A retrospective study of cattle diseases and control in in Selected Government Farms in Tanzania from 2021 to 2023

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SUMMARY

Cattle diseases remain a major challenge to production and productivity, livelihoods, public health, and the safe utilization of cattle and their products. A three-year retrospective study (2021–2023) was conducted in nine selected government livestock farms to assess disease burden, trends and distribution. Farm records were reviewed to ascertain cattle herd size, breed, age, disease events, deaths, vaccination and acaricide application. Descriptive statistics were used to evaluate trends and temporal patterns, while negative binomial regression identified significant risk factors for disease occurrence. The study analyzed a total of 18 562 cattle with 3,790 disease cases and 2,251 deaths reported. Crude morbidity and mortality rates were 20.4% and 12.1%, respectively. Black quarter recorded the highest morbidity (16.1%) and mortality (7.6%). Other notable health problems included starvation (4.9%), Contagious Bovine Pleuropneumonia (4.2%), diarrhoea (4.5%) and East Coast Fever (2.2%). The significant risk factors for the occurrence of diseases or conditions included dairy cattle (22.7%), young age (28%), cattle in the central zone (41.8%), and the dry seasons (64.1%). Vaccination and acaricide application were the only disease control methods documented. Vaccination against six diseases namely CBPP, Black quarter, Foot and Mouth Disease, Lumpy Skin Disease, Brucellosis, and Anthrax were recorded, with the highest vaccination coverage in Kongwa and Ruvu farms. Use of acaricide and vaccination in cattle were associated with reduction in disease incidence. Acaricide use and vaccination both had incidence rate ratio of less than 1 (IRR= 0.998, $p < 0.05$). Diseases and conditions are endemic in Government farms persistently cause of mortality regardless of control measures in place. Therefore, good livestock management practices in farms when integrated with proper vaccination, strategic acaricide use, and adoption of climate-resilient livestock management are the solutions to these health challenges.

Keywords: Disease burden, vaccination, acaricide, cattle, tick-borne diseases.

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INTRODUCTION

Tanzania has approximately 39.2 million cattle, 28.6 million goats, 9.7 million sheep, 108.2 million poultry and 4.1 million pigs (URT 2025). Almost 80% of the livestock population in Tanzania are raised in agro-pastoral systems, 14% under pastoral systems, and six percent on commercial ranches (Banda and Tanganyika, 2021). Despite having the large livestock population in Tanzania; the current contribution to the GDP is only 7.4% (World Bank, 2024)

possibly due to shortage of water infrastructure and pasture; low productivity of animal breeds; inadequate markets and value addition of livestock and livestock products; inadequate extension services; poor husbandry practices, and the presence of livestock diseases (Tanzania National Livestock Policy, 2006; Maleko *et al.*, 2018).

Despite the economic significance of cattle farming, livestock diseases continue to negatively impact cattle health and productivity; and causes significant livestock production losses annually (Cervantes-Godoy and Dewbre, 2020). For example, the losses due to tick-borne diseases such as East Coast Fever (ECF), Anaplasmosis, and Babesiosis are estimated at US$ 364 million annually and other unquantified losses due to lowered productivity, limitation of keeping high productive exotic breeds, disease control costs, loss of tax revenue, low prices of livestock and livestock products at local and export markets and inaccessibility to international markets (Kivaria, 2006; Kivaria *et al*., 2007; Mbassa *et al*., 2009; Allan *et al*., 2021). Additionally, transboundary animal diseases such as Foot and Mouth Disease (FMD), Contagious Bovine Pleuropneumonia (CBPP), Lumpy skin disease (LSD) and Black quarter (BQ) present the ongoing risks to the livestock sector and have the potential to disrupt both local and international trade (Lysholm *et al*., 2022).

Several studies have shown that animal diseases can be prevented and controlled by good livestock husbandry practices, biosecurity measures, vaccination and use of pesticides especially acaricides (Kappes *et al*., 2023; Sarker *et al*., 2020). The use of acaricides for tick control in Tanzania dates back when the construction of the first dip tank at Mpwapwa in 1905 and later 2041 dip tanks and 91 spray races were constructed all around the country but most of them were dilapidated (Lynen *et al.*, 2007). Further, in the efforts to control ticks and tick-borne diseases, in 2003 to 2014, the government constructed and rehabilitated 1,274 dip tanks along with supply of subsidized acaricides countrywide (Mbassa *et al.*, 2017). Additionally, between 2018/19 and 2023/2024, the government implemented another dipping campaign which increased the dips tanks from 2,389 to more than 3100 along with the supply of up to 184,859.79 litres of subsidized acaricides (URT, 2024).

To date, more than 70% of livestock in Tanzania are subjected to acaricides at least once per month and has led to a decrease in occurrence of TBD cases in cattle from 34,158 to 8,054 and TBD death from 4072 to 878 (Laizer *et al.*, 2023).

Vaccination of livestock under pastoral and agro-pastoral production systems is estimated at 30% due to lack of awareness on the importance of vaccination and reluctance of farmers to pay for vaccination costs (Sarker *et al*., 2020). On the other hand, biosecurity measures are almost non-existent under pastoral and agro-pastoral systems; therefore gives more chance for endemicity of diseases all over the country (Maziku *et al.*, 2017).

There have been several research works that investigated epidemiology and control of diseases in smallholder systems, but limited studies focused on cattle diseases in government-owned livestock farms (Maziku *et al.*, 2017; Kivaria, 2006; Kivaria *et al*., 2007; Mbassa *et al*., 2009; Allan *et al*., 2021). In Tanzania, there are more than 206 ranches and dairy farms of which 122 ranches and dairy farms are under the Government (URT, 2024). The performance of the ranches and dairy farms, especially those owned by the Government, has been low due to multiple causes including diseases. For example, the number of cattle in National Ranching Company is 17,145 has remained stagnant for the last 10 years (URT, 2024). However, there has been no study that has assessed disease magnitude and disease control strategies implemented in ranches and dairy farms. Therefore, the purpose of this study was to assess the disease burden, trends and mortality and the control measures in government-owned cattle farms.

MATERIAL AND METHODS

Description of study areas

The study was conducted in nine cattle farms across seven regions representing Southern highlands zone, Central, Lake and Eastern zones as shown in Figure 1. The farms are under the Tanzania Livestock Research Institute (TALIRI), National Ranching Company (NARCO), Livestock Multiplication Unit (LMU), Sokoine University of Agriculture (SUA) dairy farm and

Livestock Training Agency (LITA) Dairy farm. The farms include TALIRI Uyole, Saohill LMU, TALIRI Mpwapwa, Kongwa ranches, Mabuki LMU, Misenyi ranch, Ruvu ranch, LITA Morogoro and SUA dairy farm.

