Characteristic traits guiding rural farmers' selection of small ruminant for sustainable production in Ogun State, Nigeria

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Target Audience: Small ruminant breeders, Extension service providers, Policy makers

Abstract

Quality breeds of animals are crucial to attainment of increased and sustainable livestock production. Years of sheep and goats rearing by small ruminant farmers in Ogun State Nigeria, suggests that they must have prized certain productive criteria for selection of the animals to be stocked for production. In view of this, this study assessed the commonly used criteria for selection of sheep and goat in the study area. Result of binomial analysis of data showed that criteria such as sexual libido, pregnancy rate, robust outlook, well-shaped udder, freeness of pest and diseases infestations, and prolificacy of the animals constitute the major criteria for selection of small ruminant by the farmers. Impact of these criteria on production status of the farmers include sustenance of animal production/stocking and healthy animal population, and enhanced marketing/income generation. Loglinear correlation of the data showed significant association between the production status of the farmers and health condition of the selected animals. The study concluded that the used criteria were valuable for guiding the selection of quality animals and attainment of sustainable production; with the recommendation that the farmers need to be educated and guided on the use of genetic factors as part of the selection criteria.

Keywords: Young animals, Reproduction, Sustainability, Animal health, Marketing.

Description of Problem

Livestock rearing is an essential component of farm enterprise production, with farmers rearing farm animals of choice in the range of ruminants, non-ruminants, and poultry. Among the ruminants, sheep and goats constitute the major farm animals reared by smallholder farmers in developing countries; largely for providing food and nutrition for home consumption and income generation (1, 2). Small ruminant rearing is not only essential to livelihood sustenance of rural households in the sub-Saharan Africa, but with immense contribution to the socioeconomic and livelihood development of a larger population of region (3, 4). Consequently, production of the farm animals has been on the increase among smallholder farmers in the tropics, though with the need for improved productivity (5, 6). Attainment of improved productivity and sustenance of social and economic benefits derived from the animals greatly depends on quality of the breeds of sheep and goats kept for production by the farmers.

Quality breeds of farm animals are crucial to ensuring production efficiency of the farmers in terms of efficient feed utilisation and conversion, growth and carcass build-up, reproduction and disease resistance (7, 8). Selection of quality breeds of sheep and goats for increased productivity by the small ruminant farmers however depends on their good knowledge and ability

to identify farm animals with quality production traits. Criteria for selection of farm animals ranged between physiological and genetic factors; among which are age/aging, mouthing and mouth setting, set of teeth, feet and leg structure, sex character, udder size and shape, hair shedding and fleece traits (wool), body conformity and climate adaptability (9, 10, 11). Amidst the existing several farm animal selection criteria livestock farmers generally centre on morphological criteria, termed subjective, than the production criteria, termed objective criteria (12, 13). What criterion is used for farm animal selection is often determined by production objectives of the farmers. In consequence, recorded performances and pedigree of selected ruminants are underscored by the farmers' intricate knowledge and deliberate use of the selection criteria for selection of the animals to be domesticated (14). Based on expertise or intricate of the Jordanian ruminant farmers on small ruminant selection with prized criteria, some of the farmers have been locally recognised as knowledgeable on farm animal selection and breeding (12; 14). In the light of this, conscientious selection of quality farm animals or those with desired production traits does not only improve current productivity of the selected animals but also their lifetime productivity (12). Similarly, submission that used indices for dairy goat selection by the Brazilian farmers simultaneously improve both the productive and reproductive traits of the animals (13).

In Nigeria are large number of rural farmers rearing sheep and goats as a means of livelihood. The animals, which exist as different breeds, are largely reared for different purpose by the farmers. Persistent and sustenance of rearing the animals by the farmers suggest that they must have developed good skill and experience on careful and conscientious selection of the

animals to be domesticated by them (12, 13, 14). Emerging question in this regard is: What are the prized criteria for selection of the kept small ruminants by farmers in Ogun State rural communities? What is their production objectives? And how do the used criteria translate to their production objectives? Consequently, this study is set out to take an empirical assessment of the commonly used criteria for selecting sheep and goats to be domesticated by the farmers; and to examine how such criteria impact on production status of the farmers. The outcome of this study will not only provide answers to the raised research questions, but will as well serve as a useful guide to ascertain where the small ruminant farmers are not appropriately objective in their choice of criteria for small ruminant selection thereby developing appropriate advisory service guide to strengthen their production performance. To guide the direction of this study are the following research objectives:

1. Ascertain the production characteristics of the small ruminant's farmers
2. Highlights the criteria used by the farmers for small ruminant selection;
3. Examine the correlation between the used selection criteria and production outcome of the farmers

Study Hypotheses

H_{o1}: There is no significant variance among the used criteria for selection of small ruminants by the farmers

H_{o2}: There is no significant association between the used criteria for small ruminants and production status of the farmers

Methodology

Study area: The study was conducted in Ogun State, which is located in the southwest part of Nigeria. The State has a land area of about 16409.26 square

kilometres. Ecologically, the state largely falls in the rainforest zone and partly in the savannah zone. With the State situated in the Guinea Savannah zone, the mean annual rainfall ranged between 1300 and 1400mm temperature of about 28°C and humidity of about 78% (15, 16).

Economic activities in the state range across farm, off-farm and non-farm occupations. While the non-farm occupation such as merchandising, Civil service, banking, and educational services, is largely concentrated in the urban areas of the state, farm and off-farm occupations are largely concentrated in the rural areas. Commonly cultivated food crops in the state include cassava, maize, yam, cocoyam, rice, spices, and vegetables. Others are tree crops such as kola nut, cocoa, citrus, mango and oil palm; and pomological crops like pineapple and pawpaw. Farm animals readily found among the rural farmers in the state include cattle, sheep, goats, chicken, and pig.

Coordination or administration of agricultural activities in the state is carried out by the State Ministry of Agriculture. Under the Ministry are a number of agricultural agencies with the mandate of serving the farmers' various agro-services' needs. One such agency is the Ogun State Agricultural Development Programme (OGADEP) which has the mandate of providing extension services to the rural farmers. In order to reach out to the rural farmers across the state, the extension agency structured the entire state into four agricultural zones, namely Abeokuta, Ilaro, Ijebu, and Ikenne. The zones are in turn structured into 20 Blocks and subsequently to 120 cells where the frontline extension agents directly relate with the rural farmers.

Study domain: among the rural areas in Abeokuta zone, 12 villages were by cluster sampling technique; and the selected villages are Alabata, Opeji, Ajegunle-Itoko,

Akintoye, Araromi, Idera, Olokose, Papa, Ayedere, Ilugun, and Bada-Idere. These communities were typically characterised by little or no social amenities and basic infrastructure such as good roads, schools, hospitals, pipe-borne water. Houses in the surveyed areas were largely constructed with mud, but some of the buildings were plastered with cement/mortar as a way to modernise the houses.

Sampling frame and Sampling procedure: All sheep and goat rearers constitute the study population. The study, however, lacked sampling frame based on the fact that there was no official documentation of all the rearers of small ruminants in the selected villages. Based on this, the study employed a non-probability sampling technique, namely snowballing, for selection of the small ruminant farmers that were surveyed. The snowballing technique was applied by enquiring every interviewed farmer to provide a link with any other farmer that rearers sheep and goats within their communities. To guide the determination of the number of small ruminant farmers to be selected for this study, a minimum of 30 respondents, as recommended to be least in a survey research (17), was targeted in each of the rural communities, thereby giving rise to 360 respondents from the 12 villages. However, a total of 189 farmers eventually participated in the survey study.

Data collection: Primary data for the study were collected by means of an interview guide, field observation and iterative discussion over a period of 8months (July 2017 and February 2018). Collected data were on the socioeconomic characteristics of the rural farmers, the breeds of sheep and goats reared by the farmers, the purpose of rearing the animals, criteria for selection of the farm animals and productivity of the animals.

Table 1: Production characteristics of the small ruminant farmers (n = 189)

Variables	Freq	%
Small ruminant production experience		
≤ 5	16	8.5
6 – 10	79	41.8
11 – 15	62	32.8
≥ 16	32	16.9
Purpose of production*		
Mainly marketing	49	25.9
Mainly consumption	31	16.4
Both marketing and consumption	109	57.7
Breeding/reproduction	189	100
Number of sheep reared		
≤ 5	43	22.8
6 – 10	21	11.1
11 – 15	14	7.4
≥ 16	6	3.2
Number of goats reared		
≤ 5	62	32.8
6 – 10	91	48.1
11 – 15	27	14.3
≥ 16	9	4.8
Production system		
Intensive	18	9.5
Semi-intensive	148	78.3
Extensive	23	12.2
Healthcare services*		
Self-treat with vet/indigenous medications	141	74.6
Help-treat by vet/indigenous medications	61	32.3
Seek veterinary service	11	5.8

*Multiple responses

Data analysis: Collected data were subjected to both descriptive and inferential statistics. The used descriptive statistics, which include frequency count and percentages, were found appropriate for presentations of overview of the results. The inferential statistics, which include binomial test (H_{01}), and loglinear covariant estimate (H_{02}), were found appropriate for test of the stated hypotheses largely because the study variables were measured at nominal level.

