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## Assessment of Major Constraints of Dairy Cattle and Its Associated Risk Factors in Mekelle City, Ethiopia

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### Abstract

A cross-sectional study using semi-structural questionnaire survey and observation was conducted from August to November 2017 with the objective of assessing the major constraints of dairy farms and its possible risk factors. During the assessment, a total of 54 dairy farm keepers were interviewed. Result of socio- demographic characteristics of the current study showed that (35.2%) of respondents were female and (64.8%) of them were males having different educational backgrounds (9.3%), illiterate, (20.4%), primary school (37%) secondary school and (33.3%) university level). At the same time, the present finding indicated that respondents having experience of > 5 years were (77.8%). The present result also showed that the rate of small, medium and large-scale dairy farms are (50%, 31.5%) and (18.5%) respectively. The major health challenges identified in the current assessment are infectious, parasitic (ecto and endo parasites), metabolic, reproductive and other diseases disorders as shown by (64.7%, 35.3%), (85.7%, 40%, 82.9% and 83.3%) of the respondents respectively. According to the response rate of interviewee vaccination, treatment, traditional treatment, slaughtering, quarantine and do nothing of affected animals were used to contain the disease as responded by (92.5%, 85.2%, 1.8%, 1.9%, 1.9% and 3.7%) of respondents respectively. Regarding the feed and feeding of the dairy sector feed scarcity was reported as main challenge by (77.8%, 22.2%) of respondents working in intensive and semi-intensive dairy farmers respectively especially during the dry season. From the current study it was concluded that, the daily feed supply to animals was not measured by most of dairy farmers rather feed was provided roughly based on the availability of feed, experience farm workers and daily milk yield. Therefore, detailed on-farm monitoring research on the existing practice of ration formulation by the farmer to come up with possible interventions was very important.

### Article Info

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### Keywords

Assessment; Constraints; Dairy cattle; Questionnaire; Mekelle

### Introduction

Livestock production constitutes one of the principal means of achieving improved living standards in many regions of the developing world [1]. The livestock sector globally is highly dynamic, contributes 40% of the global value of agricultural output and support the livelihoods

and food security of almost a billion people [2]. In sub-Saharan African countries, livestock plays a crucial role in the national economies and the livelihood of rural communities [3]. The dominant economic future of the continent is the agricultural sector of which livestock; dairying, in particular, is a very important and essential component [4].

Ethiopia basically comprises an agrarian society; the socio-economic activities of about 85% of the population are based on farming and animal husbandry (RGE, 2014). According to the Central Statistical Agency report of 2016, the livestock population of the country is estimated to be 57.83 million cattle, 28.89 million sheep, 22.6 million goats, 1.23 million camels, 60.51 million poultry, 2.08 million horses 0.41 million mules and 7.88 million donkeys which have a significant contribution to the national economy [5]. This resource is important in livestock production system. Livestock is the sole mainstay of the livelihood for the entire human population; cattle are considered as leading species among the livestock for their high milk yield. This indicates the importance of cattle to the country's economy [6].

Dairy production, among other sectors of livestock production system, is a crucial issue in Ethiopia. Consequently, following a crossbreeding program which was introduced in the country at a wider scope in the late 1960's [7], urban dairying is flourishing in many small towns and big cities with different level of intensification from less than 1% to over 40% growth, particularly in Mekelle city of Tigray region. As a result, there are so many dairy farms in urban and peri-urban areas of Mekelle zone, which are aimed at provision of dairy milk and milk products to the community [8].

Despite the huge number of cattle and their dairy industry the productivity is low due to the constraints of disease, scarcity of feed, inefficient and insufficient AI, veterinary services, infectious diseases, environmental, noninfectious problems, reproductive and metabolic problems, nutritional imbalance, poor management, lack of marketing facilities and opportunity, inadequate animal health services, uncoordinated development programs between various levels of government institutions and /or non-government organizations and poor performance of indigenous breeds. These constraints result in health challenges of dairy cattle [9].

