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COMPETENCIES IN SMALL RUMINANT FATTENING FOR IMPROVED FOOD SECURITY IN AN ERA OF ECONOMIC UNCERTAINTY IN TARABA STATE, NIGERIA

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Abstract

This study was carried out to examine the competencies in small ruminant fattening for improved food security in an era of uncertainty in Taraba State, Nigeria. The specific objectives of the study were to determine the competency-based mechanisms in compounding high quality forage based diets and also silage and hay making. Two (2) research questions were posed and answered in the study and two (2) null hypotheses were formulated and tested at 0.05 level of significance. Instrumentation research design was used for the study. The population of the study was 101, comprising of 63 registered small ruminant fatteners, 21 Agricultural Educators and 17 Animal Scientists. The entire population of 101 was used as the sample. The instrument for data collection was a 31-item package tagged "Competency-based small ruminant fattening questionnaire (CSRFQ)". The instrument was validated by five experts. The reliability coefficient of the instrument was .90 using Cronbach-Alpha reliability method. Mean and standard deviation were used to answer the research questions, while the hypotheses were tested using ANOVA at .05 level of significance. The findings of the study revealed that that competency-based mechanisms in mixing high quality forage based diets for small ruminant fattening include among others, the provision of a 25.0 kg good quality grass-legume mixture in the form of pasture herbage for feeding small ruminants during fattening. On the basis of the findings, it was concluded that, to explore the full potentials of small ruminants fattening for enhanced food security especially among rural farmers, there is need for deliberate effort to produce competency-based educational packages.

Keywords: Competencies, Small ruminant, Fattening, Food security

Introduction

Small ruminant is a general term used to refer to sheep and goats. In Nigeria, rural farmers keep small ruminants (sheep and goats) for both subsistence and economic reasons and, in either role, they generally improve household livelihood. However, despite the importance of small ruminants in the livelihoods of rural farmers, the current productivity of goats and sheep in developing countries remains low, mainly because of underfeeding and inappropriate technologies used for their rearing. Kassahun in Khamis (2015) stressed that growth performance of small ruminant primarily depends on the availability of good quality feeds and the feeding regime employed by the farmer. Feed availability and quality can be addressed through fattening.

Fattening is a deliberate activity that exposes an animal to adequate and improved feed and feeding conditions both in quality and quantity to enhance adequate weight gain and fat deposit within a specific period of time preparatory to consumption. Fattening according

to Babale *et al.* (2018) is an intensive feeding of highly nutritious feed to promote fast growth and fat deposition to achieve desired carcass growth and quality. Fattening involves intensive feeding of animals in feedlot to slaughter weight with adequate fat deposit. Fattening is important in preparing an animal for slaughter.

The importance of fattening to the farmer and the livestock industry cannot be overemphasized. Saulawa and Dankade (2014) stressed that fattening of animals is a highly profitable venture with return of premium to the fattener. Furthermore, the growing demands for ruminants' meats from city dwellers also present opportunities for fattening as well as improved markets for the animals. Furthermore, fattening can play a key role in economic development. The current economic situation in Nigeria indicates that domestic supply of animal protein is growing at 1.8% per annum while the overall demand is estimated to be rising at 5.1% annually (Ilu, Frank and Annatte, 2016). The above demand and supply gap can be filled through a successful and sustainable fattening practice.

Successful fattening depends on feed consumption. Khamis (2015) stated that the duration of fattening depends on feed quality, feed intake, feed conversion efficiency and growth potential of the animals. Dietary nutrients, especially energy and protein are major nutritional factors responsible for quality meat production. Alfa *et al.* (2016) opined that inadequate nutrition is a major limitation to the productivity of sheep in Nigeria and other countries within the arid and semi-arid regions of sub-Sahara West Africa. The utilization of silage material and other feed ingredients for small ruminants fattening requires skills in feed formulation, compounding, mixing and should be competency-based because knowledge and skills for such activities are required. Competency is a combination of knowledge and skills involving the ability to use tools and equipment for accomplishing work to acceptable standards in the industry. Competency according to Ekele (2019) is the knowledge and skill which an individual acquires in order to perform a given task. It involves psycho-productive skills or acquired skills and abilities for performing tasks adequately with the muscle in response to sensory stimuli.