The binomial test was used to establish the degree of disparity between the farmers' use and non-use of certain criteria for small ruminant selection. Consequently, this mad it possible to clearly establish the degree of acceptance or how much important certain selection criterion is among the surveyed farmers. The loglinear covariance estimate, on the other hand, is meant to ascertain the degree of association between the production status of the farmers and the used criteria for

selection of their animals for production.

Result and Discussion
Production characteristics of the small ruminant farmers

Production characteristics of the surveyed small ruminant farmers, highlighted in Table 1, shows that the highest proportion of them (41.8%) had between 6 and 10years sheep and goats rearing experience, with 32.8% of them doing so for upward of 11to 15year. With the observed years of small ruminant keeping experience, it implies most of the surveyed farmers would have developed a prowess of animal selection criteria for enhanced productivity (18, 19). The farmers however kept the small ruminant for different purpose. While they all (100%) of them kept sheep and goats for reproduction purpose, a few (16.4%) of them kept the animals for home consumption. Also, as much as 25.9% of the farmers raised the animals largely for marketing; with 57.7% of them rearing the animals for both home consumption and marketing. This observation suggests that the small ruminant farmers largely reared sheep and goats for the purpose of meeting their immediate or long term nutritional, social and economic needs (3, 5). The economic purpose is however fulfilled either selling the animals alive or butchered as meat for income generation (5).

Consideration of the number of sheep and goats reared by the small ruminant farmers showed that 22.8% of them reared about or less than 5 sheep at a time, and a few (7.4%) of them reared between 11 and 15 sheep. In contrary to the small flock of sheep reared by most of the farmers, a larger proportion of them kept more goats at a time (20). As indicated in Table 3, 48.1% of the farmers reared between 6 and 10 goats at a time; while 14.3% reared between 11 and 15 goats at a time. A critical look at the number

of sheep and goats reared at a time by the surveyed farmers however suggests that they are micro-scale or subsistence producers. This observation is similar to other findings (4, 18) that showed that small number of sheep and goats are generally kept by smallholder farmers in developing countries. This observation is underscored by the poor production and economic resources of the farmers and as such could not readily expand production base of the small ruminants. As expressed by authors (5, 6, 18), an attempt at scaling up the production base of the small farm animals would incur additional cost of acquiring more stocks of animals, increased cost of feeding and healthcare of the animals; which the poor-resource ruminant farmers cannot afford.

Management of the stocked sheep and goats by 78.3% of the farmers was largely semi-intensive system and as such the animals were provided shelter, and to an extent, water and feed, but let loose for some hours of the day to source for additional feed to augment whatever might have been provided them by their keepers. In some cases, the animals are led to graze but mostly tethered to restrict movement or prevent the animals from straying (20, 21). In addition, the choice of semi-intensive management by the small ruminant farmers was underscored by the need to reduce the cost of daily or regular feeding of the animals as required by the intensive management system. Similarly, the semi-intensive practice saves the animals from losses and proneness to the incidence of pests and diseases, as common to the extensive management system.

Regarding the healthcare of the animals, the majority (74.6%) of the farmers rather self-treat their animals, largely using indigenous practice and sometimes veterinary drugs. But where a particular health issue cannot be self-handled by a particular farmer, help is sought from fellow

small ruminant farmers for attendance to such health issues (32.3%). A few of the farmers (5.8%) however sought the services of veterinarian. This observation is in line with a study (22) submission that the smallholder farmers found solace in self-treatment of their farm animals using either indigenous methods/local herbs or veterinary drugs because of the need to reduce cost of production. Cost of veterinary is seen as additional cost of production that may eventually reduce their income or profit at the long run (22). They farmers considered consultation of the veterinary services as the last resort only where the efforts to self-treat an animal(s) proves abortive. Those who could not afford the service of a veterinary doctor often give up on the animal(s) by either allowing the animal(s) to die or slaughter it for either home consumption or marketing as meat.