The presence constraints result in poor health performance, low genetic potential, performance, the traditional way of husbandry which bring considerable economic losses to dairy farms and the dairy industry. Among the major problems that have a direct impact on health performance of dairy cow includes prevailing diseases, mastitis, lumpy skin diseases, blackleg, Actinomycosis and Actinobacillosis, bloat, tick infestation, retained fetal membrane, abortion, dystocia, retained fetal membrane, repeat breeding, uterine and

poor management such as lack of proper breeding management like lack of accurate heat detection and timely insemination might have contributed considerably to delayed age at first service, take long days to become estrous (stay anestrous), long calving interval, late age at first calving, short lactation length and low milk production [10]. All of these diseases are related to one another, with complicated cause and effect mechanisms in place. It is an established fact that development of urban, peri-urban, intensive and semi-intensive dairy production needs above all a sound knowledge of the cause and predisposing factors of disease with its control and preventive methods [11].

While the dairy farming is increasing from time to time particularly in the Mekelle city Tigray regional state; comprehensive studies was conducted on dairy constraints and risk factors, which help to promote the desired output of dairy farming are limited. Therefore, taking this fact into account, the present study was designed with the objectives to assessing the major constraints of dairy cattle found in different dairy farms of Mekelle city and its possible risk factors that challenged in the dairy cow.

## **Materials and Methods**

### **Description of the study area**

Mekelle is one of the ancient cities of Ethiopia. Its historical development is based on oral tradition. According to this oral tradition, the formation of the city of Mekelle goes as far back as to the medieval periods. However, there are different versions of these accounts of the past that are transmitted orally from generation to generation. Mekelle is located between 33°25' to 39°38' North latitude and from 36° 271' to 40° 181' East longitudes at an average altitude of 2000 to 2200 meters above sea level. The mean annual rainfall ranges from 11.3mm to 39.1mm and the temperature varies from 12°C in November and December to 27°C in the months of January and March (MCPP, 2007). Mekelle, a rapidly developing city in northern Ethiopia, is located about 783 km from the capital, Addis Ababa, Established nearly 150 years ago by Emperor Yohanne 4th. It is located in the northern high lands of Ethiopia, covering an area of 3500 hectares. Mekelle divided in seven local administrations namely Adi haki, semen, kedamyweyane, Hadnet, Quia, Hawelti, and Aider. It is important to note that Mekelle is the primary economic hub in the Tigray region. Within a 100 km radius of the city, there are rich and fertile farmlands to the south,

significant mineral deposits to the east and west, and over one hundred rock-hewn churches throughout the region that serve as important tourist destinations. Mekelle is also home to a number of top universities, including Mekelle University and the Mekelle Institute of Technology. The Mekelle markets are reputed to be the largest vendors of livestock and salt in Ethiopia. The city's international airport, completed in 2003, provides daily flights to Addis Ababa and other Ethiopian cities. Its international cargo service is due to expand in the near future, now that the airport has received its international certification in 2008. The region is known for its superior quality of its leather, produced from local sheep and goats (Fig. 1). It has played a robust role in livestock-related industries, on which investors are eager to capitalize. Additionally, numerous readily available source materials have enabled the rapid growth of the city's industrial sector, which includes the largest cement plant in Ethiopia. Mekelle is now building what will become one of the country's largest metal re-processors, a project due to be completed in 2009. In recent years, Mekelle has experienced increased agricultural production due to improved farming techniques and a transition from subsistence to cash crop farming. This growth has improved agro-processing opportunities for fruits and vegetables. The region is also a notable producer of high quality honey, and high value/low volume items such as spices, natural gum, and color additives. In addition, Mekelle maintains a reserve area for floriculture that should help attract greater investment into the city. Mekelle, a vibrant and confident community, is located in the geographical center of the regional state of Tigray (Bryant canon, 2009). With Mekelle is one of Ethiopia's largest cities and among the closest to the ports of Djibouti, which are used for nearly all of Ethiopia's import and export trade on the Red Sea (Addis Ababa: Central Statistical Agency, 2016). There are numerous opportunities for investment in and around Mekelle. One area of particular interest is agriculture and agro-processing. The region is known for its livestock and honey, and a wide variety of fruits and vegetables. Livestock-based agro-processing can provide a myriad of opportunities for investors in the dairy, meat and leather industries. The farming system of the study area is largely characterized by mixed crop-livestock production system, which is in turn grossly divided into the lowland and highland parts according to geographical location.

### **Study population**

The study animals were dairy cattle kept in dairy farms found in Mekelle city which were exotic, local and

crossbreeds of cows. Therefore, all dairy cattle owned by selected respondents were considered as the study population. The history of the animals like farm scale, stage of lactation, lactation number, milk yield, body condition, nutritional condition, symptoms observed by the owner, past and present history regarding other illness, and have different production system were recorded in selected farms in Mekelle town. A total of 54 dairy farm keepers were chosen randomly from 182 registered in Tigray Agricultural Bureau.