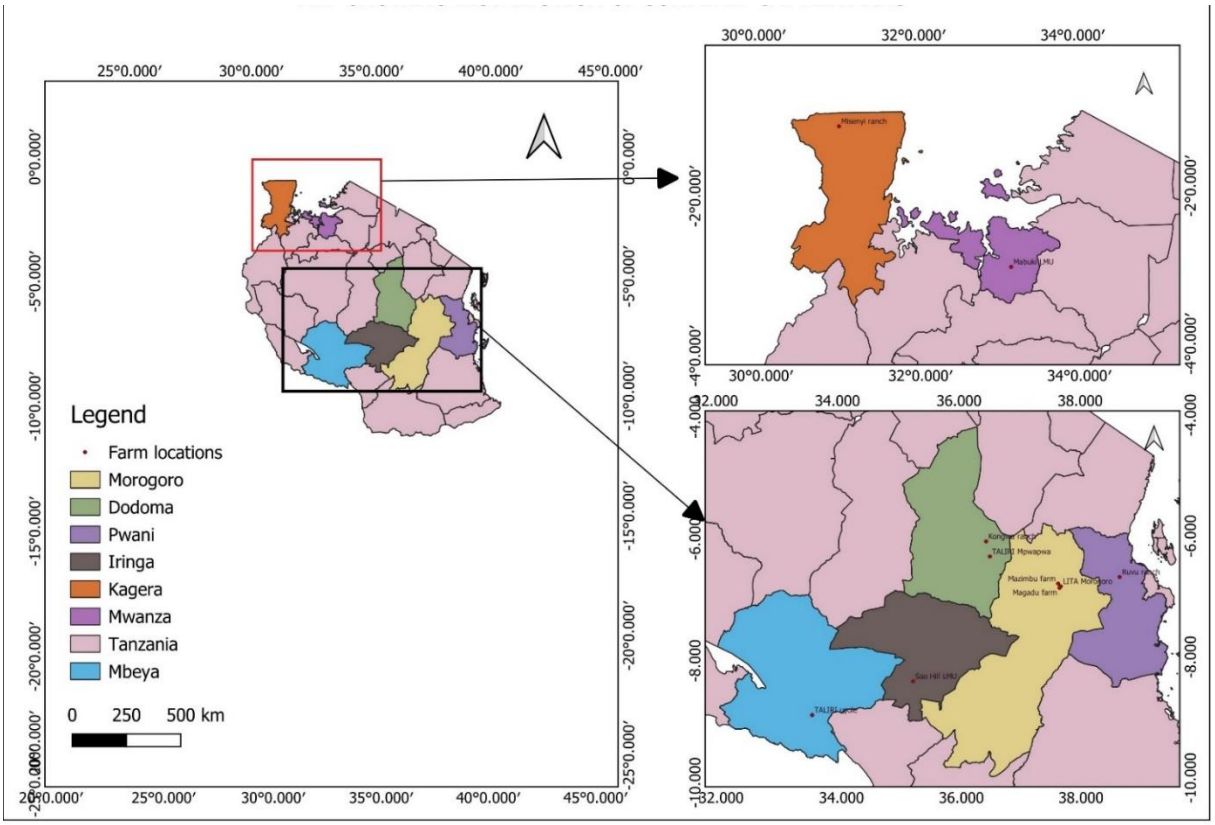

Figure 1. A map showing study areas. The named red dots show the relative location of the study farms in the region.

TALIRI Uyole, located in Mbeya region within the Southern highlands, experiences a temperate highland tropical climate. It receives unimodal rainfall ranging from 800 to 1 200 mm annually, mainly from November to May. The dry season occurs from June to October, and temperatures range from 15°C to 22°C. Sao Hill LMU, situated in Iringa region, also lies in the Southern highlands and has a sub-humid highland climate. It receives between 1,000–1 600 mm of rainfall annually, predominantly from November to May. The dry period spans June to October, with average temperatures ranging from 15°C to 25°C. TALIRI Mpwapwa and Kongwa farms are in Dodoma region (Central zone). The farms experience a semi-arid climate with 500 to 800 mm of rainfall, mostly falling between January and April. The area has a long dry season from May to December, and temperatures range from 20°C to 32°C.

Mabuki LMU, located in Mwanza region within the Lake zone, has a tropical savannah climate. Rainfall is bimodal, occurring in October to December and March to May, annual rainfall is 900 to 1,200 mm. The dry season runs from June to September/October, with temperatures ranging from 20°C to 30°C. Misenyi ranch, found in Kagera Region (northwestern Tanzania), lies in a tropical highland climate. It receives 1 200 to 1 800 mm of bimodal rainfall from September to December and March to May, with a dry season from June to August. Temperatures range from 18°C to 28°C. Similarly, Ruvu ranch, situated in Pwani region along the coast (Eastern zone) while LITA Morogoro and SUA Dairy Farms, are in Morogoro region. Pwani and Morogoro regions experience a tropical coastal climate. They receive bimodal rainfall between March and May and October to December, with annual rainfall 800 to 1,100 mm. The dry seasons occur from January to

February and June to September, with high temperatures of 25°C to 32°C.

Study design and data collection

A retrospective study of three years (January 2021 to December 2023) was conducted by gathering information on cattle diseases from archived disease surveillance reports on farms and Ministry of Livestock and Fisheries. Nine government owned cattle farms were purposively selected based on the following criteria: the farm is either beef or dairy farm; presence of farm records; having more than 80 cattle; readiness to participate in the study and located in the Southern highlands zone, Central zone, Eastern zone, or Lake zone. The farms were categorized as beef cattle farms and dairy cattle farms.

Criteria for selection of cases and data quality control

Cases were selected based on farm location, animal type, age, sex, date and season. Data on vaccination and acaricide use were included. Cattle aged ≤12 months were classified as young while above 12 months of age as adults. Records with missing biodata information or undiagnosed conditions were excluded. Disease diagnosis and management were conducted by trained veterinarians or livestock officers experienced in disease diagnosis and work under veterinarian supervision. Disease diagnosis was done clinically by observing the pathognomic features including key clinical signs, pathological lesions and presence of parasites. Samples from undistinguished or occasional cases were submitted to Tanzania veterinary laboratory agency (TVLA) located within their respective zones for confirmatory testing.

Data management and analysis

The retrospective data recorded in farm ledger book and files was entered into Microsoft Excel for cleaning, completeness, accuracy, and consistency. The data were analyzed using a descriptive Microsoft Excel 365 data analysis package. Descriptive statistics including percentages, frequencies, medians and means were used to describe and summarize data To establish disease burden, morbidity and mortality rates were used. Morbidity, also known as prevalence, refers to the proportion of cattle that are affected by a disease out of the total number of cattle at risk of becoming sick. However, the mortality rate is the number of dead cattle divided by the number of cattle populations at risk. Chi-square and Poisson regression model were employed to determine the strength and significance of associations between the independent variables (farm type and location, herd size, sex, animal type, age group, seasons) and the dependent variables (number of disease cases) and was considered significant if p-values were ≤0.05. The trend and distribution of disease cases by animal biodata, place, and time were presented using pivot tables, graphs, and charts.

Ethical Clearance

Ethical clearance was granted by Sokoine University of Agriculture through a letter with reference number SUA/ADM/R.1/8/1300 and Tanzania Livestock Research Institute (TALIRI) with reference number TLRI/CC.21/032. Furthermore, research permits were issued by the Ministry of Livestock and Fisheries with reference number FA.16/178/01/375 and National Ranching Company (NARCO), reference number BA.26/112/01/152.