Breeds of small ruminants reared by the farmers

In view of the existing different breeds of sheep and goats in Nigeria, Table 2 shows West African Dwarf sheep and goats (WAD sheep and WAD goat) as the commonly reared breeds of small ruminant by 19.6% and 100% of the farmers, respectively. Underlying reasons for the choice of these breeds of small ruminants by the surveyed farmers is in line with the submission of similar studies (23, 24, 25) that WAD breeds of sheep and goats are commonly reared by farmers in Nigeria, particularly in the southern part of the country, largely keep because of their hardiness and ability to withstand stressful condition and adaptability to the climatic condition of their farming area (23, 24).

Comparison of the proportion of sheep and goats reared by the farmers however showed that goat rearing outnumbered that of the sheep (2, 4, 20). Interaction with farmers on this observation revealed that goats are commonly reared because the animals are hardier with higher survival rate than sheep; and much more, goat meat is readily acceptable for consumption largely because of its taste and its relatively cheaper market value than sheep (8, 23). However, sheep is well prized during the festive periods and/or on occasion of certain celebrations by individuals.

Table 2: Breeds of small ruminants reared by the farmers (n = 189)

Variables	Freq	%
Breeds of sheep		
Yankasa	19	10.1
Ooda	11	5.8
Balami	18	9.5
West African dwarf sheep	37	19.6
Breads of goats		
Sokoto red/Maradi	9	4.8
Long legged goat	3	1.6
West African Dwarf goat	189	100

*Less responses   ****Multiple responses**

Table 3: Selection criteria of small ruminants (n = 189)

Variables	Freq	%
Colour		
White	11	5.8
Black	8	4.2
Brown	9	4.8
Grey	5	2.6
Mixed colours	17	9.0
Not particular about colours	139	73.6
Age of the animals		
≤ 1	156	82.5
2 – 3	79	41.8
≥ 4	115	60.8
Prolificacy of ewes/does		
2 lambs/kids per birth	73	38.6
3 lambs/kids per birth	116	61.4
State of health		
Shining skin	102	54.0
Free of wounds	131	69.3
Free of pest infestation	167	88.4
Free of symptoms of diseases	159	84.9
Diseases resistant	119	63.0
Physiological/Body structure		
Body size/Robust stomach	181	95.8
Structure of feet and legs	163	86.2
Well shaped udder/testicles	179	94.7
Dental structure	23	12.2
Reproductive status		
Buck/Ram of good libido	189	100
Doeling/Buckling	41	21.7
Doe/Buck	63	33.3
Pregnant ewe/nanny	137	72.5
Castrates/whether	31	16.4

Choice criteria for selection of small ruminants by the farm animal farmers

Examination of the used criteria for selection of sheep and goats by the surveyed small ruminant farmers, as indicated in Table 3, shows that most of the farmers were concerned with the number of lambs or kids that could be produced at a time by a sheep and/or goat to be selected for stocking. By genetic trait, breeds of sheep and goats in Nigeria ordinarily produce one lamb and two kids at a time, respectively; some of the breeds have however been observed to produce two lambs and 3-4 kids at a time or parturition (18, 19, 26). On this note, up to 38.6% of the farmers considered selection of sheep that could produce two lambs at a time while 61.4% considered selection of goats that have the trait of giving birth to triple or quadruple kids at single parturition. This is in line with the submission of some Authors (26; 27) that multiple birth quality is an important criterion for selection of farm animals as parent stock. For identification of small ruminants with this reproduction trait, the farmers ascertained this by tactical investigation of genealogy of the animals from keepers of the animals with such reproductive trait.

Table 4: Selected small ruminant's productivity status among the farmers

Variables	Freq	%
Productivity of selected animals		
Sustenance of animal production	171	90.4
Sustenance of healthy stock	163	86.3
Better income from sales of animals	118	60.8

Table 5: Binomial test of variance in criteria for small ruminants' selection by farmers