### **Study design**

A cross-sectional study was conducted from November to August 2017 using questionnaire survey and observation to assess the major constraints of dairy sectors in Mekelle city. Farms were selected randomly and farm owners, animal workers and veterinarians were interviewed to collect the required data on the major constraints of the dairy sector within the city and other possible risk factors.

In addition, dairy farmers were categorized into small scale, medium scale and large scale dairy farms according to the number of dairy cattle that they own and dairy farms having less than 5 animals were considered as small-scale, 5-10 cattle were medium scale and those having greater than 10 cattle were considered as large-scale dairy farms (ILRI, 2007).

### **Sample size determination and selected of study dairy farms**

Simple random sampling techniques were used to select 54 dairy farms from 182 in Mekelle city which is registered at Mekelle city Bureau of Urban Agriculture Development. Then the study was conducted by applying questionnaire survey to the farm workers and managers of the farm, veterinarians and by observational study.

The sample size for the questionnaire survey was determined using Arsham (2007)

$$\text{Formula of } N = 0.25 / (\text{SE})^2$$

Where N = number of sampled dairy farms  
SE = standard error (SE) = 6.8%

A confidence interval of 5% considering standard error with assumptions of 6.8% at 95% confidence interval as follows,  $N = 0.25 / (0.068)^2 = 54$ . Then a total of 54 dairy farmers were selected by using the simple random

method. Accordingly, the total sample size computed was 54 dairy farmers for the respondent required. Therefore, from each dairy farm was selected one of three (3) respondents either of farm owner, veterinarians and animal attendants respectively and 54 respondents was interviewed for this survey.

### **Study methodology**

A questioner survey and observational types of studies were conducted for the assessment of the major constraints of dairy farms and its associated risk factors in selected dairy farm in the study area.

### **Data collection**

#### **Questionnaire survey method**

Before the formal survey, preliminary visits were made to get the consent of the farmers, locate the farms and to give a brief description to each respondent on research objectives and potential benefit of involving in the study. Therefore, semi-structured questionnaire was prepared and used to collect information from 54 dairy farm owners by regular farm visit interview and recorded lists about major constrains of their dairy cattle on an individual level were studied. The questionnaires were checked for clarity of the questions prior the interview. Prior the interview, respondents were briefed on the objective of the study. Following that, the actual questions and questionnaires were presented. Accordingly, information about, breed, feeding system, the scale of the farm, housing, management system, farm type, and type of feed, health care, and major health challenges were collected.

#### **Observational study**

The observational studies which specifically cross-sectional were conducted through a visit to the urban and peri-urban dairy farms from the start to the end of the study period to increase the reliability of information collected questionnaire. In the survey, information on major factors influencing the health problem performance of dairy cattle in selected arms was collected during the visit by observed the records of the farms.

#### **Data management and analysis**

Data obtained from a questionnaire survey and observational studies were entered into Microsoft Excel

spreadsheet. Data were analyzed using Statistical Package for Social Sciences (SPSS) software, version 20.0 with descriptive statistics used to summarize the results and chi-square were used to determine the possible association between factors. For statistical inference, the level of significance was taken as 0.05 was considering as a significant association at 95% level of confidence.

### **Results and Discussion**

#### **General narrative of the study farms and respondents**

In this study, 54 respondents were interviewed and the result of the questionnaire survey indicated that majority of the respondents were male (64.8%) compared to (35.2%) female. The working experience of respondents also indicated that the majority respondents (68.5%) have different working experience on dairy farms ranging from 5-10 (Table 1). The educational background of interviewee also showed that (9.3%, 20.4%, 37% and 33.3%) of respondents were illiterate, primary, secondary and university/college level graduates respectively (Table 1).

The current study also indicated that (61.1%) were private owned farms with the majority of the being smallholder, governmental networked individuals (27.8%) and cooperative (11.1%). The study farms type were categorized into three groups based on the number of dairy cattle owning as small scale (50%), medium scale (31.5%) and large scale (18.5%) dairy farms. Likewise, management systems were also grouped as the intensive system as indicated by (77.8%) and semi-intensive system, according (22.2%) of respondents. According to the response of interviewee, (62.9%) stated that cattle are reared in open house whereas (27.8%) showed that cattle are kept indoors. The housing system in the majority of the study area was not separate for animals of different age groups and they used one house having a different partition. But some farms have a separate house for calves and dry cows regarding sanitation of the dairy houses majority of housing system in the study area were good in hygienic practice but some houses were recorded as poor in hygienic in which animals were found with dirty things like feces.

