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FARMERS' TRAITS PREFERENCES IN SELECTING BREEDING STOCKS FOR CATTLE PRODUCTION IN THREE AGRO-ECOLOGICAL ZONES OF YOBE STATE, NIGERIA

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ABSTRACT: This research assessed the preferred traits by smallholder cattle framers in selecting breeding stocks for production in three ago-ecological zones of Yobe state, Nigeria. A total of 600 cattle farmers were selected across twelve local government areas in the state. Information was sought on preferred traits for selecting breeding stock using structured questionnaires. Chi-square test was used to compare variables between agroecological zones. The study revealed that most (56.7%) farmers preferred combination of body size, coat colour and tail length to adaptation and testicular size (29.8%) in cattle for breeding stock. There were significant (P<0.001) differences between farmers' preferences among the zones. Greater portion (91.8%) of the farmers preferred tall animals with red coat colour. Preference for horn shape were 82.8% for curved. Nose profile had higher (64.0%) preference for convex nose. Most (50.5%) farmers preferred disease tolerance to tolerance to drought (49.5%). Large (51.2%) number of farmers preferred compact testicles to split ones (48.8%). Many (88.3%) of the farmers preferred long tailed cattle. Across the zones, preference on mothering ability was 54.3% for multiple births, 32.3% for short calving interval and 13.3% for offspring quality while 75.2% farmers preferred animals with large udders and long teat (91.8%). The result of this study could be useful in designing effective breeding strategies in selecting breeding stock for cattle production in this region.

Keywords: Smallholder, breeding stock, testicle, coat colour, calving interval

INTRODUCTION

Cattle is highly placed in the Nigerian livestock industry where it accounts for about 45 percent of total meat consumed in the country. Unlike in the past (1981) when the national herd can only boast of an estimated population of 9.2 million herds of cattle, recent report (2022) has it that Nigeria's cattle population is estimated at 20.9 million heads (Sasu, 2024). Interestingly, the growth rate in the national herd is estimated at 1.5 percent annually. Significant part of this were hosted by the traditional producers in the Northern parts of the country (Girei *et al.,* 2013). Whatever their level of production, livestock in developing countries provide millions of families with better nutrition, family income and employment opportunities, draft power and a more balanced agriculture.

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Cattle productivity is constrained among smallholder farmers by absence of organized breeding plans; other constraints of ruminant animal production in general are lack of technical capacity, scarce feeds, insufficient infrastructure and market information resulting in inadequate utilization of the indigenous genetic resources (Sanusi *et al.,* 2010). However, they have potentials for improvement since they have high reproductive efficiency even under harsh environmental conditions (Hassan *et al.*, 2015). Besides, there is substantial within breed variation in most of the economically important traits (Rege *et al.*, 2011).

A new approach is therefore required (Wurzinger *et al.,* 2011), since the prevailing production conditions determines the breeding or production purposes, suitability of breeds and breeding methods (Duguma *et al.*, 2011). Experience from advanced livestock genetic improvement programmes, particularly in developed countries has shown that long-term evolving strategies involving the public and private sectors can be highly successful. One of such approaches that has recently stimulated global interest is a community-based breeding practice.

In the previous decades, most breeding programmes were developed only by the scientists and implemented by the development agents neglecting the needs of the farmers and the long-term impacts of their actions (Kosgey and Okeyo, 2007). As a result, a lot of breeding programmes crumbled (Tibbo, 2006). It was later realized that indigenous knowledge can be a source of information about scientifically undocumented breeds and traits (Getachew, 2010). According to Jabbar *et al*. (1999), biological characterization may not on its own be adequate for decisions on conservation because diversity is being lost due to human activities and preferences, and due to the fact that human beings also adopt and adapt breeds to their needs.

Ultimately, both the rate of interbreeding and the success of improvement strategy, depend largely on the actions of the farmers who own, keep and use the animals day-in-day-out. Therefore, people's knowledge and preferences should be an integral part of characterization. As reported by Jabbar *et al*. (1999), *Ex ante* assessment of farmers' breeding strategies and breed preferences can assist breed conservation and improvement efforts in several ways. Among other things, it can help to assess current stocks of different at-risk breeds held by farmers, the geographic distribution of those stocks, and the likely future trends in those stocks.

