Evaluation of Skills Possessed by Agricultural Education Student for Small Ruminant Animal Production (Sheep and Goats) in Colleges of Education in North-East, Nigeria

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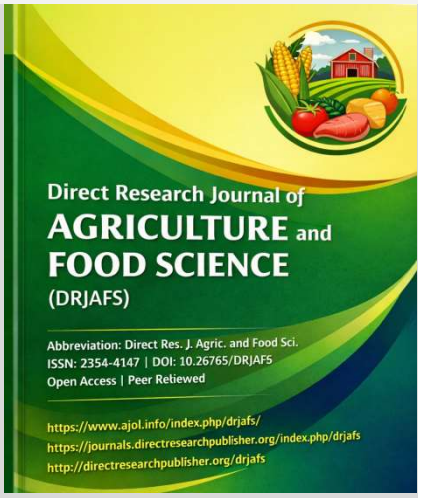
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ABSTRACT

Small-ruminant production contributes to household livelihoods, food security, employment and income generation in Nigeria, particularly in the North-East, where sheep and goats are important livestock resources. However, the sustainability and productivity of these enterprises depend partly on the practical competencies acquired through agricultural education and training. This study evaluated the production skills possessed by Agricultural Education students in Colleges of Education in North-East Nigeria, focusing on planning, housing, feeding, health management and marketing. A descriptive survey research design was adopted. The study population comprised 610 lecturers, technologists and students, from which a sample of 242 respondents was selected using a multistage sampling procedure. Data were collected using a researcher-developed 55-item questionnaire validated by five experts. The instrument had a reported Cronbach's alpha reliability coefficient of 0.97. Of the 242 questionnaires administered, 220 were completed and retrieved, representing a response rate of 90.9%. Data were analysed using mean, standard deviation and analysis of variance (ANOVA). The findings revealed moderate possession of skills across all five competency areas: planning (mean = 3.34, SD = 0.77), housing management (mean = 3.22, SD = 0.72), feeding management (mean = 3.30, SD = 0.77), health management (mean = 2.90, SD = 1.10) and marketing (mean = 3.28, SD = 0.74). Health management recorded the lowest pooled mean, indicating a particularly important area for strengthening practical training. The reported ANOVA p-values ranged from 0.050 to 0.068, with the health-management result occurring at the stated 0.05 significance threshold and requiring verification. The study concludes that students possess a foundation of small-ruminant production competencies but require stronger practical and experiential training to achieve higher proficiency. Strengthening these competencies through improved demonstration facilities, field-based learning and collaboration with livestock and veterinary professionals could improve graduates' employability, support local livestock enterprises and contribute to food security and rural livelihoods. The findings also provide a basis for further research on competency development, practical training effectiveness and the relationship between agricultural education and livestock enterprise performance.



Keywords: *Competency development; animal husbandry practices; livestock management; technical proficiency; vocational agricultural training; extension education*

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INTRODUCTION

The term agriculture is an applied science which encompasses all aspects of crop production including horticulture, livestock rearing, fisheries, forestry, among others. Agricultural Science is a discipline that is concerned with agricultural natural resources, and land management at higher levels. The objectives of agricultural science in higher education (College of Education) is to provide students with sufficient knowledge and skills that will enable them to explore their talents and enrich agriculture in Nigeria. The objectives of agricultural science at higher institutions are (i) Stimulate and sustain students' interest in agriculture; (ii) Impart functional knowledge and practical skills in agriculture to students; (iii) Prepare students for further studies in the area of agriculture; and (iv) prepare students for occupation in Agriculture (Orusha, 2021).

Nigeria possesses one of the largest small ruminant populations in Africa, with estimates indicating approximately 73.8 million goats and 42.1 million sheep, predominantly indigenous breeds concentrated in the northern parts of the country. In the North-East, these animals are vital for meat production, milk, hides, manure for crop fertilization, and as a form of savings and insurance against economic shocks. They support cultural and social functions, including use in festivals, ceremonies, and as dowry or gifts. Small ruminants contribute an estimated 35% or more to Nigeria's total meat supply, with higher significance in rural northern areas compared to urban centers or southern regions (Aphunu & Okojie, 2011).

Despite their importance, small ruminant production in Nigeria, and particularly in the North-East, faces numerous challenges. These include seasonal feed shortages, limited access to veterinary services, high disease prevalence (such as Peste des Petits Ruminants - PPR), poor genetic potential of local breeds, suboptimal management practices, and climate variability exacerbated by insurgency and displacement in the region (Alkali, 2025). Productivity remains low under traditional extensive or semi-intensive systems dominated by smallholder farmers and pastoralists. Opportunities exist for increased production to meet rising demand for animal protein, driven by population growth and urbanization, yet realizing this potential requires improved knowledge, skills, and technologies in breeding, nutrition, health management, housing, and marketing.

Agricultural education is critical for addressing these challenges by producing competent teachers, extension agents, and practitioners equipped with practical skills. In Nigeria, Colleges of Education (CoEs) serve as key institutions for training National Certificate in Education (NCE) holders who become teachers of Agricultural Science in secondary schools and contribute to community agricultural development (Lawal, Yusuf &Ibrahim, 2017). Agricultural Education programs in these colleges emphasize vocational and technical skills in areas such as crop production, livestock husbandry, and agribusiness, aligning with national goals for self-reliance and food security.