Additionally, the study farms were also assessed for the average age class of dairy cows and overall sex of animals they keep in their farm were (79.6%) female while (20.4%) female and male. Similarly, dairy farms were mostly kept different age groups of animals with

majority rearing were adults and old dairy cows (59.3%), followed by young and adults (27.8%) and Adult only (12.9%) respectively.

### **Major health problems of dairy cattle in the study**

Regarding the various challenges that exist in the dairy farms that current study revealed that infectious diseases, parasitic metabolic and reproductive and other diseases and disorders as stated by the majority of the respondents which are aggravated by many factors like feed shortage, inadequate veterinary service and season (Table 2).

### **Health service of treatment and preventive measure**

During the current assessment the major management options for the various animal challenges within the dairy farms was also assessed and it indicated that majority of the farms were using modern treatment as explained by (85.2%) of respondents whereas (1.8%) use traditional treatment but both (13%) indicated that they were using both modern and traditional treatment. At the same time, most of the respondents of (92.5%) explained that they were practiced vaccination to control the occurrence of diseases while both slaughtering of diseased animals and quarantine were very minimum as indicated by (1.9%) of the respondents (Table 3).

### **Management practice of feeding and watering**

#### **Feeding and watering**

The response from respondents indicates that the studied farms were mostly used feedstuffs like roughage only, concentrate only and mixed both as shown by (26%) and (62.9%) of the respondents respectively. A mix of roughages with concentrates was main feed compared to the other feedstuffs. The respondents also reported that feed availability depends on seasons. Feed shortage was the main problem especially during a dry season in the dairy farms (Table 7) but during summer season green pasture was provided. Green forage like Alfa- alfa and Elephant grasses were feed dairy cows. Calcium mineral supplement which was very important to dairy cows were even unknown except a small number of (11.1%) dairy farmers according to their respondents which were given as a feed supplement (Table 4). Tap water was used as a source of water for animals in the study area as indicated by (96.3%) of the respondents, whereas (3.7%) of respondents indicated that the sources of water for their animals were stagnant water. Regarding the frequency of watering of their cattle, most of their

animals got water twice a day as indicated by (81.5%) of the respondents (Table 5).

### **Constraints of dairy farm production due to of major health problems**

According to the response of respondents, the challenges hampering production and productivity of the dairy sector are a limitation of health care service, feed shortage, financial problems; market-related problems and diseases (Table 6 and 7). In the present finding the major challenges encountered in the dairy sector is disease as shown by (46.3%) of the respondents while lack of timely veterinary services and high cost of drugs and treatment services were the other bottlenecks as indicated by (24.1%) and (29.6%) of the interviewee respectively (Table 6).

### **Respondent's awareness level and management practice**

Almost all of the respondents were found to be familiar with a preventive measure of vaccination and treatment as means of disease prevention but only (92.5%) and (85.2%) were found to practically use preventive measures and treatment of their animals (Table 3). During the assessment, there was knowledge gap on the disease prevention and control options in these farms who owned medium and large scale as explained by (50%) of the respondents. According to respondents diseases of metabolic and reproductive diseases were mostly affected female only (100%) rather female and male (Table 12). Moreover, this study revealed, that male entrepreneur cover (64.8%) of the majority of the dairy farm operations, showing that majority of dairying in the study area was mainly male domain rather female, where majorities were educated high school and university (37%, 33.3%) respectively (Table 1).

### **Among variable factors associated with major health problems of dairy cattle**

In this study among risk variable factors such as preventive measures, treatment, management system, farm type, educational status, feeding shortage, season, and sex of animal were assessed and their associations with constraints were presented on the tables below. The present study revealed that there is a highly significant association ( $p < 0.05$ ) of health problems with respect to preventive measure with dairy farm experience, management system with feed shortage, diseases with the sex of the animal, treatment with educational status

level. However, no significant association ( $p > 0.05$ ) between diseases with farm types and feed shortage (Tables 9 and 11).

