



**ASSESSMENT ON CATTLE HUSBANDRY AND MARKETING
PRACTICES AND TICK PREVALENCE EVALUATION IN DHAS
DISTRICT OF BORENA ZONE, SOUTHERN ETHIOPIA**

MSc. THESIS

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ASSESSMENT ON CATTLE HUSBANDRY AND MARKETING PRACTICES
AND TICK PREVALENCE EVALUATION IN DHAS DISTRICT OF BORENA
ZONE, SOUTHERN ETHIOPIA

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DEDICATION

This thesis manuscript is dedicated to all my parents, my father Dullacha Guyo and my mother Tesso Dullacha, my beloved wife Kabale Boru and my children for their further immeasurable sacrifices to bring me up to this level for nursing and encouraging me with patience and support me in the success of my life.

STATEMENT OF AUTHOR

I, first declare and confirm that this thesis is my own work and that all sources of material used for this thesis have been properly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for MSc. degree at the Madda Walabu University and is deposited at the University library to be made available to borrowers under rules of the library. I solemnly declare that this thesis isn't submitted to the other institution anywhere for the award of any degree , diploma, or certificate.

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BIOGRAPHY

I, the author of this work was born in Yaballo District of Borana Zone in April 1987. I attended primary education at Dadim primary school and Yabello high school. After completion of high school I joined the Alage ATVET College and graduated by Diploma in Animal Health Assistant in 2006. Soon after graduation, I was employed in Dhas District of Borana Zone in the position of Animal health Assisatnt at kebele level and district developent agents (DA) supervisor where I served for eight (8) years.

Secondly, I joined Jimma University College of Agricultural and Veterinary Medicine as winter students from 2009-2014 where I earned my BVSc degree in animal health. After that, I served as Pastoralist development office vice head, vice head of Dhas Woreda administration and head of Dhas Woreda pastoralist development office where I served for five (5) years and then joined Madda Walabu University, for MSc program study in Animal Production in the Department of Animal and Range Sciences in 2018. I also attended different on job trainings (Govermental Organization and Non-Governmental Organization) and received certificates for successful completion. Jalla has married and a father of three son.

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ACRONOMYS

CSA	Central Statistics Authority
CBPP	Contagious Bovine Pluropneumonia
CAHWs	Community Animal Health Workers
DDAO	Dhas District Administration Office
DDLRO	Dhas District Livestock Resource Development Office
DDFECO	Dhas District Finance Economic Cooperation office
DDPDO	Dhas District Pastoralist Development Office
DA	Development Agent
DRLSP	Drought Resilience Livelihood Sustainable Development
ETB	Ethiopia Birr
FGD	Focus Group Discussion
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
GIS	Geographical Information system
GTZ	German Technical cooperation
HH	Household
IBC	Institute of Biodiversity Conservation
LDMPs	Livestock Development Master Plan Study
LMIS	Livestock Market Information System
LSD	Lumpy Skin Disease
m.a.s.l	meter above sea level
NGOs	Non-Governmental Organizations
Pas	Peasant associations
PDO	Pastoralist Development Office
PPR	Pest despestruminitis
SNNPRS	Southern Nation Nationality People Regional State
SSA	Sub-Saharan Africa
SPSS	Statistical Package for Social Sciences

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ABSTRACT

Cattle production is vital in the livelihoods of a pastoralist. However, poor husbandry practices and occurrence of various diseases hampering its productivity. The present study was carried out in pastoral area of Dhas District, Borena Zone, Southern Ethiopia, with the objectives of characterization of cattle husbandry practices, major health problems and marketing system. One time field visit descriptive and observational/cross-sectional study design consisting of personal observations, questionnaire survey, focus group discussions, key informants interviews and document analysis were employed for the investigation. Four kebeles were selected purposively for the study based on number of cattle population, availability of veterinary clinics and marketing center. A total of 193 households were randomly selected using simple random sampling method from the selected kebeles. Eighty five percent (85%) of the study participants (respondents) were males and 15% of them were females. The average family size and age of respondents in the study district were 7.4 ± 0.24 and 45.61 ± 0.97 , respectively. Majority of the respondents (73.1%) were illiterate while 17.6% can read and write. The survey result showed that source of income for 85.5% households were from livestock production in the study district. The overall average cattle holding was 31.761 ± 1.126 while the major purposes of keeping cattle were for milk consumption, meat consumption, income generation and social prestige, respectively. Natural pasture (grass) and browse (trees and shrubs) were the major source of feed during dry and wet season. The present result indicated that ponds, wells and motorized schemes were major source of drinking water for cattle in the study area. Lack of feed, shortage of water, disease incidence and shortage of grazing land were the major constraints for cattle production in the study district. The major diseases and parasites of cattle identified were contagious bovine pleuro pneumonia, blackleg, foot and mouth disease, trypanosomiasis, anthrax, lumpy skin disease, pasteurellosis, mastitis, ectoparasites (ticks) and endo parasites. From the diseases prevalent in the area, ticks infestation were ranked first by the study participants. Three hundred eighty four (384) cattle were randomly selected to further investigate ticks infestation. The result revealed that, Ixodid ticks infestation were found to be the most prevalent ticks infesting cattle of the study sites with overall prevalence rate of 93.75%. From the total examined cattle, 28.65% of male and 65.10% of female were found to be positive for ticks infestation harboring at least a single tick. The present result showed that age, sex and body condition scores of the cattle were significantly associated ($p < 0.05$) with the prevalence of tick infestation. Those old age group, female, poor body conditioned animals were highly affected by tick infestation than the counter parts. The current assessment showed that 86% of the study participants got market information, 34.2%, 9.3%, 56.5%, 14% of the respondents got market information weekly, monthly, sometimes and never got information, respectively. Major reasons for cattle price variation were seasonal fluctuation of market price, difference in number of attending traders, difference in market facilities and proximity to urban center. Generally, to alleviate cattle production constraints, improvement of factors such as cattle feed sources and range land productivity, water sources, health service facilities were the main points to be considered in study area.

Key Words: Dhas District, Husbandry practices, feed resources, constraints, ticks, marketing.

1. INTRODUCTION

1.1. Background of the Study

Agriculture is a main economic activity in Ethiopia where more than 80% of the population rely on agriculture. Livestock is an essential part of the agriculture which play a vital role and contributes about 16.5% of the national gross domestic product (GDP) and 35.6% of the agricultural GDP (Metaferia *et al.*, 2011; Leta and Mesele, 2014). Livestock mainly cattle in Ethiopia represent the pillar of the country's economy by generating income to pastoralist and farmers community, ensuring food security, contributing to asset, and social, cultural and environmental values, (Solomon *et al.*, 2005; Metaferia *et al.*, 2011). According to CSA (2020) the present livestock population estimated 65.35 million cattle, 39.89 million sheep, 50.5 million goats, 7.7 million camels, 56.53 million chicken, 2.11 million horses, 0.41 million mules, and 8.98 million donkeys.

In Ethiopia, the livestock sector plays a crucial role in revenue generation and it is believed that livestock play an important role in poverty reduction and supporting the socio-economic development in general and for the rural community in particular (Tadesse, *et al.*, 2014; and Temesgen *et al.*, (2015)). Asfaw *et al.*, (2011) reported that, livestock play a serious economic and social role in the lives of pastoralists, agro-pastoralists, and smallholder households. Moreover, livestock are important in coping with shocks, accumulating wealth, and serving as a store of value in the absence of formal financial institutions.

Among livestock species, cattle contribute significantly to the livelihoods of pastoralist in terms of milk, meat, manure, source of cash income, social and cultural values of the society. According to Ashenafi *et al.*, (2014), characterization of a given production system could provide an overview of the farming system and identify the major cattle production challenges, opportunities, and possible potential interventions with special emphasis on livestock feed and related aspects for the improvement of livestock production and productivity. Cattle husbandry practices such as; hygiene, feeding, watering, product

handling, and disease control (Kumar and Singh, 2011) and it forms the basis to improve the livelihood of the pastoralst populations.

Genet *et al.*, (2012) pointed that in Ethiopia, ample livestock potential isn't suitably exploited because of various factors like traditional management system, limited genetic potential, lack of acceptable disease management policy, and veterinary services. Diseases are considered a serious health problem and cause a major economic loss in countries wherever livestock production is a significant section of the agriculture (Amene *et al.*, 2012).

External parasites are common and a major hindrance to development and utilization of animal resources in tropical countries because of the favorable climatic conditions for their development and the poor standards of husbandry practices (Yalew *et al.*, 2017; Dabassa *et al.*, 2017).

Ticks took first place amongst the external parasites that cause serious economic loss to small holder farmers, the tanning industry and therefore the country as an entire through mortality of animals, decreased production, downgrading and general rejection of skins and hides (Tikit and Addis, 2011; Dabassa *et al.*, 2017). They reduce milk yield, skin and hide quality, cause the foremost health issue problems including udder damage and predispose to mastitis, suppress immunity, and increase susceptibility to other diseases. As stated by Bersissa, *et al.*, 2012 ticks are common and widely distributed in all agro-ecological zones in Ethiopia and also the major hindrances to the productivity of cattle within the country.

Cattle marketing practices in most parts of the country are characterized by seasonality in flow and prices of cattle. In the pastoral lowland areas major factors contribute to seasonal flow include festivals, pasture, seasonality of domestic consumption demand (fasting and ceremonial period) in domestic, drought, disease outbreak, lack of information, availability of food aid and clan conflicts (Getachew *et al.*, 2008; Awur, 2007). Ethiopia's lowland breeds of cattle, sheep, goats, and camels are highly demanded by domestic and neighboring countries as well as the strategic livestock markets of the Middle East due to high quality meat production (Belachew and Jemberu, 2003; Addis and Dida, 2015).

Nearly in all parts of the country, neither regular market information on prices and supplies nor formalized grades and standards of cattle, (Ayele *et al.*, 2003). The reasons of selling livestock in the past year were to fulfill household daily cash needs, debt repayment, old age, and drought (Kassaw A, 2007). Borana pastoralist has huge potential for increasing livestock production, both for local use and export purposes. However, livestock expansion and productivities were constrained by inadequate and imbalanced nutrition, disease outbreak, scarcity of water, lack of suitable livestock extension services, insufficient and inadequate data to improve animal performance, marketing, process and integration with crop and natural resources for sustainable productivity and environmental health (Aynalem *et al.*, 2011).

1.2. Statement of the Problem

Though cattle husbandry practices and environment interacting requires for improving productivity and profitability are not adequately studied in different parts of the country (Alemayehu *et al.*, 2000). In the pastoral areas, particularly the Dhas district, there is limited information available on the current status of cattle production practices; management, feed resources, feeding practices, marketing system, and health-related problems. In particular cattle husbandry practice, health-related problem and marketing system has not been studied in the study area.

The previous studies conducted in pastoral area were focused on the same line districts, with less emphasis on cattle husbandry practices, health problems of cattle production, and marketing system of Dhas district. Instead they mainly focused on the agro-pastoralist district that has accessibility of road and other infrastructure like; Taltalle, Yabballo, Moyale, and Dire. Moreover, population increase, poor rangeland management, inadequate water availability and recurrent drought changing the lifestyle of pastoral community and reduce productivity of cattle in the study district.

Furthermore, there was no known research conducted in the past and no published information regarding cattle management and marketing practices of livestock in the study area. In such scenarios, it has been difficult to plan further interventions and improve the

benefit gained from a live animal, meat, milk, skin, and other products from indigenous cattle. Yet the current livestock management and market availability is not well documented and therefore, availing up to date information to the stakeholder to plan livestock production development strategy is vital for the benefits of pastoral community. Therefore, taking the above gaps in to consideration, the present study was conducted with the aim of characterizing the cattle husbandry practices, major health problems, and marketing system in Dhas district of Borana zone.

1.3. Objective

1.3.1. General objective

- To assess the cattle husbandry and marketing practices and tick prevalence evaluation in Dhas district of Borana zone.

1.3.1. Specific objectives

- ✓ To assess the prevailing cattle husbandry practices.
- ✓ To identify the major health problems of cattle production and determine the most prevailed disease of cattle.
- ✓ To assess cattle marketing practice in the study district.

1.4. Significance of the Study

Livestock is an important part of achieving food security in pastoralist areas. Identification of overall cattle management activities with their constraints and opportunities related to cattle production and marketing system are prerequisites for designing suitable cattle production development strategies (Heffernan, 2004). The study was focused on the characterization of cattle husbandry practices, major health problem and marketing practice in Dhas district. Detailed information is necessary for planning of further interventions to increase cattle production. The findings from the present study had a potentially positive contribution to all stakeholders, governmental and non-governmental organizations to undertake appropriate measures towards development interventions in cattle production practice in the study area.

2. LITERATURE REVIEW

2.1. Livestock Production System in Ethiopia

Livestock production systems are determined by several factors. Among these agro-ecological zone (including rainfall, temperature, soil type and length of the growing season), and areas of lands for grazing in pastoralist areas. But in the highland the amount of landholding per households, the type of crop fully grown, the livestock species and numbers reared and also their economically vital for production system. In addition, the degree of integration and interactions of crops and livestock systems (LDMPS, 2007) based on these criteria there are 2 major production systems in Ethiopia: the highland crop-livestock, and lowland pastoral production system (Sintayehu *et al.*, 2010). According to Mahound *et al.*, (2004); Yitay, (2007) alternative criteria to classify production systems are; based on the integration of livestock with crop production, level of input and intensity of production, agro ecology, and market orientation. Depending on the above criteria the following systems have been defined; the pastoral, agro-pastoral, mixed crop-livestock farming, urban and peri-urban dairy farming, and specialized intensive dairy farming systems.

2.1.1. Lowland pastoral and agro-pastoral livestock production system

In the lowland area the agro-ecological setup with pastoralist doesn't allow livestock to provide inputs for crop production. However they are a backbone of life for thousands of rural population. As reviewed by IBC (2004), pastoral and agr-pastoral livestock production system is characterized by sparsely populated pastoralists in the vast rangelands, where survival of the peoples is mostly based on livestock and livestock products. The livestock husbandry practice in this system is dominated by cattle, goats, , sheep, and camels. The main source of food is milk; pastoralists tend to keep large herds to ensure mainly sufficient milk supply and generate income. Cattle are primarily for dairy for household consumption, with the majority of the herd compositions are female (Sintayehu *et al.*, 2010). The pastoral population are estimated at approximately 12–15 million in Ethiopia and the most notable pastoralists are the Borana, Somali, and the Afar around the southern, eastern, and northeastern parts to the country, respectively, (Alemayehu, 2006).

2.1.2. Highland Livestock production system

In the highland livestock production system, livestock provides inputs (draught power, transport, manure) to other parts of the farm system and generate consumable or saleable outputs (milk, manure, meat, hides and skins, wool, hair, and eggs). About 88% of the human population, 70% of cattle and sheep, 30% of goats and 80% of equines are found in this region (Alemayehu, 2004). The urban and peri-urban production systems include commercial to smallholder dairy farms. Such farms are reported to be found in and around major cities including Addis Ababa and other regional towns. This sector owns most of the country's improved dairy stock (Tsehay, 2002; Mohamed *et al.*, 2003; Sintayehu *et al.*, 2008).

2.2. Cattle Husbandry Practices in Ethiopia

2.2.1. Socio-economic importance and purpose of rearing cattle

Livestock, particularly cattle are a important part of nearly all farming systems in Ethiopia and supply power, milk, meat, manure, hides, and skins. Besides, livestock is an important source of cash income and play an important roles in ensuring food security, alleviating poverty, and serve as a capital asset against risk. (Ehui *et al.*, 2002, Alemayehu, 2004). In the arid areas, the goats and camels are the dominant species reared by the pastoralist. The former provide milk, meat, and cash income, while the latter are kept for milk, transport and a limited extent for meat. In contrast, reproduction/breeding requirements received higher ranks in pastoralist systems and for females; requirements for breeding outranked the values of milk production (Workneh and Rowlands, 2004). According to Ulfina *et al.*, (2005), cattle are also vital to generate cash in times of needs, provide collateral for local informal credit, and serve other socio-cultural functions in Ethiopia, particularly in Borana.

