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Characteristics of livestock production systems in some communal areas of the Eastern Cape Province, South Africa

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Abstract

The objectives of the study were to establish the characteristics of livestock production in the study area, to ascertain how communal livestock farmers (CLFs) are coping with the constraints and lastly to determine the adaptation strategies in ensuring sustainable livestock production. Simple random sampling method was used to collect data. Data were collected by administering semi-structured questionnaires to 388CLFs and analysed using inferential statistics. Research results indicate54.6%male dominating the livestock production in the study area. Cattle being owned being highly significant at $p \leq 0.000$. All of the respondents practiced uncontrolled breeding which is attributed to a lack of infrastructure. Selection of bull for production was associated with body size and frame. Income generation was reported as the main reason for cattle production and ranked by 97.4% of farmers as most important. Major constraints of cattle production in the study area were diseases and pests. Limited access to information and support services was report as challenges faced by farmers. About 30.2% of cattle farmers highlighted they receive information from other farmers with in the community. Animal sales, dipping, rotational grazing, water tanks and veld burning were reported as coping and adaptation strategies employed by farmers. There is a need for support services aimed at addressing challenges associated with breeding practices, youth participation and limited adaptation strategies to enhance their knowledge and improve livestock production.

Keywords: Challenges, adaptation strategies, breeding and mating practices

1.1 Introduction

Livestock is globally one of the mainstays of agricultural communities (Nkonki-Mandleni, Ogunkoya & Omotayo, 2018).In South Africa, livestock farming is the large part of the country's agricultural sector, contributing approximately 40% to the agricultural income (Department of Agriculture Forestry and Fisheries [DAFF], 2018; de la Harpe, 2021). Eastern Cape has the highest number of livestock with cattle constituting 24%, goats 38% and sheep 29% of the national livestock (National Livestock Statistics, 2017; Goni*et al.*, 2018). The majority of these livestock is found in the communal farming sectorof the provinces of the Eastern Cape, KwaZulu Natal, Free State and Northwest (Oduniyi*et al.*,2020; DAFF, 2019; National Livestock Statistics, 2006). The communal farming areas of the Eastern Cape Province are characterized by villages, which consist of a residential area, cropping area and grazing area (Goni *et al.*, 2018). The residential area is allocated for each household together with a piece of land as a household garden and another piece as a cropping field, with grazing land shared by all the households for their different livestock (Goni *et al.*, 2018). It is a common practice that in each household; there are cattle, sheep, goats, pigs and horses and donkeys (Goni*et al.*, 2018). Communal farmers allow fully integrated mixed units consisting of cattle, sheep and goats animals to freely graze (Meisnner*et al.*, 2013; Mthi *et al.*, 2017).The largest financial investment of agricultural assets in communal areas can be attributed to livestock. Farmers generate income from livestock sales and their by-products; wool, meat and dung for fuel or manure, thus contributing to farm household livelihood, poverty alleviation and food security (Nyamushamba *et al.*, 2017; Food Agricultural Organisation [FAO], 2009).Cattle, particularly indigenous breeds, are socio-cultural assets, which contribute to the agrarian culture and heritage of communal farmers through important rituals and ceremonies (Nyamushamba *et al., 2017*). Despite some of these benefits, most communal livestock farmers remain poor and inability to upscale. Several studies by Sotsha *et al., (*2018); Musemwa, (2007); Musemwa *et al.*, 2008; Sikhweni and Hassan (2013)have been conducted in South Africa to understand the challenges of communal livestock farming. These studies indicated overstocking and severe overgrazing especially in winter where natural pasture is reduced to zero and poor quality of pastures, poor road networks and lack of information. Poor management of stock as a result of high costs of veterinary services (FAO, 2005). This results not only to inadequate feed but also to poorer quality pastures each year. The South African government has in the past years implemented several policies and programmes aimed at supporting the communal livestock farmers with much enthusiasm (Department of Agriculture Forestry and Fisheries, 2017; Frequin, 2012; Aliber & Hall, 2012; Vetter, 2013; Cousins, 2010; Gwiriri *et*