Using preventive measure had a statistically significant association ( $p < 0.05$ ) with the working experience of respondents on a dairy farm (Table 8). Majority of the respondent indicated that experience on farm practice for long period of time helped that to perform effectively in the farms rather than being specialized or professionals in the specific sector.

Therefore, there was a statically significant association ( $p < 0.05$ ) between preventive measure and dairy farm experience practice of respondents and their work experience in dairy farms (Table 8). Furthermore, there was a high significant association ( $p < 0.05$ ) between treatment and educational level (Table 10).

Comparison (Table 11) of feed shortage of different seasons with farm type among small, medium and large scale showed no statistically significant with rate of P-value 0.191. Among (Table 12) diseases of the female and male, parasitic, metabolic and reproductive were higher found in female compared to male due to lactation, pregnancy and other stress factors but both sexes there were statistical significant of ( $P < 0.001$ ).

Likewise, (Table 13) showed that there is statistically significant association ( $p < 0.05$ ) between feed shortage and management practice indicating that intensive farms are exposed to feed shortage 77.8% (42/54) compared to semi-intensive farm 22.2% (13/54), since they have optional grazing for their animals and mostly keeping indigenous breed.

Similarly, the rate of respondents having knowledge of diseases was varied between male and female indicated that high rate of awareness was recorded in male 64.8% (35/54) compared to female 35.2% (19/54) as indicated in (Table 14).

Dairy cattle farming are becoming an emerging business sector in most of the developing countries, including Ethiopia, in supporting the economy of the wider community. However, a lot remains to be done in improving major constrains and health problems of dairy farms as well as the general husbandry practice and management of dairy farm that primarily related to the worker's practical skills and knowledge on the field in which this study is contributed towards that.

This study revealed that, out of the total interviewed dairy farm owners ( $N=54$ ), (64.8%) of the respondents were males and (35.2%) were females, that revealed higher proportion of male respondents with greater than 5 years of working experience in the dairy sector as stated by (64.8%). At the same time, the present result indicated that majority of dairy farm operation was mainly covered by males followed by females of which (77.8%) of the dairy owners were educated and a few were illiterates. Regarding the educational background of respondents, the current finding showed that (37%, 33.3%, 20.4% and 9.3%) of the respondents were attended secondary school, university/college, primary school and illiterate respectively. Therefore, the educational levels of the dairy farm owners and work experience have an impact on general constrains improvement and management practice and other health problems. However, this finding is not in line with the report of Danie (2008) who documented that only (12%) of respondents enrolled in primary school and (2.7%) attended secondary school.

With respect to the farm type/scale, majority of the farms i.e. (50%) were small-scale dairy farms with less than 5 heads of dairy cows, followed by 31.5% medium scale with 5-10 heads, and 18.5% having more than 10 heads of dairy cattle considered as large-scale farms.

In line with these findings, it was stated that small and large farms of optimum sizes should contain a maximum and minimum of 5 heads and 10 heads of dairy cows respectively (ILRI, 2007).

With regard to the feed and feeding of the dairy cattle, the present finding indicated that the highest feed shortage was recorded in intensive dairy production compared to the semi-intensive dairy farms as indicated by (77.8%) and (22.2%) of the interviewee respectively. This finding is in contrary to the report of Kassahun (2003), who indicated that feed shortage was common in semi-intensive dairy farms compared to the intensive once as reported by (72%) and (20%) of the respondents.

Similarly, Feleke and Geda (2001) have stated that dairy cow farm should preferably be kept in open air type for an easier and controlled access to feed and water as control of their health aspects. Moreover Dewier (2008) and Tesfaye *et al.*, (2011) have also added that animals kept in non-confined open-air houses can easily express their natural physiological behaviors and their welfare being considered too which will have positive effects on their overall production and productivity.