Cattle are kept for different purposes while the purpose varies with production systems. According to Alemayehu, (2004), traction ranked highest, followed by milk and reproduction/breeding (males and females) in both crop-livestock and agro-pastoral systems. In crop/livestock and agro-pastoralist, farmers, manure production also considered important, but as secondary rather than a primary purpose. The result of Andualem *et al.*, (2015), from Essera Woreda, Dawuro Zone Southern Ethiopia indicated that keeping cattle for both milk and traction and manure purposes. But Etafa *et al.*, (2013), reported that the primary purpose

of keeping oxen in West *Hararghe* is for draft power accounting for 99.4% of the responses, whereby cows were kept for sale of milk and other purposes accounting for 86.6 and 12.5% of responses, respectively.

The livestock in lowland areas serves an important function as a source of gifts/dowry/in cultural events such as marriage, hair shearing of elder , child naming and others. In the cultural deep rooted community,like Borana, there is a norm that before asking somebody's girl for marriage, the boy's family considers the number of livestock that the girl's family possesses (Fisahaye, 2016). Similarly, Chebo *et al.*, (2014) reported that the key functions of cattle of Gamo highland and lowland area were manure, milk, income generation (albeit small and intermittent), traction power, meat, and social values in that order of importance.

2.2.2. Family labor for cattle management

Fisahaye (2016), the major decisions regarding livestock sales, lending, borrowing of animals and giving animals for bride payment, and possession is the responsibility of the family head (male) except in the case of widow. The result of Philimon *et al.*, (2015), from the Afar Region, indicated that it had been found that the majority of the field works are taken by the husband and boys, whereas the homestead works are left for wives and girls. The responsibility of marketing and buying of cattle are handled by the husband. On the other hand, activities like cows barn cleaning, taking care of calves, milking (except camels), and milk process and marketing are handled by female.

2.2.3. Cattle feeding and feed resource

Livestock feed resources and utilizations in Ethiopia include natural pasture, crop residue, improved pasture and forage, agro-industrial by-product and different by-products. However, the food and vegetable refusal of those two primary contributor for the biggest feed sorts (Alemayehu, 2005) and majority of households used natural pasture and crop residues as feed resources each in dry and wet seasons. The natural pastures are hierarchic first of all resources in the altitude of each in dry and wet seasons (Seid and Berhan, 2014).

According to Belay, *et al.*, (2012), the most important of feed resources for livestock are natural pasture, crop residue, and conserved hay, stubble grazing, and nonconventional feeds.

Pastoralists community allow their cattle to continuously graze on communal pasturelands, though the availability and quality of this feed greatly varied with season. However, small numbers of communities began the cultivation of improved forages in their backyards and thus attempted the cut and carrying “ feeding practices (Philimon *et al.*, 2015).

Tesfaye, (2008), pointed out that, the feeding system primarily involves free grazing in pastoral and agro-pastoral areas and in the mixed farming systems where grazing land are mainly owned by private and few communal land is available. However, within the highland areas, because of the continual shrinking of grazing lands, the cut-and-carry system combined with tethering of animals is becoming a common practice, particularly in the Hararrge areas.

Cattle are reared under an extensive system of management on natural pastures, but grazing on fallow lands, wetlands, forests and bushes, and bunds of farms under a continuous grazing system are also practiced. Tethering has been practiced mostly in areas where grazing land are encroached by crop farming and when herding labor is scarce. The practice of feed conservation is nearly non-existent within the entire breeding tract; therefore; this condition leads to a scarcity of feed (Belay and Minale, (2017). According to Alemayehu, (2005), accessibility, quality, and amount of feeds differ among different production systems and cattle mainly depend on rangeland grazing or crop residues with the poor nutritive value. Specifically, the natural pasture browses, and bushes account for the major food sources of livestock owned by pastoralists.

Furthermore, in the pastoralist areas there is also a tradition of dividing the herd into *foora* and *warra* herds (Adugna. and Aster (2007). In addition, the milking animals belong to *warra* herd wick includes the young and weak animals that can't travel long distances whereas the *foora* herd includes the adult animals (male animals, non-milking female, pregnant animals and the young) which might be taken to distant places in search of feed and water when there are shortage of feed and water around the encampment areas (Adugna and Aster (2007).

According to (Adugna and Aster 2007), from Borena Southern Ethiopia, the major feed resources used for livestock feeding in the area are natural pastures (herbaceous vegetation composed mainly of grasses and forbs and browses (shrubs, tree leaves and pods).

2.2.4. Water sources and watering practices

In general, the pastoral area is characterized by low accessibility of surface water and sources are variable from place to place. The availability of water is better in areas where there are traditional wells and water development projects. Hence, the sources of water include wells (Ellas), ponds, and boreholes (Adugna and Aster 2007). Drinking poor quality of water causes pathogens and helminths infestation among the animals thereby leading to disease prevalence that contribute to the, higher morbidity, and mortality, and cut back productivity (Andualem *et al.*, 2015).

The results of Gemedo *et al.*, (2006), from Borana pastoral area, noted that, water is vital for everybody normally and therefore the Borana pastoralists in particular. However, there are no river and hence the pastoralists altogether relied on freshwater (rainwater), ponds and natural deep wells ('Eela') Farmers who live in the midland frequently use river water; dug well, tape water, stream and groundwater for their livestock. The watering frequency of livestock differs from season to season as well as from agroecology to agroecology. Throughout dry seasons, there was a shortage of drinking water for livestock within the low land area.

Generally, livestock accessed drinking water more frequently during the dry season than the wet season (Fisahaye 2016). Ebrahim *et al.*, (2016), from Kersa Woreda, Southwest Ethiopia reported that, water sources for animals are rivers, streams, ponds, and well. The majority of the owners use to stream and river for watering their animals while the sources are not available throughout the year.

2.2.5. Land uses pattern and cattle holding

The Borana pastoralists classify land into two major categories (Gemedo *et,al*, 2006). These are land for the bigger family ('*Lafa Warra Guddaa*') and land for the dry livestock ('*Lafa Gu'eessaa*'), the latter being also called 'Fooraland' ('*Lafa Fooraa*'). Land for the bigger family is further subdivided into three functional categories, called land for calves ('*Kalo*'),

land for lactating cows, calves about 2 years old, and other weak livestock (*'Lafa Haawichaa'*) (Gemedo, *et al.*, 2006). 'Worra land' (*'Lafa Worra'*), and land for settlement (*'Lafa Quftumaa'*).

The difference in the number of livestock holding and cattle holding is differing among altitude zones that cattle production systems and livestock holding differ markedly due to differences in resource endowments, climate, human population, disease incidences, level of economic development, research support, government economic policies and relying on the resources they have in the area (Devendra, *et al.*, 2002 and Seid and Berhan 2014).

The report of Azage (2009), from the North Gondar area, indicated that there were 8.7 heads per household and 8.01 heads per household reported for the Mekelle area (Nigussie, 2006). Regarding the composition of other herds in the three districts, the overall average number of sheep, goat, camel, donkey, and horse were 12.02, 15.56, 5.96, 0.74, and 0.02 heads per household, respectively (Philimon *et al.*, 2015).

2.3. Animal Health Problem

For pastoralists, livestock is the source of livelihood, providing food, income, manure and draught power, a rank of social status (Watson and Cutley, 2008). Therefore, the sector is rightly regarded as social and economic insurance for pastoralists (Vandamme *et al.*, 2010). The current climate variability and extreme events are adversely affecting the livestock sector, directly and indirectly by exacerbating the prevalence of diseases, distorting production, and minimizing the sector's profitability (Thornton and Gerber, 2010). To meet the opportunities and challenges, veterinary services need to operate on scientifically based principles and be technically competent, independent, and immune from political pressures (OIE, 2010).

Animal diseases are considered as a major health problem and cause a major economic loss in countries where livestock production is an important segment of the agricultural practice (Amene *et al.*, 2012). Diseases have varied negative impacts on productivity and reproduction of herds (losses due to mortality and morbidity, loss of weight, depressed growth, poor fertility performance, decrease physical power (CACC, 2003). The major

animal health problems on market-oriented livestock development of cattle are infectious diseases, parasitic and miscellaneous diseases (Gebremedhin, 2007).

According to Seid and Berhan, 2014, report from Burji Woreda Segenzuria Zone, of southern Ethiopia indicated major animal diseases and parasites were discussed through involving key informant farmers and veterinary technicians. They indicated that Trypanosomiasis, Contagious Bovine Pleuro Pneumonia, Blackleg, Foot and mouth disease, Fasholasis, Anthrax, Lumpy skin disease, Pasteurellosis, Dermatophylosis, Lice, Rabies, parasitic infections and Mastitis were major diseases of cattle in the study area.

As reviewed by Desalegn *et al.*, (2017), the major livestock diseases in pastoralist areas include those caused by trypanosoma, endoparasites particularly *Haemonchus contortus* and the highly zoonotic hydatidosis caused by *Echinococcus granulosus*. Other diseases include dermatitic, ectoparasite-related diseases such as orthodoxy, and tick-borne diseases caused by *Hyalomma*, *Rhipicephalus*, and *Amblyomma* species are very common.

The result of Desalegn *et al.*, (2017), from Borana, indicates that, tick infestation, Coenurosis, PPR, CBPP, camel sudden death, FMD, trypanosomiasis, blackleg and anthrax were the most prevalent livestock diseases. In addition to the above top eight livestock diseases, the study site pastoralists' livestock were affected by diseases such as Salmonellosis, liver diseases, bleeding and bloating were listed as the most frequent and were reported to cause mass death of livestock.

2.4. Livestock Market Structures

According to, Eyob and Zewdu, (2016), studies conducted in the highland of Ethiopia showed that livestock account for 37–87% of total farm cash income of farmers. Despite the contribution of livestock to the economy and smallholders' sustenance, the production system is not adequately market-oriented. There is little evidence of the strategic production of farm animals for selling except some sales targeted to traditional Ethiopian festivals. The primary reason for selling farm animals is to come up with financial gain to satisfy unforeseen expenses. Sales of live animals are taken as a final resort and large ruminants are generally sold when they are old, culled, or barren. In the highlands, large numbers of cattle

are kept to supply draft power for crop production whereas prestige and social security are the predominant factors in the lowland pastoral areas.

2.4.1. Cattle marketing practices

According to, Little (2009), livestock marketing, understood as the process through which live animals change ownership is increasingly perceived as critical for improving pastoral household income. However, there is relatively little analysis of the structure and performance of livestock marketing systems, or the various market actors involved. As reviewed by Getachew *et al.*, (2008) and Awur (2007), cattle markets in most parts of the country are characterized by seasonality in flow and prices of animals. In the pastoral lowland areas, major factors that contribute to seasonal flow include festivals, weather, pasture, seasonality of consumption demand (fasting and ceremonial period) in domestic, drought, disease outbreak, lack of information availability of food aid and clan conflicts.

The reasons mentioned as causes of selling livestock in the past year were to fulfill household cash needs, debt repayment, old age, and drought. The main selling season for cattle used for traction purposes was from January to May. Young cattle and cows are sold in May and June while small ruminants sold during any time in the year. (Kassaw, 2007). Nearly in all parts of the country, there is no regular market information on prices and supplies, nor formalized grades and standards of cattle, sheep, and goats, (Ayele *et al.*, 2003). Markets are dispersed with remote markets lacking price information.

The structure and performance of live animal markets, both for domestic consumption and for export, are generally perceived to be poor. Lack of market-oriented production, lack of adequate information on livestock resources, inadequate permanent animal route and other facilities like water and holding grounds, lack or non-provision of transport, ineffective and inadequate infrastructural and institutional set-ups, the prevalence of diseases, illegal trade, and inadequate market information (internal and external) are generally mentioned as some of the major reasons for the poor performance of this sector (Hurissa and Eshetu, 2002).

Result of Philimon, *et al.*, (2015), from the Afar Region indicated, possible reasons mentioned by them were to earn additional income, to replace old stock, to buy school materials for their children and/or to cover medication costs. Several market places were

mentioned as possible destinations for cattle. The cattle marketing also preferred at the closest market places for each district. Unfortunately, market places were farther than 20 km from settlement areas of pastoralists of Amibara and Chifra districts that favored middlemen to be the dominant actors of the market due to their capacity to easily access vehicles for transportation to settlement areas as well as market places.

Zewdie, (2010), reported that brokers are involved in the market to negotiate the price difference between sellers and purchasers. Local market prices of both crossbreds and local breed cattle Selling/purchasing price of adult crossbred cows ranged from Ethiopian Birr (ETB) 5,000.00 to 12,000.00 with an average of 8,838.00. The minimum and maximum selling/purchasing prices for heifers were ETB 3,000.00 to 11,000.00, respectively. Crossbred male calves were sold at low prices at an early age in peri-urban areas of Jimma and Sebeta but in peri-urban areas of Debre Birhan, they remained in the herd for traction purposes. When these oxen are too old, they will be fattened and sold with a price closer to the price of crossbred heifers

2.4.3. Livestock market categorization

Conventionally many livestock markets in Ethiopia are categorized into three and the basis of such classifications is mainly the number of animals that attended the market per market day or the number of market participants in the market. According to Ayele *et al.* (2003) and Getachew *et al.* (2008):

1. *Primary markets* are those in which less than 500 heads of animals attend the market per day or those in which the main sellers are producers and the main buyer are local assemblers. Market centers are found in rural areas.
2. *Secondary markets* are those in which 500-1000 heads of animals attend the market per day or those in which the main sellers are local assemblers and main buyers are big traders. Their locations are regional towns.
3. *Terminal markets* are those in which greater than 1000 heads of animals attend the market per day or the main sellers are traders and main buyers are butcheries and restaurants. Their locations are principal cities.

3. MATERIAL AND METHODS

3.1. Description of the Study Area

3.1.1. Location and physical features

The study was conducted in the Dhas district, which is one of the thirteen districts found in the Borana Zone of Oromia Regional State, Southern Ethiopia. The district is bordered by Guchi in the southeast, Wachile district in the north, Somalian Regional State in east, Miyo District in the west, Dire district in the northwest, and Dubluki district in northwest. The city of the district is, Borbor town and located about 730 km south of the capital city Addis Ababa and 171 Km from Yabello town (DDAO, 2019).

Administratively, the district is divided into seven pastoralist associations kebeles (PAs) of which 6 are rural pastoralist associations and one is urban, Namely, Borbor, Teso-Kalo, Gayo, Gorile, Dhas, Raro and Mat-arba with an estimated population of 69,856 of which (33,042 and 36,814), males and females that is (47.3% male and 52.7% female) (PDO, (2017). The land is covered with scattered short bush, red soil that dominates the majority of the eastern part of Borana rangeland and the district contains significant number of permanent water points called “*Tula*”. The major sources of income for the Dhas pastoral communities are livestock and livestock products, gum, incense and temporary wage (PDO, 2017).

3.1.2. Topography and Historical place of the District

The topography of Dhas district includes a mountain range, scattered volcanic cones, craters, and gently undulating and flat plains. The altitudinal range varies from 1,100 to 1,450 meters above sea level (m. a. s. l), and latitude $4^{\circ}12'37.95''N$, $38^{\circ}59'28.42''E$ (DDAO, 2019). The predominant soil type of the area includes red soil (*Wayama*), white or grey soil (*Biyye adi*), and Sandy soil (*Mansa*). The district has several historical places like Qalicha Borbor, Dawiti Borbor, Arda Gose, Gara Qanjibo. which were used as cultural diversity area. The pan-Borana assembly, Gumi Gayo, which has been forwarding different decisions on social, water management, and rangeland issues, has hold its meeting in this district every eight-year (woreda cultural and tourism office, 2019).

