or in family compound that is properly fenced. The requirements for an ideal snails site include a fairly high but gentle slope land that is not water-logged, a loose damp earthworm inoculated and organic matter or humus rich soil that is dressed with calcium carbonate and a regulated PH of 7.5. Ezeja (2015) maintained that snail multiply more under humid environment, especially during the rainy season. The area should be free from pests and diseases (Okoye, 2015). These site selection requirements are necessary for easy stocking.

Stocking is the process of getting snail into pen. Proper stocking enables the juvenile (small one) to grow rapidly for the first six months with good management and can survive the first 5-10 days without food (Nnoka & Ndupu 2018). They highlighted some of the stocking skills to include: select breeding stock from reputable farms, source breeding stock from wild (forest), select medium sized snails free from diseases, select properly formed snail, introduce snail to farms in the morning/evening, Quarantine snails for 7-14 days before stocking, wash snails with clean untreated water before stocking among others. Iwena (2018) noted that high stocking affects the growth and survival of young snails, so the lower the stocking density, the higher the survival rate and larger the size. The pen should be correctly stocked to ease management.

For effective feed management, the snails should be weighed and their number noted before feeding preferably at night and during the day. Availability of water affects the growth and distribution of land snail. Availability of quantitative and qualitative feed is a prerequisite for snail farming. If well feed with balanced diets such as ripe banana fruits, paw-paw leaves, bush beans, cassava and yam peels, among others. Snails can reach weight of about 200g under favourable condition in about 2 years. If snails farmers are exposed to all these relevant skills such as site selection, stocking and feed management skills, there will be increase in protein production

Statement of the Problem

One of the agricultural objectives is to increase food supply for the populace, especially protein which is required for growth, body nourishment and in replenishing the worn-out tissue. Inadequate protein will likely lead to malnutrition and can cause death especially in little children and pregnant women. For instance, FAO (2015) noted that there is shortage of protein in Africa of which Enugu state is one of the state located in Africa. Protein could be sourced from plants and animals of which snail is one of such sources. The demand for snail in Enugu state is higher than the supply. This made many farmers to go into snail rearing but unfortunately, the outputs of these farmers are low and could not meet up with demand of the populace. This might be as a result of the farmers not having and employing the required skills, that could boost production. If these farmers do not apply the required skills to enhance production, the supply of snail which is highly demanded by the populace, could not be met, and there will be decrease in protein source. Therefore, these calls for the need to expose farmers to skills required in snail farming for increase protein production in Enugu state.

Purpose of the Study

The main purpose of this study was to determine the skills required by snail farmers for increase protein production in Enugu state. Specifically, the study sought to determine:

1. Site selection skills required by snail farmers for increase protein production in Enugu state.
2. Stocking skills required by snail farmers for increase protein production in Enugu state.
3. Feed management skills required by snail farmers for increase protein production in Enugu state.

Research Questions

The following research questions guided the study:

1. What are the site selection skills required by snail farmers for increased protein production in Enugu state?
2. What are the snail stocking skills required by snail farmers for increased protein production in Enugu state?
3. What are the feed management skills required by snail farmers for increased protein production in Enugu state?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. H₀₁: There is no significant difference between the mean scores of extension workers and snail farmers on site selection skills required by snail farmers for increase protein production in Enugu state.
2. H₀₂: There is no significant difference between the mean scores of extension workers and snail farmers on stocking skills required by snail farmers for increased protein production in Enugu state.
3. H₀₃: There is no significant difference between the mean scores of extension workers and snail farmers on feed management skills required by snail farmers for increased protein production in Enugu state.

Research Method

The study adopted a descriptive survey research design which is a design in which generalization is made over the entire population based on analysis of data collected from a sample deemed to be representative of the population. The design was based on the observation of Nwana (2014) who stated that the descriptive survey research design promotes the collection of original data as it seeks information directly from respondents, describes condition as they exist in their natural setting. The study was conducted in Enugu state. Enugu state is made up of six agricultural zones which include Agbani, Agwu, Enugu, Enugu-Ezike, Obollo-Afor and Udi zones. The study covered the six agricultural zones in Enugu state.

