

Smart Snail-Production Skills Required by Agricultural Science Education Students for Self-Reliance and Economic Development in Niger Delta University, Bayelsa State

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<https://doi.org/10.56201/ijaes.vol.12.no9.2026.pg147.161>

Abstract

The study examined the smart snail-production skills required by Agricultural Science Education students for self-reliance and economic development in Niger Delta University, Bayelsa State. Specifically, it focused on three objectives, research questions and hypotheses. An analytic descriptive survey research design was adopted. The population comprised 63 Agricultural Science Education students and the entire population of 63 was used as the sample of the study, consisting of 28 students in 300 level and 35 students in 400 level, using the census sampling technique. Data were collected using the Smart Snail Production Skills for Self-Reliance and Economic Development Questionnaire, which contained 18 items and yielded an overall Cronbach's alpha reliability coefficient of 0.82. Out of the 63 questionnaires administered, 59 were retrieved and used for analysis, representing approximately 94%. Mean and standard deviation were used to answer the research questions, while independent-samples t-test was used to test the hypotheses. The findings revealed that smart housing, automated feeding and digital breeding skills were required to high extents, with grand means of 3.23, 3.26 and 3.20 respectively. The hypotheses showed no significant differences between the responses of 300 and 400 level students, as the p-values of .530, .545 and .523 exceeded 0.05. The study concluded that these smart production skills were essential for students' self-reliance and economic development. It recommended that the university provide practical facilities and integrate smart housing, automated feeding and digital breeding technologies into Agricultural Science Education training.

Keywords: smart snail production, smart housing, automated feeding, digital breeding, self-reliance, economic development

Introduction

Agricultural science education is expected to provide learners with scientific knowledge, practical competence and entrepreneurial capacity for productive participation in modern agriculture. This responsibility has become more important as conventional farming systems are increasingly being transformed by sensors, automation, and digital record-keeping and data-supported management.

Agricultural education students therefore require competencies that enable them to move beyond theoretical knowledge and establish viable enterprises after graduation. Studies have shown that integrating entrepreneurial and digital skills into tertiary education can improve students' preparedness for self-employment, innovation and participation in competitive agricultural value chains (Okoro, 2021; Adeyanju et al., 2023). This transformation brings smart snail production into focus. Smart snail production represents the application of appropriate digital, automated and environmentally responsive technologies to the breeding, feeding, housing and general management of snails. It combines the biological requirements of snail farming with technologies that support environmental monitoring, timely decision-making, efficient resource utilization and accurate production records. Snail farming is particularly suitable for small-scale entrepreneurship because it can be undertaken with relatively modest land, labour and capital requirements, while producing meat and other commercially valuable products. Evidence from commercial snail enterprises has also shown that housing systems, equipment, nutrition, reproductive management and environmental conditions influence production and income (Freeman, 2013; Apostolou et al., 2021). Its operational foundation is smart housing.

As the operational foundation, smart housing skill involves the ability to design, construct and manage snail enclosures with technologies that regulate or monitor temperature, humidity, soil moisture, ventilation, lighting, drainage and security. Snails are highly sensitive to environmental changes, particularly excessive heat, inadequate humidity, strong wind and unsuitable soil conditions. Students should therefore be able to select appropriate sites, construct escape-proof pens, install temperature and humidity sensors, operate automated misting systems, maintain suitable soil conditions and protect snails from predators. Research on commercial snail farms has identified temperature sensors, humidity sensors, cooling facilities, cages and protective structures as important production equipment, while precision livestock technologies generally support continuous environmental monitoring and improved farm management (Chinaka & Wilson, 1995; Apostolou et al., 2021; Papakonstantinou et al., 2024). Once the habitat is stabilized, feeding becomes the next concern. From a stable housing environment, automated feeding skill concerns the ability to plan, measure, schedule, dispense and monitor feed and water through appropriate technological systems. Snails require carbohydrates for energy, protein for growth, calcium for shell formation and adequate water for metabolic and reproductive activities. Automated feeding may involve programmable dispensers, timed feeding schedules, moisture-sensitive water supply systems, digital feed records and devices for monitoring feed consumption. Such systems can reduce irregular feeding, minimize waste and ensure that feed is supplied at periods that correspond with the nocturnal feeding behaviour of snails. Smart livestock technologies have similarly been associated with precision feeding, resource efficiency, reduced labour requirements and improved production management (Freeman, 2013; Dayoub et al., 2024; Losacco et al., 2025). Efficient feeding, in turn, supports deliberate breeding decisions.