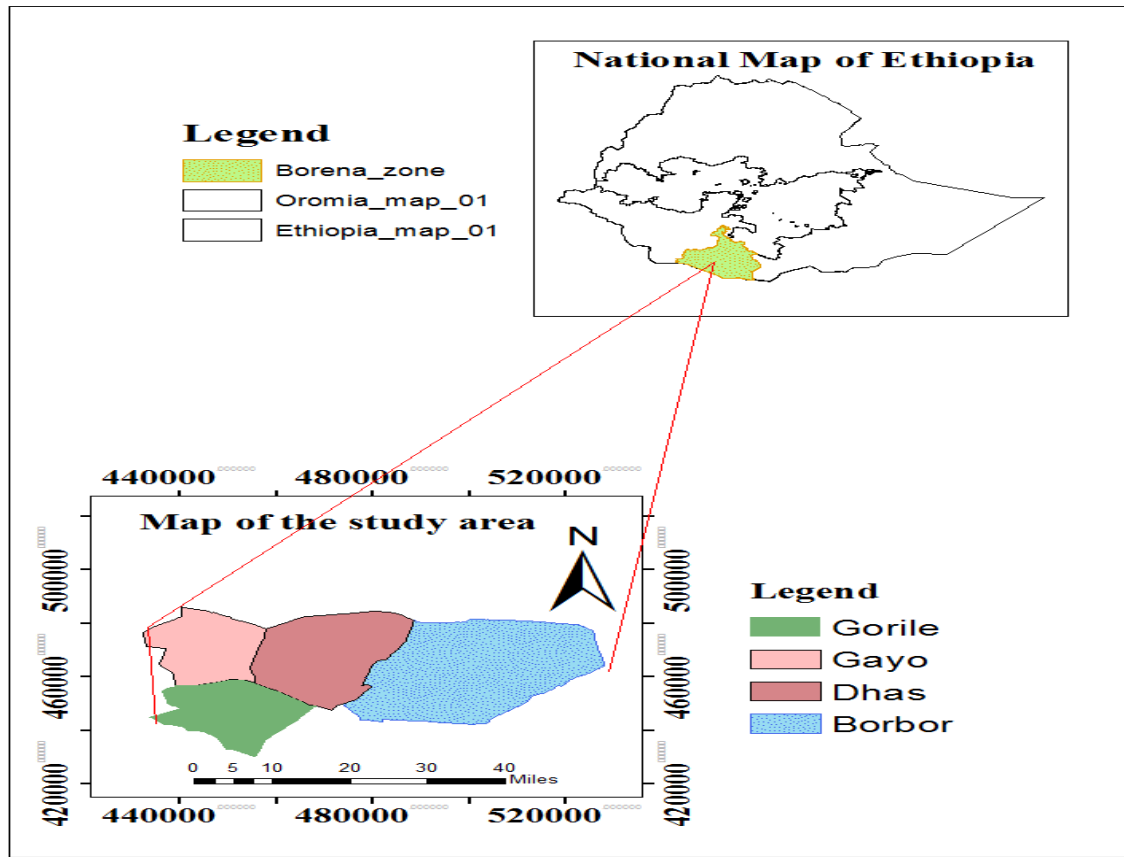


Figure 1: Map of the study area

3.1.3. Climate

Borana is increasingly drought-prone and the district receives bimodal rainfall distribution. There are four locally defined seasons comprising two rainy seasons (long rains “*ganna*”, and short rains “*hagayya*”) and two dry seasons (long dry season “*Bona hagayya*” and the short dry season “*Adoolessa*”). Rainfall distribution was bimodal where the long rainy season (“*Ganna*”) extends from mid-march to mid-May and the short rainy season (“*Hagaya*”) extends from mid-September to October. The rainfall pattern can be characterized as erratic, unpredictable, and unreliable. During the two rainy seasons, the onset and cessation of the rain are often irregular, but the “*ganna*” rain are more reliable than the “*hagayya*” rain in amount, temporal and spatial coverage. The altitude of the district ranges from 1,100 to 1,450 masl and the district climate is arid and semi-arid with an annual average rainfall ranging

from 400mm to 700mm and the mean annual temperature is 25 to 37.5⁰C. (DDPDO and DRSLP-II, 2019).

3.1.4. Livestock population

Dhas district has large livestock resources. From the early days, livestock rearing has played an important role in the life of the district population. There are about 40.6% of cattle, 31.9% of goat, 13.5% of sheep, 6.9% of camel and 3.1% of Equines, 3.98% of chicken, and 0.1% of traditional beehives, in the district (DDLRDO, 2019).

Table 1 Dhas district livestock population

Species	Number
Cattle	165,842
Goat	130,273
Sheep	55,082
Camel	28,265
Equines	12,500
Chicken	16,267
Traditional Beehives	407

Source: Dhas District Livestock Resource Development Office (DDLRDO) (2019).

3.2. Study Population

The study population included all cattle keeper households (pastoralists) and cattle kept by those pastoralists in the study area.

3.3. Study Cattle and their Management

The study animals were indigenous cattle (Borana breed) reared under traditional extensive production system by the district pastoralists. Cattle of all age groups were included in the study. The age of the cattle was grouped into young (1 to 2 years), adult (3 to 7 years), and old (>8 years) according to Gatenby, (1991) and Abera *et al.*, (2007). While body condition score was employed after categorizing the animals into poor, medium, and good according to Nicholson and Butterworth, (1986) and Maurya *et al.*, (2009). A good body condition score was given for the animals when fat cover easily seen in critical areas and felt and the

transverse processes were not seen or felt. A medium body condition score cattle was expressed as having usually visible ribs with little fat cover and barely visible dorsal spines. Extremely lean cattle, having prominent dorsal spines pointed to the touch and individual visible transverse processes into which a finger could be easily pushed were considered as poor body condition score. Accordingly, based on observation of anatomical parts such as vertebral column, ribs, and spines, the study animals were categorized as poor (score, 1 to 3), medium (4 to 6), or good (greater than 6). The sex and age of the animals were recorded.

3.4. Study Approach

Both descriptive and observational/cross-sectional study design were employed to characterize cattle husbandry practices, assess major health problems, investigate most prevalent disease affecting cattle and to assess marketing system in Dhas district from October 2020 to July 2021. Questionnaire surveys, focus group discussions, key informant interviews, field and clinical observations, document (secondary data) analysis, sample collection and laboratory analysis were conducted.

3.5. Sampling Methods and Sample Size Determination for the Questionnaire Surveys

Dhas District has seven (7) Kebeles out of which 4 (Borbor, Dhas, Gayo, and Gorile) were selected purposively based on the availability of primary livestock market, presence of primary veterinary clinic, and number of cattle population in the kebeles. The number of participants (respondents) to conduct the survey were determined using simple random sampling method according to Yemen's formula (1967).

$$n = \frac{N}{1 + N(e)^2}$$

$$\frac{3550}{1 + 3550(0.07)^2}$$

$$\frac{3550}{1 + 3550(0.0049)} = 193$$

Where, **n** = is sample sizes

N= is total households heads, which is 3,550 HHs

e = is sampling error, 7%, at 93% confidence intervals.

Multi-stage sampling procedures (purposive and random) were employed to select pastoralist associations/kebeles and households (HHs) of the district which was done with livestock resource development office and District Trade and Market development offices expert.. Four kebeles were selected purposively for the study based on number of cattle population, availability of veterinary clinics and primary marketing center. Before the commencement of the study, sampling frame of the study area was taken from the district. Accordingly, the total HHs (N) in the selected kebeles were 3,550. Then, using previous formula, 193 respondents were selected by using simple random sampling techniques for the interviews. Proportionality of incorporation of the study participants were applied as per the number population in each kebele as presented in Table 2.

Table 2: Sample size determination per selected kebeles

Kebeles name	Total #HHs	Sample size of HHs
Borbor 1	N1	$\frac{N1}{N} * n$
Dhas 2	N2	$\frac{N2}{N} * n$
Gayo 3	N3	$\frac{N3}{N} * n$
Gorile 4	N4	$\frac{N4}{N} * n$
Total	N	N

Where: N1, N2, N3, N4 = Number of HHs in Kebele 1, 2, 3, 4; N= Total HHs

Table 3 Distribution of sampled/selected respondents per each sample kebeles

Kebeles	Total Household	Sample size	Sample %
Borbor	370	20	10.4
Dhas	1319	72	37.1
Gayo	586	32	16.5
Gorile	1275	69	35.9
Total	3550	193	100

Source (Dhas District Administration Office (DDAO), 2019)

3.6. Sampling Technique and Sample Size Determination for Disease Investigation

The sample size required to investigate the most prevalent disease identified by the study participants (respondents) was calculated using a method recommended by Thrusfield (2007).

$$n = \frac{1.96^2 * P \text{ exp } (1 - P \text{ exp})}{d^2}$$

Where: n = the required sample size

P exp= expected prevalence

d= Absolute precision

Therefore, to maximize the sample size (to improve accuracy) and absence of previous study in the area, the proportion P (average expected prevalence) was taken as 50% with 95% confidence interval (CI) at 5% desired precision as stated by Thrusfield (2007). Accordingly, 384 cattle were sampled using simple random sampling method for the determination of prevalence of the disease under the study.

Multi-stage sampling procedures (purposive and random) were employed to select kebeles and households (HHs) of the district. Four kebeles (Borbor, Dhas, Gayo, and Gorile) were selected purposively for the study based on number of cattle population, availability of veterinary clinics and primary marketing center. Then, simple random sampling method was applied to select 384 cattle from the selected kebeles. Proportionality of incorporation of the sample were applied as per the number cattle population in each kebele as depicted in Table 4.

Table 4 Study kebeles cattle population

Kebeles Name	Total Number of cattle population
Borbor	11,023
Dhas	33,529
Gayo	24,420
Gorile	35,296
Total	104,268

Source: Dhas District Livestock Resource Development Office (DWLRDO) (2019)

NB: Sample size of cattle per selected kebeles calculated as; number of cattle population found in the kebele multiplied by total sample size divided by total cattle population in the selected kebeles.

Table 5. Distribution of sample size per each sample kebeles

Kebeles	Total Number of cattle population	Sample size	Sample proportion %
Borbor	11,023	41	10.6
Dhas	33,529	123	32
Gayo	24,420	90	23.4
Gorile	35,296	130	34
Total	104,268	384	100

Source: Dhas District Livestock Resource Development Office (DWLRDO) (2019)

3.7. Sources of Data

Both primary and secondary sources of data were used for this study. Primary data was collected through a household survey/questionnaire survey, focus group discussion, and key informant interview, personal observations and laboratory investigation. Secondary data such as published and unpublished institutional documents (from District Trade and Market development offices, District Livestock resource development offices and District Finance and Economic Cooperation (DFECO) Office), journals, project reports and reports on websites and clinical case recorded from the veterinary clinics were utilized in the study.

3.8. Methods of Data Collection

3.8.1. Questionnaire survey

The survey questionnaire was developed and pre-tested and adjusted on sample households to develop a structured questionnaire. A separate questionnaire was prepared in Afan Oromo to serve as a guide for interview respondents. Questionnaires having open-ended and closed-ended with main focus on cattle husbandry practices (purpose of rearing cattle, feed source and feeding practices, watering practices, land use patterns), disease problems and marketing system in the study area. Primary data including qualitative and quantitative information

were collected through interviews and personal observations at the time of visits. The data were included the socio-economic and demographic features of the selected households, land use pattern, number of cattle holding, cattle herd composition, marketing of cattle, sources of income, feed and feeding practice and health management.



Photo1: Photo during Household interview

Source: *Own picture during the survey*

3.8.2. Focus group discussion (FGD)

Focus group discussion was prepared with eight informants, those selected from PAs considering their age and experience on livestock production and rangeland and water management activities by using a checklist prepared for this purpose. Based on this, FGD with the pastoralist association elders, PA leaders, *Dheeda* committee, Gada leaders living in pastoralist association, youth, and women were included. During group discussions, participants were given the opportunity to discuss freely whatever points they talk were essential. These comprise a cross-section of individuals with firsthand knowledge and experience on the cattle husbandry practices. Issues presented in the focus group discussions included the historical background of cattle husbandry practice and utilization of communal

resources (Communal land and water), and major animal health problem in the area, accessibility of market for cattle production practices.



Photo 2: Sample photo during FGD and KII

Source: *Own picture during the survey*

3.8.3. Key informant interviews (KII)

Key informant interviews were conducted with influential producers, pastoralist association leaders, cattle traders, brokers, and district animal health expert and development agents (DA). This KII was done at pastoralist association level with checklists. Their purpose, involvement, and problems encountered in the value chain were assessed.

3.8.4. Field observation

Field observation was conducted to address the data about feeding and feed resource situation of the households, watering and management of communal grazing land (land use pattern) which was done at onetime visit of a pastoralist village. Veterinary clinics and laboratory facilities were observed. Livestock marketing and marketing situations of local (primary) market centers in the area were visited.

3.8.7. Clinical observation

Samples were taken from the selected cattle for investigation of ticks' prevalence in the area. Animal biodata (identification) such as the owner of the animal, age, sex, parity, and origin (pastoralist association) and body condition scores (poor, medium, and good) were recorded. Sample used for laboratory examination were collected by the sample collection material, labeled by sample ID, date of sampling collection, pastoralist association, sex, age and then preserved by the preservative chemicals and transported to Yaballo Regional Veterinary Laboratory for further examination.

3.8.5. Secondary data collection

Secondary data were collected from various institutions. These include published and unpublished institutional documents from (District Trade and Market development offices, District Livestock resource development offices and District Finance and Economic Cooperation (DFECO) Office were utilized in the study), journals, project reports and reports on websites and clinical case recorded at the veterinary clinic level.

3.9. Methods to Investigate the Major Disease Prevalent in the Area

3.9.1. Materials, equipments and chemicals/reagents

The materials, equipments and chemicals/reagents used for the collection and processing of samples and laboratory investigation were: rope to restrain cattle, forceps for ticks collection, universal bottles and ice box sample transportation materials, reagent (chemicals) for sample preservation, petridish, stereomicroscopic for ticks species identification, laboratory equipment kits, digital camera, and notebooks.

3.9.2. Clinical observation

Samples were taken from the selected cattle for investigation of ticks' prevalence in the area. Animal biodata (identification) such as the owner of the animal, age, sex, parity, and origin (pastoralist association) and body condition scores (poor, medium, and good) were recorded. Signs and symptoms of animals affected by the disease were observed and recorded. The sample used for laboratory examination was collected by the sample collection material,

tagged by sample ID, date of sampling collection, pastoralist association, sex, age and then preserved by the preservative chemicals and transported to Yaballo Regional Veterinary Laboratory for further examination.

3.9.3. Tick collection, identification and count

The entire body surface of the animal was examined thoroughly for the presence of any ticks and all visible adult ticks were collected after casting the animals by using thumb forceps and manually. The collection of ticks was done carefully and gently in a horizontal pull to the body surface without causing damage to the ticks. Ticks were collected from half body region of the animals on different predilection sites including the ear, neck dewlap, abdomen, anus, hip udder, fore/hind legs, perineum, scrotum and base of tail following the procedure suggested by Walker *et al.* (2014).

The ticks collected were preserved in universal bottles containing 70% ethyl alcohol and label with the animal identification and body condition score, age, sex, and date of collection. First ticks will be seen grossly and classified to different genera levels. Ticks were identified into their species-level depending upon their morphology and identification structures they have, such as the color of scutum and conscutum, leg color, body, coxae one, coxa four, and ventral plates. During tick identification in the laboratory, the sample was put on a petridish and the species was identified by examining under the stereomicroscope. Ticks were count and subsequently identify to genus and species level according to standard identification keys given by Walter *et al.*, (2007).

3.10. Statistical Data Analysis

The data collected from individual households were coded and entered into Microsoft excel spreadsheet (2007) computer software program and analyzed using Statistical Package for Social Science (SPSS) Version 21. Survey data were summarized by using descriptive statistics like mean, standard error (mean error), percentages of both dependent and independent variables, and ranking index values of various parameters. Indices were calculated as (Index = sum of (4×number of HHs ranked first +3 ×number of HHs ranked the

second +2×number of HHs ranked third+1× number of HHs ranked fourth) for particular objectives divided by the sum of (4× number of HHs ranked first+3 × number of HHs ranked second +2 × number of HHs ranked third+1× number of HHs ranked fourth) for all objectives.