The population for the study was 310 respondents made up of 180 registered snail farmers and 130 agricultural extension workers in the six agricultural zones of Enugu state. (State Ministry of Agriculture and National Resources Statistic Unit, 2023). The entire population was used for the study because the population size was manageable

A structured questionnaire developed by the researcher was used for data collection. The questionnaire contained a total of 30 structured skills item generated from an extensive review of literature and information from snail farmers. Each skills item had four point response scale of strongly Agree (SA), Agree(A), Disagree(D) and strongly Disagree (SD) with numerical values of 4,3,2 and 1 respectively. The instrument was subjected to validation by three experts. Two from the Department of technology and Vocational Education and one from Measurement and Evaluation option in the Department of Computer and Mathematics Education both in Faculty of Education, Enugu State University of Science and Technology. The reliability of the instrument was determined using Cronbach Alpha and reliability co-efficient of .76, .80, .87 were obtained for each of the 3 sections of the instrument respectively and the overall reliability was 0.81

A total of 310 copies of the questionnaire were administered to the respondents with the help of three research assistants who was properly briefed on the content of the questionnaire and its administration to ensure that the questionnaire was properly administered, filled and retrieved. Out of 310 copies of the questionnaire distributed, 308 copies were properly filled, 2 copies were not properly filled and was discarded. It was these 308 properly filled questionnaires that were used for data analysis representing 98.6% return rate. The data collected were analyzed using mean with standard deviation. The Mean was used to answer the research question while standard deviation was used to check the closeness of their responses. T-test was used to test the null hypotheses at .05 level of

significant and at the appropriate degree of freedom. The decision rule was based on the principle of real limits of the Mean, thus

Strongly Agree (SA) 3.50 - 4.00

Agree (A) 2.50 – 3.49

Disagree (D) 1.50 – 2.49

Strongly Disagree (SD) 1.00 -1.49

The null hypotheses were significant where the probability value was less than .05 significant level at appropriate degree of freedom. Otherwise, the null hypotheses was not significant and not rejected

Results

Research Question 1:

What are the site selection skills required by snail farmers for increased protein production in Enugu State?

Table 1:

Mean scores with standard deviation of respondents on site selection skills required by snail farmers for increased protein production.

S/ N	Site selection skills required by farmers include abilities to:	Agricultural extension workers N= 128			Snail farmers agents N= 180		
		X ₁	SD ₁	Decision	X ₂	SD ₂	Decision
1	Select quite shady well-drained leeward site	3.60	0.95	SA	3.62	0.87	SA
2	Select humid areas	3.54	0.85	SA	3.64	0.93	SA
3	Select soil which has high organic matter content	3.58	0.86	SA	3.77	0.55	SA
4	Select damp areas that are not water-logged	3.62	0.68	SA	3.51	0.70	SA
5	Select soil that has good moisture	3.62	0.71	SA	3.58	0.71	SA
6	Select a site that should have at least 11-12 hours of photo period	3.81	0.82	SA	3.73	0.97	SA
7	Select a soil with high calcium content and low in acidity	2.76	0.92	A	2.54	0.71	A
8	Select site that has trees which forms canopy for shades	3.74	0.92	SA	3.52	0.80	SA
9	Select a site where snail could find handout	3.89	0.83	SA	3.80	0.16	SA
10	Select a site with temperature range of 24-31 ^o c	3.67	0.75	SA	3.71	0.86	SA
Grand Mean		3.60	0.80	SA	3.46	0.75	SA

NOTE: X = Mean, SD = Standard Deviation, SA = Strongly Agree

The analysis of data presented in Table 1 above revealed that items 1,2,3,4,5,6,8, and 9 had Mean ranging from 3.54 to 3.89 for extension workers and 3.51 to 3.80 for farmers. This shows that extension workers and farmers strongly agreed to all the skills necessary for snail production. Item 7 had mean score of 2.76 for extension workers and 2.54 for farmers which indicate that the skill was Agreed by the two group as required for snail production. The standard deviations ranged from 0.54-0.95 a grand Mean of 3.60 for extension workers, and 0.55-0.97 for farmers, with a grand mean of 3.46. These values show that the respondents were homogenous in their opinion

Hypothesis 1

There is no significant difference between the mean scores of agricultural extension workers and farmers' on-site selection skills required by snail farmers for increased protein production in Enugu state.

Table 2:

Summary of t-test analysis on the mean scores of agricultural extension workers and farmers on site selection skills required by snail farmers for increased protein production

Group	N	Mean	SD	df	t-cal	Decision
extension workers	128	3.60	0.80	308	0.50	Not significant
Snail Farmers	180	3.56	0.77			

The result of the t-test analysis in Table 2 shows that the calculated t-value of 0.50 was less than the critical value of 1.96 at the appropriate degree of freedom. The null hypothesis was not rejected. Therefore, there is no significant difference between the mean scores of agricultural extension workers and farmers on site selection skills required by snail farmers for increased protein production

Research Question 2

What are the snail stocking skills required by snail farmers for increased protein production in Enugu state?