**Table.1** Characteristics descriptions of the study dairy farms and working respondents in Mekelle city (N=54)

<b>Variables</b>	<b>Frequency (N)</b>	<b>Percentage (%)</b>
<b>Sex respondents</b>		
Female	19	35.2%
Male	35	64.8%
<b>Educational status of respondents</b>		
Illiterate	5	9.3%
Primary education	11	20.4%
Secondary education	20	37%
College/university	18	33.3%
<b>Dairy Farming working experience year</b>		
<5	12	22.2%
5-10	37	68.5%
>10	5	9.3%
<b>Farm type/herd size</b>		
Small scale	27	50.0%
Medium scale	17	31.5%
Large	10	18.5%
<b>Management system</b>		
Intensive	42	77.8%
Semi-intensive	12	22.2%
<b>Farm housing type</b>		
Open air house	34	62.9%
Confined/closed house	15	27.8%
Both	5	9.3%
<b>Categorical institution of dairy farm farms</b>		
Governmental	15	27.8%
Private	33	61.1%
Cooperative	6	11.1%
<b>Sex of animal kept</b>		
Female only	43	79.6%
Female and male	11	20.4%
<b>Age class of animals rearing</b>		
Young and adults	15	27.8%

N= Number of respondents

**Table.2** Overall assessment of major health problems of dairy cattle with the respective Proportion of the respondents (N=54)

<b>Diseases/disorders</b>	<b>Total</b>	<b>Prevalence (%)</b>
<b>Parasite diseases (n=17)</b>		
Tick infestation	9	52.9%
Mange mite infection	2	11.8%
GIT Parasite	6	35.2%
<b>Infectious diseases (n=21)</b>		
Actinomycosis and Actinobacillosis	4	19%
LSD	8	38.1%
Blackleg	3	14.3%
Pasteurellosis	3	14.3%
<b>Metabolic and reproductive diseases (n=10)</b>		
Hypocalcaemia	1	10%
Bloat	3	30%
Mastitis	9	42.9%
Retained placenta	1	10%
Dystocia	2	20%
Repeat breeding and Anestrus	1	10%
<b>Other diseases and disorders (n=6)</b>		
Calf diarrhea	1	16.7%
Lameness	2	33.3%
Pneumonia	2	33.3%

N= Number of respondents

**Table.3** Measures were taken of treatment option and preventive measure of response with their respective proportion

<b>Measures</b>	<b>Frequency (N)</b>	<b>Percentage (%)</b>
<b>Treatment measures</b>		
Modern treatment	46	85.2 %
Traditional treatment	1	1.8%
Both	7	13%
<b>Preventive measures</b>		
Vaccination	50	92.5%
Slaughter	1	1.9
Quarantine	2	3.7%
Do nothing	1	1.9%

N= Number of respondents

**Table.4** Types of feedstuff

<b>Feed Stuff</b>	<b>No. of Respondents (=54)</b>	<b>Proportion (%)</b>
Concentrates only	0.0%	
Roughages only	14	26%
Minerals	6	11.1%
Mix of both	34	62.9%

**Table.5** Major water source and frequency of watering and proportions

<b>Source</b>	<b>Frequency (N=54)</b>	<b>Proportion (%)</b>
<b>Type of water</b>		
Tap water	52	96.3%
Stagnant water	2	3.7%
<b>Frequency of watering</b>		
Once a day	3	5.6%
Twice a day	44	81.5%
Thrice a day	7	12.9%

N= Number of respondents

**Table.6** Veterinary / Healthcare service

<b>Health service</b>	<b>Frequency (N)</b>	<b>Percentage ( %)</b>
Disease occurrence	25	46.3%
Lack of timely veterinary services	13	24.1%
High cost of medicine & treatment	16	29.6%
<b>Breeding</b>		
Lack of timely Artificial Insemination	28	51.9%
Difficulty in heat detection	26	48.1%

N= Number of respondents

**Table.7** Basis on constraints dairy farms of feed shortage and feeding availability (N= 54)

<b>Constraints</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Feeds and Feeding</b>		
Non availability of fodder around the year	17	31.5%
High costs of feeding & storage of feed	12	22.2%
Inadequate knowledge about feeding	9	16.6%
Market problems	7	13%
Financial problems	4	7.4%
Multiple responses	5	9.3%
<b>Feeding shortage</b>		
Dry season	41	75.9%
both dry and wet season	13	24.1%

N= Number of respondents

**Table.8** Association of some selected used preventive measure against working experience

<b>Preventive measures</b>	<b>Dairy farm experience</b>				<b>x<sup>2</sup></b>	<b>P-value</b>
	<b>&gt;5</b>	<b>5-10</b>	<b>&lt;10</b>	<b>Total</b>		
Vaccination	11(22.0%)	3(6.0%)	36(72.0%)	50(92.6%)	24.223	0.000
Slaughtering	0(0.0%)	0(0.0%)	1(100.0%)	1 (18.5%)		
Do nothing	0(0.0%)	1(100.0%)	2(100.0%)	3(5.6%)		
Overall	11	4	39	54		