RESULTS

Disease burden in cattle farms

During the three-year period nine farms had a total of 18,562 cattle. The records from the nine study farms indicated that 3,790 (20.4%) cattle suffered from various diseases and conditions, while 2,251 cattle (12.1%) died. TALIRI Uyole farm had the highest average morbidity rate of 56.1% while the least was observed at Kongwa ranch which had 2.2%. However, higher mortality was observed at SUA dairy farm (26.6%) while LITA Morogoro dairy farm had the least average mortality of 1.1%. as shown in (Table 1).

Table 1. Cattle disease burden in nine study farms, 2021–2023

Parameter	Category	Year	Number (%) diseased	Number (%) dead
Farms	Kongwa ranch	2021 (n=9797)	211 (2.2)	181 (1.8)
		2022 (n=11439)	501 (3.5)	403 (4.4)

Parameter	Category	Year	Number (%) diseased	Number (%) dead
		2023 (n=12102)	579 (4.8)	343(2.8)
	Ruvu ranch	2021 (n=1384)	158 (11.4)	49 (3.5)
		2022 (n=1129)	137 (12.1)	117 (10.4)
		2023 (n=992)	133 (13.4)	73 (7.4)
	Misenyi ranch	2021 (n=1593)	109 (6.8)	65 (7.6)
		2022 (n=1454)	278 (19.1)	151 (10.4)
		2023 (n=854)	224 (26.2)	113 (13.2)
	Mabuki LMU	2021 (n=1950)	88 (4.5)	63 (3.2)
		2022 (n=1974)	57 (2.9)	42 (2.1)
		2023 (n=2760)	190 (6.9)	146 (5.3)
	Saohill LMU	2021 (n=1441)	121 (8.4)	59 (4.1)
		2022 (n=1367)	80 (5.9)	53 (3.9)
		2023 (n=1525)	73 (4.8)	66 (4.3)
	TALIRI Mpwapwa	2021 (n=839)	86 (10.3)	34 (4.1)
		2022 (n=710)	113 (15.9)	34 (4.8)
		2023 (n=666)	94 (14.1)	20 (3.0)
	TALIRI Uyole	2021 (n=187)	105 (56.1)	49 (26.2)
		2022 (n=158)	53 (33.5)	27 (17.1)
		2023 (n=160)	41 (25.6)	30 (18.8)
	LITA Morogoro dairy	2021 (n=87)	24 (27.6)	3 (3.4)
		2022 (n=93)	39 (41.4)	2 (2.2)
		2023 (n=87)	46 (52.9)	1 (1.1)
	SUA farm	2021 (n=319)	78 (24.5)	38 (11.9)
		2022 (n=337)	54 (16.0)	24 (7.1)
		2023 (n=287)	118 (41.1)	76 (26.5)

Note. The table presents the number and percentage of diseased and dead cattle recorded across nine study farms between 2021 and 2023. Percentages are based on the total cattle population per farm and year.

Factors for occurrence of conditions, disease and mortalities in the study farms

Table 2 summarizes the factors associated with cattle disease occurrences and mortalities. Farm type, age, season, and zone positively contributed to occurrences of diseases events. In contrast, all factors except season showed a significant association with cattle mortality.

Table 2. Factors for disease occurrences and mortalities in the nine study farms

Parameter	Category	Information on diseases		Information on mortalities	
		Number (%) diseased	P value	Number (%) of deaths	P value
Farm type	Beef	2330 (14.6)	P<0.001*	1495 (11)	P<0.001*
	Dairy crosses	1460 (29.3)		756 (15.2)	
Age	Young	1924 (28)	P<0.001*	1112 (16.2)	P<0.001*
	Adult	1866 (16)		1139 (9.7)	
Season	Dry	1990 (10.7)	P<0.001*	1144 (6.5)	p>0.05
	Rainy	1800 (9.7)		1107(6.2)	
Zones	Dry climate	1585 (13.4)	P<0.001*	1015 (8.6)	P<0.001*

Wet & humid climate	2205 (32.9)	1236 (18.4)

* Statistically significant P<0.05 at 95% confidence interval

The occurrence of diseases and conditions in cattle farms from 2021 to 2023

Diseases and conditions recorded in nine study farms are shown in Table 3. A total of 14 diseases and 8 conditions were recorded in the three years period. Black quarter disease exhibited the highest morbidity rates of 16.1% and mortality rates of 7.6%. However, among the eight conditions assessed, starvation ranked the highest in morbidity and mortality of 4.9 and 4.2 respectively.

Table 3. Number of conditions/disease events and mortality rates between 2021 and 2023

Disease/condition	Animal population	Number of disease cases	Number of death cases	Morbidity (%)	Mortality (%)
Starvation	18,562	904	648	4.9	3.5
CBPP	15,453	649	392	4.2	2.5
East Coast Fever	17,824	426	271	2.3	1.5
Pneumonia	17,354	400	224	2.3	1.3
Black quarter	1,614	260	123	16.1	7.6
Diarrhea	5,642	252	79	4.5	1.4
Eye disease	2,747	171	0	6.2	0.0
Snake bite	13,717	105	105	0.8	0.8
Plant poisoning	18,333	100	75	0.5	0.4
Anaplasmosis	6,751	94	73	1.4	1.1
Bloat	12,040	85	82	0.7	0.7
Foot and Mouth Disease	4,523	80	33	1.8	0.7
Babesiosis	4,029	65	40	1.6	1.0
Reproductive conditions	12,889	64	42	0.5	0.3
Predation	4,057	45	21	1.1	0.5
Helminthiasis	2,158	26	2	1.2	0.1
Hardware disease	2,255	18	18	0.8	0.8
Ephemeral fever	319	15	1	4.7	0.3
Trypanosomiasis	1003	13	6	1.3	0.6
Mastitis	1140	12	0	1.0	0.0
Heart water	287	5	3	1.7	1.0
Lumpy skin disease	287	2	0	0.6	0.0

Note. Morbidity rates were calculated as (no. of cases ÷ population) × 100; mortality rates as (no. of deaths ÷ population) × 100. CBPP= Contagious bovine pleuro-pneumonia

Distribution and trends of cattle diseases and conditions in farms

Age, seasons and location were considered in the occurrences and distribution of diseases and conditions in cattle in different farms. It was found that disease occurrence varied significantly with age (p-value < 0.05). Pneumonia, diarrhoea, eye infection, FMD and helminthosis predominantly affected young cattle, whereas starvation, CBPP and anaplasmosis were common in adults (Table 4).