The primary responsibility of a nation is to secure both its human and natural resources. The success of human existence and development is determined by the extent to which the components of human lives are secured; food and improved nutrition are essential components of human life. Matemilola and Elegbede (2017) stressed that food is no doubt, the most basic of all human survival needs. Although, so many efforts have been sunk in improving the quality as well as production of food supplies, food insecurity remains prevalent, particularly in Nigeria.

Food security is the condition in which all people, at all times, have physical, social, and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. However, Nigeria's rapid rate of population growth coupled with uncertainties of insecurity, war and hunger has posed a serious threat to food security. Therefore, food availability, affordability, accessibility, and utilization must significantly and consistently improve to prevent food insecurity and malnutrition (Bill and Melinda Gates Foundation 2014).

Small ruminant fattening through the utilization of well formulated diets using locally available feed materials could help in improving the growth performance of small ruminants and timely availability of the stock for the market. However, in a preliminary investigation conducted by the researcher, it was discovered that, in most cases the basic feeds commonly used by rural farmers for small ruminant fattening are natural pastures and forages which are seasonal and, in most cases, insufficient both in quantity and quality. In most of the times, the feeding practice adopted by the rural farmers does not meet the animal requirement leading to low animal performance in respect to reproduction, growth and carcass quality.

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This study is anchored on Diffusion of Innovation (DOI) Theory developed by Everett M. Rogers in 1962. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behavior, or product. Adoption means that people do things differently than what they had previously (purchase or use a new product, acquire and perform a new behavior). The key to adoption is that the person must perceive the idea, behavior, or product as new or innovative. It is through this that diffusion is possible.

Objectives of the study

This study explores the competencies in small ruminant fattening for improved food security in an era of uncertainty. Specifically, the study sought to:

i. determine the competencies in mixing high quality forage-based diets for small ruminant fattening in North-east Nigeria
ii. ascertain the competencies in silage and hay making for small ruminant fattening in North-east Nigeria

Research Questions

i. What are the competencies in mixing high quality forage-based diets for small ruminant fattening in North-east Nigeria?
ii. What are the competencies in silage and hay making for small ruminant fattening in North-east Nigeria?

Hypotheses of the study

The following null hypotheses were tested in the study at 0.05 level of significance

i. There is no significant difference in the mean of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competencies in mixing high quality forage-based diets for small ruminant fattening in North-east Nigeria
ii. There is no significant difference in the mean of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competencies in silage and hay making for small ruminant fattening in North-east Nigeria

Methodology

Research Design

This study adopted the Instrumentation research. A study belongs to instrumentation research when such a study is aimed at producing new or modified content, procedure or instrument for educational purpose. Obodo in Kesiki, Igomu and Shimave (2014) stated that a study is called instrumentation research if its primary purpose is to produce a new or modified instrument for educational purposes. The design was considered suitable for the study since the study involved the production of a competency-based mechanism in small ruminant fattening.

Study Area

The study was conducted in Taraba State, North-east Nigeria. The State is bounded in the west by Nasarawa State and Benue State, northwest by Plateau State, north by Bauchi State and Gombe State, northeast by Adamawa State, south and east by Cameroon. The state has sixteen (16) Local Government areas and two Special Development Areas. The state lies largely within the tropical zone and has a vegetation of low forest in the southern part and

grassland in the northern part. The major occupation of the people of the State is crop farming and animal husbandry particularly, ruminant.

