Cattle production and breeding practice in communal farming system in the Eastern Cape Province, South Africa

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Abstract

Communal cattle farming experience high mortality levels, general low reproduction rates and low calf weaning percentages. This result in a low beef off-take of less than 12% which is much lower in comparison to 25% in the commercial sector. The objective of the study was to assess cattle breeding management and production constraints in a communal farming system towards designing a livestock improvement program. A total of 100 households heads being cattle owners were randomly sampled using a pre-tested structured questionnaire at Nxaxo community in the Eastern Cape. The interviews were conducted using vernacular Xhosa language. The questionnaire included questions related to demographics and farm characteristics such as total land size, ownership, livestock management practices such as feeding, selection traits, the purpose of keeping cattle and constraints. Of the sampled households interviewed (n=100), male to female ratio was 0.69 to 0.31. The mean number of ruminant animals per herd was 1.98±2.63 sheep, 3.59±3.98 goats and 7±4.18 cattle. All of the respondents practice uncontrolled breeding which is attributed to a lack of infrastructure. Breeding parameters such as body size (37.8%) and growth (29.1%) were ranked high for beef production, whereas milk production (18.6%) was the most used parameter for selecting breeding cows. Mothering ability (11.6%) and coat colour (2.9%) were other traits used for selecting breeding animals. Major constraints of cattle production in the study area were lack of infrastructure, tick-borne diseases, feed shortage, stock theft as well as market accessibility. Poor breeding management contributes to low reproduction in the communal areas and more training on animal related aspects are required for farmers to enhance their knowledge.

Keywords: Breeding practices, communal farming system, traits of economic importance
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Introduction

Livestock farming is a mainstay of South African agriculture and it constitutes an important natural resource in most rural communities in Africa. It is estimated that more than 60% of South Africa's population is dependent on agriculture of which livestock play a very important role (Braker *et al.*, 2002; Perret and Mercoiret, 2003; Greyling, 2012). In South Africa, the contribution of cattle production to agricultural output ranges between 25-30 % per annum, excluding the values of draught power, manure and other products (Musemwa *et al.*, 2008). The country is known for its rich and immensely diverse cattle breeds that are distributed across different agro-ecologies and socio-cultural settings, where they are kept as a source of food, farm family income, providing draught power, foreign exchange earnings and social and cultural functions (Scarpa *et al.*, 2003; Biradar *et al.*, 2013), thus contributing to household livelihood, food security and poverty alleviation (Miao *et al.*, 2005; Meissner *et al.*, 2013).

South Africa has an estimated 12.8 million cattle of which the majority is owned by 4 million black farmers who reside and farm on agricultural land in the former homeland areas of South Africa (Aliber & Hart, 2009; National Livestock Statistics, 2018). Compared to other provinces, the Eastern Cape Province holds more than 29% of cattle the population in South Africa (Department of Agriculture Forestry and Fisheries, 2018). According to Statistics South Africa (2016), there are 34% of households who own between 1 to 10 heads of cattle and 22.8% who own between 11 and 100 herds of cattle in the Eastern Cape communal farming areas.

Despite the importance of cattle and its huge resource potential, the current contribution of cattle to the producers and to the national economy is dismal compared to its size. Communal cattle farming reveals a high level of mortality (30%), a low reproduction rate, and low weaning percentage (Nowers *et al.*, 2013), which

results in a low off-take of less than 12%, which is much lower than the 25% reported in the commercial sector (Musemwa *et al.*, 2010). Researchers (Kusina & Kusina, 1999; Kiff *et al.*, 1999; Nsoso & Madimabe, 2003; Ben & Smith, 2008; Nqeno, 2008; Karimuribo *et al.*, 2011; Mthi *et al.*, 2016; Yawa, 2017) indicated that lack of breeding plans, feed shortage, poor infrastructure, diseases and poor management practices are the major constraints contributing to low productivity in communal farming systems. As a result, about 25% of low-off take attributed to private/commercial sector farming.