	Category	N	Observed Prop.	Test Prop.	Asymp. Sig.
Number births per litter	Yes	189	1.00	.50	.000[a]
	No	116	.61		
Shining skin	Yes	102	.54	.50	.309[a]
	No	87	.46		
Free of wounds	Yes	131	.69	.50	.000[a]
	No	58	.31		
Free of pests	Yes	167	.88	.50	.000[a]
	No	22	.12		
Free of disease symptoms	Yes	159	.84	.50	.000[a]
	No	30	.16		
Resistant to disease	Yes	119	.63	.50	.000[a]
	No	70	.37		
Robust tommy	Yes	181	.96	.50	.000[a]
	No	8	.04		
Strong legs	Yes	163	.86	.50	.000[a]
	No	26	.14		
Shape of udder	Yes	179	.95	.50	.000[a]
	No	10	.05		
Dental structure	No	166	.88	.50	.000[a]
	Yes	23	.12		
Sexual libido	Yes	189	1.00	.50	.000[a]
Prolific births	Yes	189	1.00	.50	.000[a]
	No	148	.78	.50	.000[a]
Doeling	Yes	41	.22		
Doe/buck	Yes	59	.31	.50	.000[a]
	No	130	.69		
Pregnant ewes	No	72	.38	.50	.001[a]
	Yes	117	.62		
Castrate	No	158	.84	.50	.000[a]
	Yes	31	.16		

a.   Based on Z Approximation.

Age of the animals matters a lot to the farmers and as such, 82.5% of them preferred sheep and goats that are less than or about a year (between doeling/buckling

and yearling) while 41.8% preferred animals that are between 2 and 3 years. Interactions with the farmers on the use of age as selection criterion revealed that it enables them to establish a generational track of reproducibility for breeding. Findings from other studies in Ethiopia (1; 18) equally revealed age as an important criterion for small ruminant selection by sheep farmers, with most of them prizing sheep within the range of 11.2 to 24.4 months. Selection of animals within this age range is premised on the fact that greater generational population and more rapid genetic progress can be obtained from a sheep or goat that produce their first offspring at an earlier age.

Table 3 shows that the surveyed farmers were concerned with the good health of the animals to be selected and as such, 88.4% and 84.9% of the farmers respectively ensured that selected sheep and goats are free from pest and disease infestations (28, 29). In the same vein, 69.3% of the farmers ensured the selection of animals with no wounds; while 54.0% of them used shining skin/coats of the animals as selection criteria. Up to 69.3% of the farmers prized sheep and goats that are resistant to disease(s) or readily adapt to the farmers' farming environment. In line with the health condition as selection criterion is consideration of the body structure of the animals (26, 29). As much as 95.8% of the small ruminant farmers used the body size or robust outlook of the animals as selection criterion, with 86.2% of them using indicators such as structure of the animals' legs and a well-shaped udder and/or testicles by 94.7% of them. Interaction with farmers on this criterion showed that physiological appearance of the animals is crucial to market acceptability and good pricing. In addition, a sheep or goat needs to be of good footing for good movement and mating, while a well-shaped udder plays significant

roles in milk production, particularly for the suckling lambs/kids (18, 27). A few of the farmers however used the dental structure (12.2%) and colour coat (26.4%) of the animals as selection criteria. Less usage of dental structure as selection criterion by the small ruminant farmers was due to their lack of awareness and understanding of how the criterion could be used for selection of farm animal selection. Lesser of use colour coats as selection criterion was largely because it has nothing to do with the production performance of the animals.

Reproductive ability of sheep and goats was observed to be a crucial criterion for selection of the farm animals by the surveyed small ruminant farmers (27, 28, 29). As much as 72.5% of them valued selection of pregnant ewes or nannies. Interactive discussion with the farmers on this observation revealed that the choice of pregnant animals was informed by the need to quickly establish and increase the population of their animals and for satisfaction of their production objectives (10, 13, 18, 28). In addition, the use of doeling/buckling and doe/buck as selection criteria by 21.7% and 33.3% of the farmers, respectively, was informed by the need to raise a set of animals with traceable production records and for further reproduction. A total of 16.4% of the farmers however used castrate/whether as selection criterion basically due to the need to stimulate growth within a short time and have such animal culled for meat production and income generation.

Production status of the small ruminant farmers

Arising from conscious selection of sheep and goats for production by the surveyed small ruminant farmers, Table 4 shows that majority (90.4%) of the farmers were able to maintain a population of sheep

and goats at any point in time, 86.3% of them had animals with good health condition while 60.8% had better income from sales of the animals. These accomplishments by the small ruminant farmers suggests that careful selection of farm animals with good production and adaptive traits is crucial to achieving productive and sustainable farm animal production. This implies that productive and sustainable sheep and goats' production largely depend on adaptability of the animals to the farming environment of the farmers and possession of productive and reproductive traits (8, 13, 24).