The philosophy of NCE Agricultural Education programs underscores the preparation of teachers who can impart practical skills for self-employment and national development. However, evidence suggests persistent gaps in the quality of training. Many programs suffer from inadequate infrastructure, insufficient practical facilities (e.g., livestock farms, demonstration units), outdated curricula, limited hands-on experience, and a shortage of qualified lecturers with specialized expertise in animal production (National Commission for Colleges of Education NCCE, 2019). In North-East CoEs, studies have highlighted issues with teaching methods, resource availability, and the translation of theoretical knowledge into practical competencies, particularly in livestock sub-sectors.

Small ruminant production is an important component of mixed and smallholder farming systems because sheep and goats can be maintained under a range of production conditions and provide food, income and assets to rural households. Evidence from Nigeria and other parts of sub-Saharan Africa shows that the contribution of these animals extends beyond meat and milk to household security, livelihood diversification and the use of crop residues and other locally available resources (Lebbie, 2004; Peacock, 2005; Kosgey *et al*., 2008; Adetunmbi & Chineke, 2022; Mustapha *et al*., 2024). These multiple functions make the development of practical production competencies relevant to agricultural education students. The effectiveness of small ruminant enterprises is influenced by the production system adopted, the availability and quality of feed, breed selection, housing, animal health and the capacity of producers to make informed management decisions. Studies of smallholder and pastoral systems have documented the importance of matching management practices to available resources and local production conditions (Kosgey *et al*., 2008; Armson *et al*., 2021). In Nigeria, the structures and constraints affecting small-ruminant rearing also demonstrate the need for context-specific production knowledge and practical skills (Achonwa *et al*., 2018; Umunna *et al*., 2013).

Planning and breed selection are foundational competencies because production objectives, enterprise scale, input requirements, labour, finance and the choice of suitable animals influence the viability of a livestock enterprise. Reviews of tropical breeding programmes have shown that genetic improvement depends on appropriate programme design and sustained management rather than breed choice in isolation (Kosgey *et al*., 2006). Recent work reviewing the germplasm of indigenous Nigerian goat breeds further underlines the relevance of understanding

available genetic resources when selecting animals for production (Akintunde *et al*., 2024). Accordingly, students need to be able to identify breeds and plan production activities in relation to their intended purpose and operating environment.

Housing and general husbandry practices provide the conditions in which animals can be protected, observed and managed. Appropriate housing should support animal welfare, sanitation, ventilation, protection from predators and adverse weather, and ease of routine management. Research on household goat keeping and comparative management practices indicates that husbandry decisions are closely connected with the resources and management capacity of producers (Lebbie, 2004; Alabi *et al*., 2025). The possession of housing skills is therefore important not only for constructing shelters but also for maintaining clean and functional animal facilities.

Feeding management is another central component of small-ruminant productivity. Feed resources in many sub-Saharan African production systems vary seasonally, making the use of crop residues, browse, forage and supplementary feeds important considerations. Matovu and Alçiçek (2023) examined feed resources used for small-ruminant nutrition in Uganda, while Fernández *et al*. (2021) demonstrated that forage-to-concentrate ratios are associated with changes in nutrient balance and production-related indicators in goats. These studies support the need for students to understand feed selection, ration composition, water provision and the relationship between nutrition and animal performance.

Animal health management requires the ability to recognize disease signs, maintain hygiene, apply preventive measures and seek appropriate veterinary support. Disease remains a major constraint to small-ruminant production in sub-Saharan Africa, and reviews have emphasized the importance of coordinated prevention, treatment and control strategies in smallholder systems (Armson *et al*., 2021; Kimeli *et al*., 2025). The circulation of peste des petits ruminants virus reported across Nigeria further illustrates the importance of disease awareness and biosecurity in sheep and goat production (Mantip *et al*., 2021). Practical training should therefore develop students' capacity to identify common health risks and understand appropriate preventive and referral procedures.

Marketing competencies are necessary to convert production activities into economic returns. Producers must understand market access, animal condition and weight, pricing, negotiation, transportation, product presentation and sales records. Studies of sheep and goat marketing in Nigeria have examined the structure and efficiency of marketing channels and the factors affecting returns to producers (Dipeolu *et al*., 1999; Asafa *et al*., 2024; Upton, 1985). These issues are relevant to agricultural education because students who acquire production skills should also be able to understand the commercial decisions that connect livestock production with consumers and markets. Taken together, the literature indicates that small-ruminant production is a multi-dimensional enterprise requiring integrated competencies in planning, housing, feeding, health management and marketing. Although the cited studies address production systems, constraints, nutrition, animal health, genetics and marketing, the present study focuses specifically on the skills possessed by Agricultural Education students in Colleges of Education in North-East Nigeria. This focus is important because the practical competence of future agricultural educators can influence the quality of livestock instruction and the extent to which learners are prepared for productive agricultural activities.