To date, research in cattle production systems has emphasized much on their production parameters and constraints, and there is a scarcity of information on socio-economic roles, farmers preferred traits of economic importance and traditional breeding practices. In view of this, the present study was taken up with the objective to characterise cattle production, traditional breeding practices and production constraints, in order to formulate relevant strategies for the development of the livestock sector in communal farming systems.

Materials and methods

The study was conducted in Nxaxo administrative area (ward 8) which falls under Mnquma local municipality in Amathole district. Nxaxo is located at about 15 km east from the town of Centane at 28°30'17" E and 32°32'47" S. Its elevation is 55 meters above the sea level and most of the land is undulating. The mean annual rainfall is 1015 mm. Nxaxo covers an area of 4000 ha (including homestead, natural forestry, rivers, grazing land and crop fields). The vegetation is classified as Transkei Coastal Belt and Bhisho Thornveld towards inland (Mucina& Rutherford, 2006) with potential grazing capacity of more than 3ha/Au. The estimated livestock population is about 3000, of which 48% are cattle (Luzipho, personal communication 2018). Mixed crop-livestock is the dominant production system in the study area.

Study design

Purposeful sampling technique was used to select the study site and population, respectively. Purposeful sampling was used to select farmers who keep livestock. A total of 100 respondents were interviewed using a pre-tested structured questionnaire. The questionnaire included questions related to demographics and farm characteristics such as total land size, ownership, livestock management practices such as feeding, selection traits, major feed resources and constraints. The interviews were conducted using vernacular Xhosa language.

Data analysis

The data collected were entered in Microsoft Excel and analysed using Chi-square test of SAS (2003) to determine associations between demographic information and other variables.

Results and Discussion

Socio-demographic characteristics

Table 1 shows the socio-demographic characteristics of the respondents. Of the sampled households interviewed (n=100), males were the majority (69%) with females representing only 31%. The dominance of male respondents in this study is in agreement with findings of Mapiliyao *et al.* (2012) in other rural communities of the Eastern Cape. Similar trends were reported from surveys conducted in Tanzania, Ethiopia and Nigeria, where men constituted a higher proportion than women (Maeda-Machang'u *et al.*, 2000; Haile *et al.*, 2012; Adedeji *et al.*, 2013), reflecting the tendency towards male dominance in the livestock industry in most rural communities in Africa.

The age of the respondents ranged from 20 to 85 years (Table 1). The majority (49%) of the respondents were between the ages of 31 and 50, 33% were above 50 years of age, and 18% were less than 31 years. The high proportion of involvement of middle-aged farmers in agriculture was observed in North West Province by Motiang and Webb (2016), which confirms the low participation rate of youth in agricultural development.

Table 1 Demographic data of respondents

Respondents characteristics	Number of respondents	Percentage (%)
Gender	69	69
Male	31	31
Female		
Age	18	18
20-35	49	49
35-55	33	33
>55		
Marital Status	27	27
Single	42	42
Married	11	11
Divorced	20	20
Widowed		
Level of education	18	18
Illiterate	48	48
Primary	30	30
Secondary	4	4
Tertiary		
Employment status	16	16
Employed	62	62
Unemployed	10	10
Self-employed	12	12
Retired		
Source of income	14	14
Salary	33	33
Livestock	27	27
Pension	26	26
Social grant		

This implies that youth in these areas do not participate in livestock farming. Among other reasons for lack of participation in livestock farming by youth, is that, youth are more focus in urban areas than living in rural communities. This could be attributed to the fact that looking after large ruminants require less attention than other livestock species.

It is evident from the study that the majority (40%) attained primary education, 30% having a secondary school education, 18% illiterate, and 4% having post matric. The educational dynamics especially those who can read and write can play a role in records keeping, and could be able to adopt and practice new technologies that may enhance cattle production. These results are in agreement with those of Mthi and Nyangiwe (2018) where the majority of male respondents had primary education in Ngcobo local municipality, Eastern Cape Province. But Chimonyo *et al*. (1999) had different results when only majority of male had secondary education in Zimbabwe.