Population of the Study

The population of the study was 101, comprising of 63 registered small ruminant fatteners, 21 Agricultural Educators who are Lecturers of Agricultural Education in Colleges of Education in Taraba State and 17 Animal Scientists who are also Lecturers of Animal Science and Animal Science related courses in public universities in Taraba State, Nigeria. Both Agricultural Educators and Animal Scientists used in this study had a minimum of Master (M.Ed/M.Sc./M.Tech.) degrees. The choice of these respondents who are mostly lecturers in higher institutions of learning was aimed at assembling respondents that are knowledgeable about ruminant fattening practices.

Sample and Sampling Technique

There was no sample and sampling as the entire population was used for the study. This was due to the manageable nature of the population.

Instrument for Data Collection

The instrument for data collection was a 31-item package tagged "Competency-based small ruminant fattening questionnaire (CSRFQ)" which was designed by the researchers. The instrument had four point response options of Highly Needed (HN) (4), Moderately Needed (MN) (3), Slightly Needed (SN) (2) and Not Needed (NN) (1). The instrument was divided into two clusters based on the Research Questions of the study. The clusters include competencies in mixing high quality forage-based diets and silage and hay making in small ruminant fattening.

Validation and reliability of the instrument

CSRFQ was validated by three experts for face, content and construct validity. The experts were given the first draft copy of the instrument and the specific objectives of the study. The experts were required to check the appropriateness of items and language expression. They were also requested to check whether the items in the instrument were accurate in addition to correcting both technical and spelling errors. All the corrections made by all the experts were used to produce the second draft copy of the instrument. A reliability coefficient of 0.90 was obtained, indicating that the instrument was reliable enough for the purpose of collecting the needed data. The data for the reliability test was collected from a trial test which was conducted in Benue and Nasarawa States.

Method of Data Collection

The researcher engaged two research assistants in administering the instrument on the respondents in their respective institutions. Furthermore, various rural farming communities and fattening sites were also visited to administer the instrument on small ruminant fatteners. A total of one hundred and one (101) copies of the instrument were produced and administered to the respondents. In the case of small ruminant fatteners, the research assistants educated them on how to respond to the instrument. The administered copies of the instrument were retrieved on the spot.

Data Analysis Techniques

Mean and standard deviation were used to answer research questions. Any item with a mean value of 2.50 and above was regarded as "Needed" whereas any item with a mean value of 2.49 and below was regarded as "Not Needed". The null hypotheses were tested using

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ANOVA at 0.05 level of significance (α-level). The hypotheses of no significant difference were rejected where the p-value ≤ α-level while the null hypotheses of no significant difference were accepted where the p-value > α-level.

Results and discussion

Table 1: Mean and Standard Deviation of Respondents on Competencies in mixing high quality forage-based diets for small ruminant fattening in Taraba State Nigeria (N=101)

S/N	Competencies in mixing high quality forage based diets	$\bar{X}_g$	SD_g	Remark
1	Provide a 25.0 kg good quality grass-legume mixture in the form of pasture herbage for feeding small ruminants during fattening	3.78	.44	Needed
2	Add 15.0 kg fresh foliage together with the succulent twigs and immature pods of the herbage to increase palatability of the diet	3.73	.44	Needed
3	Provide 10.0 kg sugar cane leaves with tops to improve feed digestion	3.32	.67	Needed
4	Select 10.0 kg carbohydrate-rich forage-based resource such as maize leaves to improve performance of the fattened animals.	3.45	.82	Needed
5	Provide mineral block for the animal to lick to meet their mineral requirements	3.33	.74	Needed
6	Provide highly digestible green forage at 10.0 kg of diet dry matter to enrich the diet.	3.32	.77	Needed
7	Provide a 10.0 kg source of by-pass protein such as oilseed meal/ cereal bran for feeding small ruminants	3.46	.60	Needed
8	Provide a source of by-pass energy such as rice polishing at 5.0 kg of diet dry matter to increase body weight of the animals	3.52	.71	Needed
9	Provide 8.0 kg grass hay/mixed grass-legume hay to boost the diet for small ruminants	3.56	.61	Needed
10	Provide Sodium chloride (salt) for the animals to lick at choice	3.57	.59	Needed
	Cluster Mean	**3.51**	**.64**	

N= number of respondents (N= 101; n_1=21 Agric. Educators, n_2=17 Animal Scientists and n_3=63 Small Ruminant Farmers), $\bar{X}_g$= grand mean of respondents SD_g = grand Standard deviation of respondents.