**Table.9** Association of some selected farm type against diseases

<b>Diseases value</b>	<b>Farm types</b>				<b>x<sup>2</sup></b>	<b>P-value</b>
	<b>SS</b>	<b>MS</b>	<b>LS</b>	<b>Total</b>		
Parasitic	12(70.6%)	3(17.6%)	2(11.8%)	17(31.5%)	8.369	0.212
Infectious	11(52.4%)	8(38.1%)	2(9.5%)	21(38.9%)		
M and R	3(30.0%)	3(30.0%)	4(40.0%)	10(18.5%)		
ODAD	2(33.3%)	2(33.3%)	2(33.3%)	6(11.1%)		
Overall	28	16	10	54		

SS= Small scale, MS= Medium scale and LS= Large scale, ODAD= Other diseases and disorders, M= Metabolic and R= Reproductive.

**Table.10** Association of some selected dairy farm used treatment measure against treatment against educational level

Treatment value	Educational status					x <sup>2</sup>	P-
	I	P	S	U	T		
Modern treatment	2(4.3%)	10(21.7)	16(38.9%)	18(39.1%)	46(85.2%)	18.73	0.005
Traditional treatment	1(100%)	0(0.0%)	0(0.0%)	0(0.0%)	1(1.9 %)		
Both treatments	0(0.0%)	0(0.0%)	3(42.9%)	4(57.1%)	7(12.9%)		
Overall	3	10	19	22	54		

I= Illiterate, P= Primary, S= Secondary, U= University and T= total

**Table.11** Feed shortage against health problem of farm type during seasons

Feed shortage value	Farm types				x <sup>2</sup>	P-
	SS	MS	LS	Total		
Dry season	24(58.6%)	11(26.8%)	6(14.6%)	41(75.9%)	3.306	0.191
Dry and wet season	5(38.5%)	4 (30.8%)	4 (30.8%)	13(24.1%)		
Overall	32	15	10	54		

SS= Small scale, MS= Medium scale and LS= Large scale

**Table.12** Association of sex of animal against diseases

Diseases value	Sex of animal			x <sup>2</sup>	P-
	Female only	Male and female	Total		
Parasitic	15 (100.0%)	2(0.0%)	17(31.5%)	16.971	0.001
Infectious	16(76.2%)	5 (33.8%)	21 (38.9)		
Metabolic and reproductive	10(100.0%)	0(0.0%)	10(18.5%)		
Other diseases and disorders	2(33.3%)	4(66.7%)	6(11.1%)		
Overall	43	11	54		

**Table.13** Association of management against feed shortage

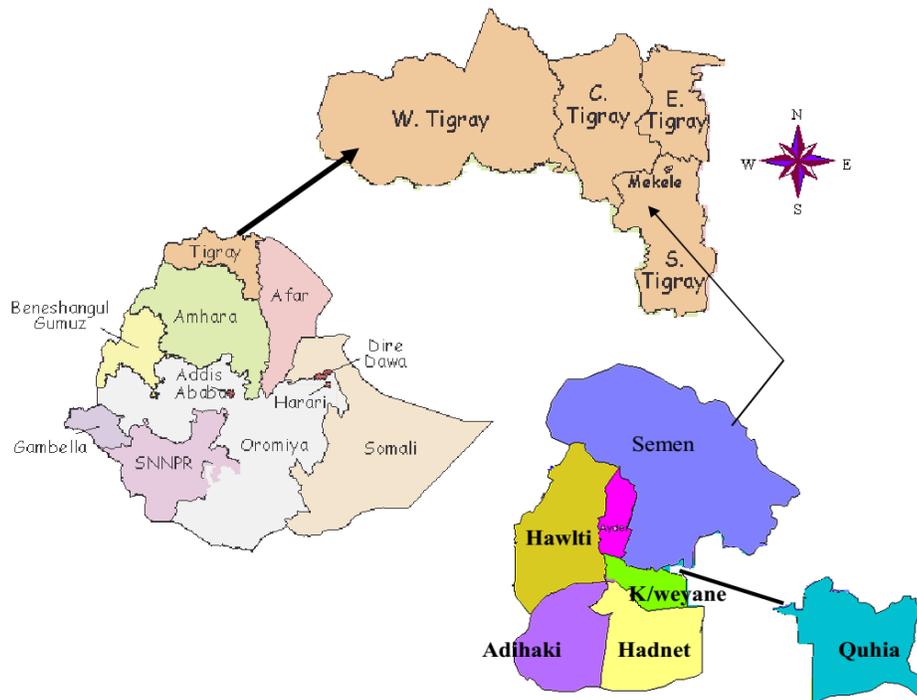
Management system	feed shortage		x <sup>2</sup>	P-value
	Dry season	Dry and wet season		
Intensive	41(100.0%)	1(7.7%)	42(77.8%)	48.659
Semi-intensive	0(0.0%)	12(92.3%)	12(22.2%)	0.000
Overall	42	13	54	