The majority (62%) of the respondents were actively (Table 1) and their source of income was through sales of livestock (33%) followed by pension (27%), social grant (26%) and salary (14%). The income through livestock sales supports the fact that cattle play an important role in livelihoods of the small-scale farmers in the region. However, the findings are similar with those of Matanyaire (1997) who reported that livestock was the major source of income in Kavango region, Namibia.

In Table 1, the majority of respondents were married (42%), 27% were single, 20% were windowed (20%) and 11% were divorced. The main attribute to this is that single people are less accountable for performing household duties compared to married individuals. This is in contrast with the results reported in

Kenya, Ethiopia and Uganda by Matsumoto *et al.* (2006) who found that there were more single women in the study areas.

Household size, landholding and farming experience in the study area

The majority of the respondents had smaller family sizes of 1 to 4 members followed by more than 10 family members and 6 to 10 members. The study revealed that the average family size in the study area was 5.4 members (Figure 2). This size obtained in this survey was higher than the national family size of 3.3 members (Statistics South Africa (Stats SA), 2018). These findings are in agreement with those reported by Gracinda *et al.* (2018) that average household results were between 5.3 and 7.2 in Moamba districts of Southern Mozambique.

The overall average landholding per household in the study area was 2.9 hectares (Figure 3). However, the average landholding per household varied among different farming enterprise and family size. The major proportion of land in the study area was allocated for homestead (55%), followed by crop production (30%). A possible reason for this might be due to increase in human population. The findings concur with those reported by Mwambene *et al.* (2012) in Tanzania, where more land in rural communities was allocated for other agricultural activities (cropping) rather than grazing. The number of years of farming experience was above 15 years (Table 2). This is in contrast to a previous study by Goni *et al.* (2018) who reported 10 years livestock farming experience.

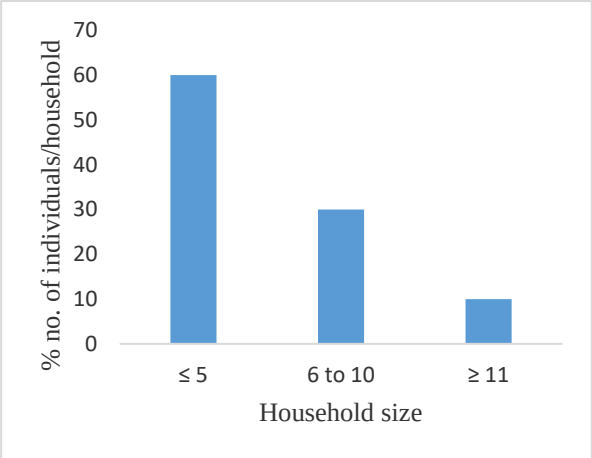

Figure 2 Household size

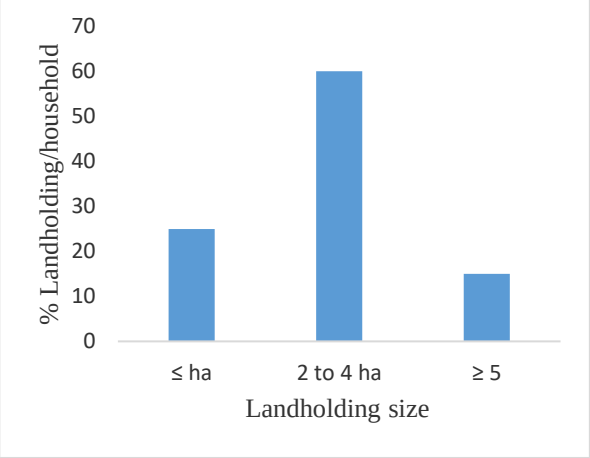

Figure 3 Landholding

Table 2 Farming experience of the respondents in the study area

Farming experience (years)	Gender		Percentage %
	Male	Female	
0-5	9	21	30
6-10	18	6	24
11-15	29	3	32
Above 15	13	1	14