Data presented in Table 1 showed that, all the 10 items are competencies in mixing high quality forage based diets for small ruminant fattening since all the items had their mean values ranged between 3.32 to 3.78, indicating that their mean values were above the cut-off point of 2.50. This further shows the importance of all the 10 items in mixing high quality forage based diets for small ruminant fattening in Taraba State, Nigeria. The Table also revealed that the standard deviation of the items ranged from .44 to .82, indicating that the respondents were not too far from the opinion of one another in their responses on the competencies in mixing high quality forage based diets for small ruminant fattening in Taraba State, Nigeria. The findings agreed with Amole *et al.* (2016) who opined that some forages such as *G. sepiumis* is a protein-rich, highly nutritive and fast-growing perennial leguminous browse plant which is commonly fed to goats. The leaves contain as much as 20% to 30% CP and about 15% crude fibre. Furthermore, Lamidi and Ologbose (2014)

stressed that, forage conservation is basically aimed at producing at low cost staple products that are suitable for ruminant animal feeds and feeding with minimum loss of nutritive value.

Table 2: Analysis of Variance (ANOVA) of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competencies in mixing high quality forage based diets for small ruminant fattening in Taraba State, Nigeria

	Sum of Squares	df	Mean Square	F	Sig.	Decision
Between Groups	5.628	2	2.814	27.481	.000	S, R
Within Groups	26.827	262	.102			
Total	32.454	264				

Significance level= 0.05, df = degree of freedom, F = F-ratio, Sig.= p-value, NS= Not Significant, NR= Not Rejected, S=Significant, R=Rejected

Table 2 showed a p-value of .000 which is less than the alpha value of 0.05. This indicated that, there was a statistical significant difference in the mean of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competences in mixing high quality forage based diets for small ruminant fattening. Therefore, the null hypothesis of no significant difference in the mean of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competencies in mixing high quality forage-based diets for small ruminant fattening in Taraba State, Nigeria was rejected. This shows that the experiences of the three groups particularly that of small ruminant fatteners significantly influence their responses on the competencies in mixing high quality forage-based diets for small ruminant fattening.

Table 3: Mean and Standard Deviation of Respondents on Competency-based mechanism in silage and hay making for small ruminant fattening in Taraba State, Nigeria (N=101)

S/N	Competencies in silage and hay making	$\bar{X}_g$	SD_g	Remark
	Bag method of silage making			
1	Harvest legumes and grass legume mixtures at the ratio of 1:2 before flowering stage to improve feed quality	3.84	.36	Needed
2	Spread the harvested material under shade to reduce the moisture content to 30-35% dry matter at the time of ensiling	3.86	.34	Needed
3	Chop the fodder into small pieces (1-3cm) using a large knife before ensiling	3.68	.51	Needed
4	Fill the chopped fodder into plastic bags layer by layer to create an air-tight condition; compress material to remove air.	3.57	.54	Needed
5	Pack the silage using shopping bags for storage	3.44	.71	Needed
6	Stack the bags carefully in an area protected against rodents to avoid contamination	3.56	.59	Needed
	Pit method of silage making			
7	Organize/chop forage crop into pits with plastic material covering the walls of the pit.	3.63	.50	Needed
8	Set the crop to eliminate oxygen pockets	3.64	.55	Needed
9	Choose the right equipment/silage plastic materials	3.72	.62	Needed
10	Put the silage up at around 60-70% moisture for best preservation activity	3.67	.54	Needed
11	Avoid lower moisture which may not guarantee the best fermentation activity for silage making	3.79	.45	Needed
12	Use polythene plastic to cover the pile/pit for silage	3.81	.49	Needed