Table 6. Loglinear correlation estimate of the association between the selection criteria and productivity of the animals

Variables	Free of wounds	Free of pests	Free of disease symp-toms	Resistance to diseases	Robust tummy	Strong legs	Well-shaped udder	Measure of association	
								Ent-ropy	Conc.
Healthy animals	-0.240	0.011*	-0.133	-0.240	0.000*	-0.097	-0.089	0.110	0.083
Better income	-0.367	-0.061	-0.065	-0.247	-0.085	-0.066	-0.021*	0.036	0,047
Sustenance of production	-0.042*	-0.093	-0.061	-0.307	-0.071	-0.054	-0.023*	0.028	0.017

Binomial test of variance in criteria for small ruminants' selection by farmers

Examination of variance in the chosen criteria for small ruminant selection by the surveyed farmers revealed a signification difference at the test ($p = 0.50$). As indicated in Table 5, selection criteria such as the numbers of litter at parturition ($z – 1.00$; $p = 0.00$), sexual libido ($z\ 1.00$; $p = 0.00$) and prolific birth-giving by the animals ($z = 1.00$; $p = 0.00$). Also, freeness of wounds ($z = 0.69$; $p = 0.00$), pest infestation ($z = 0.88$; $p = 0.00$) and symptoms of diseases ($z = 0.84$; $p = 0.00$) were found significant as determinant of animals to be selected for management. Other significant criteria in farm animal selection among the farmers include robustness of the animals' tummy ($z = 0.96$; $p = 0.00$), strong legs ($z= 0.86$; $p = 0.00$), shape of the animals' udder ($z = 0.95$; $p = 0.00$), pregnant dam ($z = 0.62$; $p = 0.00$). This observation implies that majority of the surveyed small ruminant farmers highly prized these criteria whenever they were to select sheep and goats for stocking and production purpose.

Criteria such as dental structure ($z =$ 0.88; $p = 0.00$), doeling ($z = 0.78$; $p = 0.00$) and doe/buck ($z = 0.69$; $p = 0.00$), and castrate statuses ($z = 0.84$; $p = 0.00$) of the animals were however inversely significant. This implies that these farm animal traits were not important criteria for farm animal selection. In essence, these criteria did not matter to the farmers and as such were hardly considered for selection of animals. On another note, the use of shining skin ($z = 0.54$; $p = 0.00$) as selection criterion of small ruminant was not significant in any direction, and by implications, it might not be considered as important criterion.

Loglinear correlation of the association between the selection criteria and production outcome of the animals

Loglinear test of association between the criteria for selection of small ruminants and production outcome of the small ruminant farmers revealed a significant relationship between health status of the animals and freeness from pests ($r = 0.011$; $p<0.05$); robust stomach ($r = 0.000$; $p<0.05$). This implies that sustenance of population of healthy animals by the farmers largely

depends on selection of animals that are free from pest infestation, and with robust outlook. Also, a significant association was observed between income realised from sales of selected animals and well-shaped udder (r = 0.021; *p*<0.05). This implies that small ruminants with good body structure attracts better market demand and price. An inverse significant association was however observed between the number of sustained animal population at a particular time and freeness from wounds (r = 0.024; *p*<0.05); good shape of udder (r = -0.023; *p*<0.05). This implies that, in as much as good body structure and robust outlook of the selected animals have much to do with the healthy status of the animals kept by the farmers, the criteria have little or nothing to do with the number of animals kept by the farmers. The study observed that the surveyed ruminant farmers conscientiously select sheep and goats with good characteristic traits for production. Prized selection criteria by the by famers include prolificacy, sexual libido, physiological or body structure and age of the animals. Although the used criteria for selection of sheep and goats by the farmers had worthwhile impacts on their production status, in terms of having sizeable and healthy animal population; and market acceptability for income generation, it could be concluded that the farmers mainly relied on characteristic traits that rare visible to sight and/or perceived to be present in the animals. However, reliance on visible characteristic traits as selection criteria could be deceitful as selected animals may not necessarily be disease resistant or free of pests and diseases; largely because it takes time for symptoms and effects of pests or parasites, especially intestinal ones, to become manifested. Similarly, a genetically deformed animals, which cannot be facially detected, may result in poor productivity and/or profitability of the farmers. This notwithstanding, the prized selection criteria have proven valuable to the farmers and such should be sustained.