In addition, the prevalence was calculated as the percent of infected animals from the total number of animals examined. The association between the prevalence of major cattle diseases and independent variables (risk factors) were analyzed by using Chisquare (χ^2). A confidence level of 95% and a *P*-value of less than 5% were judged as statistically significant. Moreover, data collected from the field through FGD, key informant interviews and personal observations were analyzed after categorizing and narrating based on the research objectives using a thematic analysis approach.

4. RESULT AND DISCUSSION

4.1. Socio-Economic Characteristics of the Respondents in the Studied Area

Household's age, sex, marital status, family size, and educational level were shown in (Table 6). The study revealed that the majority of the respondents (85%) were male and the remaining (15%) were females. The finding of this study was agreed with Seid (2012), who reported 81% male and 19% female from Burji Zone Segen Zuria District. In current finding proportion of respondents was higher than the report of Andualem (2015), 70% of male and 30% of female from Essera district. The higher number of male respondents in the present study indicates that in Borena culture, males are responsible head of his family members and marry or more wives.

In the pastoral area of Borena, cattle husbandry is commonly practiced in the rangelands where the community involved in livestock-based lifestyles, which needs them to move from place to place seasonally based on feed and water availability due to this large number (85%) respondents were males. Lower number of female respondents indicate that, they have many responsibility from family member like fetching water, child care, preparing food for family, which took much of their time. As a result they may not be available for interview.

About Seventy three percent of household heads were (73.1%) illiterate, where as 17.6% can reading and writing, 6.2% attended elementary school, 2.1% attended junior school, and 1.0% attended secondary school respectively. The level of education in the study district was very low and the community in the study area practice cattle rearing in an extensive way of production system and had no access to modern education. As a result the community might be resistant to adopt a modern livestock production system and new technologies. The present finding was higher than the report of Abdi *et al.*, (2013), Daniel (2018), and Shewangizaw (2016) which was 35.2 and 12.1%, 31.9 and 11.9% and 46.67% of the HHs were illiterate and educated respectively. However, our finding was lower than the result from North West Ethiopia 82.1%, (Halima; 2007) and Ayeneshet *et al.*, (2017), who reported 86.0% and 83.3 % of respondents in Quara and Alefa districts north Gondar respectively. No access to school might be one of the reason for high level of illiterate HHs in this study.

The difference was due to no access to school in pastoralist and community areas; no practice to take their child to school. The high illiteracy level in the recent study might call attention to establish adult education that can increase the adoption level of new technologies in relation to cattle husbandry practice. Focused group discussion and key informant interviews indicate that traditionally pastoral communities manage their cattle without any technological input. About 88.1 % of the respondents were married followed by 5.2%, single, 3.6%, widowed, and 3.1%, divorced respectively (Table 6). The present finding was higher than that of Andualem (2015), who found that 77.8% of respondents were married from Eserra district Dawuro Zone.

Table 6: Socio-demographic characteristics of respondents (%) in the study district

Variable	Categories	Respondents				
		Borbor (20)	Dhas (72)	Gayo(32)	Gorile(69)	Overall
Sex	M	16(80)	66(91.7)	24(75)	58(84.1)	164(85.0)
	F	4(20)	6(8.3)	8(25)	11(15.9)	29(15.0)
Marital status	Married	16(80)	64(88.9)	29(90.6)	61(88.4)	170(88.1)
	Single	-	4(5.6)	1(3.1)	5(7.2)	10(5.2)
	Divorced	-	3(4.2)	1(6.3)	1(1.4)	6(3.1)
	Widow	4(20)	1(1.4)	-	2(2.9)	7(3.6)
Educational level	Illiterate	14(70)	46(63.9)	29(90.6)	52(75.4)	141(73.1)
	Reading and writing	4(20)	14(19.4)	2(6.3)	14(20.3)	34(17.6)
	Elementary	1(5)	8(11.1)	-	3(4.3)	12(6.2)
	Junior school	1(5)	3(4.2)	-	-	4(2.1)
	Secondary	-	1(1.4)	1(3.1)	-	2(1.0)

N = number outside the parenthesis indicate sample size

According to focused group discussion (FGD) except for children less than 7 years, all family members participate in cattle husbandry practice. Focused group discussion indicates that in the study area the children have less chance to go to school because they should participate in cattle management unless more children are available in the given household. Having more than two wives and several children is one of the wealth indicator and essential to meet the labor force for different management activities.

Table 7: Age category and family members of respondents

Variable	Categories	Respondents				
		Borbor (20)	Dhas (72)	Gayo(32)	Gorile(69)	Overall
Age	20-30	-	17(23.6)	4(12.5)	8(11.6)	29(15.0)
	31-40	2(10)	14(19.4)	10(31.3)	10(14.5)	36(18.7)
	41-50	8(40)	9(12.5)	12(37.5)	13(18.8)	42(21.8)
	51-60	5(25)	20(27.8)	4(12.5)	33(74.8)	62(32.1)
	>60	5(25)	12(16.7)	2(6.3)	5(7.2)	24(12.4)
Family size	1-5	3(15)	28(38.9)	6(18.8)	22(31.9)	59(30.6)
	6-10	12(60)	23(31.9)	21(65.6)	30(20.3)	86(44.6)
	>10	5(25)	21(29.2)	5(15.6)	17(4.7)	48(24.9)

N = Numbers outside the parenthesis indicate number of respondents.

The mean age and family size of the respondents in the studied district were 45.61 ± 0.975 and 7.4 ± 0.242 , respectively (Table 8). The family size of the respondents with 1-5 family members were (30.6%), 6-10 (44.6%), and >10 (24.9%) Table 7. Family size is dominated by 6-10 person might indicate adequate labor for cattle management activity was enough in study area. Majority of the respondents were in the age range of 51-60 (32.1%) years. However respondents >60 (12.4%) years were lower in number. The present finding was in agreement with the finding of Seid and Berhan (2014), who indicated average mean age 43.4 ± 1.0 southern Ethiopia. In the study area, the larger family size could be further associated with the polygamous family that Borana can marry more than two wives and early marriage in the study area. All respondents falling in these age groups were directly participating in the cattle husbandry practices at the time of the interview. This finding

indicates that family members in the productive age group were high. This result shows that in the study area households have good sources of labor to attend different cattle management activities.

Table 8: Mean age and family members in study area

mean age and family members	Mean $\pm$ SE	p-value
Age	45.61 $\pm$ 0.975	.020
Family members	7.4 $\pm$ 0.242	.734

SE=Standard Error

4.2. Cattle Holding and Herd Structure of the Households

The mean $\pm$ SE of cattle holding per household head in the district was shown in (Table 9). In general, the cattle herd structure was composed of milking cows, dry cows, heifers, bulls, male and female calves, and oxen. The current study revealed that the overall mean of cattle holding per household was 31.761 $\pm$ 1.126 and maximum and minimum cattle holding per household were 6 and 97, respectively. There was no statistical significance difference ($P>0.05$) between herd structure (Table 9). The present finding was higher than the result of Anduallem, (2015) and Belay *et al.*, (2012) who reported the overall mean of cattle holding per households 11 $\pm$ 0.69 and 4.53 $\pm$ 0.4 from Essera district and Dandi district, respectively. This finding indicates that all HHs in the study area have at least more than five cattle per household.

The high number of cattle holding per household indicated that, the livelihood of pastoral community mostly based on livestock production particularly cattle. Regarding herd structure, the herd was mainly composed of milking cow 8.75 $\pm$ 0.36 and calves 8.55 $\pm$ 0.035, and the small number of herd observed was oxen and bulls which was 2.05 $\pm$ 0.09 and 1.88 $\pm$ 0.09, respectively. The observed herd structure was higher than the findings of Anduallem (2015), were cows, oxen, calves, bulls, and heifers 5.89 $\pm$ 0.43, 1.84 $\pm$ 0.17, 2.00 $\pm$ 0.18, 0.62 $\pm$ 0.09, and 0.69 $\pm$ 0.09, respectively from Essera District. It is observed that the pastoralist community primarily keeping cattle for milking and milk product and bull

primarily uses for natural mating purposes. Bull also sold during the shortage of food for family consumption.

Focused group discussion and Key informants interview indicate that in Borana pastoralist areas cattle herd structure was milk cow (*'loon Aananii'*), dry cow (*'gu'eessaa'*), calves both weaned and unweaned from 0 to 2 years, heifers (*'goromsa'*) and bulls (*'kormaa'*). The FGD also confirmed that cattle production in Borana was strongly tied with the community not only for food consumption purposes but for social and cultural heritage.

Table 9: Means and standard errors of cattle herd structure in the study area

Cattle herd structure	Borbor	Dhas	Gayo	Gorile	Overall	P value
	Mean $\pm$ SE					
Milk cow	7.35 $\pm$ 1.084	8.56 $\pm$ 0.572	5.69 $\pm$ 0.909	9.19 $\pm$ 0.642	8.75 $\pm$ 0.360	0.269
Dry cow	10.85 $\pm$ 1.567	8.17 $\pm$ 0.637	5.00 $\pm$ 0.691	6.19 $\pm$ 0.486	7.37 $\pm$ 0.363	0.478
Oxen	2.50 $\pm$ 0.500	2.11 $\pm$ 0.179	1.21 $\pm$ 0.195	2.05 $\pm$ 0.140	2.05 $\pm$ 0.097	0.159
male and female calves	7.55 $\pm$ 1.109	8.68 $\pm$ 0.575	5.63 $\pm$ 0.892	9.12 $\pm$ 0.613	8.55 $\pm$ 0.0354	0.412
Heifers	6.32 $\pm$ 0.720	5.56 $\pm$ 0.440	8 $\pm$ 3.34	4.20 $\pm$ 0.297	4.93 $\pm$ 0.217	0.584
Bull	5 $\pm$ 0.337	2.19 $\pm$ 0.177	3 $\pm$ 1.10	1.57 $\pm$ 0.102	1.88 $\pm$ 0.091	0.104

4.3. Sources of Income for Households

As presented in (Figure 2), the present study revealed that in the study district, the major sources of household income were generated (85.5%) from livestock production. Where as the remaining income driven from cash for work (5.2%) and daily wage labor (9.3%). Both cash for work and wage labour are carried out in times of food scarcity mostly during prolonged dry season serving as income.

The result shows that in the study area the source of income for the community was mainly from livestock and livestock productivities. The present result was in contrary from Daniel

(2018), Abdi *et al.*, (2013), Estefanos *et al.*, (2014) and Tsigereda *et al.*, (2016) who found that source of income for community are obtained from mixed farming activities. The observed difference was due to different agroecology, availability of job opportunity in the area and livestock production as means of livelihood.

Focused group discussion and key informants interview from Borbor PAs indicate that selling gum and incense was another source of income during the dry season. The present finding confirms that the livelihood of the pastoral community in the study area directly depends on livestock production and productivity.

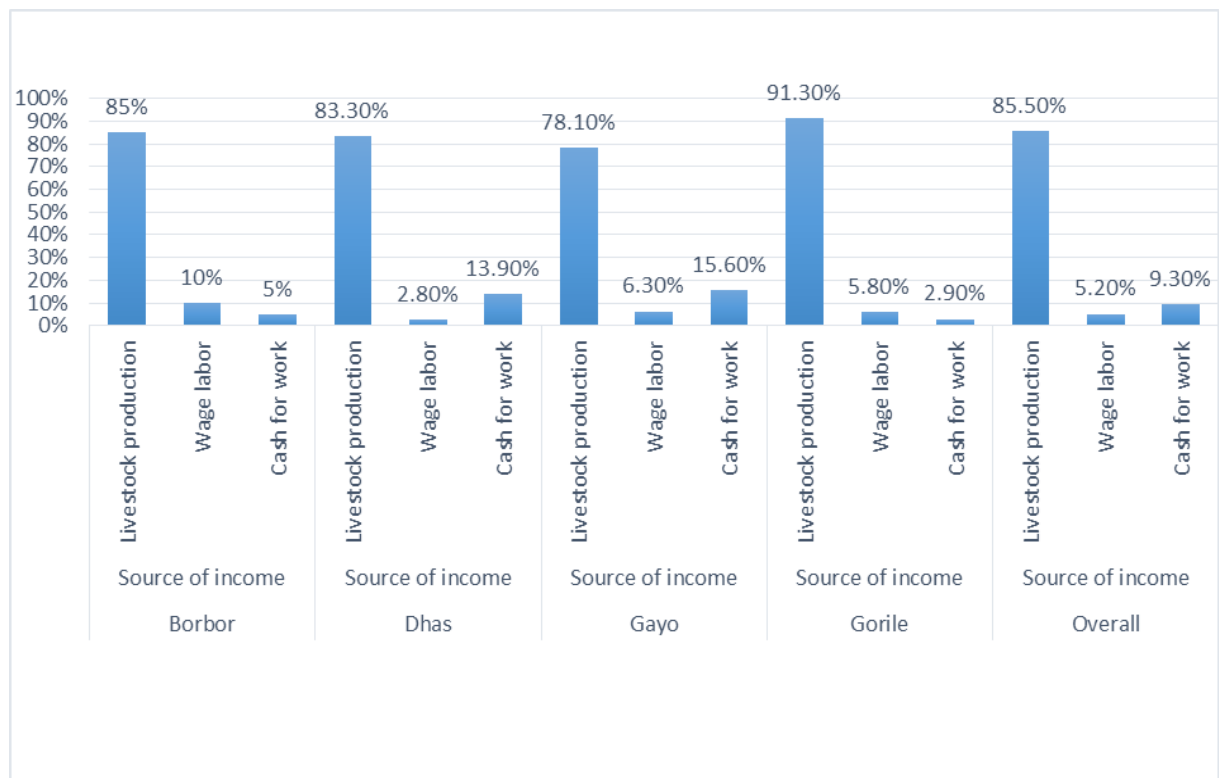


Figure 2: Households' sources of income (%)

4.4. Purpose of Keeping Cattle in the Study Area

The survey result revealed that cattle were kept for different purposes in the district. Four major purposes, namely: milk and milk product consumption, meat, income generation, and saving, and social prestige were listed and ranked by the respondents (Table10) . According to the index of ranking, milk and milk product for household consumption was ranked first and followed by meat consumption, income generation and social prestige by the indices of 0.259, 0.235, and 0.128, respectively. The finding indicated that, the pastoral community

primarily keeping cattle for milk and milk product consumption. The present finding was in line with the finding of Hiwet (2013), from the southern part of Ethiopia who reported the main objectives of livestock keeping were milk and milk products and income source.

Focused group discussion and key informant interview indicates that milk plays a major role in daily home consumption as food mostly for children and selling it for buying family daily needs. Focus group discussion and key informants' interview made it clear that the milk and milk product (butter and cheese) is the main source of income for family consumption mostly for children, meat consumption and milk product (butter) selling as a source of cash for the small home expense.

Table 10: Purpose of keeping cattle

Variable	First	Second	Third	Fourth	Index	Rank
Milk for HH consumption	155	24	11	1	0.376	1 st
For meat	18	91	67	15	0.259	2 nd
Income generation and saving	19	62	82	23	0.236	3 rd
Social prestige	0	11	31	150	0.129	4 th
Overall	192	188	191	189	1	

Respondents sell cattle to buy food expenses for the family during a shortage of food in the drought season and to cover health and school fees. It is also a common culture in the district that milk and milk products (butter) are offered as gifts to neighbours and other household in village during ceremonies. Moreover, cattle are important gifts/dowry/ during marriage ceremony. There is a norm that before asking somebody's girl for marriage, the boy's family considers the number of cattle that the girl's family possesses.