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al.,2019). Such programmes include; Comprehensive Agricultural Support Programme (CASP), the livestock development strategy (Department of Agriculture, Land Reform and Rural Development [DALRRD]. 2021).Industrial Development Corporation (IDC), Lima, Small Enterprise Development Agency (SEDA), Eastern Cape Development Corporation (ECDC) and non-governmental organizations (NGOs) to improve the living condition of the farmers (Sikwela & Mushunje, 2013). Despite the over-arching contributions of the communal livestock production to the socio-cultural values and development of the communities, the system is still deluged with several challenges. Communal livestock production systems in South Africa, as in other developing countries, are characterised by low input and productivity levels, lack of infrastructure, and poor management practices (Khapayi & Celliers, 2016; Mthi *et al.,* 2017). Challenges associated with stock theft, diseases, inadequate infrastructure, and lack of access to markets and expansion of dwelling areas (Mugwabana, 2018; Mapiye, 2018) may be contributing to why farmers have been unable to upscale. In an attempt to overcome some of these challenges, evaluation of cattle production systems through identification and prioritization of constraints is a prerequisite for planning and improving production.

This study aimed to characterise existing communal livestock production systems regarding breeding practices and constraints encountered in communal livestock production in Eastern Cape Province, South Africa. Therefore, this paper seeks to address this by: (a) establishing characteristics of communal livestock farmers CLFs, (b) ascertain how CLFs are coping with the constraints and (c) and determine the adaptation strategies that can be used to minimise the challenges faced and ensure improved communal livestock production.

2. Main text

The study was conducted in Amathole District Municipality, Eastern Cape Province of South Africa. Three local municipalities were selected; Raymond Mhlaba, Amahlathi and Ngqushwa local Municipalities. These local municipalities differ on geological location. The Raymond Mhlaba is in a semi-arid environment, Amahlathi is in a forest dominated by trees and Ngqushwa is in coastal area. The population for the study was made up of 388 Communal Livestock Farmers (CLFs) taken from five communities (Endulwini, KwaManana, Mqukwana, Endlovini, and LowerQetho) in the Raymond Mhlaba Local Municipality (RMLM), Amahlathi Local Municipality (ALM) and Ngqushwa Local Municipality (NLM). Data were collected using the snowball technique for the CLFs in each of the community. A structured questionnaire was used to investigate the production and breeding systems, adaptation and coping strategies common to the CLFs of different types of livestock kept with special focus on cattle in ECP. The questionnaire was an adapted version of those designed for the livestock breed survey in Southern Africa (Rowlands *et al*. 2003). The questionnaire included socio-economic profile of the CLFs (e.g. sex, age, and education level, economic value of livestock and production constraints), breeding management and cattle production systems of each participant. Participants were asked to rank their major sources of income, reasons for keeping livestock, buck selection criteria and major constraints (ranging from1 to 3, where 1 = most important and 3 = least important). Information was obtained through an oral interview for which individual consent was given by the farmers. Data analysis was performed using Chi-square tests ($\chi 2$) to assess the statistical differences, with $P < 0.05$ as significance level. An index described by Kosgey (2004) was used to calculate rankings and indicated the criterion's relative importance to the household. Statistical analyses were performed using Statistical Package for Social Sciences (SPSS, 2007).If P-value (asymptotic significance) is less than or equal to alpha (0.05), the result is statistically significant. It means the two variables are dependent on each other or associated. Otherwise, it is not statistically significant. Which means the variables are independent of each other or not associated.

2.1 Demographic information of communal livestock farmers

The demographic characteristics of communal livestock farmers described in Table 1 indicates that more males (54%) were involved in livestock production as compared to female farmers and 38.5% were between the ages of 60-69 years. About 52.1 % of the respondents had primary school education. A significant number (63.9%) of respondents were married. As shown in the table, majority (82.0%) of the respondents had up to five occupants per household; only about 0.5 percent of the respondents had more than 15 occupants per household. This showed that some of the household members were likely to provide family labour for livestock production. The results shows that cattle production was popular amongst elderly male farmers as compared to females and youth farmers.