Table 4. Occurrence of cattle conditions and diseases distributed by age

Disease	Total cases	Young (n=6869)	Adult (n=11693)	Odds	95%CL	p-value

Disease	Total cases	Young (n=6869)	Adult (n=11693)	Odds	95%CL	p-value
Starvation	904	385	519	1.3	1.1-1.4	P<0.001*
CBPP	649	182	467	0.6	0.6-0.8	P<0.001*
ECF	426	146	280	0.9	0.7-1.1	P>0.5
Pneumonia	400	357	43	14.9	10.8-20.4	P<0.001*
Black quarter	260	248	12	36.5	20.4-651	P<0.001*
Diarrhea	252	243	9	47.6	24.5-92.6	P<0.001*
Eye infection	171	81	90	1.5	1.1-2.1	P<0.05*
Snake bite	105	33	72	0.8	0.5-1.2	P>0.5
Poisoning-plant	100	35	65	0.9	0.6-1.2	P>0.5
Anaplasmosis	94	22	72	0.5	0.3-0.8	P<0.001*
Bloat	85	36	49	1.3	0.8-1.9	p>0.05
FMD	80	43	37	2.0	1.3-3.1	P<0.001*
Babesiosis	65	30	35	1.5	0.9-2.4	p>0.05
Helminthosis	26	25	1	23.60	5.8-315	P<0.01*
Hardware disease	18	4	14	0.5	0.2-1.5	p>0.05
Ephemeral fever	15	4	11	0.6	0.2-2.0	p>0.05
Trypanosomiases	13	2	11	0.3	0.1-1.4	p>0.05
Heart water	5	1	4	0.4	0.04-3.8	p>0.05
Total	3682	1921	1791			

Note. N = 18,562 (n = 6,869 for young cattle and n=11,693 for adult cattle). * Statistically significant P<0.05 at 95% confidence interval

Monthly trends show consistent increases in disease cases during December each year, with the highest peak in December 2023 which had 452 cases, and the lowest cases were in October 2021 and February 2023 with 37 cases (Figure 2). Table 5 and Figure 3 show the seasonal distribution of cattle diseases and conditions in different zones. The distribution of cases varied significantly by season and zone ($p < 0.0001$), indicating that cattle diseases and conditions were not evenly distributed between zones and seasons. More cases occurred during the dry season 1990 (52.5%) compared to the rainy season 1800 (47.5%). The Central zone had the highest proportion of cases (n=1584; 41.8%) in which 1016 (64.1%) cases occurred during the dry season with notable peak for starvation (Figure 3), while the Lake zone had 946 (25%) cases of which 557 (58.9%) cases were recorded during the rainy season with black quarter cases being at high rates.

Table 5. Seasonal distribution of cattle diseases in four zones, 2021–2023

Parameter	Category	Season		P-value
		Dry	Rain	
Zones	Central (n=1584)	1016 (64.1)	568 (35.9)	<0.0001*
	Lake (n=946)	389 (47.5)	577 (58.9)	
	Eastern (n=787)	381 (48.4)	406 (51.6)	
	Southern highlands (n=473)	204 (43.1)	269 (56.9)	
Total		1990	1800	

* Statistically significant P<0.05 at 95% confidence interval.

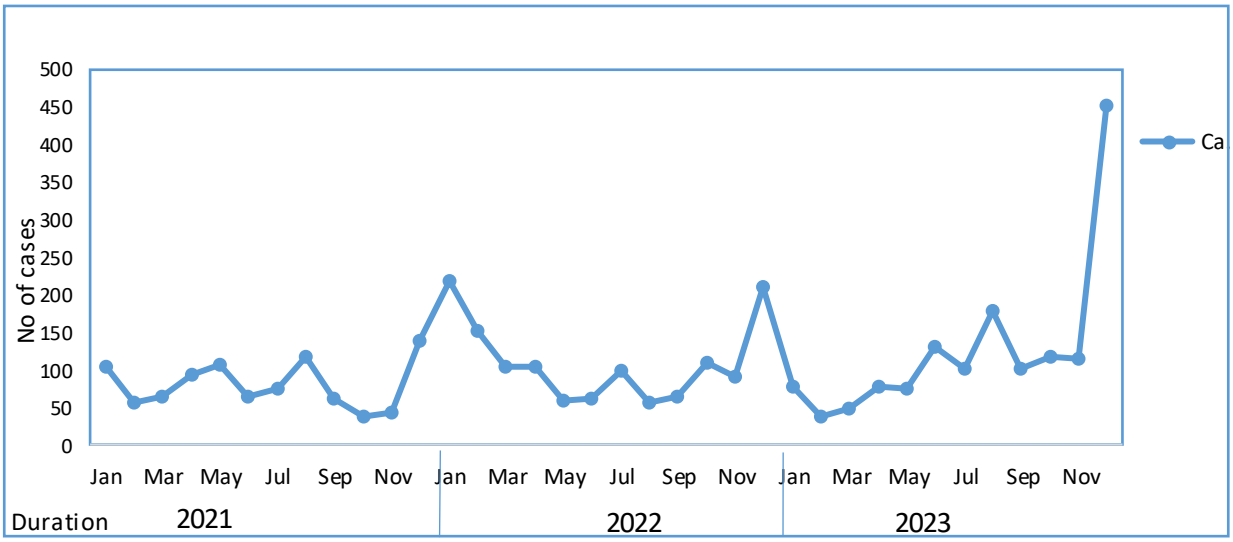

Figure 2. Monthly and annual trends of cattle diseases in the nine study farms

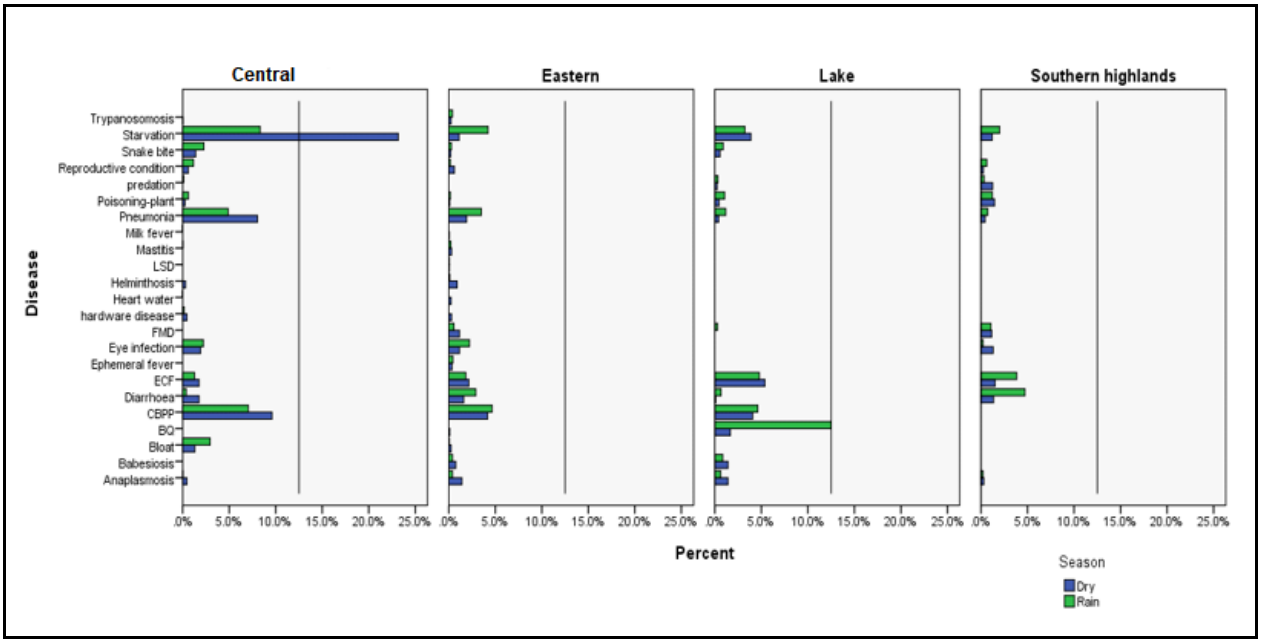

Figure 3. Seasonal distribution of cattle diseases in four zones where the study farms are located