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13	Use ensiling method in large silos for preserving silage	3.66	.49	Needed
14	Seal the silo and wrap bale perfectly in order to achieve the air-free conditions to prevent mould growth	3.77	.47	Needed
	Competencies in Hay making			
15	Harvest hay at an early stage before they are overgrown	3.79	.40	Needed
16	Use 1.0kg propionic acid for hay preservation	3.55	.52	Needed
17	Preserve hay at moisture content of not more than 15% to avoid mold growth	3.53	.61	Needed
18	Use plastic wrap/ plastic twine to tie the hay in bales	3.27	.59	Needed
19	Place bale hay on a well-drained surface such as gravel rather than on the ground	3.55	.67	Needed
20	Keep hay in the dark to avoid exposure to moisture	3.64	.63	Needed
21	Preserve hay by keeping it in a cool environment	3.55	.75	Needed
	Cluster mean	**3.64**	**.54**	

N= number of respondents (N= 101; n_1=21 Agric. Educators, n_2=17 Animal Scientists and n_3=63 Small Ruminant Farmers), $\bar{X}_g$= grand mean of respondents SD_g = grand Standard deviation of respondents.

Data presented in Table 3 revealed that, all the 21 items are competencies in silage and hay making for small ruminant fattening. This is because, all the items had their mean values ranged from 3.44 to 3.86, indicating that their mean values were above the cut-off point of 2.50. This also affirm the importance of all the 21 items in silage and hay making for small ruminant fattening in Taraba State, Nigeria. The Table also indicates that the standard deviation of the items ranged from .34 to .75, indicating that the respondents were not too far from the opinion of each other and in their responses on the competencies in silage and hay making for small ruminant fattening in Taraba State Nigeria.

The findings of the study corroborated Lamidi and Ologbose (2014) who stressed that, during the rainy season when there is abundant supply of fresh, succulent and highly nutritious forages, it is advised that ruminant animal producers should cut up a mixture of grasses and legumes and conserve them. Forage can be conserved in form of hay (dry fodder) or silage to provide to the animals during the period of scarcity (dry season). Similarly, Ekele *et al.* (2020) emphasized that, pastoral farmers needed improvement in planning and implementing of pasture preservation activities in silage, hay and straw for livestock production.

Table 4: Analysis of Variance (ANOVA) of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competency-based mechanism in silage and hay making for small ruminant fattening in Taraba State, Nigeria

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	.133	2	.067	.849	.429	NS, NR
Within Groups	20.533	262	.078			
Total	20.666	264				

Significance level= 0.05, df = degree of freedom, F = F-ratio, Sig.= p-value, NS= Not Significant, NR= Not Rejected, S=Significant, R=Rejected

Table 4 showed a p-value of .429 which is greater than the alpha value of 0.05. This indicated that, there was no statistical significant difference in the mean of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competencies

in silage and hay making for small ruminant fattening. Therefore, the null hypothesis of no significant difference in the mean of the responses of Agricultural Educators, Animal Scientists and Small Ruminant Fatteners on the competencies in silage and hay making for small ruminant fattening in Taraba State, Nigeria was not rejected. This implies that the experiences of the three groups did not significantly influence their responses on the competencies in silage and hay making for small ruminant fattening.

Conclusion

The livestock sector especially the small ruminant production is critical to the attainment of food security and the development Nigeria's economy. Nigeria has great potentials for livestock production including small ruminants. Small ruminant fattening has huge potentials. To explore the full potentials of small ruminants especially among rural farmers, there is need for deliberate effort to explore the competencies in small ruminant fattening.

Recommendations

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

1. Agricultural educators and animal scientists should make available competencies in mixing high quality forage-based diets for small ruminant fattening in Taraba State, Nigeria
2. Agricultural Educators and Animal Scientists make available competencies in silage and hay making for small ruminant fattening in Taraba State, Nigeria

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