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Table 1 Characteristics of survey respondents (n=388)

Attribute	Category	Frequency	Percentage
Gender	Male	212	54.6
	Female	176	45.4
Age	20-29	16	4.2
	30-39	24	6.3
	40-49	21	5.5
	50-59	80	20.5
	60-69	149	38.5
	70-79	85	21.9
	80-89	13	3.2
Marital status	Single	79	20.4
	Married	248	63.9
	Divorced	5	1.3
	Widowed	56	14.4
Highest level of education	No formal education	41	10.6
	Primary	202	52.1
	Secondary	127	32.7
	Tertiary	18	4.6
Household size	1-5	318	82.0
	6-10	64	16.5
	11-15	4	1.0
	16-≥20	2	0.5

2.2 Livestock ownership

Cattle is the most livestock species owned by farmers in the study areas. Number of cattle mostly owned are between the ranges of 1-6 cattle. KwaManana is leading in cattle, goats and chicken 23.5%, 19.2% and 8.1 % respectively. There is a significant difference between livestock owned (see Figure 1).

2.3 Cattle kept between 2016- 2017 and 2018 -2019 production periods

Research results revealed that cattle farmers owned more cattle in the 2018-2019 production period as compared to the 2016-2017 production period. Cows (44.8%) and heifer (34.9%) being reported to be at most. In the 2018-2019 production period about 6.3% of increase in heifer numbers was reported as compared to that of 2016-2017 (Table 2). Farmers reported low cattle ownership in 2016-2017 to be associated with animal death caused by drought and high temperatures.

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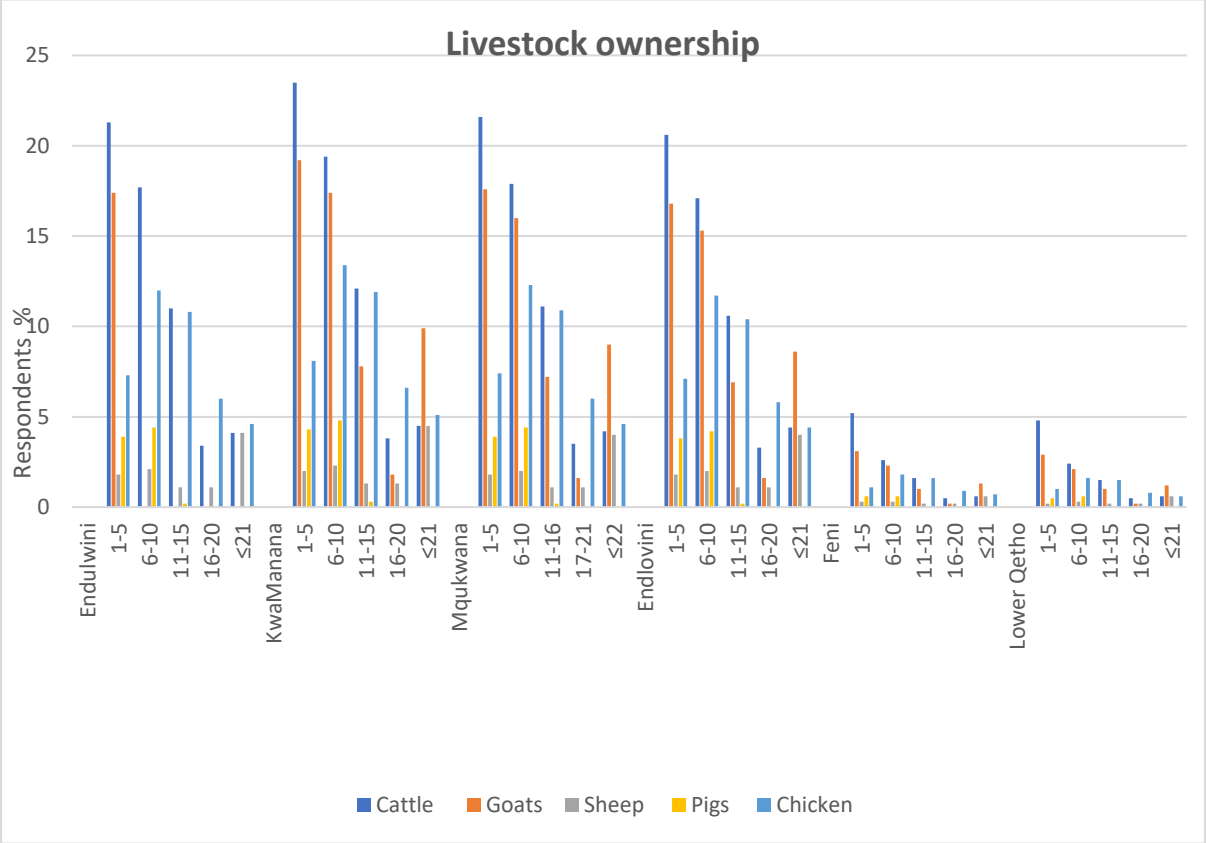