Objectives of the Study

The main objective of the study is to evaluate the skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East, Nigeria. Specifically, the study seeks to assess the:

1. planning skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East Nigeria
2. housing skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East Nigeria
3. Feeding skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East Nigeria.
4. Health management skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East Nigeria
5. Marketing Skills Possessed by Agricultural Education Students for Small Ruminant Animal Production in Colleges of Education in North-East Nigeria.

Research Questions

The following research questions were asked and answered for the study:

1. What are the planning skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria?
2. What are the housing skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria?
3. What are the feeding skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria?
4. What are the health management skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria?

5. What are the marketing skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance.

H_{01}: There is no significant difference between the mean ratings of Agricultural Education Lecturers, Technologists and students on the planning skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria.

H_{02}: There is no significant difference between the mean ratings of Agricultural Education Lecturers, Technologists and students on the housing skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria.

H_{03}: There is no significant difference between the mean ratings of Agricultural Education Lecturers, Technologists and students on the feeding skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria.

H_{04}: There is no significant difference between the mean ratings of Agricultural Education Lecturers, Technologists and students on the health management skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria.

H_{05}: There is no significant difference between the mean ratings of Agricultural Education Lecturers, Technologists and students on the marketing skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria.

METHODOLOGY

The study adopted survey research design. Survey research design is a design which attempts to provide an accurate description of a particular situation at one or more points in time. It is a research design in which a group of people or items are studied by collecting and analyzing data from representative of the entire group. The choice of the design is based on suggestion of Knussan (2015) who opined that when the study involves collecting opinions of the respondents using questionnaire regarding a situation or relationship, survey research design should be used Emaikwu (2015) opined that, descriptive design is the only practical way to get an answer whenever the researcher is interested in assessing the present state of affairs with regard to some variables that change over time for a large group or subjects. The present study tends to collect data from lecturers, technologist and students to be used to determine the skills possessed by the students for small ruminant animals in Colleges of Education comprises of six states namely; Adamawa State, Bauchi State, Borno State, Gombe State, Taraba State and Yobe State. North-East, Nigeria has many higher educational institution ranging from Universities to Colleges of Education to Polytechnics and Monotechniques. The study was focused on Public Colleges of Education approved by the National Commission for Colleges of Education (NCCE, 2023).

The study was conducted in North-East Nigeria which comprises of six states namely; Adamawa State, Bauchi State, Borno State, Gombe State, Taraba State and Yobe State. North-East, Nigeria has many higher educational institutions ranging from Universities to Colleges of Education to Polytechnics and Monotechniques. The study was focused on Public Colleges of Education approved by the National Commission for Colleges of Education (NCCE).

The population of the study was 610 persons made up of 120 lecturers, 80 technologist and 410 students of Agricultural Education Departments across Colleges of Education in North-East Nigeria. These respondents were directly involved in the teaching and practical instruction of small ruminant animal production. The population figure was gotten the registration officers from the Colleges of Education approved by the National Commission for Colleges of Education (NCCE) in the six states of the North-East geo-political zone: Adamawa-2 CoE, Bauchi-4 CoE, Borno- 2 CoE, Gombe- 3 CoE, Taraba- 1 CoE and Yobe- 2 CoE. There are total of 16 public Colleges of Education across these States out of which only 14 offers Agricultural Education as distributed above. The inclusion of both lecturers and technologists was necessary because evaluation skills in Small Ruminant Animal Production are developed through both theoretical and practical demonstration, which these categories of staff and students are responsible for.

The sample of the study is two hundred and forty two (242) selected from all Colleges of Education respectively. The study adopted multi-stage sampling techniques. The population of 610 lecturers, technologists and students was stratified into three groups: lecturers, technologists and students using Taro Yamane's formula, proportional sampling technique whereby sampling selection reflects the population size was adopted. The area was first divided into six according to the States. All the 14 Colleges offering Agricultural Education from the States were selected. Further, respondents (students: technologist: lecturers) were selected proportionally according to number of schools as follows: Bauchi-80 (66:4:10), Gombo-60 (47:3:10), Yobe-30 (20:1:9), Borno-30 (20:2:8), Adamawa-30 (20:2:8), Taraba-12 (7:1:4)

The instrument used for data collection was a structured questionnaire titled "Skills Possessed in Small Ruminant Animal Production Questionnaire (SPSRAPQ)" the

instrument was developed by the researcher with information from literature review. The instrument was administered in Public Colleges of Education in North-East, Nigeria. The questionnaire was measured in four points rating scale bordering on level of possession of skills in small ruminant animal production as follows Highly possessed (HP), Moderate possessed (MP), Slightly possessed (SP) and Not possessed (NP). The instrument had two parts via A and B. Part A sought information on respondent's relevant biodata while part B was divided into five clusters in line with the research questions. The whole instrument has 55 items cutting across the five clusters.
The instrument was validated by the five experts: one from Federal University Gashua, Yobe State, one from Federal University of Technology, Owerri, Imo State, and three from Josepth Sarwan Tarka University Makurdi. The expert were requested to check the appropriateness of the instrument for collecting relevant data for the study. Their inputs with reference to appropriateness, wordings, clarity, spellings and grammar by applying content and face validity which are incorporate into the final copy of the questionnaire should be used for data collection.