Farmer preference for different breeds, criteria used for selection of breeds, value placed on homogeneity versus diversity, the skills and information exchange mechanisms used in the process of breed selection and management, and farmers' knowledge about specific attributes of different breeds under village conditions, can all help to focus scientific research on particular traits, and identify needs for extension and farmer education. It can help to determine the incentives that might be required by farmers for the conservation of threatened or endangered breeds. Consequently, valuable time can be saved for generating appropriate breeds and production practices to meet farmers' needs. The aim of this research work was therefore to examine the farmers' traits preferences in selecting breeding stocks for cattle production in three Agro-ecological zones of Yobe state, Nigeria.

MATERIALS AND METHODS

Description of the study environment and climate

The study was conducted in Yobe state. The state is located in the North eastern geo-political zone of Nigeria. It has a total land area of 47,153 km^2. Yobe state is on latitude 11^0 N and longitude 13.5^0 E of the Equator. The State's vegetation is predominantly Sudan savanna, with scattered semi- and arid trees such as *acacia* species. There is a portion of the state which is Sahel savanna, consisting of sandy soils and thorn scrubs. This is located in the far north. The state has borders with three other northeastern states (Bauchi, Borno, Gombe) and one north western state (Jigawa). Yobe has international border with Niger Republic towards the north of Diffa and Zinder regions.

The annual rainfall in the state is between 1000 mm and 1100 mm per annum with effective rainy season from mid-May and early-June. Mean monthly minimum and maximum temperatures were 24.13°C and 33°C respectively, with an average temperature of 29.3°C; March is the hottest month of the year while December is the coldest month. Relative humidity of Yobe state ranges from about 12% in February to about 68% in August.

This study was carried out from July 2019 to January 2020 in selected Local Government Areas of Yobe State. The selected local government areas covered all the three (3) Agricultural zones of the state as demarcated by the Yobe State Agricultural Development Programme (YOSADP). The zones are; Northern, which comprises of seven local

government areas: Bade, Jakusko, Karasuwa, Machina, Yunusari, Yusufari and Nguru local government areas. Eastern Agricultural zone covered six local government areas: Damaturu, Geidam, Bursari, Gujba, Gulani and Tarmuwa local government areas. Southern Agricultural zone consists of four local government areas: Potiskum, Nangere, Fika and Fune local government areas (Dossa *et al.,* 2015).

Out of the seventeen (17) local government areas of the state, twelve (12) were randomly selected (four local government areas from each agricultural zone). Five (5) villages/ communities were then purposively selected in each of the randomly selected local government areas based on accessibility and livestock population. Ten (10) farmers/households were purposively chosen in each of the selected village/ community based on their years of experience with the aid of extension agents and ward heads, giving a total sample of 600. A cattle farmer was defined as a person who owns the animal, is involved in their maintenance and is the decision maker concerning management, selection and disposal (Dossa *et al.,* 2015). The farmers were individually interviewed using questionnaires earlier pretested for suitability. The questionnaires covered information on the socio-economic characteristics of the respondents, reasons for keeping cattle, herd sizes and structure, selection practices, breeding methods and trait preferences.

Statistical Analysis

Data obtained were first sorted and checked for errors to improve precision and then analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 (IBM Corp, 2011). Descriptive statistics using frequency counts and standard errors were performed. Cross tabulations and Chi square (χ^2) statistics were used to compare categorical variables between agroecological zones. One-way analysis of variance was used to compare herd size between the agroecological zones and where significant differences were detected, means were separated using Fisher's Least Significance Difference (LSD) test.

RESULTS AND DISCUSSION

Table 1 shows the respondents' trait preferences in selecting breeding males. It revealed that 56.7% of the respondents had preferences for a combination of body size, coat colour and tail length, whereas (29.8%) had preferences for adaptation and testicular size. Those that had preferences for only tail length and testicular size in selecting breeding males were least (13.5%). There were highly ($P<0.001$) significant differences between farmers' preference for these traits among the zones. The findings in the current study that majority of the respondents sourced their breeding stocks from the market agrees with the reports of Dossa *et al*. (2015) and Usman (2016). Ahmed and Egwu (2014) stated the reason for this was the relative ease with which farmers could purchase their animals from the market and the variety of cattle breeds available for sale. However, sourcing breeding stock from market without knowledge of animal record poses risks for genetic improvement. In line with this, Demissu and Gobena (2015) observed that the use of breeding stocks of unknown sources results in extended calving interval.