Vaccination coverage

During the three-year period of study (2021 to 2023), six cattle farms out of nine that had vaccination records were assessed for vaccination coverage in corresponding to disease occurrence across six cattle diseases namely CBPP, FMD, LSD, Black quarter, Brucellosis, and Anthrax. Vaccination coverage varied substantially across farms and diseases, and the mostly used vaccine were CBPP and FMD. The farm with the highest vaccination coverage were Kongwa and Ruvu ranch both ranging from 99.1% to 100% (Table 6). Further, the results show that vaccination lowered the occurrence of diseases for example of CBPP (IRR = 0.988, 95% CI: 0.979–0.997, p = 0.008).

Table 6. Vaccination coverage in cattle farms from 2021 to 2023

Farms	Disease	No. of targeted animals	No. vaccinated	% coverage
Kongwa ranch	CBPP	11613	11610	99.9
Kongwa ranch	LSD	10618	10618	100
Kongwa ranch	FMD	11091	10988	99.1
Mabuki LMU	FMD	2228	1707	88.6
Ruvu ranch	CBPP	1254	1254	100
Ruvu ranch	Brucellosis	436	436	100
Ruvu ranch	LSD	1278	1222	95.6
Ruvu ranch	FMD	1493	1493	100
TALIRI Mpwapwa	CBPP	730	559	76.6
TALIRI Mpwapwa	Anthrax	841	586	69.7
TALIRI Mpwapwa	Brucellosis	117	117	100
TALIRI Mpwapwa	FMD	710	494	69.6
TALIRI Mpwapwa	Black quarter	666	565	84.8
Saohill LMU	CBPP	1525	1015	66.6
Saohill LMU	Black/anthrax	1525	1108	72.7
SUA	FMD	226	218	96.5

Acaricide application and frequency

The line graph shows the temporal trend of both acaricide application frequency rate and disease cases across cattle farms over the years 2021 to 2023 (Figure 4). The acaricide application records were assessed over the use of acaricide in control of diseases and the occurrence of vector-borne diseases. The result reveals that increased frequency of acaricide application (13,691.6) is associated with decreased occurrence of vector borne diseases. For example, the occurrence of vector-borne diseases at TALIRI Mpwapwa decreased from 8 (1%) cases in 2021 (n=837) to 1 (0.1%) case in 2023 (n=666). However, this relationship is inconsistent across other cattle farms such as Mabuki with high frequency of acaricide applications (5614) yet had 88 (3.2%) cases in 2023 (Figure 4). Routine application of acaricide reduced number of TBD cases (IRR = 0.998, 95% CI: -1.46×10^{-5} to -5.39×10^{-5}, $p < 0.0001$).

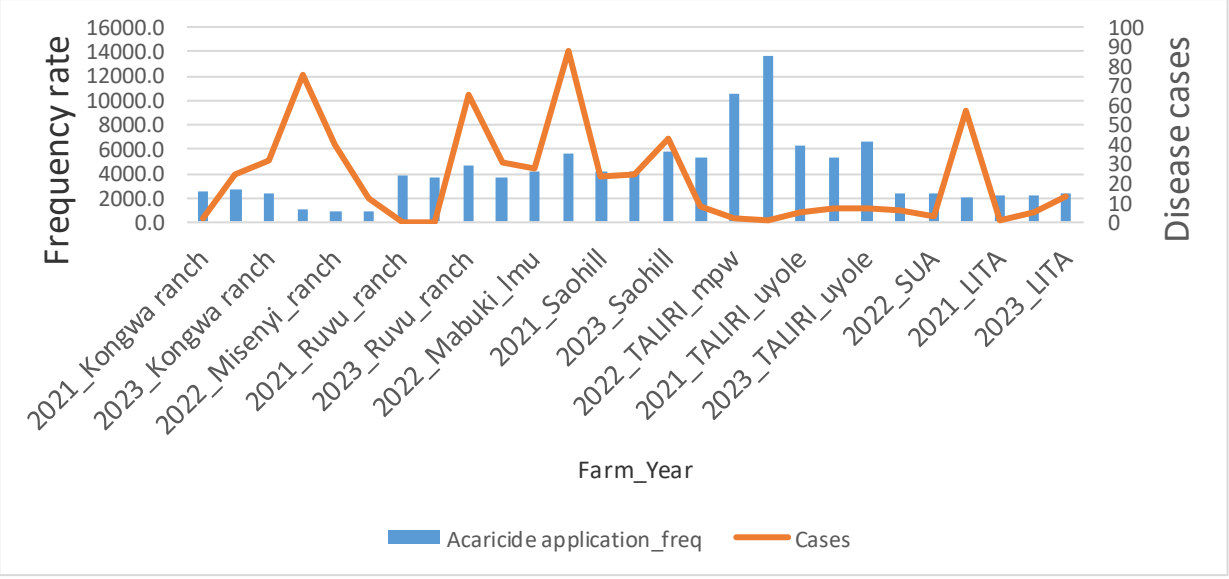

Figure 4. Trends of acaricide application in the study farms between 2021 to 2023

DISCUSSION

The purpose of the current study was to assess the incidence of cattle diseases and conditions, mortality, and disease control measures implemented in nine cattle farms between 2021 and 2023. The study revealed an overall morbidity rate of 20.4% and 12.1% mortality rates. TALIRI Uyole had the highest morbidity rate while SUA cattle dairy farm had high mortality. Among the factors for disease occurrence were farms with dairy crossbred cattle and young cattle were affected. Cattle diseases occur mostly during the dry season, especially in central zone. Black quarter disease and starvation exhibited the highest morbidity and mortality rates. Vaccination and acaricide use were the available control strategies implemented for disease control. Both vaccination and acaricide use significantly reduced the occurrence of targeted diseases. The high morbidity and mortality observed is due to weak implementation of the control strategies. Therefore, it is essential to enhance the effectiveness of disease control programs through strengthening institutional accountability and animal health surveillance in cattle farms. For the betterment of livestock farming, pasture production and forage conservation are inevitable along with establishing livestock water infrastructure, which ensures water supply throughout the year. The measures can tremendously reduce challenges of starvation and other health problems associated with shortage of pasture and water.

The current study is aligning with previous in Tanzania which reported cattle mortality rates of 14.2% and 15.06% caused by different diseases and conditions (Swai *et al.*, 2010; Glanville, 2017; Shija *et al.*, 2022). However, findings were contrary to other studies, which reported a lower mortality of cattle (Ndung'u *et al*., 2024). These findings suggest the diseases and conditions in cattle farms are of great importance that warrant institution of control measures. The disparities in morbidity and mortality could be due to endemicity of the diseases in cattle farms which are distributed countrywide.