To ascertain the reliability of the instrument, a trial test was conducted in North Central, Nigeria. The area was chosen because it had similar characteristics with the study area. Respondents for the trial test were drawn from 2 colleges of education in in the zone. The respondents were also Agricultural lecturers, Technologist and Student in the schools, except that they were not part of the sample of the study. Data collected were analysed using Cronbach's Alpha Coefficient to determine the internal consistency. Cronbach's Alpha Coefficient was considered suitable because the instrument was scored on a continuous response.

In the data collection, the service of five research assistants was employed. The questionnaire was distributed using face to face contact. The approach was considered appropriate because it enable the researcher or research assistants to completely explain the purpose, importance and confidentiality of all information to the respondents (Adamu & Kabir, 2019). 220 copies of the instrument representing 91 percent was retrieved for analyses. Data collected were analyzed using descriptive and inferential statistics. Research questions were answered using mean and standard deviation. Mean scores were interpreted using real limit of numbers as shown below. Hypotheses were tested using One-way ANOVA at 0.05 level of significance. The null hypotheses were rejected if the p-value (sig) is less than the alpha value of 0.05, but was not rejected if the p-value (sig) is equal to or higher than the alpha value of 0.05. All analyses were carried out using SPSS version 26.

RESULTS

Research question 1: What are the planning skills possessed by Agricultural Education students for small ruminant animals production in Colleges of Education in North-East Nigeria?

The finding in (Table 1) revealed that all the items except items 1,2 7 and 8 had their mean scores ranged from 3.00 to 3.43 which are all within moderate level in the real limit of numbers. But items 1,2,7 and 8 had their mean ranged from 3.56 to 3.64 which are within high level in the real limit of numbers. The pooled mean of 3.34 implies that in all, agricultural education students in Colleges of Education possess moderate skill in planning small ruminant animal production in Colleges of Education in North-East Nigeria. The standard deviation ranged from 0.56 to 0.93 which implied that the responses of the respondents were not too far from each other on the planning skills possessed by Agricultural education students for small ruminant animals production in Colleges of Education in North-East, Nigeria.

Research question 2: What are the housing skills possessed by Agricultural Education students for small ruminant animals production in Colleges of Education in North-East Nigeria?

The findings in (Table 2) revealed that all the items except item 6 had their mean scores ranged from 2.86 to 3.43 which are all within moderate level in the real limit of numbers. But items 6 had a mean of 3.71 which is within high level in the real limit of numbers. The pooled mean of 3.32 implies that in all, agricultural education students in Colleges of Education possess moderate skill in housing for small ruminant animal production in Colleges of Education in North-East Nigeria. The standard deviation ranged from 1.06 to 0.62 which implied that the responses of the respondents were not too far from each other on the housing skills possessed by Agricultural education students for small ruminant animals production in Colleges of Education in North-East, Nigeria.

Research question 3: What are the feeding skills possessed by Agricultural Education students for small ruminant animals production in Colleges of Education in North-East Nigeria?

The findings in (Table 3) revealed that all the items except items 4, 8 and 10 had their mean scores ranged from 2.71 to 3.43 which are all within moderate level in the real limit of numbers. But items 4, 8 and 10 had their mean ranged from 3.50 to 3.57 which are within high level in the real limit of numbers. The pooled mean of 3.30 implies that in all, agricultural education students in Colleges of Education possess moderate skill in feeding, for small ruminant animal production in Colleges of Education in North-East Nigeria. The standard deviation ranged from 1.02 to 0.62 which implied that the responses of the respondents were not too far from each other on the feeding skills possessed by Agricultural education students for small ruminant animals production in Colleges of Education in North-East, Nigeria.

Table 1: Mean Ratings and Standard Deviation of the Respondents on the Planning Skills Possessed by Agricultural Education Students for Small Ruminant Animals Production in Colleges of Education in North-East Nigeria (N=220).

S/N	Item	Mean	SD	Remark
1.	Formulate specific objectives for small ruminant animals production	3.64	0.61	HP
2.	Review the objectives of small ruminant animal production	3.56	0.62	HP
3.	Design the programme plan for small ruminant production	3.00	0.93	MP
4.	Identify where to locate the small ruminant animals	3.29	0.88	MP
5.	Procure inputs for small ruminant animals	3.43	0.91	MP
6.	Identify relevant production required for small ruminant animals	3.00	0.93	MP
7.	Prepare budget for small ruminant animal productions	3.57	0.62	HP
8.	Identify the breeds of small ruminant animal to produce	3.61	0.56	HP
9.	Identify the competence personnel to assist in small ruminant animal production	3.14	0.92	MP
10.	Identify various records to keep in small ruminant animals productions	3.14	0.74	MP
	Pooled	3.34	0.77	MP

Keys: $\bar{x}$-Mean, S- Standard deviation, MP-Moderate performance, HP-High performance

Table 2: Mean Ratings and Standard Deviation of the Respondents on the Housing Skills Possessed by Agricultural Education Students for Small Ruminant Animals Production in Colleges of Education in North-East Nigeria (N = 220).