Details for trait preferences for selecting breeding stock is presented in Table 2. The table revealed that 91.8% of the cattle farmers preferred taller animals than short ones (8.2%) with red coat colour (72.8%). This is followed by 17.3%, 8.2% and 1.7% for reddish brown, white and brown and white coat-coloured cattle, respectively. No (0.0%) cattle farmer preferred cattle with black coat as breeding stock. In terms of coat colour pattern, the results (Table 2) showed higher (46.8%) preference for plain coloured cattle, followed by 30.5% and 22.7% for patchy and spotty ones, respectively. Preferences for horn shape were 82.8% for curved, 12.2% for straight and 5.0% for spiral shaped horns. Nose profile had higher (64.0%) preferences for convex profiled nose than flat (24.8%) and concave ones (11.2%). The preferences for adaptational traits were 50.5% for disease tolerance and 49.5% for tolerance to drought. Higher (51.2%) proportion of the respondents preferred compact testicles than split ones (48.8%). For tail length, 88.3% of the respondents had preference for long tailed cattle than those with short ones (11.7%).

The high preferences for body size, coat colour, horn orientation, testicular size and tail length in selecting breeding males in all the locations is in agreement with the findings of Duguma *et al*. (2011). There were higher preferences for compacted testicles by farmers in the locations which the respondents said was borne out of the fact that bulls with compacted testicles gain weight faster relative to those split testicles. Duguma *et al*. (2011) reported body size as an evident selection tool for breeding bulls in Ethiopia as they command premium price in the market. A similar observation was made by Marshall *et al*. (2016) in Sudan, a predominantly Muslim country. Duguma *et al*. (2011) observed higher preferences for horned bulls to polled ones and further emphasized that the size and orientation of the

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horns matter in the traditional breeding bull selection as big and twisted horned bulls were highly valued. However, Hagos *et al*. (2015) reported high preference for polled bulls in Northern Ethiopia based on farmers' belief that such bulls have tender meat than horned bulls.

Table 1: Traits Preferences in Selecting Breeding Stocks

Variables	North	East	South	N	χ^2	LOS
Males						
BS and CC	112(56.0)	107(53.5)	121(60.5)	340(56.7)	70.255	***
AD and TS	76(38.0)	77(38.5)	26(13.0)	179(29.8)		
TL and TS	12(6.0)	16(8.0)	53(26.5)	81(13.5)		
Total	**200**	**200**	**200**	**600**		
Females						
MA, BS and UP	138(69.0)	149(74.5)	82(41.0)	369(61.5)	148.916	***
MA, UP and CC	40(20.0)	26(13.0)	38(19.0)	104(17.3)		
MA and UP	8(4.0)	25(12.5)	55(27.5)	88(14.7)		
BS and UP	14(7.0)	0(0.00)	25(12.5)	39(6.5)		
Total	**200**	**200**	**200**	**600**		

Figures in parenthesis are in percentages, BS: Body size, *** (P<0.001), AD: Adaptation
TS: Testicular size, TL: Tail length, UP: Udder parameters, CC: Coat colour, MA: Mothering ability

Table 2: Details of Trait Preferences in Selecting Breeding Males

Variables	North	East	South	Total(N)	χ^2	LOS
Body height						
Tall	192(96.0)	179(89.5)	180(90.0)	551(91.8)	6.978	NS
Short	8(4.0)	21(10.5)	20(10.0)	49(8.2)		
Coat colour						
Red	158(79.0)	149(74.5)	130(65.0)	437(72.8)	39.906	***
Red brown	10(5.0)	0(0.0)	0(0.0)	10(1.7)		
Reddish brown	8(4.0)	21(10.5)	20(10.0)	49(8.2)		
Black	24(12.0)	30(15.0)	50(25.0)	104(17.3)		
Coat colour pattern						
Plain	89(44.5)	122(61.0)	70(35.0)	281(46.8)	78.425	***
Patchy	91(45.5)	41(20.5)	51(25.5)	183(30.5)		
Spot	20(10)	37(18.5)	79(39.5)	136(22.7)		
Horn shape						
Curved	153(76.5)	176(88.0)	168(84.0)	497(82.8)	28.487	***
Straight	30(15.0)	11(5.5)	32(16.0)	73(12.2)		
Spiral	17(8.5)	13(6.5)	0(0.0)	30(5.0)		
Nose profile						
Convex	127(63.5)	136(68.0)	121(60.5)	384(64.0)	41.978	***
Flat	31(15.5)	49(24.5)	69(34.5)	149(24.8)		
Concave	42(21.0)	15(7.5)	10(5.0)	67(11.2)		
Adaptation						
Disease tolerance	87(43.5)	11(55.5)	105(52.5)	303(50.5)	6.241	NS
Drought tolerance	113(56.5)	89(44.5)	95(47.5)	297(49.5)		
Testicular size						
Compact	123(61.5)	107(53.5)	77(38.5)	307(51.2)	21.825	***
Split	77(38.5)	93(46.5)	123(61.5)	293(48.8)		
Tail length						
Tall	190(95.0)	182(91.0)	158(79.0)	530(88.3)	26.911	***
Short	10(5.0)	18(9.0)	42(21.0)	70(11.7)		