A total of 14 diseases and eight conditions were recorded in the three-year period dominated by black quarter disease with 16.1% morbidity and 7.6% mortality while starvation was the leading condition with 4.9% morbidity and 3.5 mortality. Black quarter primarily affected young beef cattle, particularly during and shortly after the rainy season. This finding is similar to a previous study in Pakistan (Jamil *et al*., 2022) who highlighted the role of flooding in facilitating the spread of blackleg among livestock in Pakistan. The high incidence of black quarter observed in this study could be attributed to the pathogen's high virulence, as supported by Sousa *et al*. (2024). Among the conditions, starvation was most frequently reported, accounting for 4.9% morbidity and 3.5% mortality. Other diseases and conditions observed were diarrhoea, CBPP, pneumonia and ECF. Diarrhea was also among the frequently reported condition, especially in young animals possibly due to their weak immune systems, inadequate colostrum intake, poor hygiene, and stress factors like weaning increased the risk (Monney *et al*., 2020). Contagious Bovine Pleuropneumonia (CBPP) contributed 2.3% of total cattle mortality. This rate is comparatively lower than those reported in previous studies, potentially due to improved vaccine coverage across farms, which may have reduced the frequency of CBPP cases. The study is comparable to previous a study by Yansambou *et al.* (2018) but high prevalence of CBPP have been reported elsewhere in East Africa (Hussien *et al.*, 2024; Tweyongyere *et al.*, 2024). Further, our findings also indicate that East coast fever was among the prevalent disease and occurred mostly during the rainy or shortly after rain season as previously reported (Laisser *et al.*, 2017). Pneumonia also emerged as a common condition especially in young calves as previously reported in Kenya (Gitau e*t al*., 2010). Occurrence of pneumonia is influenced by stresses such weaning, dust, poor ventilation and extreme weather like cold conditions.

Further, the study established that farm type, age, season and zones were significantly associated with occurrence of disease events and cattle mortalities. Dairy crossbred cattle farms had a higher proportion of disease occurrence and mortality compared to beef cattle farms. This could be attributed to physiological and genetic differences whereas dairy crossbreeds have lower

tolerance to tropical climates and endemic pathogens compared to indigenous beef cattle (Hernandez-Castro *et al.*, 2025). This observation was similar to other findings that demonstrated high diseases and mortality rates in dairy crossbreeds in Tanzania (Mruttu *et al.*, 2016).

The study also observed that young cattle were more affected than adult cattle ($p<0.05$). Age has consistently been identified as a critical determinant influencing susceptibility to infections in cattle farms (Moran, 2011). For example, diarrhoea was the most frequently observed disease in young than adult cattle, followed by pneumonia as previously reported by other scholars in Tanzania and elsewhere (Swai *et al*., 2009; Hordofa *et al*., 2021; Alemu *et al*., 2022; Yohannes and Geinoro, 2024). The increased vulnerability of young cattle may be attributed to their underdeveloped immune systems, less exposure to pathogens and the prevailing poor management practices in most farms.

The dry season was found to play a significant role since most of the diseases occurred during this season. Inadequate feeding during this period, along with hot and dry temperature, may result in a reduction in nutritional elements in pasture and predispose cattle to general body weakness and lowers immunity (Chang *et al*., 2010). Semi-arid areas like Dodoma, are at higher risk of starvation and exposure to poisonous plants during the long dry seasons due to scarcity of grazing resources and poor pasture regeneration (Maleko and Koipapi, 2015; Mngumi *et al.,* 2021).Indeed, the dry season is accompanied by a shortage of water further aggravates the health condition of livestock, which increases incidences of diseases and mortalities (Ahmed *et al.,* 2019). Differently, the present study revealed that tick-borne diseases were common during the rainy season, mostly in Lake and Southern highland zones as previously reported by other scholars (Laisser *et al*., 2017). This implies that tick density is high during rainy season which calls for more tick control efforts to overcome the problem of tick-borne diseases.

Furthermore, only five out of nine assessed farms had routine vaccination against six cattle diseases, mostly CBPP and FMD. Other diseases vaccinated against were LSD, black quarter, brucellosis, and anthrax. Farms with highest vaccination coverage, ranged from 99.1% to 100%, still recorded CBPP and FMD cases. This finding is comparable to other studies which also reported occurrences of cattle diseases in vaccinated animals (Yilmaz *et al*., 2022).This may be due to inefficiency of vaccines, insufficient coverage, pathogen strain variations, and waning immunity. Animal stress may also interfere with vaccine response by impairing or inhibiting the immune system. Indeed, the study revealed that vaccination of cattle against CBPP decreased the occurrence of CBPP cases. This findings are in line with the previous study by Ahmed *et al.*, (2022) who observed that vaccinations was effective in reducing disease death rates by 1.25% in Northern Tanzania. However, to achieve herd immunity through vaccination 70% to 80% vaccination coverage is required (Carpenter *et al*., 2022). However, the effectiveness of vaccination can be influenced by interaction between wildlife and cattle population, pathogenicity, transmissibility, replication rate, and antigenic diversity of the pathogen (Miguel *et al*., 2013). Therefore, to achieve a successful control of diseases, hence, regular, timely and adaptation to vaccination strategies are crucial.

Further, the findings on the use of acaricide to control vectors and vector-borne diseases showed that increased frequency was associated with a reduction in the occurrence of TBDs. However, the cases of tick-borne diseases that were still experiences may be due to several factors including improper application methods, high level of tick infestation, and resistance to acaricide or environmental condition (Byaruhanga *et al*., 2017). Moreover, the effectiveness of acaricides might have been reduced during the rainy season as the chemicals could have been washed off from the animals by rain (Nagagi *et al.*, 2020). These findings suggest the need to improve acaricide application methods, consider seasonal weather patterns, and strengthen integrated tick control strategies.

CONCLUSION AND RECOMMENDATION

In conclusion, diseases and conditions are common in Government farms and are the major cause of cattle morbidity and mortality regardless of control measures in place. Therefore, good livestock husbandry practices in farms integrated with strategic vaccination and acaricide use, and adoption of climate-resilient livestock management practices can be the solutions to the existing health problems.

CONFLICT OF INTEREST

Authors have no conflict of interest on the issues presented in this article.