4.5. Labor Division for Cattle Management

Almost all members of the household in the study district participated in different activities of cattle management practices. The labour division for cattle management is indicated in

(Table 11). Herd feeding and watering were performed husband (73.6%) followed by wife and children (18.1%) and 8.3%) respectively. Health care management (84.5%) was the responsibility of the husband in the study district. About 57% of the respondents indicate that the responsibility of calf rearing was given for the children, while 23.3% and 15% of this activity was the task of wife and partner respectively.

Table 11: Responsibilities of family members in the routine cattle management activities (%)

Activities	Respondents (N=193)			
	Husband	Wife	Children	Partner
Herd feeding and watering	142(73.6)	35(18.1)	16(8.3)	-
Calf rearing	9(4.7)	45(23.3)	110(57)	29(15)
Cattle rearing	47(24.4)	47(24.4)	76(39.4)	23(11.9)
Milking and milk product marketing	-	148(76.7)	37(19.2)	8(4.1)
Barn cleaning	71(36.8)	34(17.6)	85(44)	3(1.6)
Health care management	163(84.5)	30(15.5)	-	-

Number of respondents represent outside parenthesis

Regarding milking and milk product marketing 76.7% of respondents show that it was responsible for the wife followed by 19.2% for children and 4.1% for the partners. The current results are in agreement with the findings of Andualem *et al*, (2015), from Essera district, who reported that wives are responsible for milking a cow in the *kola* area. Similarly Lamma (2004), from East Showa zone where female members of the HH entirely undertook milking. The result was also agreed with the finding of Desalegn (2017), who reports milking, milk processing, sale of milk products, and barn cleaning were mainly the jobs of women.

According to respondents, husbands was not involved in milk processing, milk and milk products selling and the same with children and partners were not participate in Health care management. The present study result was different from the findings of Azage *et al*. (2013) who reported that milking activities of the dairy cow was the job of men. In Borana pastoralist area the overall livestock management was the responsibility of men but livestock

product like: meat, milk and milk product was managed female in the home. Traditionally, in the study area female collect the grass during feed available and store in the form of hay for dry season.

4.6. Land use Pattern in the Study Area

The land is one of the most important resources required for the successful implementation of any livestock production activities. The outcome of FGD and key informants' interviews indicated that land use pattern in the study area was communal land. The grazing land which was the source of natural pasture and standing hay was mostly owned communally in the study area. The participants indicate that land was categorized into two major classifications, land used during the rainy (wet) season and land used for the dry season. They also indicate that traditionally community classify their pasture land for the dry and wet season to increase land productivities, systematically rotational grazing for the rangeland and copping mechanisms to overcome feed shortage during the dry season.

Key informant interview and FGD show that in pastoralist area land is categorized as land for the bigger family settlement (*'Lafa Worra Guddaa'*) and land for the dry livestock locally known as (*Lafa Gu'eessaa*), the latter being also called '*Fooraland*' (*Lafa Fooraa*). The land for the bigger family is further subdivided into land for calves, lactating cows and weak cattle which is known as (*'Kalo'*) in the local language. '*Kalo*' is a small area of fenced land near settlements that are used during the dry season or feed scarcity as standing hay that closed during the rainy (wet) season wich help to save the natural grass for the dry season.

The land was categorized into land for settlement (*Lafa Quftumaa*). Land classification into these different functional land-use units is performed through discussions and agreements among the community members. The management of rangeland utilization is the responsibility of every member of the community, although '*Arda*' elders (seniors) or *Gada* leaders in the area play an overall coordination role. '*Arda*' means specific location or geographic units that villages occupy come together and decide on the borders of land for lactating livestock and settlements.

There was practice of purchasing bell of hay at the time of drought outbreak or during prolonged dry seasons in the study area mainly from the central parts of the country. Focused

group discussion and key informants interview identified that, recently there was a practice of making bell of hay in study area to feed animals in dry season. During field visit the researcher observed that the community harvest natural grass and store which was provided for calves and weak and lactating cattle during feed scarcity.

Result of Focused group discussion and key informant interview, show that land used for livestock grazing decline in productivity due to land degradation, unwanted bush encroachment, inappropriate community settlement and shortage and erratic rainfall were the major contributing factors in the study area that highly decrease rangeland productivity.

4.7. Main Feed Sources and Feeding Practices

Different types of feeds were used in the study area and ranked depending on the abundance and availability of feeds both during dry and wet seasons. The survey result in (Table 12) indicated that grass hay (natural pasture), mixed (grass, trees, and shrubs), only trees and shrubs (browse), and industrial by-product (concentrate) was ranked first, second, third, and fourth feed types with the indices of 0.333, 0.283, 0.267 and 0.267, respectively. The majority (83.4%) of the respondents indicated that they allowed their cattle to continuously free grazing on communal grazing land followed by cut and carry system (16.1%). cut and carry practice was mostly practiced around the village *kalos* (fenced grazing land near to the village).

Communities most of the time partition their grazingland by fence to make '*kalo*'. The fence can be used as a padock for rotational grazing on a '*kalo*'. The current result indicated that natural pasture was the main feed resource and ranked first in the study area. The Current finding agreed with the result of Philimon *et al.*, (2015) and Elias *et al.*, (2007), from the Afar region who report shows that 97.8% of the respondents indicated that major feed resource for cattle was contributed by natural pasture and they allowed their cattle to continuously graze on communal pasturelands, though the availability and quality of feed greatly varied from season to season and browse ranked 2nd in lowland areas as a source of cattle feed respectively.

Feeding systems include grazing and/or browsing on communal or private natural pasture and rangelands. cut and carry feeding, hay and crop residues Seid (2012). Focus group

discussion indicated that partitioning of grazing land during the wet season and dry season for their cattle were traditionally practised and availability of feed resources varied among the season. In both dry and wet season natural grass was the major source of feed followed by trees, browse (shrubs).

Table 12: Reported feed resources and feeding practices (%)

Feed source	Wet season						Dry season					
	1	2	3	4	Index	Rank	1	2	3	4	Index	Rank
Grass hay (Natural pasture)	91	48	34	20	0.336	1 st	78	50	38	27	0.333	1 st
Trees and Shrubs (browse)	34	52	82	23	0.270	3 rd	32	48	73	39	0.267	3 rd
Mix of grass, Trees and shrubs	42	73	46	27	0.285	2 nd	42	69	48	28	0.283	2 nd
Industrial by-product (Frushkelo)	12	6	21	83	0.108	4 th	25	13	22	91	0.267	4 th
Total	179	179	183	153	1		177	180	181	185	1	

Browsing plants were available and used throughout the year, but mainly during the dry season when there is a shortage of natural pasture. During prolonged dry season, feed shortage is critical and leads to the death of cattle. As a result the communities buy roughage feed and other supplements (*frushkelo*) from market to save lives of their cattle. Traditionally pastoral community was harvesting the natural grass (pasture) in the form of hay and store for the dry season and recently there is practice of making bell and store for cattle during feed scarcity. Both survey result and FGD indicated that there was no practice of using crop residue for cattle feed.

Focus group discussion and key informant interview indicated that communities are feed their cattle separately, depending on the age, body condition and availability of feed. Weak cattle (lactating and emaciated) and calves were fed small fenced communal grazing land near to the village locally known as '*Kalo*'. Sometimes, during prolonged dry season these

cattle fed hay locally known as '*Okaa*'. Adult and dry cows moved to another area during the dry season in search of water and feed.

4.8. Water Resources and Watering Practices

The water resource is very crucial for any agricultural and production activities especially in the lowland of pastoralist area. The present study revealed that the source of water and watering frequency for the cattle varies based on the seasonal availability throughout the year. The major source of water for cattle during the wet (rainy) season were ponds (63.9%), both wells and ponds (25.8%), and during dry season wells (50.5%) and both wells and motorized scheme (26.3%) (Table 13). In the study area, there were no practices of using motorized scheme (deep wells) during the wet season and no available rivers. In our study we found that the most important sources of water for cattle were ponds and traditional wells.

The frequency of watering was depends on different factors, such as season, accessibility or distance from water source. The difference of water sources observed during the dry and wet season was due to seasonal availability and accessibility of water because water source was not accessible throughout the year. During dry season ponds were dried-up and cattle were forced to move in search of water near to traditional wells locally known '*Tulaa*' which was overcrowded around a water source in the study area.

The FGD and KII participants identified an other source of water for their livestock during dry and wet season which is locally called '*Ella (tula)*'. Sometimes they use a motorized water source for cattle like calves, lactating and weak cattle during the prolonged dry season. Female fetch water for weak cattle at home during the prolonged dry season when water was not available in the nearby village locally known '*dhaanee*'. '*Dhaanee*' means fetching water from long distance during the drought which was carried by a donkey or human power. The temporary surface water, ponds, streams traditional well "*Ellas*", hand-dug wells like hand and solar pumps are the main source of water identified for cattle in the study area. According to Bainesagn (2016), in West Shewa Zone of Oromia Regional State showed that about 12.26, 2.58, 23.29, and 61.9 % of respondents were watered their cows ground well, stream, pipe and river water, respectively.

Table 13: water source in the study area

Source of water	Wet season		Dry season	
	Frequency	%	Frequency	%
	(N=193)		(N=193)	
Wells	13	6.7	98	50.5
Ponds	124	63.9	2	1.0
Wells and ponds	50	25.8	6	3.1
Deep wells (motorized)	6	3.1	36	18.6
Wells and motorized	-	-	51	26.3

Majority of the respondents (55.5%) take their cattle to water once every two days *locally known as* ('*dhabsuu*'), 35.6%, of the respondents water their cattle once every three days *locally known* as '*limaalima*' and and 8.8% once a day *locally known* '*takaa*' during the dry season (Table 15). While 79.9% of the respondents offer water to their cattle once a day, 16.0% twice a day and 3.6% once every two days during the wet season. The survey result indicated that distance travelled for watering on average during the dry season was (10.74 ± 0.40)km and a maximum 23km and minimum of 1 km. During the wet season the corresponding distance trecked by cattle was (6.47 ± 0.22) with (20km) and minimum (1km) respectively (Table 13).

The current finding indicated that there was no significant difference ($p > 0.05$) between dry and wet season for distance traveled for water (Table 12). Long-distance journey for searching water during the dry season shows that there was water scarcity during the dry season than the wet season. The current finding was different from result of Ayeneshet *et al.*, (2017) of Alefa and Quara Districts of North Gondar Zone, Amhara National Regional State, Ethiopia who reported that distance of water source was not greater than 2km.

Table 14: Distance travelled for watering

Distance traveled	Mean $\pm$ SE	p-value	Maximum distance traveled (km)	Minimum distance traveled (km)
during dry season	10.74 $\pm$ 0.40	0.384	23	1
during wet season	6.47 $\pm$ 0.22	0.198	20	1

Table 15: Watering frequency in the study area

Watering frequency	Wet season		Dry season	
	(N=193)	%	(N=193)	%
Once a day	155	79.9	17	8.8
Twice a day	31	16.0	-	-
Once every two days	7	3.6	107	55.2
Once every three days	-	-	69	35.6

4.9. Major Constraints of Cattle Production

Cattle production is affected by several factors in the study area as ranked by the respondents. Lack of feed (1st), shortage of water (2nd), disease incidence (3rd) and shortage of grazing land (4th) were the major constraints that affect cattle production practices (Table 16). Focused group discussion and key informants interview pointed out that recurrent drought, bush encroachment, rangeland degradation and overgrazing which leads to a reduction of rangeland productivity, cause feed shortage and cattle death during prolonged drought. The low productivity of cattle led to decreasing cattle market price and finally leads to food insecurity.

The study result was in line with the study of Tolera and Abebe, (2007) from southern Ethiopia who showed that lack of feed and water during the dry season and drought is the main constraint affecting livestock production and Ayeneshet, *et al.*, (2017), and Abdi *et al.* (2014) reported that shortage of feed for cattle production was the main problem. Shortage of

feed, recurring drought and the harsh climatic condition in the area are a major cause for reduced feed production that seriously affect the productivity of cattle.

The 2nd constraint of cattle production was shortage of water which affect livestock production in the study area. The current finding was different from the report of Ketema (2014) who reported disease as a second constraints for cattle production. During severe drought and critical water shortage the owners migrate from permanent settlement to find water. Whereas, weak cattle like calves and lactating was drink water in the village. Disease incidence and shortage of grazing land were the third and fourth cattle production constraints ranked by respondents with indices of 0.21169 and 0.153239 respectively. Shortage of grazing land was resulted due to unwanted bush encroachment which aggravates feed shortage in the study area.

Focused group discussion and Woreda animal health workers strongly agree that disease incidence and rangeland degradation cause poor productivity of cattle in the study area. Disease problem was common because of poor quality veterinary service, lack of policy for livestock disease control strategies, inadequate cattle vaccination service and the high price of medication expense in the study area. In addition to the above mentioned factors that hinder cattle production in the study area, focus group discussion, Woreda animal health expert and key informants suggested that recurrent drought, poor facilities of veterinary service, rangeland degradation by unwanted bush encroachment, lack of market accessibility and other factor were also problem in the study area.

Table 16: Major constraints of cattle husbandry practices

Variables	Rank of major constraints					
	First	Second	Third	Fourth	Index	Rank
Shortage of water	36	90	41	23	0.273	2 nd
Lack of feed	131	49	5	6	0.362	1 st
Disease incidence	12	32	118	22	0.212	3 rd
shortage of grazing land	14	18	27	127	0.153	4 th
Total	193	189	191	178	1	

4.10. Common Disease Types Affecting Cattle Production in the Study Area

The current study reveals that major diseases and parasites of cattle were identified through group discussion with the involvement of key informant interview and animal health experts. They indicated that Ectoparasite (ticks) (*'diraandisaa fi silmii'*), Contagious Bovine Pleuro Pneumonia (CBPP) (*'Sombeessa'*), Blackleg (*'Harkaa'*), Foot and mouth disease (FMD) (*'Ooyale'*), Trypanosomiasis (*'Gandii'*), Anthrax (*'Citaa'*), Lumpy skin disease (*'suukii'*), Pasteurellosis, and Mastitis (*'dhukuaba gurruu'*) and Endo parasite (*'raammoo'*) were major diseases and parasite of cattle in the study area.

Table 17: Presence of disease in the study district

Is there any disease affecting cattle in the district		
Variable	Frequency	Percentage (%)
Yes	184	93.9
No	9	4.7

Table 18: Major cattle disease in the study area

Variable	Ranking of major cattle diseases and parasites						
	First	Second	Third	Fourth	Fifth	Index	Rank
Ecto-parasite (Ticks)	104	34	16	13	8	0.266	1 st
Pasteurolosis	38	49	62	17	10	0.222	2 nd
CBPP	33	63	33	30	21	0.216	3 rd
FMD	9	28	50	68	32	0.172	4 th
Endo-parasite	6	17	24	39	96	0.124	5 th
Total	190	191	185	167	167	1	

The result indicated that majority of the study participants (93.9%) responded that there was cattle disease as a problem in the study area (Table 16). The present survey showed that, among the major diseases and parasites in the study area, Ectoparsite (Ticks) infestation was the most prevalent and ranked first followed by Pasteurolosis, Contagious Bovine Pleuro

Pneumonia (CBPP) and Foot and mouth disease (FMD) and Endo parasite infestation. The 1st, 2nd, 3rd, 4th, and 5th ranked diseases in terms of distribution and frequency of occurrence by the indices were 0.266, 0.222, 0.216, 0.172, and 0.124, respectively (Table 18). The ranking of ticks infestation by respondents in the study area as first among the health challenges of their cattle concurs with the report of Kumsa *et al.* (2015a) from other parts of Ethiopia by participatory investigation where the study participants ranked the ticks infestation as major constraint in cattle production.

4.11. Animal Health Service in the Study District

About 58.7% of the respondents receive animal health service from public (government) veterinary clinic, 22.4% of respondents use private veterinary pharmacy while 17.3% use traditional medications (Table 20). Accordingly, government is the major animal health service provider to the community followed by private veterinary pharmacy and traditional medication. About 37.8%, 23%, 21.8% and 15.3% of the respondents indicate that distance from the veterinary service was 1-5km, 6-10km, >10km and <1km respectively.