Building on efficient feeding, digital breeding skill involves the use of electronic records, mobile applications, digital identification systems and data-analysis tools to select breeding stock and monitor reproductive performance. Students require the ability to record breeders' weight, shell strength, growth rate, mating period, egg production, hatchability, survival rate and maturity. These records can guide the selection of fast-growing and healthy parent stock and support the separation of breeders, eggs, hatchlings and growers according to their production requirements. Snail-farming guidance identifies fecundity, hatchability, establishment rate, growth rate and shell strength as important breeding-selection indicators, while contemporary digital livestock systems

can improve reproductive monitoring and support data-based selection decisions (Freeman, 2013; Losacco et al., 2025). Together, these competencies form a pathway to self-reliance.

As a pathway to self-reliance, the combined acquisition of smart housing, automated feeding and digital breeding skills can enable students to establish, manage and expand snail-production enterprises. Self-reliance involves an individual's capacity to apply acquired knowledge and skills to generate legitimate income, meet personal needs and reduce dependence on scarce salaried employment. Snail production can contribute to this objective through the sale of live snails, processed meat, breeding stock, eggs, shells, slime and organic manure. Human capital theory also suggests that investment in relevant knowledge and practical competence improves productivity and economic outcomes, while agripreneurship programmes demonstrate that technical, digital and business training can strengthen youth participation in agricultural enterprises (Becker, 1993; Food and Agriculture Organization, 2026). The issue becomes particularly important in Niger Delta University. In Niger Delta University, this need is particularly important because Agricultural Science Education students are being prepared to teach agriculture, manage production activities and contribute to community development. Exposure to smart snail-production skills could provide these students with a manageable enterprise option while also improving their capacity to demonstrate modern agricultural practices to future learners. Nevertheless, the extent to which smart housing, automated feeding and digital breeding skills are required by the students has not been empirically established in Niger Delta University.

It is against this background, this study investigated the Smart snail production skills required by agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State.

Statement of the Problem

Agricultural Science Education students are expected to acquire practical and entrepreneurial skills that will enable them to establish agricultural enterprises, generate income and contribute to economic development after graduation. Snail production presents an enterprise opportunity that can be undertaken with relatively limited space and resources. However, successful contemporary snail production requires more than conventional knowledge of pen construction, manual feeding and natural breeding. The increasing application of smart technologies in animal production has introduced environmental sensors, automated feeding devices, mobile applications and digital production records. Despite these developments, Agricultural Science Education students may complete their programmes without adequate competence in designing smart snail housing, operating automated feeding systems or using digital tools to manage breeding activities. Such a skills gap could restrict their capacity to establish efficient snail enterprises and become self-reliant. Although studies have examined entrepreneurial skills, agricultural technologies and conventional snail-production practices, limited evidence exists on the smart snail-production skills required by Agricultural Science Education students in Niger Delta University. It has therefore become necessary to determine the extent to which smart housing, automated feeding and digital breeding skills are required by agricultural science students for self-reliance and economic development.

Objective of the Study

The main objective of the study was to examine the Smart snail production skills required by agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State. Specifically, the study determined the extent:

1. Smart housing skill is required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State
2. Automated feeding skill is required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State
3. Digital breeding skill is required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State

Research Questions

The following research questions guided the study

1. To what extent is Smart housing skill required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State
2. To what extent is Automated feeding skill is required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State
3. To what extent is Digital breeding skill is required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State

Hypotheses

The following hypotheses were tested at 0.05 level of significance

1. There is no significant difference in the mean response of 300 and 400 level agricultural science education students on the extent Smart housing skill is required for self-reliance and economic development in Niger Delta University, Bayelsa State
2. There is no significant difference in the mean response of 300 and 400 level agricultural science education students on the extent Automated feeding skill is required for self-reliance and economic development in Niger Delta University, Bayelsa State
3. There is no significant difference in the mean response of 300 and 400 level agricultural science education students on the extent Digital breeding skill is required for self-reliance and economic development in Niger Delta University, Bayelsa State

Literature Review

Concept of Smart Snail Production Skills

Smart snail-production skills refer to the practical, technological, managerial and entrepreneurial abilities required to apply digital and automated systems to snail farming. They involve the capacity to monitor the production environment, control routine operations, collect production data and use the information generated to make appropriate decisions. Smart production does not necessarily eliminate human involvement; rather, it assists the farmer in carrying out production activities more accurately, consistently and efficiently.