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REFERENCE

Ahmed, H., Yoder, J., Glanville, W. De, Davis, A. and Kibona, T. J. Relationships between vaccinations , herd introductions, and livestock losses in Northern Tanzania. *Anim Health Res Rev*, *23*(1), 1–19.1–19, 2022. https://doi.org/ 10.1017/age.2021.11

Ahmed, H., Yoder, J., de Glanville, W.A., Davis, A and Kibona, T.J. Economic burden of livestock disease and drought in Northern Tanzania. *J Devel Agricul Econom*, 11(6): 140-151, 2019. DOI: 10.5897/JDAE2018.1028

Alemu, Y. F., Jemberu, W. T., Mekuriaw, Z., Abdi, R. D., James, A. and Cook, C. Incidence and Predictors of Calf Morbidity and Mortality From Birth to 6-Months of Age in Dairy Farms of Northwestern Ethiopia. *Frontier Vet Sci*, 9: 1-12, 2022. https://doi.org/10.3389/fvets.2022.859401

Allan, F. K., Sindoya, E., Adam, K. E., Byamungu, M., Lea, R. S., Lord, J. S., Mbata, G., Paxton, E., Mramba, F., Torr, S. J., Morrison, W. I., Handel, I., Morrison, L. J. and Auty, H. K. A. cross-sectional survey to establish Theileria parva prevalence and vector control at the wildlife-livestock interface , Northern Tanzania. *Prev Vet Med*, *196*(March), 105491, 2021. https://doi.org/10.1016/j.prevetmed.2021.105491

Banda, L. J. and Tanganyika, J. Livestock provide more than food in smallholder production systems of developing countries. *Anim Frontiers 11*(2), 7-14, 2021. https://doi.org/10.1093/af/vfab001

Byaruhanga, J., Tayebwa, D. S., Eneku, W., Afayoa, M., Mutebi, F., Ndyanabo, S., Kakooza, S., Okwee-acai, J., Tweyongyere, R., Wampande, E. M. and Vudriko, P. International Journal of Veterinary Science and Medicine Retrospective study on cattle and poultry diseases in Uganda. *Intern J Vet Sci Med*, *5*(2), 168–174, 2017. https://doi.org/10.1016/j.ijvsm.2017.07.001

Carpenter, A., Waltenburg, M. A., Hall, A., Kile, J., Killerby, M., Knust, B., Negron, M., Nichols, M., Wallace, R. M., Behravesh, C. B. and McQuiston, J. H. Vaccine preventable zoonotic diseases: Challenges and opportunities for public health progress. *Zoonoses Pub Health*, *69*(2), 125–139, 2022. https://doi.org/10.1111/zph.12903.

Cervantes-Godoy, D. and Dewbre, J. The future of food and agriculture: trends and challenges. *In* The future of food and agriculture: trends and challenges, *2020*. https://openknowledge.fao.org/server/api/core/bitstreams/2e90c833-8e84-46f2-a675-ea2d7afa4e24/content

Chang'a, J. S., Mdegela, R. H. and Ryoba, R. Calf health and management in smallholder dairy farms in Tanzania. *Trop Anim Health Prod*, *42*(8), 1669–1676, 2010. https://doi.org/10.1007/s11250-010-9619x

Gitau, G. K., Aleri, J. W., Mbuthia, P. G. and Mulei, M.C. Causes of calf mortality in peri-urban area of Nairobi, Kenya. *Trop Anim Health Prod*, *42*(8), 1781–1787, 2010. https://doi.org/10.1007/s11250-010-9614-2

Glanville, D. Mortality rates of cattle and small ruminants at the national level in Tanzania (Report No. 42), 2017. University of Edinburgh. https://www.research.ed.ac.uk/en/publications/ceb79e19-c805-48be-95e9-89982fe9d627

Hernandez-Castro, L. E., Cook, E. A. J., Matika, O., Mengele, I. J., Motto, S. K., Bwatota, S. F., Zirra-Shallangwa, B., Pong-Wong, R., Prendergast, J., Mrode, R., Toye, P. G., Komwihangilo, D. M., Lyatuu, E., Karani, B. E., Nangekhe, G., Mwai, A. O., Shirima, G. M. and Bronsvoort, B. M. de C. Genetic estimates and genome-wide association studies of antibody response in Tanzanian dairy cattle. *Frontiers Genet*, *16*(April), 1–16, 2025. https://doi.org/10.3389/fgene.2025.1497355

Hordofa, D., Abunna, F., Megersa, B. and Abebe, R. Incidence of morbidity and mortality in calves from birth to six months of age and associated risk factors on dairy farms in Hawassa city, southern Ethiopia. *Heliyon*, *7*(12), e08546, 2021. https://doi.org/10.1016/j.heliyon.2021.e08546

Hussien, M., Abdelhabib, E., Hamid, A., Musa, A., Fadolelgaleel, H., Alfaki, S. and El Hussein, A. R. Seroepidemiological survey of contagious bovine pleuropneumonia among cattle in El Jazeera State (Central Sudan). *Irish Vet J*, *77*(1), 1–7, 2024. https://doi.org/10.1186/s13620-024-00271-2

Jamil M., Ali M., Jabeen N., J. G. and N. U. Importance of Livestocks and Blackleg Disease Spread in Livestock After. *1*(1), 15–26. *Indus J Agric Biol*, 1 (1), 15 – 26, 2022. https://journals.airsd.org/index.php/ijab

Kappes, A., Tozooneyi, T., Railey, A. F., Mcintyre, K. M., Mayberry, D. E., Rushton, J., Marsh, T. L. Randolph, T. Livestock health and disease economics : a scoping review of selected literature. *Frontiers Vet Sci*, *10*, Article 1168649, 2023. https://doi.org/10.3389/fvets.2023.1168649

Kivaria, F.M. Estimated direct economic costs associated with tick-borne diseases on cattle in Tanzania. *Trop Anim Health Prod*, 38:291–299, 2006.

Kivaria, F.M., Ruheta, M.R., Mkonyi, P.A. and Malamsha, P.C. Epidemiological aspects and economic impact of bovine theileriosis and its control: A preliminary assessment with special reference to Kibaha district, Tanzania. *The Vet J*, 173: 384 – 390, 2007.

Laisser, E. L. K., Chenyambuga, S. W., Karimuribo, E. D., Msalya, G., Kipanyula, M. J., Mwilawa, A. J., Mdegela, R. H. and Kusiluka, L. J. M. Shorthorn Zebu cattle tolerance to East Coast fever in Tanzania: A review on prevalence, control measures, and tolerance. *Trop Anim Health Prod*, *49*(3), 517–528, 2017. https://doi.org/10.1007/s11250-017-1266-z

Laizer, V., Mkupasi, E., Kimera, S., Nonga, H.E. Situational analysis of bovine tick-borne diseases and control in Tanzania: A retrospective study. *Tanzania Vet J*, *38*(2), 21–29, 2023. https://doi.org/10.4314/tvj.v38i2.3

Lynen G, Zeman P, Bakuname C, Giulio GD, Mtui P, Sanka P, Jongejan F. Cattle ticks of the genera *Rhipicephalus* and *Amblyomma* of economic importance in Tanzania: distribution assessed with GIS based on an extensive field survey. *Exp Appl Acarol*, 43:303–319, 2007.