Livestock species and herd structure

All the households reported being keeping more than one species of livestock (Table 3). Of the livestock species kept, cattle were kept in biggest numbers, on average 7 (range 1 to >24). Concur with the findings of (Bester *et al.* (2003) and Musemwa *et al.* (2008), where they estimated the average herd size to range from 5 to 10 cattle per household with the purpose of primarily addressing needs for subsistence with limited use of technology. This is in contrast with a previous study by Motiang and Webb (2016) differs in their study where the average herd size was 35 ranging from 1 to 169 in Taung in the North West Province of South Africa. In most of the households interviewed, ruminants were owned by males and in some households it was joint

ownership. This observation is inconsistent with findings reported by Mwambene *et al.* (2012) in Tanzania, where they concluded that joint ownership of cattle is a sign of promoting gender equality.

More than 45% of households owned medium size herds (9-23 cattle), 32% owned small herds (1-8 cattle), while 18.2% owned large herds of 24 or more cattle. As shown in Figure 4, breeding cows and heifers dominate (54.4%) the most shares of cattle herd followed by oxen (18%), bull calves (11.7%), female calves (10.1%) and mature bulls (5.8%). Similar findings were observed by Tokozwayo *et al.* (2018) who reported a high number of breeding cows and heifers in Sheshegu in the Eastern Cape.

Table 3 Livestock species kept by households and gender ownership

Species	Herd size (mean±SD)	Frequency/numbers
Cattle	7±4.18	100
Goats	3.59±3.98	55
Sheep	1.98±2.63	38
Chickens	9.75±5.11	98
Pigs	0.64±0.99	37
Others (dogs, mule, horses, etc.)	2.72±2.29	92

Small stock (sheep and goats) ranged between 1 to 19 with an average of 2.63 and 3.98 in sheep and goats, respectively. Most of households (98%) own chicken ranging from one to 35 with an average flock of 9.75 birds per household. Majority of households own dogs than horses, which could signify the role of dogs as a source of security for stock theft and other domestic use. In their study, Motiang & Webb (2016) attributed the farming of horses as mainly for animal herding than other purposes. This was also similar with the current study.

Cattle herd structure

As shown in Figure 4, breeding cows were the most owned cattle (36.1%), followed by heifers (18.3%), oxen (18%), bull calves (11.7%), female calves (10.1%) and mature bulls (5.8%). Similarly, Tokozwayo *et al.* (2018) reported a high number of breeding cows and heifers in the Eastern Cape.