P ≤0.05 *; P ≤0.005 **; P ≤0.0005 ***; Cattle 0.000; Goats 0.016; Sheep 0.000; Pigs 0.000; Chicken 0.000

Figure 1 Livestock owned by farmers in the study communities

Table 2 Cattle kept in the period of 2016-2019

Year	**2016-2017**					**2018-2019**			
Cattle	**Cows %**	**Heifers %**	**Bulls %**	**Calves %**	**Oxen %**	**Cows %**	**Heifers %**	**Bulls %**	**Calves %**
#owned									
1-5	14.7	13.7	14.7	11.9	11.1	19.8	18.3	8.8	17.5
6-10	9.3	8.2	3.1	8.2	5.9	20.1	11.1	9.5	9.8
11-15	8.0	6.2	7.2	5.9	7.2	2.3	5.2	9.0	5.4
16-20	1.0	0.5	1.5	0.5	-	2.3	0.3	-	
≤21	0.3	-	-		-	0.3	-	-	0.5
Total	**33.3**	**28.6**	**26.5**	**26.5**	**24.2**	**44.8**	**34.9**	**27.3**	**33.2**

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2.4 Reasons for keeping livestock

Majority (39.4%) of respondents kept livestock for multiple reasons (Table 3); income generation being ranked by majority (97.4%) of farmers (97.4%) as the most important.

2.5 Communication and advisory services

Research results presented in Table 4 reveal that about 30.2 % of farmers receive information from community members and other farmers. Only 5.4% of farmers indicated that they received information from extension officers. Media has been reported by farmers (17.3%) as the mostly used channel of communication. Majority (91%) of farmers reported that they do not receive any advisory support services. Only 5.7% and 2.6% of farmers received vaccines and dip, respectively. Such services are received quarterly.

Table 3 Reasons for keeping livestock and ranking based on importance

Reasons for keeping livestock	Percentage %	Rank Score (%)		
		Most important	Important	Less important
1.Income generation	20.1	97.4	9.5	3.4
2.Draught power and manure	4.1	80.7	23.2	27.3
3.Social status and recognition	0.5	88.4	46.1	51.8
4.Cultural rituals	0.3	91.8	73.2	73.2
5.Consumption	2.3	76.0	97.2	94.8
6.Income generation, draught power, manure	4.4	-	99.2	95.1
7.Social status and recognition, cultural rituals	13.7	-	99.7	99.2
8.Income generation, consumption and social status and recognition	7.7	-	-	-
9.All of the above	39.4	-	-	-

Table 4: Communication and extension services

Communication, advisory support services and frequency	Frequency	Percentage %
Sources of information		
Community/ other farmers	117	30.2
Extension officers	21	5.4
Media	43	11.1
Neutral	207	53.3
Communication channel		
Media	67	17.3
Field visit	28	7.2
Meetings	12	3.1
Phone call	14	3.6
No response	267	68.8
Frequency		
Weekly	3	0.8
Monthly	2	0.5
Quarterly	11	2.8
No response	372	95.9
Advisory support services		
Yes	27	7.0
No	42	10.8
Didn't respond	319	82.2
Type of advisory support services		
Dip	10	2.6
Vaccines	22	5.7
Water	3	0.8
None	353	91.0

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Frequency of support		
Monthly	9	2.3
Quarterly	22	5.7
Didn't respond	357	92.0

2.6 Breeds, breeding methods and mating

As shown in Table 5 majority (97.2%) of farmers kept non-descript breeds with uncontrolled mating being the dominant practices at about 4-6 and 7-9 years of age for the cow or bull. The uncontrolled mating system may be attributed to poor infrastructure; lack of fence on grazing lands and lack of access to information. The choice of bull mainly used for production is due tohistory performance. The history performance as explained by farmers refers to body size and body frame or structure of calves produced from the chosen bull.

2.7 Challenges

Figure 2 below presents several challenges faced by farmers in cattle production. Disease and pests (74 %) being the major challenge. Farmers further explained that the challenges can be associated with drought, high temperatures and lack of access to support services.