Lysholm, S., Lindahl, J. F., Dautu, G., Johansson, E., Karlsson, P., Munyeme, M. and Johansson, J. Seroepidemiology of selected transboundary animal diseases in goats in Zambia. *Prev Vet Med*, *206*: 105708, 2022. https://doi.org/10.1016/j.prevetmed.2022.105708

Maleko, D. D. and Koipapi, M. L. Opportunities and constraints for overcoming dry season livestock feed shortages in communal semi-arid rangelands of Northern Tanzania: A case of Longido district. *Liv Res Rural Develop*, *27*(4), 2015. https://www.researchgate.net/publication/281731311

Maleko, D., Msalya, G., Mwilawa, A., Pasape, L. and Mtei, K. Smallholder dairy cattle feeding technologies and practices in Tanzania: failures, successes, challenges and prospects for sustainability. *Intern J Agricult Sustain*, *16*(2), 201–213, 2018. https://doi.org/10.1080/14735903.2018.1440474

Maziku, M., Tegegn, Gebru. G. and Stapleton, J. *Livestock Health Priorities in the Tanzania livestock master plan*. Tanzania Livestock Master Plan Brief 4. International Livestock Research Institute (ILRI), 2017. https://hdl.handle.net/ 10568/89054

Mbassa, G. K., Mgongo, F.O.K., Melau, L.S.B., Mlangwa, J.E.D., Silayo, R.S., Kimbita, E.N., Hayghaimo, A.A. and Mbiha, E.R. A

financing system for the control of tick-borne diseases in pastoral herds: The Kambala (Tanzania) model. *Liv Res Rural Develop*, 21(3), 2009.

Mbassa, G.K, Masawe, S., Mdoe, N., Swai E.S., Mwaseba, D. and Luziga C.D. Effectiveness of Construction and Rehabilitation of Dips and Acaricide Subsidy Programs on Tick-Borne Diseases Control in (Unpublished report) 2017.

Miguel, E., Grosbois, V., Caron, A., Boulinier, T., Fritz, H., Cornelis, D., Foggin, C., Makaya, P. V., Tshabalala, P. T. and De Garine-Wichatitsky, M. Contacts and foot and mouth disease transmission from wild to domestic bovines in Africa. *Ecosphere*, *4*(4), 1–32, 2013. https://doi.org/10.1890/ES12-00239.1

Mngumi, S., Makungu, S. and Mdetele, D. Epidemiological Assessment of Contagious Bovine Pleuropneumonia in Central Tanzania. *World's Vet J, 10*(4), 597–601, 2021. DOI: https://dx.doi.org/10.54203/scil.2020.wvj71

Monney, J. D., Adjogoua, E. V., Karamoko, Y. and Akran, A. Incidences of calf diarrhea and the associated risk factors in Ivory Coast (2015–2017). *Revista de Ciências Agroveterinárias*, *19*(4), 454–461, 2020. https://doi.org/10.5965/223811711942020454

Moran, J. B. Factors affecting high mortality rates of dairy replacement calves and heifers in the tropics and strategies for their reduction. *Asian-Australasian J Anim Sci*, *24*(9), 1318–1328, 2011. https://doi.org/10.5713/ajas.2011.11099

Mruttu, H., C., N. and Nandonde, S. and Nigussie Brook, K. *Animal genetics strategy and vision for Tanzania, 2016*.

Nagagi, Y. P., Kimaro, E. G. and Temba, V. Practical application and the possible emergence of tick resistance to commonly used acaricides in various districts of Tanzania. *Liv Res Rural Develop*, *32*(8), 2020. http://www.lrrd.org/lrrd32/8/yusufu32083.html

Ndung'u, C., TuraI, I., Muema, L, Kemboi, F. and Mghanga, S. Mortality rates among improved boran beef cattle and their crosses from birth to two years under ranching conditions in Kenya. *Intern J Vet Sci Anim Husb*, *9*(3), 321–331, 2024. https://doi.org/10.22271/veterinary.2024.v9.i3e.1434

Nonga, H. E., Muwonge A. and Mdegela R. R. Tick infestations in extensively grazed cattle and efficacy trial of high-cis cypermethrin pour-on preparation for control of ticks in Mvomero district in Tanzania. *BMC Vet Res*, 2012 8:224, 2012.

Sarker, M. S. A., Zowalaty, M. E., El, Shahid, M. A. H., Sarker, M. A., Rahman, M. B. and Järhult, J. D. Maximization of Livestock Anthrax Vaccination Coverage in Bangladesh : An alternative approach. *Vaccines*, *8*(3), 435, 2020. https://doi.org/10.3390/ vaccines8030435

Shija, D. S., Okeyo, M. A., Migwi, P. K., Kelya, N. J. and Bebe, B. O. Assessing Animal Disease Prevalence and Mortality in Smallholder Dairy Farms under Contrasting Management Practices and Stressful Environments in Tanzania. *Open J Vet Med*, *12*(11), 117–134, 2022. https://doi.org/10.4236/ojvm.2022.1211011

Sousa, A. I. de J., Galvão, C. C., Pires, P. S. and Salvarani, F. M. Blackleg: A Review of the Agent and Management of the Disease in Brazil. *Animals*, *14*(4), 1–13, 2024. https://doi.org/10.3390/ani14040638

Swai, E. S., Karimuribo, E. D. and Kambarage, D. M. Risk factors for smallholder dairy cattle mortality in Tanzania. *J South African Vet Assoc*, *81*(4), 241–246, 2010. https://doi.org/10.4102/jsava.v81i4.155

Swai, E. S., Karimuribo, E. D., Kambarage, D. M. and Moshy, W. E. A longitudinal study on morbidity and mortality in youngstock smallholder dairy cattle with special reference to tick borne infections in Tanga region, Tanzania. *Vet Parasitol*, *160*(1–2), 34–42, 2009. https://doi.org/10.1016/j.vetpar.2008.10.101

Tanzania National Livestock Policy, 2006, p. 21. https://www.mifugouvuvi.go.tz/

Tweyongyere, R., Nkamwesiga, J., Etiang, P., Mugezi, I., Wamala, H., Wasswa, A. T., Kamusiime, M., Ainebyoona, S., Abizera, H., Mwiine, F. N. and Muhanguzi, D. Seroprevalence of contagious bovine pleuropneumonia (CBPP) in cattle from Karamoja region, North-eastern Uganda. *BMC Vet Res*, *8*, 1–9, 2024.

https://doi.org/10.1186/s12917-024-03938-8

United Republic of Tanzania (URT)- Ministry of Livestock and Fisheries. *Budget speech of 2025/2026*, 2025. https://www.mifugouvuvi.go.tz/speeches

United Republic of Tanzania (URT)- Ministry of Livestock and Fisheries. *Budget speech of 2024/2025*, 2024. https://www.mifugouvuvi.go.tz/speeches

Yansambou, M. S., Diallo, A. A. and Idi, M. Serological Prevalence of Contagious Bovine Pleuropneumonia in Niger in 2017. *Frontiers Vet Sci*, *5*, Article 238, 2018. https://doi.org/10.3389/fvets.2018.00238

Yilmaz, A., Umar, S., Turan, N., Kayar, A., Richt, J. A. and Yilmaz, H. Current scenario of viral diseases and vaccination strategies of cattle in Turkey. *J Infec Develop Count*, *16(8)*: 1230–1242), 2022. https://doi.org/10.3855/jidc.14767

Yohannes, T. and Geinoro, T. Calf morbidity and mortality rates Associated risk factors in smallholder dairy farms in Kembata Tembaro zone, Southern Ethiopia. *Ovozoa: J Anim Reprod*, *13*(2), 67–81, 2024. https://doi.org/10.20473/ovz.v13i2.2024.67-81