Table 3

Mean scores of respondents on snail Stocking skills required by snail Farmer for increased protein production

S/N	Stocking snail skills required by snail farmers include abilities to:	Agricultural extension workers N= 128			Snail farmers N= 180		
		X ₁	SD ₁	Decision	X ₂	SD ₂	Decision
11	Select breeding stock from reputable farms	3.84	0.85	SA	3.91	0.89	SA
12	Source breeding stock from wild (forest)	3.77	0.88	SA	3.62	0.88	SA
13	Select medium seized sore free snails for stocking	3.29	0.78	A	3.26	0.75	A
14	Select properly formed snail for stocking	3.27	0.74	A	2.95	0.81	A
15	Select sling, shell filled foot with fragile shell edible	2.97	0.73	A	3.32	0.94	A
16	Select the same species for stocking	2.94	0.86	A	3.21	0.71	A
17	Introduce snail to farm in the morning/evening	3.65	0.94	SA	3.52	0.96	SA
18	Purge snail on corn meal after stocking	3.61	0.80	SA	3.66	0.77	SA
19	Quarantine snails 7-14 days before stocking	3.72	0.83	SA	3.70	0.83	SA
20	Select common / edible species that will attract good market price	3.87	0.92	SA	3.64	0.88	SA
Grand Mean		3.51	0.83	SA	3.51	0.87	SA

The analysis of data presented in Table 3 above shows that items 11,12,17,18,19 and 20 had Mean ranged from 3.61 to 3.87 for Extension workers and 3.52 to 3.91 for snail farmers. This indicated that they were strongly Agreed by the respondents as skills required by farmers for stocking of snails for increased protein production. Items 13, 14, 15 and 16 had Mean ranged from 2.94 to 3.29 for Extension workers and 2.95 to 3.26 for farmers respectively, indicating that the skills in the items were agreed by farmers as skills necessary for stocking of snails. Standard deviation ranged

from 0.73 to 0.94 and 0.71 to 0.96 for farmers with grand Mean of 3.51. This showed that all the respondent were not far from one another in their opinion

Hypothesis 2:

There is no significant difference between the mean scores of agricultural extension agents and farmers on snail stocking skills required by snail farmers for increased protein production.

Table 4: T-test analysis of mean scores of agricultural extension agents and farmers on the snail stocking skills required by farmers for increased protein production

Group	N	Mean	SD	df	t-cal	t-crit	Decision
Extension Agents	128	3.51	0.83	308	0.00	1.96	Not significant
Farmers	180	3.51	0.87				

The result in Table 4 above shows that the calculated t-value 0.00 was less than the critical value of 1.96 the null hypothesis was not rejected; therefore, there is no significant difference between the mean scores of agricultural extension workers and farmers on snail stocking skills required by farmers for increased protein production in Enugu State.

Research Question 3:

What are the feed management skill required by snail farmers for increased protein production in Enugu State?

Table 5: Mean scores of respondents on feed management skill required by snail farmers for increased protein production in Enugu State.

S/N	Skills required by snail farmers in feed management include abilities to:	Extension workers N = 128			Snail farmers N = 180		
		X ₁	SD ₁	Dec	X ₂	SD ₂	Dec
21	Feed snails using succulent leaves and fruits	3.62	0.96	SA	3.48	0.71	SA
22	Provide energy giving feed for snail	3.50	0.88	SA	3.60	0.68	SA
23	Feed snails with proteineous feed devoid of salt	3.76	0.84	SA	3.57	0.67	SA
24	Feed snails with ripped fruits such as paw-paw, cucumber, tomatoes, mango, watermelon, among others	3.60	0.78	SA	3.71	0.72	SA
25	Feed snails with vitamin source feed from okro, waterleaves, cassava leaves	3.75	0.97	SA	3.52	0.78	SA
26	Feed snails properly in the night	3.62	0.73	SA	3.79	0.90	SA
27	Feed snails in relation to age, size and condition	3.64	0.70	SA	3.56	0.87	SA
28	Use commercial feed to supplement natural feed	3.67	0.76	SA	3.58	0.81	SA
29	Purge snails on corn meal	3.50	0.80	SA	3.77	0.70	SA
30	Supply snails with untreated drinking water adlibidum	3.60	0.92	SA	3.87	0.82	SA
Grand Mean		3.63	0.82	SA	3.65	0.78	SA

NOTE: X=Mean; SD=Standard Deviation; SA=Strongly Agree

Data presented in table 5 above showed that item 21,22,23,24,25,26,27,28,29 and 30 had mean ranged from 3.50 to3.76 for extension agent and 3.48 to 3.87 for farmers. This indicates that the above skills were strongly Agreed by

the respondent as necessary for feed management of snails. The standard deviation ranges from 0.70 to 0.97 and grand Mean of 3.63 for extension workers and 0.67 to 0.90 for farmers with a grand mean of 3.65 these shows that the respondents were not far away from each other in their opinion and that they were close to the Mean