Table 5: Breeds, breeding methods and mating

Breeds, breeding methods and mating	Frequency	Percentage
Breeds kept		
Non-descript	377	97.2
Brahman	7	1.8
Non-descript and Brahman	4	1.0
Mating method		
Uncontrolled	388	100
Reasons for breeding practice		
1.Uncontrolled/mix of breeds	78	20.1
2. Lack of knowledge on other on other breeding practices	17	4.4
3. No controlled grazing	36	9.3
4. One bull in a community for mating	104	26.8
5. 1,3, and 4	129	33.2
6. 1,2,3,4	24	6.2
Reasons for the choice of breeding the cow/bull		
Reproduction	84	21.6
Body size/ frame	66	17.0
Performance history	125	32.2
Reproduction, Body frame, performance history	113	29.1
Age of the cow/bull (years)		
1-3	6	1.5
4-6	103	26.5
7-9	129	33.2
10-12	71	18.3
1-3 and 4-6	79	20.4

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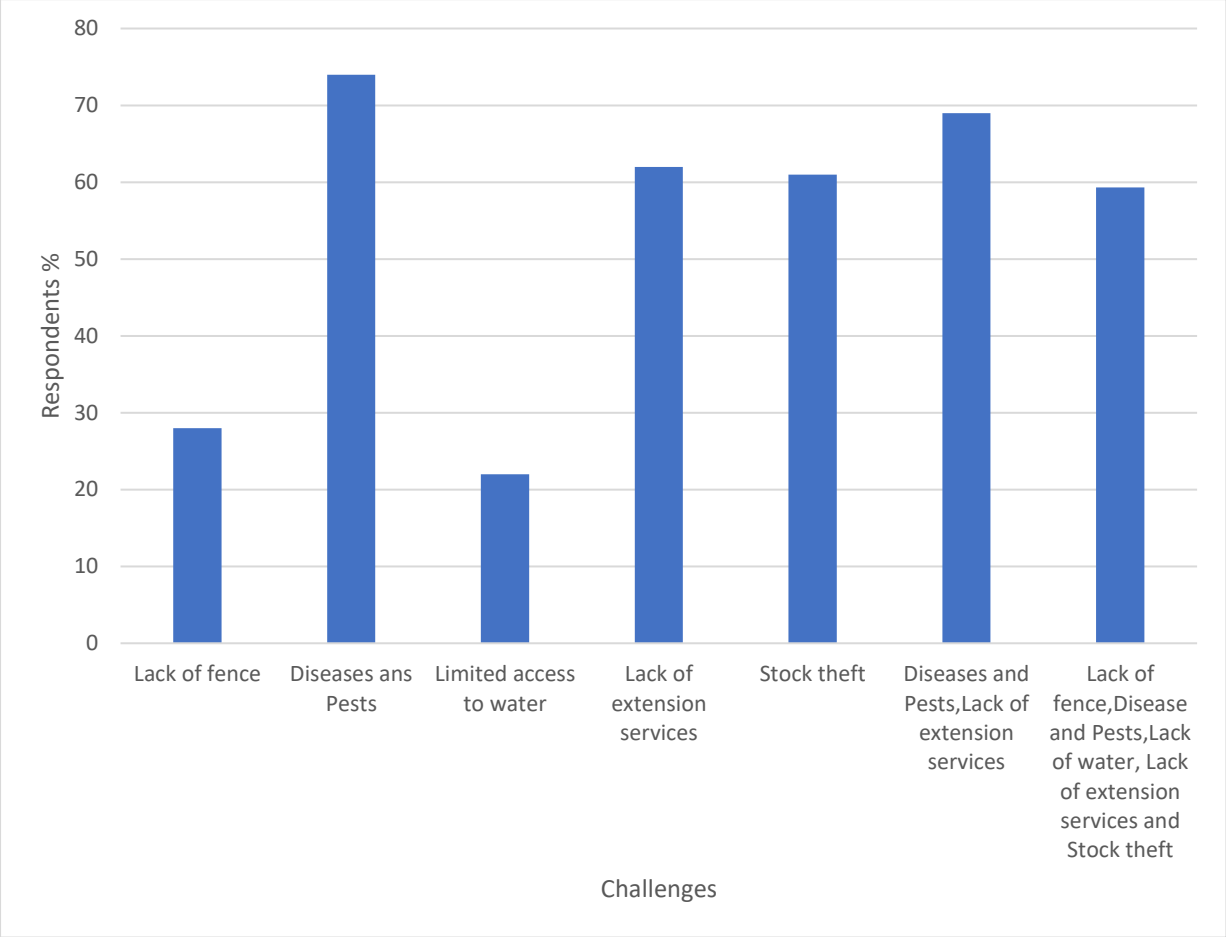