Conclusion and Applications

1. Farmers used prized selection criteria like prolificacy, sexual libido, physiological or body structure and age of the animals.
2. The farmers' capacity for objective animal selection should however be strengthened with the support of animal breeding scientists, and through extension education services.
3. This is essential to enhance the farmers' understanding of genetic and phenotypic factors, and veterinary assessment. With this, small ruminant production by the farmers could become productive and sustainable.

References

1. Getachew, T. Haile,A., Tibbo, M., Sharima, A. K., Solner, J. and Wurzinger, M. (2010). Herd management and breeding practices of sheep owners in mixed-cropping and pastoral system in Ethiopia. *African Journal of Agricultural research,* 5(8), 685-691. Doi: 10.5897/AJAR10.392

2. Okali, C., and Sumberg, J. E. (2019). Sheep and goats, men and women: Household relations and small ruminant production in Southwest Nigeria. In J. L. Moock (Ed). Understanding Africa's rural households and farming systems. Rutledge

3. Albenzio, M., Santillo, A., Avondo, M., Nudda. A., Chessa, S., Pirisi, A. and Banni, S. (2016). Nutritional properties of small ruminant food products and their role on human health. *Small Ruminant Research,* 135, 3-12 https://doi.org/ 10.1016/j. smallrumres.2015.12.016

4. Armson, B., Ekiri, A. B., Alafiatayo, R., and Cook, A. J. (2021). Small ruminant production in Tanzania, Uganda and Ethiopia: A systematic review of constraints and potential solutions. *Veterinary Science,* 8(1), 5. https://doi.org/10.3390/vetsci8010005

5. Adams, S., Ohene-Yankyera, K., Aidoo, R., and Wongnaa, C. A. (2021). Economic benefits of livestock management in Ghana. *Agricultural and Food Economic,* 9(17), https://doi.org/10.1186/s40100-021-00191-7

6. Lalljee, S. V., Soundararajan, C., Singh, Y. D. and argison, N. D. (2019). The potentials od small ruminant farming as means of poverty alleviation in total Southern India. *Tropical Animal Health and Production,* 51, 303-311. https://doi.org/10.1007/s11250-018-1686-4

7. Ahiagbe, K. M. J., Shaibu, M. T., Avornyo F. K., Ayantunde A. A., and Panyan, E. K. (2021). A guide to developing the small ruminant value chain in Northern Ghana: A value chain approach. International Institute of Tropical Agriculture. www.africa-rising.net

8. Yusuf, A., Aruwayo, A. and Muhammad, I. R. (2018). Characterisation of small ruminant production systems in Semi-Arid Areas of Northern Nigeria. *Journal of Applied Sciences and Environmental Management,* 22(5), 725-729. DOI: 10.4314/jasem.v22i5.18

9. Nunes, J. F. and Salgueiro, C.C. M. (2011). Strategies to improve the reproductive efficiency of goats in Brazil. *Small Ruminant Research,* 98(1–3), 176-184 https:// doi.org/ 10.1016/ j.smallrumres.2011.03.036

10. Tabbaa, M. J. and Al-Atiyat, R. (2009). Breeding objectives, selection criteria and factors influencing them for goat breeds in Jordan. *Small Ruminant Research*, 84(1-3), 8-15

11. Lopes, F. B., de los Reyes Borjas, A., Silva, M. C., Facó, O., Lôbo, R. N., Fiorvanti, M. C. S. and Manus, M. (2012). Breeding goals and selection criteria for intensive and semi-intensive dairy goat system in Brazil. *Small Ruminant Research,* 106(2–3), 110-117. https://doi.org/10. 1016/j. smallrumres.2012.03.011

12. Leite-Browning, M. L. and Browning Jr., R. (2009). Criteria to select goat breeding stock. Alabama Cooperative Extension System: Alabama A&M and Auburn Universities. https://ssl. acesag.auburn.edu/pubs/docs/U/UNP-0110/UNP-0110-archive.pdf

13. Garcia L, I. P. (2012). Production objectives and selection criterions of three endemic ruminant breeds in The Gambia and Senegal. Swedish University of Agricultural Sciences https://pdfs.semanticscholar.org/5d32/ 7368be50a97fe80ada4436cb84d56aa6 c71e.pdf

14. Premium Times (2016). Nigeria releases census of goats, sheep, pigs, other livestock in country. Premium Times, June 2. (online) https://www. premiumtimesng.com/news/top-news/ 204577-nigeria-releases-census-goats-sheep-pigs-livestocks-country.html

15. Dauda, T. O., and Adetayo, A. O. (2019). Multivariate analysis of rainfall characteristics and yield of selected crops in Ogun State, Nigeria. *Journal of Horticulture, Forestry and Biotechnology,* 23(3), 78-85.