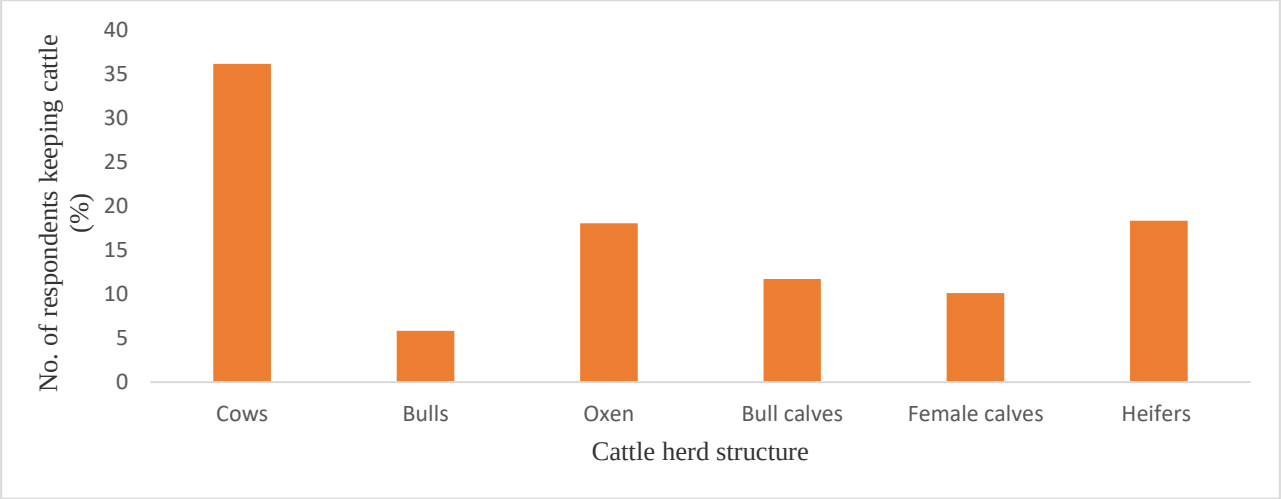

Figure 4 Cattle herd structure in the study area

Means of acquiring foundation stock

Apart from offsprings born, the majority of household heads (52.2%) acquired foundation herd mainly by purchasing (Figure 5). Other means of the acquisition were inheritance (22.5%), exchange (11.2%), gift from relatives (8%) and bride price (5.8%). These observations are in agreement with those reported by Nsoso

and Madimabe (2003) who reported that the majority of Karakul sheep farmers bought their foundation stock in the Southern Kalahari. Recently Mthi *et al.* (2018) reported similar finding with regard to ways of acquiring cattle and sheep in various parts of Africa.

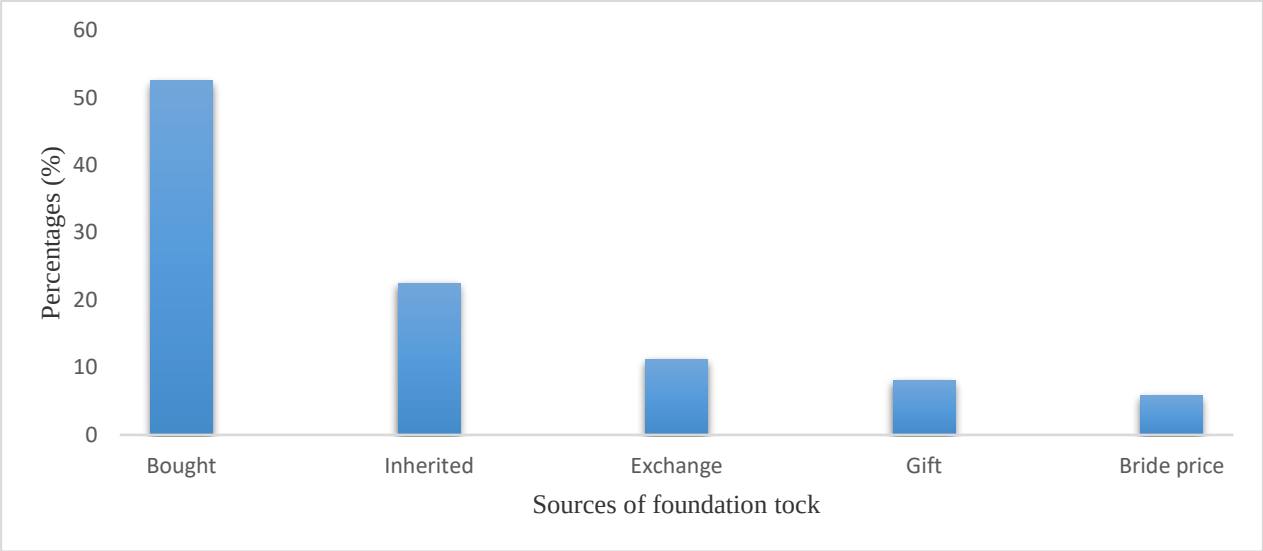

Figure 5 Sources of foundation stock of the cattle raised in the study area

Purpose of keeping cattle

Households were asked to give the reasons for keeping cattle and they gave several reasons (Table 4). Family cash income (26%) from sales of livestock was viewed as the most important reason for keeping cattle. Milk for home consumption was the second and the third was for traditional ceremonies and family rituals. Keeping livestock for investment, draught power, and manure as a source of fertilizer were the other reasons for keeping cattle in order of importance. The findings were in line with the findings of Aphunu *et al.* (2011) and Biradar *et al.* (2013) who reported that cattle are kept as a source of income.