Figure 2: Challenges faced in cattle production

2.8 Adaptation strategies

Figure 3 of the research results shows that 89% of cattle farmers use multiple strategies; dipping, rotational grazing, water tank, feed storing, and veld burning adapt to climate change related challenges faced in cattle production. Farmers burn one side of the communal grazing lands and allow the other side to be utilized for animal grazing. The side of the camp that has been grazed will be allowed to rest for grass to grow. Once the grass has grown stock will then be allowed to graze and the other side being burnt.

2.9 Coping strategies

Research findings further reveal coping strategies used by cattle farmers to cope with climate change related challenges (see Figure 4). About 33.9% of farmers rely on saving and livestock sales to cope with the challenges. Few (9.8%) farmers use money borrowed from loan sharks to buy feed and medicine for livestock. It was further explained by farmers that they borrow money from local loan sharks as they cannot access bank loans.

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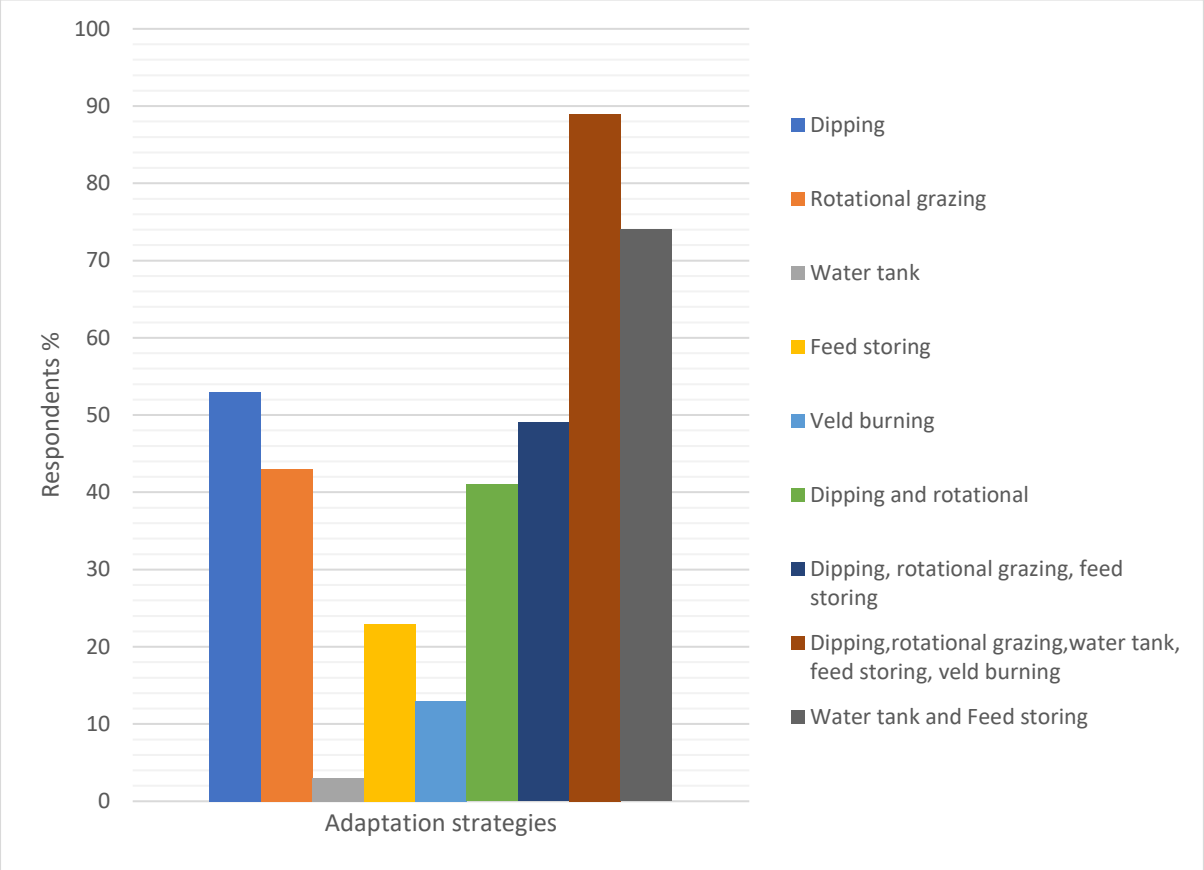