16. Ogungbenro, S. B. and Morakinyo, T. E. (2014). Rainfall distribution and change detection across climatic zones in Nigeria. *Weather and Climate*

Extremes, 5–6, 1-6. https://doi.org/ 10.1016/ j.wace.2014.10.002

17. Bailey, K.D. 1987. Methods of Social Research. (2nd edn) The Free Press: New York.

18. Getachew, T., Haile, A., Tessema, T. Dea, D., Edea, Z., and Rischkowsky, B. (2020). Participatory identification of breeding objective traits and selection criteria for indigenous goat of pastoral communities in Ethiopia. *Tropical Animal Health and Production,* 52, 2145-2155. https://10. 1007/s11250-020-02243-4

19. Dubeuf, J.-P. and Boyazoglu, J. (2009). An international panorama of goat selection and breeds. *Livestock Science,* 120, 225–231.

20. Shivakumara, C., Reddy, B. S. and Patil, S. S. (2020). Socioeconomic characteristics and composition of sheep and goat farming under extensive system rearing. *Agricultural Science Digest,* 40(1), DOI: 10.18895/ag.D-5006

21. Anyawu, N. J., Ogualu, J. O., Odoemelam, Kalio, G. A. and Ekpe, I. I. (2020). Sheep and goat farming in Imo State Southeast Nigeria: A traditional vocation at the verge of extinction? *Nigerian Journal of Animal Production,* 47(4). https://doi.or/10.51791/njap.v47i4.70

22. Fabusoro, E. Lawal-Adebowale, O. A. and Akinloye, A. K. (2007). A study of rural livestock farmers' patronage of veterinary services for healthcare of small farm animals in Ogun State. *Nigerian Journal of Animal Production,* 34(1): 132 – 138.

23. Abdul-Rahman, I. I. (2017). Reproductive performance of West African Dwarf goats under Guinea Savannah conditions. *Ghana Journal of Science, Technology &*

Development, 5(1). https://doi.org/ 10.47881/100.967x

24. Ozung, P.O., Nsa, E. E., Ebegbulem, V. N., Ubua, J. A. (2011). The potentials of small ruminant production in Cross River Rain Forest Zone of Nigeria: A Review. *Continental Journal of Animal and Veterinary Research,* 3 (1): 33-37, Wilolud Journals http://www. wiloludjournal.com

25. Lawal-Adebowale, O. A. (2012). Dynamics of Ruminant Livestock Management in the Context of the Nigerian Agricultural System. https://api.intechopen.com/chapter/pdf -preview /40420

26. Okpeku, M., Ogah, D. M., and Adeleke, M. A. (2019). A review of challenges to genetic improvement indigenous livestock for improved food production in Nigeria. *African Journal of Food, Agriculture, Nutrition and Development,* 19(1). DOI: 10.18697/ajfand.84.BLFB1021

27. Hussein, T. Hussein, T. (2018). Local sheep and goat reproductive performance managed under farmer condition in Southern Ethiopia. *International Journal of Livestock Production*, 9(10), 280-285. https://doi.org/10.5897/IJLP2018.0509

28. Nigussie, H., Mekasha,Y., Kebede, K., Abegaz, S. and Pal, S. K. (2013). Production objectives, bree-ding practices and selection criteria of indigenous sheep in eastern Ethiopia. *Livestock Research for Rural Development,* 25(9), http://www.lrrd.org/lrrd25/9/nigu25157.htm

29. Ayele, S. and Urge, M, (2019). Productive and reproductive performances of indigenous sheep in

Ethiopia: A review. *Open Journal of Animal Sciences*, 9, 97-120. DOI: 10.4236/ojas.2019.91009

30. Enwelu, I. A., Ezeuko, E. L. and Machebe, N. S. (2015). Challenges of smallholder sheep and goat keeping in rural communities of Aguata Agricultural Zone of Anambra State, Nigeria. *Indian Journal of Animal Research, 49*(3), 373-377.