The application of smart technologies to snail production may include temperature and humidity sensors, automated misting devices, timed feeding equipment, digital weighing scales, electronic breeding records, mobile applications and cloud-based production databases. These technologies are especially relevant because the feeding, growth, reproduction and survival of snails are influenced by environmental and management conditions. Precision livestock farming similarly uses sensors, automation and data analytics to monitor animals and support efficient use of production resources (Papakonstantinou et al., 2024; Losacco et al., 2025).

Smart snail-production skills should combine technical operation with decision-making. A student may know how to switch on a temperature sensor but still lack the competence to interpret the reading or adjust the production environment. Competence therefore includes equipment selection, installation, calibration, operation, maintenance, data interpretation, problem identification and corrective action. These abilities can make snail production more predictable and commercially sustainable.

Smart Housing Skill

Smart housing skill refers to the ability to establish and manage snail enclosures using appropriate structures and environmental-control technologies. Conventional housing knowledge includes site selection, pen construction, stocking, drainage, shading, soil preparation and predator control. Smart housing extends these activities by incorporating sensors, automated misting devices, controlled lighting, alarms and remote-monitoring facilities.

A suitable snail house should provide adequate moisture, moderate temperature, ventilation, shade and protection against predators and escape. Snails depend heavily on the conditions of their immediate environment because they lose moisture easily and may become dormant when conditions are unfavorable. Chinaka and Wilson (1995) maintained that site selection should consider soil type, moisture, wind direction, environmental temperature and access to water, while Freeman (2013) emphasized escape-proof housing, appropriate soil and protection against predators. Students require skills in selecting temperature and humidity sensors, positioning them correctly and interpreting the data they generate. They should also be able to install automated misting or irrigation devices that maintain moisture without causing waterlogging. Additional competencies include determining stocking density, providing drainage, constructing secure covers, maintaining soil quality and setting alert thresholds for unfavorable environmental conditions. Smart housing can improve productivity by reducing environmental stress, mortality, escape and irregular growth. Apostolou et al. (2021) found that commercial snail farms differed in their housing systems, environmental equipment and facilities, and that farm location and production arrangements influenced productivity. The study also identified temperature and humidity sensors among the equipment evaluated in commercial farms.

Automated Feeding Skill

Automated feeding skill refers to the ability to use programmable devices and structured feeding systems to provide suitable quantities of feed and water at appropriate periods. It includes feed selection, ration formulation, equipment calibration, scheduling, feed-level monitoring, hygiene and the interpretation of consumption records. Snails consume leaves, fruits, tubers and formulated feeds and require adequate protein, energy, vitamins, minerals and calcium. Feed must be fresh, free from salt and harmful chemicals, and appropriate to the age and production stage of the snails. Freeman (2013) explained that young snails require tender materials, while all production stages need balanced nutrients and supplementary calcium for shell development. Automation can help students maintain consistent feeding periods, particularly because snails are mostly active during the evening and night. Students should possess skills in programming feeding times, adjusting dispenser openings, measuring feed quantities, preventing obstruction, cleaning feeding equipment and maintaining water-supply devices. They should also be able to compare feed supplied with leftovers to determine consumption patterns. Smart feeding systems can reduce labour, irregular feeding and unnecessary feed wastage. Dayoub et al. (2024) observed that smart livestock production incorporates precision feeding, automated monitoring and resource management to

improve farm productivity and efficiency. Losacco et al. (2025) similarly explained that digital systems could monitor feed and water use and support more precise farm-management decisions.

Digital Breeding Skill

Digital breeding skill refers to the competence required to use electronic tools and production data in selecting, pairing, monitoring and evaluating breeding snails. It includes the digital identification of breeding stock, recording of reproductive characteristics, monitoring of eggs and hatchlings and analysis of reproductive performance.

Effective snail breeding begins with the selection of healthy and mature parent stock. Important characteristics include body weight, shell strength, growth rate, egg production, hatchability and survival of young snails. Freeman (2013) recommended selecting breeding stock based on fecundity, hatchability, establishment rate, and growth rate and shell strength. Such information can be recorded more accurately through digital systems than through informal memory or unstructured paper notes. Students should be able to create digital profiles for breeders, assign identification codes, enter mating and egg-laying dates, record clutch sizes and calculate hatchability and survival rates. They should also be able to use spreadsheets or mobile applications to compare breeders and identify parent stock with desirable performance characteristics. Digital photographs, electronic weighing scales and cloud storage can further support breeding records.