Table 4 Purpose of keeping cattle in the study area

Purpose of keeping cattle	Percentage %
Source of income	26
Milk	24
Traditional ceremonies/rituals	18
Investment	17
Draught power	13
Manure	02

Purposes of keeping other livestock species

Chickens, goats, sheep and pigs were also kept as a means of savings, meat, wool and milk production, cultural functions, and donation for family functions in the study area (Table 5). Dogs and horses were kept for hunting, security against thieves, attending functions, herding and racing. This indicates that other livestock species plays an important role in livelihoods in the study area.

Breeding management

As shown in figure 6 uncontrolled breeding was the dominant practice employed by farmers in the study area. The majority (45%) of farmers generally reared their breeding bulls, followed by 30% farmers who do not own bulls and are only depended on community bulls, 20% bought/exchange bulls and 5% acquired

through Livestock Improvement Scheme (LIS). The observed uncontrolled mating system in the communal farming system may be attributed to lack boundary fencing in communal grazing lands.

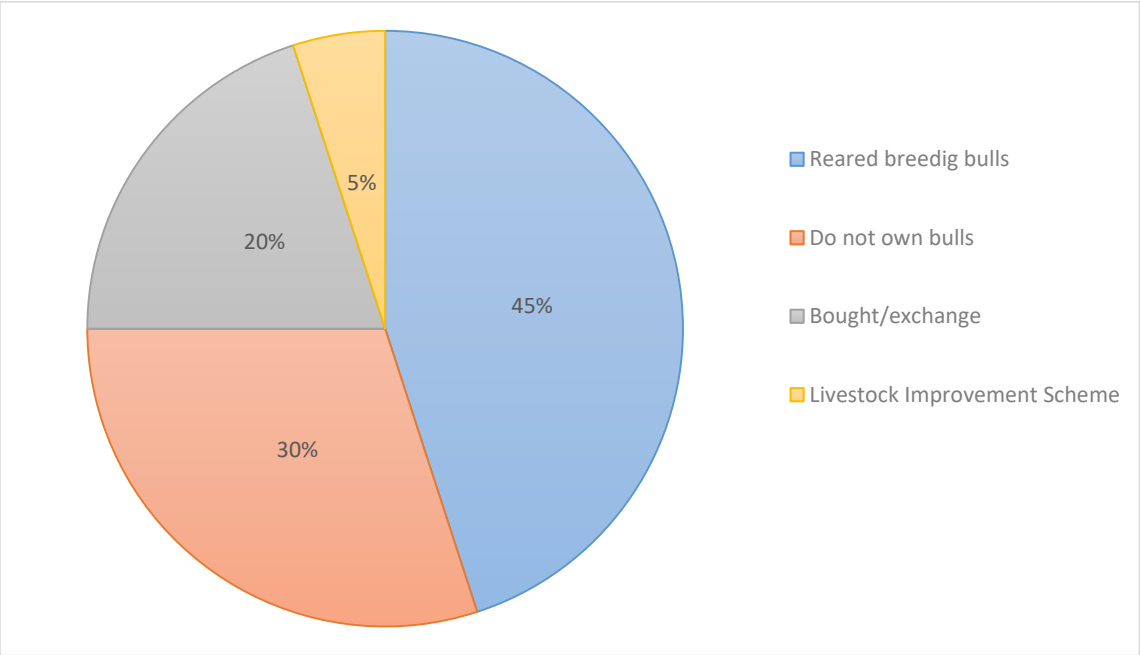

Figure 6 Sources of breeding bulls in the study area

Table 5 Purpose of keeping other livestock species

Species	Purposes	Frequency	Percentage %
Sheep (n=38)	Wool production	38	28.2
	Savings	30	22.2
	Donation	15	11.1
	Skin	5	3.7
	Milk	8	5.9
	Meat	32	23.7
	Fertilizer	7	5.2
		135	**100**
Goats (n=55)	Cultural functions	55	57.9
	Skin	2	2.1
	Milk	20	21.1
	Fertilizer	18	18.9
		95	**100**
Chickens (n=98)	Savings	45	31.5
	Meat	98	68.5
		143	**100**
Pigs (n=37)	Savings	37	64.9
	Meat	20	35.1
		57	**100**
Dogs (n= 63)	Security	60	70.6
	Hunting	25	29.4
		85	**100**
Horses (n=20)	Herding	7	14
	Racing	11	22
	Attending functions	32	64
		50	**100**