About 59.2% of the respondents were satisfied with the government veterinary service whereas 39.2% of them were not satisfied with the service. The survey result also indicates that overall average medication expense was 627.55±28.473 ETB per year/herd. The average payment for the medication was high because of expensive cost of the drugs both in government and private pharmacy.

Table 19: Satisfaction of community to veterinary service in the study area

Variables	Respondents	Frequency	Percentage (%)
Satisfaction with veterinary service in the area	Yes	116	59.2
	No	77	39.3
Degree of satisfaction to veterinary service	Poor	28	14.3
	Good	64	32.7
	Very good	21	10.7
	Excellent	2	1.0

According to the observation made during the field visit and group discussion there was one animal health post for each kebele and the government assigned one animal health technician for each post; however, the service delivery was not satisfactory due to inadequate veterinary supplies, cost of veterinary drugs, lack of transport facilities and absence of animal health technician at the post/reluctance to serve effectively.

Table 20: Major alternative veterinary service in the study area

Variables	Respondents	Frequency	Percentage (%)
The major alternative to assist cattle health service	Government	115	58.7
	Private	44	22.4
	Traditional medication	34	17.3

The FGD and KII raised additional points that communities use their own indigenous knowledge to treat their sick cattle using traditional medication like medicinal plants and burning of a skin, however the dosage of these treatments and the impact of the drugs are not yet known. Burning of cattle body as a treatment causes mechanical damage on their skin which affect quality of hide and skins.

According to the district animal health professionals, the main problems impeding prevention and control of diseases incidence were shortage/lack of drugs and vaccines. In addition, the available drugs are costly in the district because of that owners search for other options to treat their animal such as use of traditional medication. They also indicated that the reason for the existence of different diseases among the study areas was probably due to season based wide spread disease outbreaks, lack of implementation of sound prevention and control strategies by the government and other concerned stakeholders, inadequate veterinary service delivery, lack of/shortage of animal health experts, agro-ecological and feed shortage during the prolonged dry season due to decrease in the resistance of cattle immunity to the disease.

4.10.1. Determination of prevalence of ticks infestation in the study area

According to the present study, ticks infestation was ranked first by study participants/ respondents. Based on preliminary assessment, investigation was carried out to determine the prevalence of ticks infestations. Hence, a total of 384 cattle were examined to determine prevalence of ticks infestation. The present result revealed that Ixodid ticks were highly prevalent in the Dhas district infesting 360 animals out of 384 examined giving an overall prevalence of 93.75%. Out of 384 cattle examined, 122 (31.77%) were males and 262 (68.23%) were females. From the total 360 infested cattle, 110 (28.65%) males and 250 (65.10%) females were found to be affected harboring at least a single tick (Table 21). Examined animal was considered to be positive for a given tick infestation when at least harbouring one tick.

The prevalence of ticks infestation within various kebeles of the study area showed that, Gayo (97.7%) was the most affected kebele followed by Dhas (93.4%), Borbor (92.68 %), and Gorile (91.5%) (Table 21). Slight variation among the kebeles was due to different sample size collected from each kebeles and management system/veterinary care (treatment given). The present study shows that there is no statistically significant differences among Kebeles ($\chi^2 = 3.6702$; $p > 0.05$) as presented in the (Table 21).

Table 21: Prevalence and distribution of tick in the different PAs in the study area

Origin (PAs)	No. of cattle examined	No. of cattle positive	No. of cattle negative	Total PAs Prevalence (%) from observed cattle	X ²	P-Value
Borbor	41 /10.67%)	38/9.9%	3/0.78%	92.68		
Dhas	123 /32%	115/29.95%	8/2.08%	93.4		
Gayo	90 /23.4%	88 /22.92%	2/0.32%	97.7	3.6702	0.299
Gorile	130 /38.85	119/30.99%	11/2.86%	91.5		
Total	384 /100%	360 /93.75%	24/6.25%	93.75		

The distribution of ticks within a specific habitat depends on several environmental and climatic factors such as annual rainfall, atmospheric temperature and relative humidity (RH), vegetation cover, and altitude and host availability (Sonenshine, 1993). Ticks and tick-borne pathogens are the major hindrances to cattle production and known to have great medical and veterinary importance worldwide (De la Fuente *et al.*, 2015) including Ethiopia (Kumsa *et al.*, 2015a). In the present study, overall prevalence of tick infestation was about 93.75%.

This high prevalence of tick infestation showed that tick is widely distributed and the most significant external parasites of cattle in the district. This finding was comparatively in line with the earlier reported of Misgana, (2017) 91.5% tick infestation in cattle from Ada'a and Boset districts and Ayana (2018), who reports 90.12% from pastoral areas of Yabello district, Borana zone, southern, Ethiopia. In this particular study, there was no significant difference ($p > 0.05$) of tick infestation between four Kebeles of the district (Table 21). This may probably due to similarities in agro-ecological setting and animal health practice in these study sites.

The prevalence in the present finding was higher than the prevalence (16.0%) in Benchi Maji Zone, Southern Ethiopia Tesfahewet and Simeon (2013), 40.26% in and around Haramaya, Eastern Ethiopia Yalew *et al.*, (2017), 81.25% in Dembia district, Northern Ethiopia (Alemu *et al.*, 2014), 82% in Borena province of southern Oromia Regassa, (2001), 89.58% tick infestation in cattle in and around Gambella town Gudina *et al.*, (2016), 81.5% of tick infestation in cattle in Somali Region, Ethiopia Tomassone *et al.* (2012) and 88.8% in Jimma district, Western Ethiopia Chali *et al.*, (2017). This variation could be due to the difference in the agro climatic condition of the study areas. The current finding was lower than 98.2% in Dillo district of Borana Zone, Southern Ethiopia Golo *et al.*, (2017). This might be due to the variation within the agro-climatic condition of the study areas because tick activity is influenced by rainfall, altitude and atmospheric relative humidity according to Pegram, *et al.*, (1981).

The highest tick prevalence in the current study area could be largely due to environmental suitability for ticks' reproduction, short and sticky grasses used for adherence of adult ticks and their transmission to grazing animals, large livestock population and herd size may also

contribute as ticks can easily get access to the host and complete their life cycle to perpetuate rapidly. Furthermore, arid agro-ecology, poor animal health extension service, traditional management practice also conducive for the highest tick infestation. Ecto-parasites are common in tropical countries due to the favourable climatic conditions for their development and therefore the poor standards of husbandry practices.

Table 22: Total tick genera count within kebeles of the study area

Kebele Name	Amblyomma	Hyalomma	Rhipicephalus	Boophilus	Total
	Total count	Total count	Total count	Total count	Total count
Borbor	422(10.5)	165(5.8)	366(11.2)	116(6.3)	1069(8.9)
Dhas	1133(28.3)	1098(38.5)	896(27.4)	448(24.3)	3575(29.8)
Gayo	1077(26.9)	431(15.1)	663(20.3)	505(27.4)	2676(22.4)
Gorile	1374(34.3)	1160(40.6)	1343(41.2)	775(42.1)	4652(38.9)
Total	4006(100)	2854(100)	3268(100)	1844(100)	11972(100)

Number of genera count outside paranthesis

4.10.2. Relative Abundance of Ticks Genera and Species

A total of 11,972 adult Ixodid ticks were collected from different body regions of 360 cattle that were found to be positive for tick infestation and consequently sampled. Generally, four Ixodidae tick genera and eight species were identified from the study area. The genera *Amblyomma* (33.46%), *Hyalomma* (23.83%), *Rhipicephalus* (27.29%) and *Boophilus* (15.4%) were abundant in the study area (Table 22). Regarding tick species count and distribution were *Amblyomma gemma* (20.06%) and *Rhipicephalus pulchellus* (19.9%) were the most abundant tick species of the total ticks count in the Dhas district, followed by, *Boophilus decoloratus* (15.46%), *Hyalomma marginatum* (13.61%) and *Hyalomma truncatum* (9.9%), respectively. In contrast, *Rhipicephalus pravus* (7.4%) *Amblyomma*

varigutum (7.12%), and *Amblyomma lepidum* (6.41%), were the least abundant Ixodid species in the study district (Table 22).

From the total tick species identified *Amblyomma gemma* (94.27%) was found to be the first prevalent species in the study area. The current finding was higher than the report (65.8%) from the Dilo district of Borana Zone, southern Ethiopia (Golo *et al.*; 2017), 2.42% report from Jimma high land (Chali *et al.*, 2017) and 8.3% report from Mizan Teferi (Tadesse *et al.*, 2012). This finding agrees with the previous report of Pegram *et al.* (1981) who reported *Amblyomma gemma* as the most widely distributed and abundance cattle tick in areas with woodland and thorn bush vegetation habitats in the Rift valley of Ethiopia. The higher prevalence of *Amblyomma gemma* in the Dhas district could be due to the arid climate condition which as reported by many scholars that are very suitable for *Amblyomma gemma*.

Table 23: Relative abundance of tick genera and species

Ticks species	Total number of cattle examined	Number of +ve cattle	Total percentage	Total number of ticks Spp counts	Total percentage of spp from the total count
<i>Amblyomma gemma</i>	384	362	94.27	2392	20.06
<i>Amblyomma varigutum</i>	384	182	47.39	849	7.12
<i>Amblyomma lepidum</i>	384	211	54.9	765	6.41
<i>Hylomma marginatum</i>	384	294	76.5	1623	13.61
<i>Hylomma truncatum</i>	384	201	52.75	1181	9.9
<i>Rhipicephalus pulchelus</i>	384	309	80.46	2380	19.9
<i>Rhipicephalus pravus</i>	384	191	49.7	888	7.4
<i>Boophilus decoloratus</i>	384	269	70.05	1844	15.46
Total ticks count				11922	

SPP= Species

On the other hand, *Rhipicephalus pulchelus* (80.5%) was the second most prevalent tick species in the present study and slightly agrees with previous studies from Borena province

(Regassa, 2001) and West Hararghe Zone, East – Ethiopia (Abebe *et al.*, 2017). This attributed to the fact that the Dhas district has lowland altitude and favourable agro-ecology for the survival, breeding and multiplication of tick species. Conversely, this was in contrast to the previous report of the least abundance of this tick species from Western Amhara (Nigatu and Teshome, 2012) and Haramaya, Eastern Ethiopia (Kassa and Yalew, 2012). This difference is attributed to the nature of this tick species that favours semi-arid and low land areas in Ethiopia (Pegram *et al.*, 1981).

Hylomma marginatum was the third abundant tick species in the current study area with a prevalence of 76.5%. The present finding was higher than the report of Tessema and Gashaw (2010) in Asela (2.5%), Belew and Mekonnen (2011) in Holeta (1.86%), Tegegn *et al.* (2016) in Bishoftu (4.7%). *Boophilus decoloratus* was the fourth abundant tick species with a prevalence of 70.05% in the study area. This result is greater than the finding of Mathewos and Morka; (2019), Kassa and Yalew, (2012), Wasihun and Doda (2013), Gedilu *et al.* (2014) and Bedaso *et al.* (2014) and Sileshi *et al.* (2007) who described that *B. decoloratus* is the commonest and most widespread tick in a different part of Ethiopia.

Ambyloma lepidum (54.9%), *Hylomma truncutum* (52.75%), *Rhipicephalus pravus* (49.7%) and *Ambyloma varigutum* (47.39%) were also prevalent tick species obtained from the study area. The current study finding was somewhat agreed with the find of Golo *et al.*, (2017), who reports *A. lepidum* (30.9%), and *R. pravus* (29.4%), from the Dilo district, Borana Zone, southern Ethiopia. Probably the two study were carried out in the same climatic condition and management of cattle in the Borana area. On contrary the current finding disagrees with the result on *R. pravus* Wasihun and Doda (2013) who reported a lower finding of 6.68% *A. lepidum* from Humbo district. It was also reported that *A. lepidum* was common but not abundant in Wolaita zone according to Dessie and Getachew (2006). The difference observed was due to agro-ecological condition which may not be appropriate for spread and multiplication.

Table 24: Tick species burden in the study area.

Ticks Species	Total number of cattle examined	Number of +ve cattle	Percentage of prevalence	P-value of relation to risk factor Sex	Age	BCS
<i>Ambyloma gemma</i>	384	362	94.27	0.380	0.115	0.643
<i>Ambyloma varigutum</i>	384	182	47.39	0.637	0.332	0.969
<i>Ambyloma lepidum</i>	384	211	54.9	0.111	0.591	0.733
<i>Hylomma marginatum</i>	384	294	76.5	0.041	0.177	0.203
<i>Hylomma truncutum</i>	384	201	52.75	0.030	0.345	0.303
<i>Rhipicephalus pulchelus</i>	384	309	80.46	0.004	0.181	0.096
<i>Rhipicephalus pravus</i>	384	191	49.7	0.000	0.235	0.524
<i>Boophilus decoloratus</i>	384	269	70.05	0.254	0.632	0.140

BCS= Body condition score

4.10.3. Risk Factor Association of Ticks (Sex, Age and Body condition score)

Body conditions of the cattle were considered during examination and cattle were assigned into three body condition scores (good, medium and poor). Out of the 384 cattle's examined, 87 had good body condition and 76 (87.35%) were positive to tick infestation, 218 were in medium body condition out of which 205 (94%) were positive for tick infestation and the remaining 79 cattle had poor body condition and all of them, 79 (100%) were positive to tick infestation.

There was statistically significant difference for tick infestation between body condition scores $p = 0.001$ which is ($p < 0.05$), those with poor body condition were highly affected by a tick than medium and good body condition cattle (Table 23). This was because poor and medium body condition scored cattle have reduced resistance and are exposed to any kind of disease when grazing on the field, less management of cattle and favourable environmental condition for tick's multiplication. Comparatively good body condition was very resistant, so they become less infested than medium and poor sized cattle.

The current study was in agreement with the finding of Bereket and Tekalign (2019) from Damot Woyde Woreda, Wolaita zone, Southern Ethiopia who reported high prevalence was observed in poor (92.2%) and medium body scored cattle (82.5%) than good body conditioned animals (80.6%), Hika *et al*; (2018), the prevalence of ticks was high poor (67.79%), medium (42.01%) and good body condition (34.04), Golo *et al*; (2017), who reports cattle with poor body condition were highly affected than medium and good body condition respectively, from Dilo district Borana zone, southern Ethiopia. This may be due to poorly conditioned cattle had low resistant to tick infestation and lack enough body capacity to build resistance.

Table 25: Prevalence of ticks in relation to putative risk factor (Age, Sex and BCS)

Risk factor (Variable)	Risk factor categories	Number of cattle examined	Number of cattle infected with ticks	Prevalence(%)	X ²	P-value
Age	Young	76	62	81.5	51.6	0.001
	Adult	239	229	95.8		
	Old	69	69	100		
Sex	Male	122	110	90.16	3.9244	0.048
	Female	262	250	95.4		
BCS	Poor	79	79	100	11.3670	0.003
	Medium	218	205	94		
	Good	87	76	87.35		

Prevalence of ticks markedly ($p < 0.05$) varied with age group of cattle. Higher prevalence was observed in older (100%) and adult (95.8%) cattle than young (81.5%) (Table 23). The higher proportion may be associated with grazing system management and long distant movement of old and adult cattle to search for food and water when compared to younger, so the chance of exposure is higher in the aged cattle group. This finding was agreed with the finding of, Yakhchali and Hasanzadehzarza (2004), who reported tick infestation were higher

in adults (60.8%) than in youngest (20%) and Tessema and Gashaw (2010) also stated that a higher proportion in adults cattle than youngest.

The current finding is in agreement with the result of Golo *et al.*, (2017), who found that adults are more prone to tick infestation than young cattle from Dilo district Borana zone, southern Ethiopia, and also similar with Bossena and Abdu (2012) in and around Assosa town, Gedilu *et al.*, (2014), from Bahir Dar, Ethiopia. In the current study, younger animals are kept indoors in a small separate housing locally called “*dhokoba*” and sometimes in the family house and easily managed by family members. As a result younger animals are less affected by ticks than adult ones. Young animals are affected less than adult animals due to the less exposure to field grazing with other animals in the field and adults are exposed due to the communal grazing habit (Admassu *et al.*, 2015).