Figures in parenthesis are in percentages N=Total, NS: Not significant. χ^2 =Chi-square. *** (p<0.001)
LOS =Level of significance

Response of the cattle farmers on traits preferences in selecting breeding cows (Table 2) revealed that larger proportion (61.5%) of the respondents had preferences for a combination of mothering ability, body size and udder parameters while, 17.3%, 14.7% and 6.5% of the respondents had preferences for a combination of: mothering ability; udder parameters and coat colour; mothering ability and udder parameters, and body size and udder parameters, respectively. Details of respondent's trait preferences in selecting breeding cows are shown in Table 3. The preference in all the zones for mothering ability was 54.3% for multiple births, 32.3% for short calving interval and 13.3% for offspring quality. Most (75.2%) cattle farmers had preferred large udders over thin ones (24.8%). Similar to their response for udder traits was the teat lengths. Over ninety percent (91.8%) of the respondents preferred longer teats than short ones. More so, majority (92.7%) of the respondents preferred tall cows with red coloured coats (84.3%), while none of the respondents gave preference to black ones.

The higher preference for mothering ability (twinning), body size and udder parameters in selecting breeding cows in all locations in this study agrees with the findings of Duguma *et al.* (2011) and Dossa e*t al.* (2015) who in their studies reported higher preferences for mothering ability and body size by farmers in selecting cows for breeding. The authors further observed that the most preferred mothering ability attributes were prolificacy and fertility while most of the farmers did not have strong preference for short calving interval (Duguma *et al*., 2011). Getachew *et al.* (2010) explained that calving was usually synchronized with season of feed availability and therefore it was quite logical that short calving interval was less favoured in selecting cows for breeding.

Table 3: Details of Trait Preferences in Selecting Breeding Females

	North	East	South	N	χ^2	LOS
Mothering ability						
Short calving interval (SCI)	51(25.5)	81(40.5)	62(31.0)	194(32.3)	63.142)	***
offspring quality	40(20.0)	40(20.0)	0(0.0)	80(13.3)		
Teat length						
Long	180(90.0)	175(87.5)	196(98.0)	551(91.8)	16.045	***
Short	20(10.0)	25(12.5)	4(2.0)	49(8.2)		
Udder circumference						
Thin	53(26.5)	34(17.0)	62(31.0)	149(24.8)	10.947	***
Large	147(73.5)	166(83.0)	138(69.0)	451(75.2)		
Body height						
Tall	195(97.5)	181(90.5)	180(90.0)	556(92.7)	10.350	***
Short	5(2.5)	19(9.5)	20(10.0)	44(7.3)		
Coat color						
Red	143(865)	168(84.0)	168(84.0)	509(84.3)	31.892	***
Reddish brown	4(2.0)	21(10.5)	12(6.0)	3.7(6.7)		
White and black	23(11.5)	11(5.5)	20(10.0)	54(9.0)		
Coat color pattern						
Plain	119(59.5)	128(64.0)	115(57.5)	362(60.3)		
Patchy	63(31.5)	54(27.0)	23(11.5)	140(23.3)		
Spot	18(9.0)	18(9.0)	62(31.0)	98(16.4)		

χ^2 =Chi-square, ***: $p<0.001$, Figures in parenthesis are in percentages, N=Total, NS: Not significant

CONCLUSIONS

The study revealed that most cattle farmers preferred a combination of body size, coat colour and tail length to adaptation and testicular size in cattle for breeding stock selection. Taller cattle with red coat colour were preferred. Most farmers had preferences for cattle with curved horns and convex nose profile. On preferences for adaptational traits, most farmers preferred to select animal with potential for disease tolerance to tolerance to drought. Higher proportion of the respondents preferred compact testicles to split ones. For tail length, the cattle farmers had preference for long tailed cattle than those with short ones. Many farmers chose animal based on a combination of mothering ability, body size and udder parameters. Across the zones, preference on mothering ability was for multiple births, for short calving interval and for offspring quality. Most cattle farmers had preferences for large udders over thin ones.

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Longer teat was preferred to shorter ones. The results of this study should therefore be considered in making effective breeding strategy in selecting breeding stock for cattle production in this region.

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