Association of farmers demography, landholding, household size, farming experience, means of acquiring cattle and purpose of keeping cattle

The association between demographic information of the farmer's landholding, household size, farming experience, means of acquiring cattle and purpose of keeping cattle are shown in Table 6. Gender, marital status and sources of income influenced farming experience, means of acquiring cattle and purpose of keeping cattle.

Table 6 Association between demographic information and landholding, household size, farming experience, means of acquiring cattle and purpose of keeping cattle

Demographics	Land holding	Household size	Farming Experience	Means of acquiring cattle	Purpose of keeping cattle
Gender	NS	NS	**	**	**
Age	NS	NS	NS	NS	NS
Marital status	NS	NS	NS	NS	**
Level of education	NS	NS	NS	NS	NS
Employment status	NS	NS	NS	NS	NS
Sources of income	NS	NS	NS	*	*

Significant at *P≤0.05, **P≤0.001 and NS not significant at P≥0.05

Traits of economic importance for selecting breeding animals

The survey indicated that the majority of respondents were selecting breeding animals from traits such as phenotypic, production and reproduction (Table 7). The majority of respondents gave the highest emphasis on production traits rather than reproduction and phenotypic traits. Selection for fast growth rate and body size appeared to be the most preferable traits for male and female animals. Growth is a reflection of body changes at different ages and there is a positive correlation between growth rate and body size as stated by Malau-Aduli *et al.* (1996). The results of the present study are in agreement with the study of Okeno *et al*. (2011) for poultry farming and that of Kugonza *et al.* (2011) in cattle farming where the majority of respondents preferred growth rate and body size. Whereas in a study conducted by Mbuku *et al*. (2006) and Akpa *et al.* (2006) reported that body size is one of the primary factors to consider in any improvement plan for livestock. Animals that grow fast reach slaughter weight and maturity at an early age and fetch a higher price compared to slow growing animals and this results in savings on maintenance costs.

Milk yield potential as a trait of preference was mentioned by 18.6% of the respondents. This justifies why milk production was one of the reasons for keeping cattle in the study. This is in agreement with the findings published by Chawala *et al.* (2019) who reported cows are selected for milk yield in Tanzania. Mothering ability was mentioned as the second trait of economic importance for selecting breeding cows. This is similar to the results of the previous study by Zewdu *et al.* (2018), where good mothering ability was among the important traits for selecting breeding cows in East Gojjan Zone, Ethiopia.

Table 7 Traits of economic importance for selecting cattle

Important traits	Cattle (male/female)	Frequency	Percentage %
Production	Body size	65	37.8
	Growth rate	50	29.1
	Milk yield	32	18.6
Reproduction	Mothering ability	20	11.6
Physical appearance	Coat colour	5	2.9
Totals		**172**	**100**

Coat colour was the least trait of economic importance for selecting cattle in the study area. The main reasons for respondents to select a coat was based on cultural beliefs. Grey coat (*inkomo emdaka*) was used for cultural beliefs related to promoting witchdoctor, the animal is slaughtered near the big river (*isiziba/elwandle*). Red (cattle) and white (goats) coat were used to praise and bringing back ancestors with the belief to protect their homestead, whereas black coat for sheep is associated with the protection of evil spirits (*ukuqinisa*). Contrary to the findings from this study, Mwacharo & Rege (2002) reported that communities in the Southern rangelands of Kenya associate bright coat colour to reduction of the risk of attack by tsetse flies and thus acting as a natural control against trypanosomosis.