Digital breeding records provide information for long-term selection and enterprise planning. They can help students determine the number of breeders required, predict hatchling output, plan housing space and reduce the retention of poorly performing stock. Precision livestock technologies support this process by integrating animal performance, reproductive and environmental data into management decisions (Losacco et al., 2025).

4.1.4 Concept of Self-Reliance

Self-reliance refers to the ability of an individual to use acquired knowledge, skills and available resources to create legitimate employment and meet personal and social responsibilities. It does not imply complete isolation from other people or institutions; rather, it reflects the capacity to initiate productive activities, make responsible decisions and generate sustainable income.

For Agricultural Science Education students, self-reliance may be demonstrated through the establishment of agricultural enterprises, provision of consultancy services, production of agricultural inputs or training of other farmers. Snail farming offers opportunities for students to begin at a small scale and expand gradually as experience, capital and market access improve. The relatively adaptable production systems of snail farming make it suitable for home-based and smallholder entrepreneurship (Freeman, 2013). Skill acquisition is central to self-reliance because individuals cannot successfully manage an enterprise through theoretical knowledge alone. Okoro (2021) found that tertiary students and graduates required entrepreneurial, accounting, marketing and information technology competencies for global relevance. This suggests that technical snail-production skills should be combined with planning, record-keeping and enterprise-management competence.

Concept of Economic Development

Economic development involves sustained improvement in productive capacity, employment opportunities, income, entrepreneurship and the general standard of living. At the individual level, it may occur when acquired skills increase productivity and income. At the community level, it can result from business formation, employment creation, value addition and increased availability

of goods and services. Smart snail production can contribute to economic development by creating enterprises along the production and marketing chain. Opportunities exist in breeding-stock supply, pen construction, equipment installation, feed production, live-snail marketing, meat processing, packaging and training. Apostolou et al. (2021) demonstrated that commercial snail farms generated income and that production outcomes were affected by farm systems, facilities and management practices.

Agricultural students who possess relevant production and entrepreneurial skills can become producers and employers rather than depending solely on government employment. Adeyanju et al. (2023) found that training, networks and institutional support were important to the development of young agripreneurs in African countries, including Nigeria. Accordingly, smart snail-production training can support both individual self-reliance and broader economic participation.

Agricultural Science Education Students

Agricultural Science Education students are individuals being prepared with agricultural knowledge, pedagogical competence and practical skills for teaching, extension, enterprise management and community service. Their training should integrate subject-matter knowledge with practical activities that reflect current developments in agricultural production.

The students need opportunities to practice the construction of snail houses, installation of environmental sensors, operation of automated feeders and creation of digital breeding records. Practical exposure can strengthen their confidence and enable them to transfer the same knowledge to learners and community farmers. Agricultural training that combines experimentation, observation and enterprise development has been recognized as important for youth employment and livelihood formation (Food and Agriculture Organization, 2026).

The distinction between 300 and 400 level students provides a basis for examining whether progression in the programme influences their perceptions of required skills. Students in 400 level may have received more agricultural instruction and field experience, while those in 300 level may have different levels of exposure to production technologies. Comparing the two groups can therefore reveal whether the identified skills are commonly required across levels.

Theoretical Perspective Human Capital Theory

The study was anchored on Human Capital Theory, principally associated with Gary Becker. The theory proposes that education, training, knowledge and skills constitute productive investments in individuals. Just as organizations invest in physical equipment to improve output, individuals and societies invest in education and training to strengthen competence, productivity and economic returns (Becker, 1993). Human Capital Theory assumes that people become more productive when they acquire relevant knowledge and skills. The value of education is therefore not limited to certification; it also lies in the learner's ability to apply acquired competence in employment, entrepreneurship and productive decision-making. Skills that are relevant to contemporary economic activities are more likely to improve graduates' capacity to generate income and contribute to development. The theory is relevant to the present study because smart housing, automated feeding and digital breeding skills represent forms of specialized human capital. When Agricultural Science Education students acquire these competencies, they may be better positioned to establish snail enterprises, use resources efficiently, improve productivity and generate income.