S/N	Item	Mean	SD	Remark
1.	Clean trough regularly for sanitary purposes	3.14	0.92	MP
2.	Provide proper spacing for weaned small ruminant animal	2.92	0.89	MP
3.	Provide play areas for small ruminant animal in the house	3.00	0.93	MP
4.	Provide adequate ventilation in the house has advantages	3.43	0.62	MP
5.	removes dungs in the house	3.43	0.73	MP
6.	Ensure availability of feed in the house	3.71	0.45	HP
7.	Protect sheep and goats by fencing the area	2.86	1.06	MP
8.	Keep appropriate numbers of small ruminant animal in the house.	3.29	0.70	MP
9	Remove dungs and waste from the house on daily basis.	3.43	0.73	MP
10.	Construct a very strong house for small ruminant animals.	3.07	0.89	MP
	Pooled	3.22	0.72	MP

Keys: *$\bar{x}$-Mean, S- Standard deviation, MP-Moderate performance, HP-High performance*

Table 3: Mean Ratings and Standard Deviation of the Respondents on the Feeding Skills Possessed by Agricultural Education Students for Small Ruminant Animals Production in Colleges of Education in North-East Nigeria (N = 220).

S/N	Item	Mean	SD	Remark
1.	Feeding small ruminant animal with roughage give the maximum requirement of nutrients	2.79	1.02	MP
2.	Concentrate feeds makes small ruminant animals to grow rapidly	3.43	0.73	MP
3.	Provide bulky feed ingredients like vegetables as roughage.	3.00	0.93	MP
4.	Adding antibiotics in feed formulation for small ruminant animals	3.57	0.62	HP
5.	Provision of fresh drinking water to small ruminant animals on regular basis	3.43	0.73	MP
6.	Feeding small ruminant animal on individual basis	2.71	0.96	MP
7.	Feeding small ruminant animals with protein will maintain proper health	3.57	0.62	HP
8.	The supplement of others ingredients such as fish meal, blood meal and bone meal to small ruminant animals	3.50	0.73	HP
9.	Flushing a ram and buck in the production of small ruminant animals	3.43	0.73	MP
10.	Give 2.8 kg of concentrate feeds daily to sheep and goats.	3.57	0.62	HP
	Pooled	3.30	0.77	MP

Keys: *$\bar{x}$-Mean, S- Standard deviation, MP-Moderate performance, HP-High performance*

Research question 4: What are the health management skills possessed by Agricultural Education students for small ruminant animals production in Colleges of Education in North-East Nigeria?

The findings in (Table 4) revealed that items 1-3, 11, 13 and 15 had their mean scores ranged from 3.50 to 3.57 which are all within high level in the real limit of numbers. But the rest of the items had their mean ranged from 2.88 to 3.43 which are within moderate level in the real limit of numbers. The pooled mean of 2.90 implies that in all, agricultural education students in Colleges of Education possess moderate skill in health management, for small ruminant animal production in Colleges of Education in North-East Nigeria. The standard deviation ranged from 1.06 to 0.61 which implied that the responses of the respondents were not too far from each other on the health management skills possessed by Agricultural education students for small ruminant animal's production in Colleges of Education in North-East, Nigeria.

Research question 5: What are the marketing skills possessed by Agricultural Education students for small ruminant animals production in Colleges of Education in North-East Nigeria?

Table 4: Mean Ratings and Standard Deviation of the Respondents on the Health Management Skills Possessed by Agricultural Education Students for Small Ruminant Animals Production in Colleges of Education in North-East Nigeria (N = 220).

S/N	Item	Mean	SD	Remark
1.	Introduce animals that are resistance to climatic condition	3.57	0.62	HP
2.	Introduce animals with resistance to diseases habit	3.57	0.62	HP
3.	Maintain adequate sanitation in small ruminant animal management to prevent ill-health	3.57	0.62	HP
4.	De-worm small ruminant animal regularly to control worms in the small ruminant animals is good management	3.14	0.92	MP
5.	Use disinfectant to control both endo and ecto-parasite in the flock for health management	3.11	0.94	MP
6.	Quarantine will be done well to control disease outbreak in small ruminant animals	3.14	0.96	MP
7.	Culling management tools should be provided in house	3.43	0.62	MP
8.	Place foot dips at the entrance of small ruminant animals.	3.39	0.68	MP
9.	Diagnose small ruminant disease for proper treatment	3.36	0.61	MP
10.	Identify common disease of small ruminant animal for proper control	3.39	0.65	MP
11.	Eradicate small ruminant animals from pest such as ticks, lies and flies.	3.57	0.62	HP
12.	Hooving in sheep and goats in small ruminant animals	2.88	1.06	MP
13.	Delay weaning in small ruminant animals gives them strength and grow healthy	3.50	0.63	HP
14.	Identify any common pests and diseases of small ruminant animals.	3.00	0.85	MP
15.	Keep proper record of production practice of small ruminant animals is very important	3.57	0.62	HP
	Pooled	**2.90**	**1.10**	**MP**

Keys: $\bar{x}$*-Mean, S- Standard deviation, MP-Moderate performance, HP-High performance*

Table 5: Mean Ratings and Standard Deviation of the Respondents on the Marketing Skills Possessed by Agricultural Education Students for Small Ruminant Animals Production in Colleges of Education in North-East Nigeria (N = 220).