Major feed resource and sources of water for cattle

The major feed resources in the study area are shown in Table 8. In the present study, four different feed resources were identified and categorised into: natural pasture grazing, crop residues, browse plants and commercial diet. The findings of the presented study with regard to identified feed resources were in agreement with previous work of Gilo& Berta (2017) in Haramaya district, East Ethiopia. Crop residues were the main source of supplementation in communal farming systems.

There are some households who practice cut and carry system to supplement breeding cows with browse plants and crop residues. Home-made rations with a combination of red maize with bran/gem-meal were used as supplementary feeding. Brewer's grain was used when they have to perform traditional ceremonies and commercial diet was bought to nearby co-operatives and this was only practised by 11% of the population. The major sources of water for cattle in the study area were rivers and dams. This is similar to findings reported by Kedija *et al.* (2008) at Mieso district (Oromia).

Table 8 Major feed resources in the study area

Feed resources	Frequency	Percentage %
Natural pasture	100	75.7
Crop residues	10	7.6
Browse plants	5	3.8
Commercial diet	17	12.8
Totals	132	100

Major constraints in cattle production

Shortage of feed (20.4%) during the dry season (winter) was reported as the major constraint affecting livestock production in the study area (Table 9). This is in agreement with the observation of Giwaz *et al.* (2013), who reported that feed shortage remained to be the most limiting factor in livestock production in the highlands of Ethiopia. Disease and parasites problems are other important problems faced by 19.6% of cattle farmers. Similar findings were observed by Mapiliyao *et al.* (2012) and Jana *et al.* (2014), who reported that high incidence of diseases and parasites cause low production in livestock.

Table 9 Major constraints in cattle production in the study area

Constraints	**Households in Nxaxo (n=100)**	
	Frequency	**Percentage %**
Shortage of feed	53	20.4
Diseases and parasites	51	19.6
High cost of drugs/vaccines	47	18.1
Shortage of grazing land	33	12.7
Stock theft	32	12.3
High cost of feed	20	7.7
Lack of infrastructure	13	5
Lack livestock management skills	7	2.7
Poor accessibility of roads	5	1.9
Totals	**260**	**100**

Lack of infrastructure was ranked as the third most important constraint whereas poor accessibility of roads was ranked as the eighth most important constraint affecting livestock production. This conforms to findings by Sabapara (2003), who reported that infrastructure development was a serious problem faced by goat keepers. The results revealed that a shortage of grazing land was amongst the major constraints hampering livestock production and was ranked as the fourth most important constraint. The following report is in line with results reported by Demeke *et al.* (2017) in north watersheds of Ethiopia.

The high cost of medicine to control livestock diseases was ranked as the fifth most important constraint and was reported by 18.1% of cattle owners. Maingi & Njoroge (2010) and Deshpande *et al.* (2009) reported that the high cost of veterinary drugs was among the major constraints that hinder livestock production in most rural communities in the region. The sixth most important constraint mentioned by respondents was stock theft. This finding is in agreement with the observation of Mthi & Nyangiwe (2018) who reported that stock theft is a major challenge faced by small-scale farmers in the Eastern Cape.

More than 6% of respondents ranked the high cost of feed as the seventh most important constraint faced by cattle owners. The findings confirm the assertions made by Harilala *et al.*, 2014 who reports that the majority (90.83%) of respondents in Srikakulam district of Andhra Pradesh mentioned the high price of feed (concentrate) as a major constraint for livestock development during the dry season. Gaten (2006) reported that well fed animals with good quality feed are less likely to become ill than underfed animals. Lack of management skills on different aspects of livestock was mentioned as a major constraint to the development and improvement of cattle and was ranked as least constraint in the study area.

Conclusion

Poor breeding management contributes to low reproduction in the communal areas and more training on animal related aspects are required for farmers to enhance their knowledge. Traits preferred by communal farmers need to be incorporated in livestock genetic improvement programs in order to improve production in the communal farming system. As long as the decision making in rural based areas is communal owned, no proper breeding objectives could be clearly achieved.

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