Regarding the sex of cattle's, a comparison was made on the prevalence of male and female. Out of 262 cattle sampled, the majority 250 (95.4%) females were infested while about 110 (90.16%) males were infested by ticks. However, the result recorded that, there was a statistically significant difference between sex of cattle ($p < 0.05$) (Table 24). The present study reveals that a high prevalence of tick infestation occurs in female cattle with a prevalence rate of 95.4% and a lower prevalence occurs in male with a prevalence of 90.16%.

This may be due to female animals have less immunity than a male and a large number of sample collected from female cattle. The current finding was in line with the result of Bereket and Tekalign (2019) from Damot Woyde Woreda, Wolaita zone, Southern Ethiopia, who reports female cattle were highly infested in female than male. But, contrary to this current finding was lower than the same author who reports a high prevalence of tick infestation occurs in female cattle with a prevalence of (89.9%) and a lower prevalence in male animals with a prevalence of (78.9%).

However, the present result differs from with Hika *et al.* (2018), who reported female cattle were less affected than males (51.3% female and 52.6% male) with no statistical significance ($P > 0.05$ and $\chi^2 = 0.063$) and the current finding was greater than the report

of Mathewos and Morka (2019), who result shows that the prevalence of all tick species was higher in female animal than male animals. There was no statistically significant association ($P > 0.05$) in the infestation rate between sex groups, where the higher infestation was recorded in females (43%) compared to males (28%).

4.11. Marketing Practices

4.11.1. Market Information

Gathering market information ahead of time is a basic issue for a successful transaction and gaining reasonable price both from the seller and buyer side and to disseminate market information to keep all cattle market participants at the same level of access for market information (price, time-specific demands, and quality information). The survey result indicated that about 86% of the respondents had access to market information and 14% did not get any information. Obtaining market information before cattle selling is important for owners because they would develop confidence in bargaining for cattle price in the market (Table 25).

The current finding was in line with the finding of Daniel (2018), from West Hararghe, and Daniel (2008) from Borana, who reported that most of the respondents get market information before they sell cattle. In the study area, regular market information dissemination was not available. Rather the communities gather market price from own market visit or from other relatives. The livestock market information system (LMIS) was not well established and the community does not get market information regularly. The cattle price they get from the particular market was not similar to another market center because no standard cattle price with age, sex, body condition and season of the year.

Regarding the frequency of getting market information 56.5% of respondents get sometimes, 34.2% weekly and 9.3% monthly (Table 25). Source of market information they use to get were by their own market visit 39.9%, from neighbour 23.8% and traders 8.3% (Table 25). Preferred source of market information for HHs were own visit, relatives, traders and extension agent (DA) (Table 24). The reasons for selecting the specific market source of information were accessibility (54.5%), reliability (34.2%) and both reliability and accessibility (9.8%) in the study area. Most of the respondent indicated that they get market

information sometimes. This finding shows that the community in the study area gather market information when need a rise to sell their cattle.

Table 26: Sources of market information

Variables	Respondents	Frequency	Percentage (%)
Getting market information	Yes	166	86.0
	No	27	14.0
Source of market information	Extension agent (DA)	9	4.7
	Relatives	14	7.3
	Cooperatives	3	1.6
	Neighbours	46	23.8
	own market visit	77	39.9
	Traders	16	8.3
Frequency of getting market information	Weekly	66	34.2
	Monthly	18	9.3
	Sometimes	109	56.5
The most preferred source of market information	Extension agent (DA)	1	0.5
	Relatives	15	7.8
	Neighbours	10	5.2
	Own market visit	136	70.5
	Traders	3	1.6

Focused group discussion and key informant interview indicate that the source of market information they use was by their market visit and some of them indicate that they get market information from the relatives. According to FGD they sell their cattle at least partly in response to demand for cash to meet home needs like grains for food, clothes, school and health.

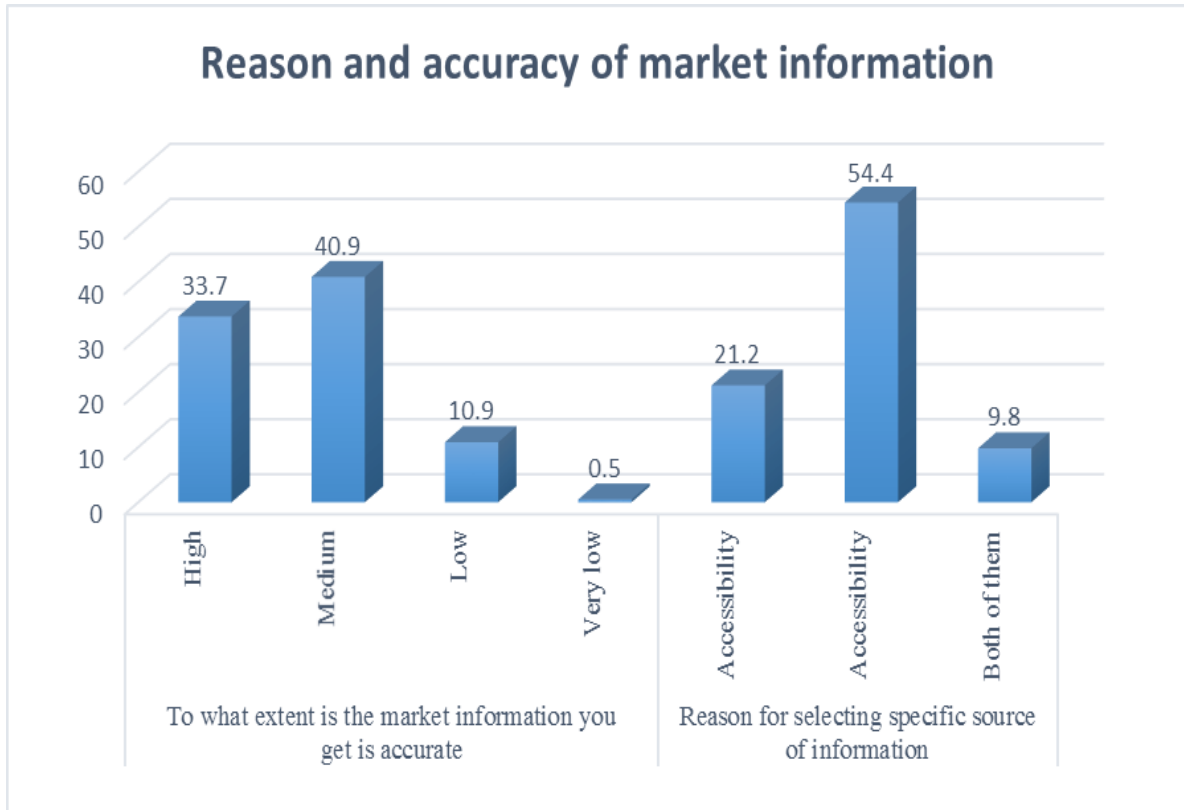


Figure 3: Reason and reliability of market information

4.11.2. Market Place and Marketing Days

There were two local livestock primary market centres in Dhas district Borbor and Dhas primary market. Respondents reported that they also use another market out of Dhas district (Miyo and Mega primary market and Dubluqi secondary market center) to sell their cattle. Both primary and secondary markets were fenced by trees and metal in which the respective municipalities charged tax on buyers upon exit from the market. The most common livestock marketing day of week were Tuesday (Borbor), Wednesday (Dhas), Friday (Dubliq) and Saturday (Miyo and Mega) as shown in (Table 26). The current finding shows that one market day within one week. Community travel from one market to another market center if the price of one market was not satisfied them. This causes community has no option if the price was not satisfactory for their cattle, they forced to sell or wait for the next market day.

Table 27: Marketing day and market place in the study area

Name of the market center	Frequency nuber of respondents	Percentage (%)	Market day	Market type	No. of livestock attended per market day
Borbor	10	5.2	Tuesday	Primary	<100
Dhas	52	26.9	Wednesday	Primary	<100
Dubluqi	90	46.6	Friday	Secondary	500-1000
Mega	27	14	Saturday	Primary	<500
Miyo	14	7.3	Saturday	Primary	<500

About (100%) of respondents stated that the mode of transportation of cattle to the market was mainly by trekking. About 46.6% of the respondents use hired labor to trek their cattle and 29.5% by themselves, 14.5% by relatives and 9.3% by neighbour (Table 27). The result also indicates that about 46.6%, of respondents, sell their cattle in Dubluqi market center and sell at 26.9% Dhas, 14% Mega, 7.3%, Miyo and 5.2% Borbor respectively (Table 26). The reason for preferring while deciding to sell cattle at a particular market was relative advantage 52.3% and proximity to market 47.2%. The shortest market distance travelled by the communities took (32%) 1-3 hours. On the otherhand, communities travelled (67.5%) 4 hours of long distances to reach market centers.

The pastoralists were travelled an average distance of $6.11 \pm .438$ km. Regarding cattle price determination at market place survey indicated that about 44.6% of the respondents decided market price through negotiation with buyers 37% with sellers and 21.8% with brokers respectively. About 96.4% of the respondents sell their cattle for traders and 3.6% for butchers. In the livestock markets of the study woredas, dominantly there were market participants such as producers (pastoralist community), traders, brokers, tax collectors, trekkers, and butchers according to woreda livestock and development office and market development office experts.

Participant of FGD highly blames the middlemen or broker during price decision making at the market center. Brokers are individuals that involve in the price negotiation process in the livestock market center. They are meant to easily facilitate the transaction and take a

reasonable commission from the seller and/or buyer sides. If they don't get a commission, they disturb the trader, producer, and all the transaction process and even try to create physical conflict. In the study area, brokers are not legally supported to work but they forced to work in the area. Therefore, because of their dishonest and confusing influence, producers usually lose premium price. They did not have any limited range of workplace so they move to every market in the zone, even occasionally travel to Kenya to do the same job.

Table 28: Cattle price determination at the market center

Variables	Parameters	Frequency	Percentage (%)
Respondents preference while deciding to sell cattle at a particular market	Relative advantage	101	52.3
	Proximity to the market	91	47.2
How to take cattle to the market	Trekking	193	100
Who trek cattle to the market	Own labor	57	29.5
	Relative	28	14.5
	Hired labour	90	46.6
	Neighbour	18	9.3
To whom they sell cattle	Traders	186	96.4
	Local butchers	7	3.6
Who determines the price of cattle at the market place	Sellers	65	33.7
	Brokers	42	21.8
	Negotiation	86	44.6

4.11.3. Major Reason for Selling Cattle

The present study revealed that the major reasons for selling cattle were to cover household food gaps, health fee, school fee, to settle government debt and earn profit were ranked as 1st, 2nd, 3rd, 4th, and 5th (Table: 28). Cattle age group mostly sold were ranked as an adult, old and young was 1st, 2nd and 3rd. The recent finding agreed with Seid (2012), who stated that in mid and highland altitude areas, the most important reasons for selling their cattle are filling food gap, loan repayment and forced sales during the dry period and crop planting seasons. This finding is also in line with the result of Daniel (2018), who described the major reason for selling cattle was to earn profit and use the money for supporting their livelihood, while the

rest replied paying school fee, cover the medical bill and government debt. The current study shows that in the study area, primarily community sell their cattle when need a rise or to cover household food gap.

Focused group discussion and key informants interview indicated that livestock was sold to cover household food needs, clothing and school fee, health fees and social events. In the study area, since the drought-prone area, the main reasons for selling cattle were to cover cash needs to buy food grains, during the traditional ceremony and disease problems. Communities also sell their cattle as commercial destocking during prolonged drought. Comparatively age group, mostly pastoralist community sell culled cattle that have locally known '*sa'aa malaa*' (old age cattle, cannot resist disease, the low yield for milk production and not proper for breeding purpose).

Table 29: Major reason for selling cattle

Reason	Rank of cattle selling reason						Rank
	First	Second	Third	Fourth	Fifth	Index	
To settle Government debt	12	23	27	76	50	0.153	4 th
To cover school fee	17	26	85	45	18	0.195	3 rd
To cover health fee	46	86	34	17	5	0.252	2 nd
To earn profit	14	19	27	44	88	0.141	5 th
To cover household food gaps.	103	34	15	10	23	0.259	1 st
Total	192	188	188	192	184	1	

Table 30: Cattle age group for sell.

Age group	Respondents ranking				
	First	Second	Third	Index	Rank
Young	67	22	97	0.306	3 rd
Adult	79	74	33	0.375	1 st
Old	45	80	62	0.319	2 nd
Total	191	176	192	1	

4.11.4. Seasonal Cattle Price Variation

Cattle price in the pastoralist area is not constant/standardized price throughout the year. The seasonal price difference in the study area was highly related to the beginning and end of the dry season period, Ethiopian festival and availability of feed. About 52.8% of respondents agreed that cattle price was high during summer locally known as ‘*Ganna*’ followed by Autumn (36.78%) locally known as ‘*Arfasa*’ and Spring (10%) ‘*Birraa*’. About 67.35% of respondents identified winter as a season of low cattle price.

The current finding was in line with Estefanos *et al*, (2014), from East and West Zones of the Ethiopia, who identified that seasonal price variation was expressed in feed availability which has direct negative impact on cattle production in the area. Daniel, (2008), reported that, price of cattle in the market rises when there is a high amount of feed available in Borena pastoral area because body condition of cattle was in good progress and increase milk production for family consumption. In contrast to the current report seasonal price variation of fattened cattle was highly associated with the beginning and end of the ploughing period (Daniel, 2018). This cattle price variation is due to drought, community cash need was increased during drought to buy food and lack of market facilities at the market center.

The FGD and KII emphasized the idea that price of cattle in the markets was varied based on the number of available buyers, brokers, sellers and accessibility of the market location to the main road. Participant of FGD and KII also indicated that during drought cattle price was decreased reverse to grains that increase during drought which used for home consumption.

Table 31: Season of cattle price variation

Season	High price		Low price	
	Frequency	(%)	Frequency	(%)
Summer (‘ <i>Gannaa</i> ’)	102	52.8	5	2.59
Spring (<i>Birraa</i>)	20	10	39	20.2
Autumn (<i>Abraasaa</i>)	71	36.78	19	9.8
Winter (‘ <i>Bonaa</i> ’)			130	67.35
Total	193		193	

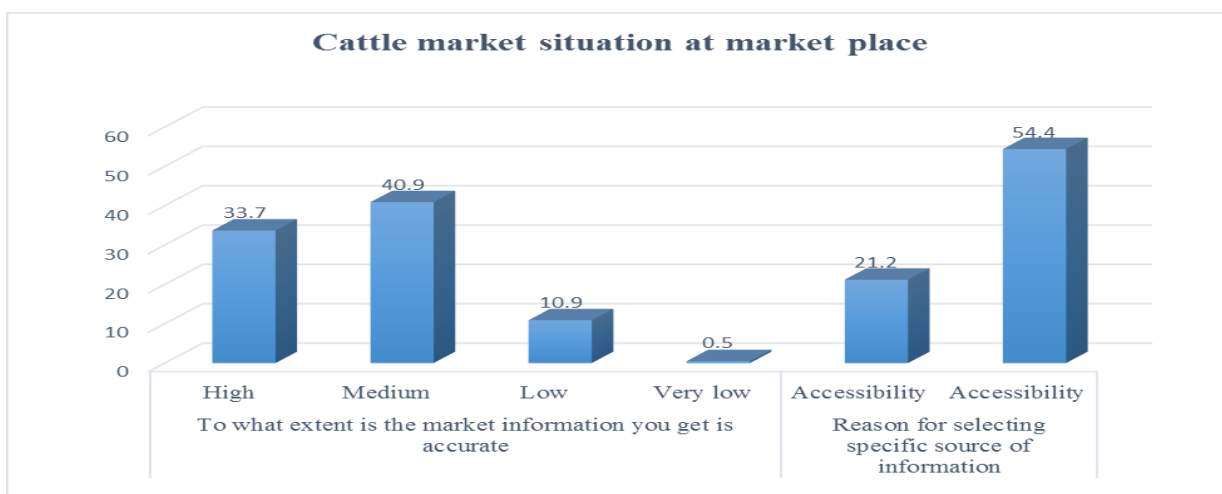


Figure 4: Cattle market situation at the market place

4.11.5. Major Reasons for Cattle Price Variation

The present finding revealed that the major reasons for cattle price variation were seasonal fluctuation of market price, the difference in the number of attending traders, difference in market facilities and proximity to the urban center were ranked 1st, 2nd, 3rd and 4th, respectively by the respondents (Table: 30). The result showed that 54.9%, 13.5% and 4.1% of the respondents believed that the trend for cattle price in their area is increasing, decreasing and no change respectively. About 67.9% of respondents stated that they sell cattle when the need arises or if the problem exists in the family and 32.1% sell cattle during price was high. About 81.3% of respondents reported that they were not happy about the existing price in their area due to seasonal fluctuation and drought happened every year. According to focus group discussion there was seasonal variation in demand, supply and price of cattle and cattle products depending on times of holidays, drought and feed supply.