Figure 3: Adaptation strategies used by cattle farmers in the study area

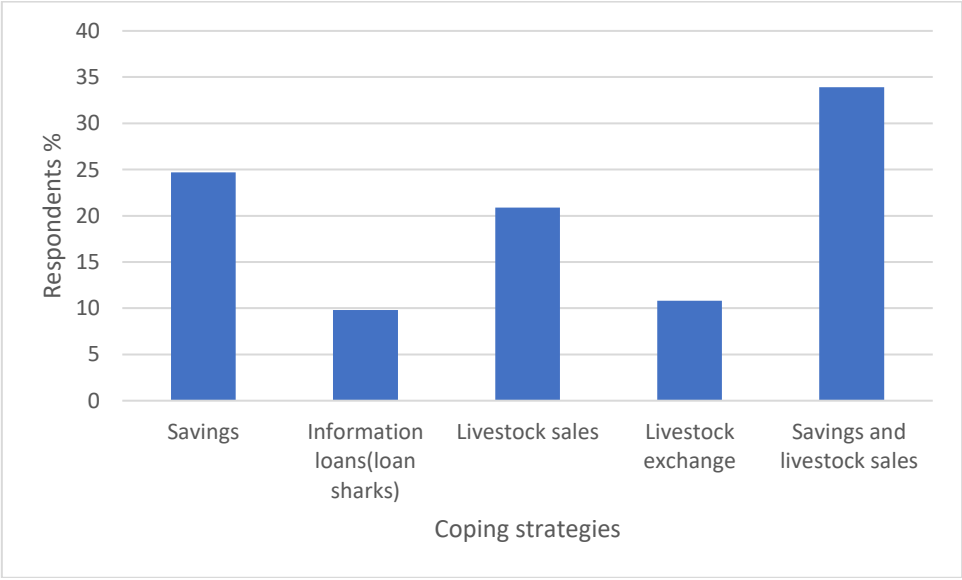

Figure 4 Coping strategies employed by cattle farmers in the study areas

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2.10 Discussion

The findings of the study reveal that male, married farmers with primary education were reported to be actively involved in livestock production. The dominance of male respondents in this study is in agreement with findings by Mthi *et al.,* (2020). Age of farmers participating in livestock production ranges between 60-69 years (see Table 1). Youth participation was reported to be at minimal. Among other reasons for lack of participation in livestock farming by youth, is that, youth are more focused in urban areas than living in rural communities. 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. Figure 1 of the research results shows that respondents mainly owned cattle as compared to other livestock species (goats, sheep, pigs and chicken). In the 2016-2017 (Table 2) production period number of cattle owned was low. Animal deaths due to drought and high temperatures were reported as the reasons to low number of stock owned. A study by Vetter *et al.*,(2020) in KwaZulu Natal also reported similar findings in terms of loss in cattle numbers in 2015-2016. In 2018-2019 production period the number of cattle improved (cows 44.4%; heifers 34.5%; bulls 27.3%; calves 33.2%) as compared to that of 2016-2017, this could be because of multiple adaptation strategies reported by 89% of cattle farmers. A study by Vetter *et al.,* (2020) are in support of these findings where it is reported that cattle suffered lower mortality rate because farmers have better means to support herds. About 74% of farmers reported disease and pests as major challenges faced in cattle production, these were associated with high temperature and drought. It is evident from the research results that livestock farming is negatively affected by climate related challenges hence there is a need for adaptation and coping strategies. Zwane (2019) also alluded that livestock production has declined over time, cattle industry being the most affected. This study revealed lack of fence, limited access to water, lack of extension services as other prevailing challenges facing cattle production (Figure 2). However, farmers employed several adaptation and coping strategies to minimise challenges faced in livestock production such include dipping, rotational grazing, water tanks, feed storage and animal sales. A study by Nkonki-Mandleni *et al.,* (2019) in Free State reported lack of camp systems, drought prevalence, poor veterinary interventions, insufficient breeding stock, diseases, and stock theft as the prevalent factors that affected cattle. Diseases and parasites, which can be worsened by drought, were the major cause of cattle losses in semi-arid environments. It is important to adapt to the challenges experienced in cattle production as it is important to the livelihood for most communal farmers. Farmers keep livestock for multiple reasons (Table 3) income generation being the main reason. The livestock system is a primary source of livelihood in developing countries. Yet, erratic climate changes are severely affecting the livelihoods of people who depend upon mixed crop–livestock production (Ahmad & Ma, 2020). The adverse effects of climate change and variability forced farmers to design proper adaptation strategies (Araro, *et al*., 2020). Long-term changes in average temperatures, precipitation, and climate variability threaten agricultural production, food security, and the livelihoods of farming communities globally. Whilst adaptation to climate change is necessary to ensure food security and protect livelihoods of poor farmers (Sapkota *et al.,* 2019).Improving farm-level use of multiple climate change adaptation strategies is essential for improving household food security, particularly against a backdrop of a