The theory therefore provides a logical explanation for the connection between smart snail-production skills, self-reliance and economic development.

The study relied on Human Capital Theory because it directly explains how investment in the practical and technological training of students can produce personal and societal economic benefits. It suggests that the university's responsibility extends beyond transmitting agricultural concepts to developing competencies that students can convert into productive enterprises.

Related Scholarly Arguments

Available scholarship generally converges on the importance of combining technical agricultural competence with entrepreneurial and digital skills. Okoro (2021) examined the entrepreneurship skills required by Nigerian tertiary institution students and graduates and found that business-planning, accounting, marketing and information technology competencies were needed. Although the study addressed tertiary students broadly rather than snail-production students, it established that contemporary graduates require integrated technical and entrepreneurial preparation.

Evidence from youth agripreneurship research further indicates that skills alone may be insufficient without practical exposure, networks and institutional support. Adeyanju et al. (2023) examined young agripreneurs in Kenya, Nigeria and Uganda and demonstrated the relevance of training and support structures to enterprise development. This implies that Agricultural Science Education students should not only be informed about smart technologies but should also operate them during practical training. Research on commercial snail production has consistently demonstrated that housing, feeding, breeding, equipment and environmental management are interconnected. Apostolou et al. (2021) studied 29 commercial snail farms and found variations in housing systems, facilities, feeding practices, reproductive periods, production and income. Temperature and humidity sensors were among the equipment evaluated, showing that environmental monitoring already has practical relevance in organized snail production.

The wider precision-livestock literature has equally maintained that sensors, automated feeding, real-time monitoring and digital records can improve resource use and production decisions. Papakonstantinou et al. (2024), Dayoub et al. (2024) and Losacco et al. (2025) agreed that smart technologies could support animal health, feeding, environmental control and farm efficiency. However, their discussions focused mainly on conventional livestock and did not specifically determine the skills required by university students for smart snail production.

The reviewed studies therefore established the importance of entrepreneurship skills, snail-production management and smart livestock technologies. Nevertheless, limited attention was given to the integration of smart housing, automated feeding and digital breeding skills among Agricultural Science Education students in Niger Delta University. The present study addressed this contextual and competency gap.

Methodology

The study adopted analytic descriptive survey research design. The design was considered appropriate because it enabled the researcher to collect and analyze the opinions of Agricultural Science Education students regarding the extent to which smart snail-production skills were required without manipulating the variables. It also permitted a comparison of the mean responses of the two student groups. Creswell and Creswell (2022) explained that survey research enables researchers to describe the opinions, attitudes and characteristics of a population through information collected from respondents. The population of the study was 63 Agricultural Science Education students in Niger Delta University. The population consisted of 28 students in 300 level

and 35 students in 400 level. The entire population of 63 Agricultural Science Education students was used as the sample of the study. This consisted of the 28 students in 300 level and the 35 students in 400 level. The census sampling technique was adopted because the population was relatively small, accessible and manageable. Consequently, no student was excluded from the study. Data collected using a researcher-developed instrument titled **Smart Snail Production Skills for Self-Reliance and Economic Development Questionnaire (SSPSSREDQ)**. The instrument consists of two sections. Section A elicit information on the respondents' level of study, while Section B would contain 18 items arranged into three clusters. Cluster A contain six items on smart housing skill, Cluster B contain six items on automated feeding skill, while Cluster C contain six items on digital breeding skill. The items would be rated on a four-point scale of Very Highly Required (VHR) – 4 points, Highly Required (HR) – 3 points, Slightly Required (SR) – 2 points and Not Required (NR) – 1 point. The instrument was subjected to face and content validation by three experts. Two experts was drawn from Agricultural Science Education, while one expert was drawn from Measurement and Evaluation in Niger Delta University. The validators examined the clarity, relevance, adequacy and alignment of the items with the objectives, research questions and variables of the study. Their corrections and recommendations were incorporated into the final version of the instrument. The reliability of the instrument was established through a pilot study involving 10 Agricultural Science Education students from Delta State University, outside the study area. The completed instruments was analyzed using Cronbach's alpha to determine the internal consistency of the three clusters. Reliability coefficients of 0.82 was obtained and was considered acceptable. The researcher, with the assistance of two trained research assistants, administered the questionnaire directly to the 63 Agricultural Science Education students. Permission was obtained from the Head of Department office, while the respondents were informed about the purpose of the study and assured that their responses were treated confidentially. The completed questionnaires were retrieved, screened, coded and prepared for analysis. Frequency counts and percentages was used to present the respondents' level distribution. Mean and standard deviation was used to answer the three research questions. A criterion mean of 2.50 was adopted. Items with mean scores of 2.50 and above was interpreted as required, while items with mean scores below 2.50 was interpreted as not required. The independent-samples t-test was used to test the three null hypotheses at the 0.05 level of significance. A null hypothesis was rejected when the probability value was less than or equal to 0.05 but was not rejected when the probability value was greater than 0.05.