Table 32: Prevailing cattle price in study area

Prevailing cattle price in your area	Frequency	Percentage
Yes	36	18.7
No	157	81.3
Total	193	100.0

During FGD and KII the respondents stated that market problems, such as traders availability, lack of infrastructure and conflict cause cattle price variation. Seasonal fluctuation and severe drought were the major reasons, which forces the sale of cattle at cheap price and during the wet season the cattle price was increased. Seasonal fluctuation had directly affected the cattle price variation in the study area. During the prolonged dry season there was a shortage of feed and water which leads cattle to lose their productivity, due to the typically irregular patterns of rainfall leads animal body condition was decreased then traders had no need to buy cattle.

Table 33: Reason for price variation in the study area

Variable	First	Second	Third	Fourth	Index	Rank
Difference in number of attending traders	38	93	33	29	0.282	2 nd
Proximity to urban center	15	22	36	107	0.164	4 st
Difference in market facilities	37	31	90	21	0.237	3 rd
Seasonal fluctuation of market price	100	40	26	19	0.317	1 th
Total	190	186	185	176	1	

5. CONCLUSION AND RECOMMENDATION

In this study Assessment of cattle husbandry and marketing practices and evaluation of ticks prevalence carried out in the pastoral area of the Dhas district. The results indicate that the major purpose of cattle rearing in the study area were for milk consumption, meat, income generation and social prestige. All family members of a households in the study district were participated in different activities of cattle rearing practice. Natural pasture and standing hay were mostly owned communally in the study area. Natural pasture, grass, trees and shrubs were the major source of feed both during the dry and wet season. The result indicates that ponds, wells and the motorized scheme were the major sources of water during the dry and wet season for cattle in the study area. Lack of feed, shortage of water, disease incidence and shortage of grazing land were the major constraints for cattle production in the study district. The major diseases and parasites of cattle identified were Ectoparasite (ticks), Contagious Bovine Pleuro Pneumonia (CBPP), Blackleg, Foot and mouth disease(FMD), Trypanosomiasis, Anthrax, Lumpy skin disease, Pasteurellosis Mastitis and Endo parasites. From the total examined cattle 28.65% male and 65.10% female. The overall tick prevalence was 93.75%. Conducive climatic and appropriate of host animals for ticks, insufficient veterinary extension service combined with an extensive management system contributed to the highest tick burden in the current study area. About 86% of the respondents got access to market information and 14% did not get. Most of the HHs (70.5%) preferred to get market information source through own market visit. The major reasons for cattle price variation were seasonal fluctuation of market price, the difference in the number of attending traders, the difference in market facilities, proximity to the urban centre. While the major reason for selling cattle were to cover household food gaps, health fee, school fee, to settle government debt and saving. The market participants of the study district were dominantly producers, traders, brokers, trekkers and butchers.

Among livestock species, cattle contribute significantly to the livelihoods of the pastoralist community. Based on the current study result, the following key recommendations have been developed.

- ❖ Developing rules and regulation on grazingland management strategies by the government together with Gada leaders and elders by encouraging customer

- institution, awareness creation on the value of these common resources can reduce constraints such as shortage of feed and grazing land deterioration.
- ❖ Awareness creation to minimize feed shortage through conservation and storage of natural pasture in the form of hay, standing hay and encourage to use better machinery to reduce the problem.
 - ❖ Increasing water source that can be utilized throughout the year and rehabilitation of traditional deep well (*'Elas'*) and ponds in the study area.
 - ❖ Improving animal health service delivery including training animal health professionals and CAHWs, increasing health service centers, fulfill veterinary clinic equipment, drug and vaccine supply system with close monitoring and supervision.
 - ❖ Awareness creation to livestock owners on the potential effect of ticks and tick-borne diseases and the effect of ticks on downgrading of hiding and skin is needed.
 - ❖ The pastoralist community should be updated about cattle price information in the central market through collection and dissemination of market information by accessible media service by government office.
 - ❖ Upgrading of primary market center and improving cattle market infrastructures.
 - ❖ Further research and development work should be encouraged to alleviate dry seasonal feed scarcity, way coping mechanism during drought and control strategies of livestock disease.

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Appendix 1 Questioner Survey

Part one:

Name of enumerator _____

Date of interview _____ Time start _____

Region _____ Zone _____

Woreda _____ Kebele name _____ Code _____

Name of respondent _____ Code _____

1. Sex of respondent 1.Male 2.Female

2. Marital status

a) Married

b) Single

c) Divorced

3. Age _____ (years)

4. Education level of house hold head

1. Illiterate

2. Reading and writing

3. Elementary school

4. Junior school

5. Secondary school

6. Above secondary school

5. How many family members do you have?

1) Male _____ 2) Female _____ 3) Children (= 14 years) _____

4) Adult (=15-64 years) _____ 5) Dependents (>65 years) _____

6. What are the sources of income for living?

1. Livestock production only 2.Wage labor/off-farm activity only. 3. Crop and livestock production only 4. Other _____

Part two: cattle Husbandry practices

1. Purpose of keeping cattle

Purpose	Cattle			
	1	2	3	4
Milk				
Meat				
Draft power/traction				
Income				
Saving				
Social Prestige				
Others(Specify)				

2. Land holding and land use system

1. Total area of land owned by the household _____hak
2. Grazing land_____hak: Communal land (*kalo*) _____hak, Private (*Kalo*) _____hak
3. Other (specify)_____

3. Labor division of the family member in cattle management activities

Do you have sufficient family labor power for cattle production? 1. Yes 2.No

No	Type of activities	Husband(1)	Wife(2)	Children(3)	Partner (4)	
1	Herd feeding/watering					
2	Calf rearing					
3	Cattle Herding					
4	Milking					
5	Milk and milk product marketing					
6	Barn cleaning					

7	Feed and watering					
8	Health care					

4. Cattle Holding

No	Livestock herd structure	Type of animal Total owned by HHs
1	Milking cows	
2	Dry cows	
3	Oxen	
4	Male and Female calves	
5	Heifers	
6	Bulls	

Feed and feeding practices

5. How grazing lands are owned in your area?

1. Individually owned
2. Communally owned
3. Both
4. Other_____

6. Do you have sufficient grazing land for your cattle?

1. Yes
2. No, if no, how do you overcome the shortage? _____

7. Are the main feed resources for your cattle during feed available seasons?

1. Grass
2. Shrubs
3. Weeds Stubble feeding
4. Other _____ (specify)

8. What are the feed resources for your cattle during dry periods of the year?

1. Grass Hay
2. Trees

3. shrubs
4. Other _____ (specify)

9. Do you store feed for your animals?

1. Yes 2.No

If yes, what type of feed you store?

1. Grass hay
2. Crop residue
3. Other _____(specify)

10. What type of feeding system do you follow?

1. Cut and carry 2. Grazing 3. Semi-grazing 4. Other _____ (Specify)

11. Do you buy cattle feed from the market? 1. Yes 2.No,

If yes; what type of feed do you buy? 1. Concentrate feed 2. Roughage feed

12. When is feed shortage critical? _____ (write months)

Water and watering practices

13. What are the sources of water for your cattle?

1. Wells 2. Rivers, 3. Ponds, 4. Deep well (Motorized scheme)
5. Other _____ (Specify)

14. Watering frequency

1. Once a day 2. Twice 3. Once every two days 4. Other_____(specify)

15. Do you have any other associated problems regarding water sources? 1. Yes 2.No

If yes, what is it? _____ (Mention)

16. Do you have any other consequent cattle production problems?

1. Yes 2. No

If yes what are the problems? (Mention) _____

If yes, what are the indigenous alleviation strategies?

Mention. _____

17. What are the major constraints of cattle husbandry practices in the your areas

1. Shortage of grazing land____ 2. Shortage of water ____ 3. Lack of feed____
4. Disease incidence____ 5. Low selling price_____

Part three; Animal health survey

1. Is there a problem of cattle disease? 1. Yes 2.No .

Which type of disease is common in your area?

No	Name of diseases	Rank (priority) of disease in the area (Number0										Others name
		1	2	3	4	5	6	7	8	9	10	
1	CBPP											
2	Pasteurolosis											
3	Balck leg											
4	Anthrax											
5	Endo parasites											
6	Ecto parasites											
7	FMD											
8	LSD											
9	Trypanosomiasis											
10	Mastitis											
11	Brucellosis (Abortion)											
10	Others											

2. Distance to veterinary services

- a. <1km.....
- b. 1-5km.....
- c. 6-10km.....
- d. >10km.....

3. Constraints of Government veterinary services _____

4. Constraints of private veterinary services _____

5. Are you satisfied with veterinary services you use? 1) Yes...2) No

6 Which alternative do you use to assist the health of your cattle?

1. Government 2. Private Veterinarians 3. Traditional medications

4. Other _____(Specify)

7. Are you satisfied with the service Veterinary clinic in your areas? 1. Yes 2.No

If yes; 1.Poor 2. Good 3. Very good 4.Excellent

8. How much do you pay on average per year for medication of your cattle?

9. Do you have any suggestions on how to increase the effectiveness and opportunities associated with veterinary services of you use, please explain?_____

Part four: Field survey for cattle market assessment

1. Do you get market information before you sell your cattle? 1. Yes 2. No

If yes, from where do you get market information?

1. Extension agent 2. Relatives 3. Cooperatives 4. Neighbors 5. Own markets visit 6. Other (specify) _____

2. Which source of market information do you prefer?

1. Extension agent 2. Relatives 3. Cooperatives 4. Neighbors 5. Own market visit
6. Other (specify) _____

3. What is your reason for selecting the specified source(s) of market information?

1. It is accessible 2. It is reliable 3. Other (specify)

4. To what extent is the market information you get is accurate?

1. Very high 2. High 3. Medium 4. Low 5. Very low 6. Other_____ (specify)

5. How frequent do you get market information?

1. Weekly 2. Fortnightly 3. Sometimes 4. Other_____ (specify)

6. Where do you mostly sell your cattle? Specify-----

7. What is your reason of preference while you decide to sell your cattle at a particular market?

1.Relative advantage of price 2. Proximity of the market 3.Other (specify)

8. How many hours does it take to reach the market that you frequently visit to sell your cattle? 1.

nearest market _____hours 2. Farthest market _____hours

9. How do you take your cattle to the market? 1. Trekking 2. Trucking 3. Both

Who trek your cattle to the market place?

1. Yourself 2. Relative 3. Hired labor 4. Neighbor 5. Other (specify)

10. If you hire labor, how much do you pay?

1. For nearest market _____birr/head 2. For farthest market _____birr/head

11. To whom do you sell your cattle? 1. Trader 2. Local butcher 3. Abattoir 4. Other (specify)

12. Do you think that there is road/ transportation problem to access market in your area?

1. Yes 2. No

13. What is your suggestion to improve physical market access? _____

14. Who determine the price at the market place?

1. Seller 2. Buyer 3. Brokers 4. Negotiation b/n seller and buyer 5. Other (specify)

15. Do you think that there is cattle price difference across different markets in your area?

1. Yes 2. No

If yes, in which market is the cattle price is higher and lower?

1. Better /higher price at _____market

2. Lower price at _____market

16. What do you think is the reason for these price variations?

1. Difference in number of traders 2. Proximity to urban center 3. Difference in road transportation facilities 4. Other (specify) _____

17. In which months of the year do you think is the cattle price become higher and lower?

1. Season higher price 2. Season lower price

28. Why do you think is the reason for cattle price variation across Months/season? _____

19. Do the brokers have an influence on you while you sell your cattle?

1. Yes 2. No

If yes, how do they influence you? _____

20. What is the trend of cattle price in your area?

1. Increasing 2. Decreasing 3. No change 4. Others

21. Are you happy with the prevailing cattle price in your area? 1. Yes 2. No

If no, what do you think is the solution to improve cattle price in your area?

Mention _____

22. Why do you sell your cattle?

1. To settle government debt 2. To cover school fee 3. To cover health fee
4. To earn profit 5. Other (specify)

23. When do you mostly sell your cattle? 1. When price is high 2. During harvest season 3. When need arises 4. Other (specify) _____

24. Who decides on purchase or sell of cattle/ replacement in your family?

1. Husband 2. Wife 3. Negotiation 4. Other (specify) _____

Appendix 2 Checklist for Focus Group Discussion

A checklist of questions used during focus group discussion with, known eight (8) individuals identified by the DA for about 2 hr in the Dhas district of Borana zone.

Topic: Characterization of cattle husbandry practices, major health problems and market availability in pastoral area of Dhas district, Borena zone, southern Ethiopia

- What are the major practices of cattle husbandry in your area? (feed resource, feeding system, water source and watering system, Housing system)
- How do you see the availability of market in the area (trend in the last five years)?
- Rank/list the months of a year that high market price availability.
- What are the critical problems facing your cattle? (Disease, Feed shortage, Water shortage and others)
- Mention your method to prevent as well as reduce those problems?
- What is the major disease of cattle in your area?
- What are your sources advices on health and husbandry practices for your milking cows?

Appendix 3 Checklist for Key informant interviews

A checklist of questions used during interviewing key informants livestock resource management expert, livestock health expert, Gada leaders, elders, Kebele administrative leaders, Traditional medicinal person (*Cirreesa*) and development agent in the Dhas district of Borena zone.

- What are the major practices of cattle husbandry in your area? (feed resource, feeding system, water source and watering system, Housing system)
- How do you see the availability of market in the area (trend in the last five years)?
- Rank/list the months of a year that high market price availability.
- What are the critical problems facing your cattle? (Disease, Feed shortage, Water shortage and others)
- Mention your method to prevent as well as reduce those problems?
- What is the major disease of cattle in your area?
- What are your sources advices on health and husbandry practices for your milking cows?

Appendix 4 Animal biodata (general information of sampled animals)

Date _____

Owner's name _____ Code _____

Woreda _____

Kebele _____

Animal information

Species _____

Sex _____

Age _____

Body condition _____

Stage of production _____

Sample ID or Labeling of sample

Date of Sample collection _____

Type of sample collected _____

Site of collection _____

Preservative chemicals _____

Appendix 5 Data collection sheet for individual samples

Sample ID	Owner Name	District	Date of collection	Sex	Age	BCS	Type of sample collected
							Ticks

Appendix 5: Sample photo during field visit



Photo; Fetching water for calves and weak cattle which was locally known 'Dhaanee'



Source: Own picture during the survey



Photo; during cattle drink Eella water.

Source: Own picture during the survey



Photo: Cattle freely drink pond water during wet season

Source: Own picture during the survey



Sample photo: During Tick collection from different body part
(Photo by: Jalla Dullacha, researcher)



Photo: Sample labeling and preservation before transporting to laboratory
(Photo by: Jalla Dullacha, researcher)



Photo: Sample identification at the laboratory

(Photo by: Jalla Dullacha, researcher)