S/N	Item	Mean	SD	Remark
1.	Determine market weight of small ruminant animal regularly	3.71	0.46	HP
2.	Locate market for small ruminant animals and its products	3.07	0.89	MP
3.	Advertise small ruminant animals and its products to promote patronage	3.57	0.62	HP
4.	Fix prices for different grade of small ruminant animals and its products	3.07	0.89	MP
5.	Negotiate for highest bidders in the sales of small ruminant animals and its products	3.14	0.79	MP
6.	Package small ruminant animals and its products for market	3.07	0.89	MP
7.	Select means of transporting small ruminant animals and its products to customers	3.14	0.92	MP
8.	Distribute small ruminant animals and its products to customers at their base	2.93	0.89	MP
9.	Sale small ruminant animals and its products at maximum profit	3.64	0.48	HP
10.	Keep records of sales of small ruminant animals and its products	3.50	0.63	HP
	Pooled	3.28	0.74	MP

Keys: $\bar{x}$*-Mean, S- Standard deviation, MP-Moderate performance, HP-High performance, SP- Slight performance*

The findings in (Table 5) revealed that items 1, 3, 9 and 10 had their mean scores ranged from 3.50 to 3.57 which are all within high level in the real limit of numbers. But the rest of the items had their mean ranged from 2.93 to 3.14 which are within moderate level in the real limit of numbers. The pooled mean of 3.28 implies that in all, agricultural education students in Colleges of Education moderately possesses marketing skill, for small ruminant animal production in Colleges of Education in North-East Nigeria. The standard deviation ranged from 0.46 to 0.89 which implied that the responses of the respondents were not too far from each other on the marketing skills possessed by Agricultural education students for small ruminant animals production in Colleges of Education in North-East, Nigeria.

Hypothesis 1: There is no significant difference between the mean ratings of Agricultural Education Lecturer, Technologist and students on the planning skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria.

The results presented in (Table 6) show an F-ratio of 1.934 and a p-value of .57 which is higher than the alpha value of .05. The hypothesis is therefore accepted. This means that there is no statistically significant difference in the mean rating of the respondents on the planning skills possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria. This implies that respondents did not differ significantly in their perceptions regarding the level of planning skills possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria.

Hypothesis 2: There is no significant difference between the mean ratings of Agricultural Education Lecturer, Technologist and students on the housing skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East Nigeria.

Table 6: ANOVA Result of the Respondents on the Planning Skills Possessed by Agricultural Education Students in Small Ruminants Animals Production in Colleges of Education in North-East Nigeria for feeding.

Source of variation	Sum of squares	df	Mean square	F	p	Alpha
Between Groups	841.124	2	76.466	1.935	.057	.05
Within Groups	8220.126	217	39.520			
Total	9061.250	219				

Keys: *df-degree of freedom, F-calculated value, Sig.- p-value*

Table 7: ANOVA Result of the Respondents on the Housing Skills Possessed by Agricultural Education Students in Small Ruminants Animals Production in Colleges of Education in North-East Nigeria for feeding.

Source of variation	Sum of squares	df	Mean square	F	p	Alpha
Between Groups	895.780	2	81.435	1.872	.055	.05
Within Groups	9047.857	217	43.499			
Total	9943.636	219				

Keys: *df-degree of freedom, F-calculated value, Sig.- p-value*

Table 8: ANOVA Result of the Respondents on the Feeding Skills Possessed by Agricultural Education Students in Small Ruminants Animals Production in Colleges of Education in North-East Nigeria for feeding.

Source of variation	Sum of squares	df	Mean square	F	p	Alpha
Between Groups	894.983	2	81.362	2.033	.058	.05
Within Groups	8325.017	217	40.024			
Total	9220.000	219				

Keys: *df-degree of freedom, F-calculated value, Sig.- p-value*

Table 9: ANOVA Result of the Respondents on the Health Management Skills Possessed by Agricultural Education Students in Small Ruminants Animals Production in Colleges of Education in North-East Nigeria for feeding.

Source of variation	Sum of squares	df	Mean square	F	p	Alpha
Between Groups	1696.437	2	154.222	1.837	.050	0.05
Within Groups	17460.013	217	83.942			
Total	19156.450	219				

Keys: *df-degree of freedom, F-calculated value, Sig.- p-value*

The results presented in (Table 7) show an F-ratio of 1.872 and a p-value of .55 which is higher than the alpha value of .05. The hypothesis is therefore accepted. This means that there is no statistically significant difference in the mean rating of the respondents on the housing skills possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria. This implies that respondents did not differ significantly in their perceptions regarding the level of skill in housing possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria.

Hypothesis 3: There is no significant difference between the mean ratings of Agricultural Education Lecturer, Technologist and students on the feeding skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East Nigeria.

The results presented in (Table 8) show an F-ratio of 2.033 and a p-value of .58 which is higher than the alpha value of .05. The hypothesis is therefore accepted. This means that there is no statistically significant difference in the mean rating of the respondents on the feeding skills possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria. This implies that respondents did not differ significantly in their perceptions regarding the level of skills in feeding possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria.