Results

Analysis of Demographic Data

Table 1. Distribution of questionnaires administered, retrieved and not retrieved

S/N	Number of respondents	Frequency	Percentage %
1	Retrieved	59	94
2	Not retrieved	4	6
	Total	63	100

Source: *Researcher's Field Survey (2026).*

Table 1 showed that 63 copies of the questionnaire were administered to Agricultural Science Education students, 59 questionnaires were retrieved and used for the analysis, representing approximately 94% of the questionnaires administered while 4 (6 percent) were not retrieved. The response rate was considered adequate for the study.

Table 2: Distribution of Respondents According to Level of Study

Level of Study	Frequency	Percentage
300 level	26	44
400 level	33	56
Total	59	100

Source: Researcher's Fieldwork, 2026.

Table 2 showed that 26 respondents, representing 44%, were 300 level Agricultural Science Education students, while 33 respondents, representing 56%, were 400 level students. This indicated that 400 level students constituted the larger proportion of respondents used for the study.

Analysis of Research Questions

Research Question One: To what extent is Smart housing skill required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State

Table 3: Mean and Standard Deviation on Smart Housing Skill Required by Agricultural Science Education Students

S/N	Smart Housing Skill Items	300 Level		400 Level		Total		Remark
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	
1	Selecting an appropriate site for the construction of a smart snail house	3.19	0.72	3.30	0.66	3.25	0.69	Required
2	Constructing an escape-proof snail house with adequate ventilation and drainage	3.15	0.75	3.24	0.70	3.20	0.72	Required
3	Installing temperature and humidity sensors in a snail house	3.27	0.68	3.33	0.64	3.30	0.66	Required
4	Operating automated misting systems to regulate moisture	3.12	0.78	3.21	0.73	3.17	0.75	Required
5	Monitoring and maintaining suitable soil temperature and moisture	3.23	0.70	3.29	0.67	3.26	0.68	Required
6	Using protective devices to prevent predators and snail escape	3.12	0.77	3.25	0.71	3.19	0.74	Required
Grand Mean		3.18	0.73	3.27	0.69	3.23	0.71	Required

Key: Agricultural Science Students 300 level = 26 respondents; 400 level = 33 respondents; Criterion Mean = 2.50.

Table 3 showed that the total mean scores ranged from 3.17 to 3.30, and all exceeded the criterion mean of 2.50. Installing temperature and humidity sensors recorded the highest mean score of 3.30, while operating automated misting systems recorded the lowest mean score of 3.17. The grand means of 3.18 for 300 level students and 3.27 for 400 level students produced an overall grand mean of 3.23. This indicated that smart housing skill was required to a high extent by Agricultural Science Education students for self-reliance and economic development.

Research Question Two: To what extent is automated feeding skill is required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State

Table 4: Mean and Standard Deviation on Automated Feeding Skill Required by Agricultural Science Education Students

S/N	Automated Feeding Skill Items	300 Level		400 Level		Total		Remark
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	
1	Selecting and formulating nutritionally appropriate feed for snails	3.23	0.71	3.32	0.66	3.28	0.68	Required
2	Programming automated feeders according to appropriate feeding periods	3.19	0.74	3.27	0.69	3.23	0.71	Required
3	Calibrating automated feeding devices to dispense suitable feed quantities	3.27	0.68	3.36	0.62	3.32	0.65	Required
4	Operating automated water-supply systems for snail production	3.15	0.77	3.23	0.72	3.19	0.74	Required
5	Monitoring feed and water consumption through digital devices	3.22	0.72	3.29	0.68	3.26	0.70	Required
6	Cleaning and maintaining automated feeding equipment	3.20	0.73	3.31	0.67	3.26	0.70	Required
Grand Mean		3.21	0.73	3.30	0.67	3.26	0.70	Required

Key: Agricultural Science Students 300 level = 26 respondents; 400 level = 33 respondents; Criterion Mean = 2.50.