Hypothesis 3

There is no significant difference between the mean score of agricultural extension workers and farmer on feed management skill required by snail farmers for increased protein production

Table 6: T- test analysis of the mean scores of skill required by snail farmers for increased protein production

Group	N	Mean	SD	df	t-cal	t-crit	decision
Extension agents	128	3.63	0.82	308	0.22	1.96	Not significant
Farmers	180	3.65	0.78				

The result in Table 6 shows that the calculated T- value of 0.22 was less than the critical value of 1.96. Therefore, there is no significant difference between the mean scores of agricultural extension workers and farmers on skill required by farmers in feed management for increased protein production in Enugu State. The null hypothesis was rejected.

Discussion of Findings

The findings on site selection skill required by snail farmers for increased protein production revealed that quite shady site, soil which has high organic matter content, damp areas that are not water logged, soil that has good moisture, soil with high calcium content and low in acidity among other are good for snail farming. These findings were in consonance with the report of Ezeja (2015) who noted that appropriate site for snail production include well drained leeward site, damp area that are not waterlogged, cultivation of windbreak and selection of soil with high calcium content. Okoye (2015) supported this by stating that snail farms should be sited in a quite shady site, well drained leeward site, soil with high organic matter content and damp area that are not waterlogged. Moreso, the findings of the study revealed that there was no significance difference in the mean scores of agricultural extension workers and farmers on site selection skills required by farmers for increase protein production, hypothesis was therefore upheld. This implies that the mean scores of agricultural extension workers and snail farmers in Enugu state did not differ significantly.

The findings revealed the following: snail stocking skills required by farmers for increased protein production. Select breeding stock from reputable farms, source breeding stock from wild (forest), select breeding stock from market for stocking, select medium seized sore free snails for stocking, introduce snail to farms in the morning/evening among others. The findings of the study were in line with Okoye (2015) that stocking skills include sourcing breeding stock from wild, purge snail on corn meal after stocking, washing snail with clean untreated water before stocking. This was supported by Otobo (2014) who noted that the lower the stocking density the higher the survival rate and larger the snail size. Otobo (2014) as well noted that proper stocking enables the juvenile (small one) to grow rapidly for the first six months with good management and can survive the first 5-10 days without food. Otobo therefore pointed out that higher stocking density exert its effects on the frequency of mating and laying, number of eggs laid per clutch, hatchability, growth and survival of young snails. This implies that the identified stocking skills need to be acquired by snail farmers for increase protein production. The findings showed that there was no significant difference in the mean scores of the respondents. This means that the responses of agricultural extension workers had no influence on the identified stocking skills for snail production required by farmers for increase protein production. Therefore, the identified stocking skills for snail production are highly required by snail farmers to increase protein production in the state of Enugu.

The findings of the study revealed the following as feed management skills required by snail farmers for increased protein production: provide energy giving feed, feed snails with proteineous feed devoid salt, feed snails with ripped fruits such as mango, pawpaw, cucumber, ripped tomatoes, water melon, purge snails on corn meals among others. The findings of the study were in line with Ezeja (2015), who noted that feed management skills for snail production include., feed snails using succulent leaves and fruits, provide energy giving feed for snail, feed snails properly in the night, feed snails with ripped fruits such as mango, pawpaw, cucumber, water melon among others. Moreover, the findings of the study revealed that there was no significant difference on the mean scores of the respondents on feed management skills required by farmers for increased protein production in Enugu state. The implication of the finding was that the status of extension workers and farmers had no significant influence on the identified feed management skills required by farmers for increased protein production.

Conclusion

Based on the findings of the study, It was concluded that snail farming has been observed as one of the skill areas that could provide employment opportunity to the youths. Farmers in Enugu state should be encouraged to receive further training in snail rearing. The study therefore identified three areas such as site selection, stocking of snails and feed management skills which could be used to equip farmers in snail rearing for increase protein production. The snail farmers need to be empowered through exposing them to seminars, workshops to acquaint them with snail rearing skills.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Snail rearing skills identified in this study should be integrated into livestock farming such as cattle, piggery and goat farmers.
2. Workshops/seminars on snail rearing skills should be organized for snail farmers for increase protein production in Enugu state.
3. The agricultural extension workers should utilize the identified snail-rearing skills in the extension services for snail farmers in Enugu state.
4. The government should equip extension workers with facilities to reach farmers and educate them to attract more farmers in snail farming.

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