Hypothesis 4: There is no significant difference between the mean ratings of Agricultural Education Lecturer, Technologist and students on the health management skills possessed by Agricultural Education students for small ruminant animals' production in Colleges of Education in North-East Nigeria.

The results presented in (Table 9) shows an F-ratio of 1.837 and a p-value of .50 which is equal to the alpha value of .05. The hypothesis is therefore accepted. This means that there is no statistically significant difference in the mean rating of the respondents on the health management skills possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria. This implies that respondents did

Table 10: ANOVA Result of the Respondents on the Marketing Skills Possessed by Agricultural Education Students in Small Ruminants Animals Production in Colleges of Education in North-East Nigeria for feeding.

Source of variation	Sum of squares	df	Mean square	F	p	Alpha
Between Groups	768.339	2	69.849	1.846	.068	0.05
Within Groups	7870.839	217	37.841			
Total	8639.177	219				

Keys: *df-degree of freedom, F-calculated value, Sig.- p-value*

not differ significantly in their perceptions regarding the level of skills health management possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria.

Hypothesis 5: There is no significant difference between the mean ratings of Agricultural Education Lecturer, Technologist and students on the marketing skills possessed by Agricultural Education students for small ruminant animal production in Colleges of Education in North-East Nigeria.

The results presented in (Table 10) show an F-ratio of 1.846 and a p-value of .68 which is higher than the alpha value of .05. The hypothesis is therefore accepted. This means that there is no statistically significant difference in the mean rating of the respondents on the marketing skills possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria. This implies that respondents did not differ significantly in their perceptions regarding the level of skills in marketing possessed by Agricultural education students for small ruminant animal production in Colleges of Education in North-East, Nigeria.

DISCUSSION

Result in research question 1 revealed that agricultural education students in Colleges of Education moderately possess skills in planning small ruminant animals' production in North East Nigeria. This finding agrees with Asogwa (2010), who reported that competencies in planning for goat production were critical for effective livestock management and teaching. In keeping with the finding s of the study similarly, Onuka and Olaitan (2007) emphasized the importance of entrepreneurial planning skills in broiler production, supporting the present study's emphasis on planning competencies. The finding is also in line with Ose (2018) who found that for any animal production venture to be successful, planning is essential and indispensable. However, the finding of the study disagrees with Ajulu (2021) who emphasized that animal production does not require much of planning but ability to demonstrate the technical skills in the breeding process. This disagreement could be as a result of the difference in the area of the study and period at which the study was carried out. Further, the findings of the study in hypothesis 1 revealed that there is no significant difference between the mean responses of the respondents on small ruminant animal production planning skills possessed by Agricultural Education students in Colleges of Education in North-East Nigeria. This finding agrees with Onipede, Lawal and Kumta (2025) who identified that planning skills are required for pig production among secondary school graduates.

This result can also be considered in relation to the wider evidence that successful small-ruminant production depends on decisions made before and during production. Planning includes defining production objectives, selecting suitable breeds, estimating resource requirements and maintaining records. The importance of appropriate breeding programme design in tropical production systems has been discussed by Kosgey et al. (2006), while Akintunde et al. (2024) highlight the value of understanding indigenous goat genetic resources in Nigeria. The moderate pooled rating in the present study suggests that students demonstrate some of these planning competencies, while the lower-rated items indicate areas where practical instruction can be strengthened. Result in research question 2 revealed that agricultural education students in Colleges of Education moderately possess skills in housing for small ruminant animals' production in north central Nigeria. This finding aligns with Mustapha, Shehu, Nwosu, and Malabe (2024), who highlighted students need to possess skills in the use of semi-intensive and extensive housing systems to ensure security, health, and productivity of small ruminants. This demonstrates a clear agreement regarding the importance of proper housing management for sustainable production. The findings of the study also agree with Luis (2019) who found that housing is the most essential skill needed in animal production and should be highly possessed by anyone attempting to enter into the venture. More so, the findings of the study from hypothesis 2 agrees with Girei and Ayola (2024) who found that there is no significant difference between the mean response of respondents on the level of housing skills possessed by farmers in Adamawa State. The moderate pooled rating for housing skills is consistent with the view that animal housing is part of a wider husbandry system rather than an isolated construction activity. Housing, sanitation, ventilation, stocking and protection need to be considered together to support animal well-being and effective daily

management. Lebbie (2004) discusses goat management under household conditions, while Alabi et al. (2025) compare indigenous and improved small-ruminant management techniques among rural households in Osun State. The present findings therefore reinforce the need for practical demonstrations that enable students to apply housing principles under locally available conditions.

Result in research question 3 revealed that agricultural education students in Colleges of Education moderately possess skills in feeding for small ruminant animals' production in north central Nigeria. This finding aligns with Mustapha et al. (2024) and Fakoya and Oloruntoba (2024), who identified feed quality and feeding practices as central to small ruminant growth, reproduction, and health. The study's findings reinforce that effective feeding management is essential for productive livestock enterprises. Further, the findings of the study in hypothesis 3 revealed that there is no significant difference between the mean responses of the respondents on small ruminant animal feeding skills possessed by Agricultural Education students in Colleges of Education in North-East Nigeria. This finding agrees with Ifeakor and Omodara (2023) who found that the responses of the respondents on the skills required in small ruminant animal production are not statistically significant.