Table 4 revealed that all the item mean scores were above the criterion mean of 2.50. The mean scores ranged from 3.19 to 3.32. Calibrating automated feeding devices recorded the highest total mean of 3.32, while operating automated water-supply systems recorded the lowest total mean of 3.19. The overall grand mean of 3.26 indicated that automated feeding skill was required to a high extent by the students for self-reliance and economic development.

Research Question Three: To what extent is Digital breeding skill is required by 300 and 400 level agricultural science education students for self-reliance and economic development in Niger Delta University, Bayelsa State

Table 5: Mean and Standard Deviation on Digital Breeding Skill Required by Agricultural Science Education Students

S/N	Digital Breeding Skill Items	300 Level		400 Level		Total		Remark
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	
1	Using digital identification systems to identify breeding snails	3.15	0.77	3.27	0.70	3.22	0.73	Required
2	Recording mating and egg-laying dates electronically	3.08	0.81	3.18	0.75	3.14	0.78	Required
3	Monitoring egg production, hatchability and survival rates digitally	3.19	0.73	3.30	0.68	3.25	0.70	Required

4	Using electronic weighing devices to monitor breeders' growth	3.12	0.79	3.21	0.73	3.17	0.76	Required
5	Analysing digital breeding records to select productive parent stock	3.17	0.75	3.25	0.71	3.21	0.73	Required
6	Using mobile applications or cloud platforms to preserve breeding records	3.13	0.78	3.23	0.72	3.19	0.75	Required
Grand Mean		3.14	0.77	3.24	0.72	3.20	0.74	Required

Key: Agricultural Science Students 300 level = 26 respondents; 400 level = 33 respondents; Criterion Mean = 2.50.

Table 5 showed that the total item means ranged from 3.14 to 3.25, and all were above the criterion mean of 2.50. Digital monitoring of egg production, hatchability and survival rates recorded the highest total mean of 3.25, while electronic recording of mating and egg-laying dates recorded the lowest mean of 3.14. The grand means were 3.14 for 300 level students and 3.24 for 400 level students. The overall grand mean of 3.20 indicated that digital breeding skill was required to a high extent by Agricultural Science Education students.

5.3 Test of Null Hypotheses

Hypothesis One: There is no significant difference in the mean response of 300 and 400 level agricultural science education students on the extent Smart housing skill is required for self-reliance and economic development in Niger Delta University, Bayelsa State

Table 6: Independent-Samples t-Test on Smart Housing Skill Based on Level of Study

Level	N	Mean	SD	df	t-value	p-value	Alpha Level	Decision
300 level	26	3.18	0.56	57	-0.632	.530	0.05	Not Significant
400 level	33	3.27	0.53					

Key: N = Number of respondents; df = Degrees of freedom; $p > 0.05$.

Table 6 showed that 300 level students recorded a mean score of 3.18 and a standard deviation of 0.56, while 400 level students recorded a mean score of 3.27 and a standard deviation of 0.53. The calculated t-value was -0.632, while the p-value was .530 at 57 degrees of freedom. Since the p-value was greater than the 0.05 level of significance, the null hypothesis was not rejected. This indicated that there was no significant difference between the mean responses of 300 and 400 level students on the extent to which smart housing skill was required.

Hypothesis Two: There is no significant difference in the mean response of 300 and 400 level agricultural science education students on the extent Automated feeding skill is required for self-reliance and economic development in Niger Delta University, Bayelsa State

Table 7: Independent-Samples t-Test on Automated Feeding Skill Based on Level of Study

Level	N	Mean	SD	df	t-value	p-value	Alpha Level	Decision
300 level	26	3.21	0.58	57	-0.609	.545	0.05	Not Significant
400 level	33	3.30	0.55					

Key: N = Number of respondents; df = Degrees of freedom; $p > 0.05$.

Table 7 revealed that 300 level students had a mean score of 3.21 and a standard deviation of 0.58, while 400 level students had a mean score of 3.30 and a standard deviation of 0.55. The calculated t-value was -0.609, while the p-value was .545. Since the p-value exceeded the 0.05 level of significance, the null hypothesis was not rejected. This implied that 300 and 400 level students did not differ significantly in their responses on the extent to which automated feeding skill was required.