high risk of climatic shocks (Enahoro *et al.,* 2019). A survey conducted by Geize (2019) in Ethiopia revealed that farmers adopt many strategies in response to climate change as it negatively affects agriculture and poverty. These strategies include selling animals as the most important adaptation strategy. A number of local adaptation strategies used by farmers in face of climate change effects enhance their livelihood resilience (Sarker *et al.,* 2020). Climate variability and change has continued to wreak havoc on the agricultural sector, with small-scale farmers being the most hard-hit. The limited adaptive capacity of small-scale farmers faced with the impacts of climate variability and change principally explains their high level of vulnerability (Awazi *et al.,* 2019)as livestock is kept as primary and secondary sources of income**.** Rural households in Sub-Saharan Africa and Ethiopia earn a substantial part of their living from rain-fed smallholder agriculture and their source of livelihood, which is highly sensitive and effected to climate change (Wichern *et al.*,2020). Livestock is a critical asset for many rural poor. However, the current climate crisis is affecting livestock farmers (Popoola, *et al*,2019). Access to information might also have an effect on challenges and adaptation strategies used by farmers. As per the findings of the study farmers mostly depend on information they share amongst each other when it comes to livestock production and climate related issues. Support service received quarterly being dipping and vaccines. Hence, majority (74%) of farmers reported diseases and pest and the major challenge experienced. Mamogobo *et al.*,(2020) reported similar findings on constraints on cattle production; tick-borne diseases, limited water support, feed shortage as well as stock theft. Such challenges possess threats to most livelihoods as they depend on livestock for survival. Level of education, access to extension and credit, information and climate social capital; lack of information on adaptation methods and financial constraints are alsobarriers to adapt climate change and variability (Gezie, 2019).Communal farmers kept non-descript breeds under uncontrolled mating due to uncontrolled grazing. Lack of fence and lack of information reported by farmers might be the reasons for the uncontrolled grazing.

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Motiang and Webb (2016) also reported non-descript breeds. Mamogobo *et al.,* (2020); Mthi *et al.,* (2020) agrees with these findings that uncontrolled breeding practised is attributed to a lack of infrastructure. Furthermore, poor breeding management contributes to low reproduction in communal areas and training on animal related aspects is required for farmers to enhance their knowledge (Mthi *et al.,*2020). Findings of the study revealed that male farmers are actively involved in production. Cattle being the main livestock species kept. Cattle are kept for multiple reasons. Most farmers kept non-descript breeds with uncontrolled mating practised. However, farmers reported challenges lack of fence, disease and pest, lack of water, lack of extension services and stock theft. To adapt and cope with these challenges farmers use different strategies. It is important to adapt because livestock play an important role in the rural livelihoods as they are kept for multiple purposes; income, social status and recognition and cultural rituals. The findings of this study could be crucial to framing adaptation strategies relating to climate change, and to safeguarding the vulnerable population. Farmers have used different adaptation mechanisms to minimize the adverse impacts of climate change and variability. Boosting livestock production, initiating and promoting better adaptive capacity is important and might help to reduce challenges experienced by cattle farmers and improve food security and farmers' income.

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