The feeding findings are supported by literature identifying feed availability, feed quality and ration management as important determinants of small-ruminant performance. Matovu and Alçiçek (2023) describe the range of feed resources used in small-ruminant systems in sub-Saharan Africa, and Fernández et al. (2021) report production-related responses to different forage-to-concentrate ratios in goats. In the context of the present study, the moderate pooled mean indicates that students possess a foundation in feeding management, but practical learning should continue to emphasize locally available feed resources, appropriate supplementation and reliable access to clean drinking water. The result of the study in Research question 4 revealed that students in Colleges of Education moderately possess skills in health management for small ruminant animals' production in North central Nigeria. finding is consistent with Ahmed and Egwu (2024), who reported that disease control, sanitation, and good management practices are critical constraints and determinants for effective small ruminant production. This shows agreement with existing research on the importance of management practices. More so, the findings of the study in hypothesis 4 agrees with Asogwa (2023) who identified that there is no significant difference between the responses of the respondents on the entrepreneurial competency in goat production possessed by secondary school teachers in Enugu State The health-management results should be interpreted against the continuing disease burden affecting sheep and goat production. Kimeli et al. (2025) review important small-ruminant diseases and control strategies in sub-Saharan Africa, while Mantip et al. (2021) report the wide circulation of peste des petits ruminants' virus in sheep and goats across Nigeria. These studies underline the relevance of hygiene, disease recognition, biosecurity, parasite control and timely veterinary intervention. The moderate overall rating in the present study suggests that students require further practical exposure to preventive health procedures and the safe handling of animal-health problems. The result of the study in Research question 5 revealed that students in Colleges of Education moderately possess skills in marketing for small ruminant animals' production in north central Nigeria. The finding is consistent with Jacob and Ariya (2020) and Chinonye et al. (2018), who emphasized the role of entrepreneurial and marketing competencies in translating skills into profitable enterprises. The finding of the study in hypothesis 5 agrees with Onipede, Lawal and Kumta (2025) who identified that marketing skills are required for pig production among secondary school graduates in Ekiti State. Across the five skill areas, the descriptive results consistently indicate moderate overall possession of the assessed competencies. The ANOVA results likewise report no statistically significant differences among the respondent groups at the stated 0.05 level, as presented in the study's hypothesis tests. Considered alongside the literature on production systems, nutrition, disease control, genetic resources and marketing, these findings point to the value of strengthening practical and integrated training in small-ruminant production within Colleges of Education. This interpretation is based on the study's reported results and does not alter its data, analyses or methodology.

The marketing findings are consistent with the understanding that production skills have greater livelihood value when they are linked to market participation and enterprise management. Dipeolu et al. (1999) examined sheep and goat marketing in Ogun State, and Asafa et al. (2024) assessed the efficiency of small-ruminant marketing in Ikorodu, Lagos State. Upton (1985) also examined returns from small-ruminant production in South-West Nigeria. The moderate pooled rating in the present study indicates that students have some marketing capacity, while the lower-rated areas point to the need for more exposure to market identification, pricing, negotiation, distribution and product promotion.

Conclusion

The study has shown that Agricultural Education students in Colleges of Education in North-East Nigeria require a comprehensive set of skills to effectively engage in small ruminant animal production. These skills span planning, housing management, feeding, overall management practices, and marketing. However, they only possess theses skills at moderate level in general while performing low in some the skill items and high in some. Successful production depends on their ability to set clear objectives, manage finances, select appropriate breeds, and apply effective management strategies.

They must also be competent in housing management, ensuring consistent feed and water supply, proper sanitation and ventilation, protection, and suitable housing structures. Feeding management skills are essential for providing balanced nutrition, feed supplementation, and precise feed allocation to support optimal growth and health. Effective management practices, including disease resistance, pest control, proper weaning, sanitation, and accurate record-keeping, are critical for sustainable production. Finally, strong marketing skills, focusing on product promotion, market weight determination, profit maximization, and record-keeping, are necessary for the success and profitability of small ruminant enterprises. Collectively, these competencies form the foundation for producing healthy, productive animals while ensuring sustainability and economic viability in small ruminant production.

Recommendations

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

i. Colleges of Education should improve their training instruction on planning in order to enable the students possess high level of skills in planning small ruminant animal production.

ii. Housing is very essential for success in small ruminant animal production. Lecturers and technologist should therefore ensure they properly demonstrate the skills in housing to the students so that they upgrade their skills from moderate level to high level.

iii. Students should ensure they actively participate in all practical training opportunities so they develop high level of skill in feeding of small ruminant animal.

iv. The lecturers and technologist should seek collaboration with veterinary doctors in providing training to students on the health management skills in order to improve the students' skills to a high level.

v. The lecturers should expose the students to more marketing skills so that they could acquire and demonstrate the skills in marketing small ruminant in high to a high level.

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