Hypothesis Three: There is no significant difference in the mean response of 300 and 400 level agricultural science education students on the extent Digital breeding skill is required for self-reliance and economic development in Niger Delta University, Bayelsa State

Table 8: Independent-Samples t-Test on Digital Breeding Skill Based on Level of Study

Level	N	Mean	SD	df	t-value	p-value	Alpha Level	Decision
300 level	26	3.14	0.61	57	-0.643	.523	0.05	Not Significant
400 level	33	3.24	0.58					

Key: *N* = Number of respondents; *df* = Degrees of freedom; *p* > 0.05.

Table 8 showed that 300 level students recorded a mean score of 3.14 and a standard deviation of 0.61, while 400 level students recorded a mean score of 3.24 and a standard deviation of 0.58. The calculated t-value was -0.643, while the p-value was .523. Since the p-value was greater than the 0.05 level of significance, the null hypothesis was not rejected. This showed that there was no significant difference between the mean responses of 300 and 400 level students on the extent to which digital breeding skill was required.

Discussion of Findings

Smart Housing Skill Required by Agricultural Science Education Students

The first research question revealed that smart housing skill was required to a high extent, with an overall grand mean of 3.23. This showed that Agricultural Science Education students required competencies in site selection, construction of escape-proof pens, and installation of temperature and humidity sensors, operation of automated misting systems and maintenance of suitable soil conditions. The corresponding hypothesis revealed no significant difference between the mean responses of 300 and 400 level students, as the p-value of .530 was greater than the 0.05 level of significance. This indicated that students at both levels had similar perceptions of the importance of smart housing skill. The finding supported Apostolou et al. (2021), who found that housing systems, environmental equipment and farm facilities influenced snail productivity. It also agreed with Papakonstantinou et al. (2024), who established that sensors and automated environmental-monitoring technologies improved livestock management and production efficiency.

Automated Feeding Skill Required by Agricultural Science Education Students

The second research question showed that automated feeding skill was required to a high extent, with a grand mean of 3.26. This implied that students required skills in feed formulation, programming and calibrating automated feeders, operating water-supply systems and monitoring feed consumption through digital devices. The corresponding hypothesis showed no significant difference between the mean responses of 300 and 400 level students because the p-value of .545 exceeded the 0.05 level of significance. This suggested that both groups similarly recognized automated feeding as essential for efficient snail production. The finding agreed with Dayoub et

al. (2024), who reported that precision feeding and automated monitoring improved livestock productivity and resource utilization. It also supported Losacco et al. (2025), who found that digital feeding systems enhanced the monitoring of feed and water consumption and strengthened farm-management decisions.

Digital Breeding Skill Required by Agricultural Science Education Students

The third research question established that digital breeding skill was required to a high extent, with an overall grand mean of 3.20. This indicated that students required competencies in digital identification of breeding snails, electronic recording of mating and egg-laying dates, monitoring hatchability and survival rates and analyzing breeding records for parent-stock selection. The corresponding hypothesis revealed no significant difference between the responses of 300 and 400 level students, as the p-value of .523 was greater than the 0.05 level of significance. This demonstrated that the two groups shared comparable views on the relevance of digital breeding skill. The finding supported Freeman (2013), who identified fecundity, hatchability, and growth rate and shell strength as important criteria for selecting breeding snails. It also agreed with Losacco et al. (2025), who established that digital livestock technologies improved reproductive monitoring and supported data-based breeding decisions.

Conclusion

The study concluded that smart housing, automated feeding and digital breeding skills were required to high extents by Agricultural Science Education students for self-reliance and economic development in Niger Delta University. The absence of significant differences between 300 and 400 level students further showed that students at both levels shared similar perceptions of the relevance of these skills to efficient snail production, enterprise establishment, income generation and sustainable agricultural development.

Recommendations

1. The Agricultural science Education should provide practical training facilities that enable Agricultural Science Education students to acquire smart housing skills, including the installation and operation of temperature sensors, humidity sensors and automated misting systems.
2. Agricultural Science Education lecturers should integrate automated feeding systems into practical snail-production courses and train students in feed formulation, feeder programming, equipment calibration and digital monitoring of feed and water consumption.
3. The university should expose students to digital breeding technologies, including electronic identification, mobile applications, cloud-based record keeping and data analysis for monitoring reproduction and selecting productive breeding stock.

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