**Table.14** Knowledge of various diseases between male and Female

Sex value	Disease types					x <sup>2</sup>	P-value
	Parasite	Infectious	M and R	Others	Total		
Male	8 (47.1%)	19(90.5%)	2(20%)	6(100%)	35(64.8%)	20.478	0.000
Female	9(52.9%)	2 (9.5%)	8(80%)	0(0.0%)	19(35.2%)		
Overall	17	21	10	6	54		

M=Metabolic, R= Reproductive

**Fig.1** The total area of Mekelle city is 53 Km square (Mekelle Strategic Plan 2005-2007)



Source: Tigray BoFED, Information and Statistics Department (2007).

In the recent study, the majority of dairy farms were found privately owned (61.1%) with the majority of them kept in an open type of housing system (62.9%). The present finding is in contrary to the report of Nardos (2010) who found that a majority (77%) of respondents were kept their cattle in the separate house is in agreement with Lemma *et al.*, (2007) have reported that most of the dairy farm used open barn that did not have a roofing.

According to the current study, all of the dairy farms were found to be privately owned (61.1%) with the majority were found to keep female animals (79.6%). Likewise, the majority of the farms were rearing adults and older (59.3%) dairy cows in their farms. At the same time Feleke and Geda (2001) have stated that young cows or heifers need to be raised in a dairy farm investment as a replacement stock for the future sustainability of the farm. Furthermore, results have also indicated that most of the respondents were aware of to use preventive measures of vaccination (92.5%) and treatment (85.2%). In agreement with this finding, Abebe *et al.*, (2001) have stated that the animal being vaccinated and treated using drugs and vaccines is only to protect the health of animals and the safety of the animal products and productivity that are so essential to the income of the farmers that they prevent health problems.

The current result showed that many health challenges including parasite, infectious, metabolic, reproductive and other diseases and disorders followed by feed shortage and poor housing management of the dairy cattle were encountered frequently in the study area. Regarding the distribution of various diseases in the current study indicated that the major health challenges affecting the dairy sector are ectoparasitic, infectious diseases, reproductive, metabolic and other diseases as shown by (64.7%, 35.3%), (85.7%, 40%, 82.9% and 83.3%) of the respondents respectively. According to the response of the interviewee, the possible risk factors affecting the dairy sector are a shortage of feed, lack of treatment and absence of deworming especially in dry season and wet season. In agreement with these findings, Nwaru and his colleagues (2006) have also reported that several livestock diseases are among the principal factors affecting the production and productivity of dairy plants in general. Moreover, Dawite and Ahmed (2013) have also reported several health problems including lameness, LSD, brucellosis, pneumonia, dystocia, and others in cows kept under different management system in and around Kombolcha, Northern Ethiopia. At the

same time, the present finding is in agreement with Tesfaye (1991) who reported that poorly fed animals develop low disease resistance to disease.

The current finding also showed that reproductive and metabolic problems were reported by (82.9%) and (40%) of the respondents respectively. The present finding is higher compared to the report of (44.3%) reproductive disorder and (35%) metabolic diseases reported by Adane *et al.*, (2014) in urban and peri-urban area of Hossana, and by Hadush *et al.*, (2013) in central Ethiopia and by Dawite and Ahmed (2013) in Northeast Ethiopia. This difference might be due to risk factors like age group, parity, management system; farm scale, body condition, and productivity are the great effect upon major health challenges of dairy cattle, low feed quality and as well as environmental factors.

In the present result majority of the disease identified belongs to parasitic diseases, infectious diseases, and other disorders. This agrees with Tesfaye (1991) who reported that poorly fed animals, low disease resistance of lactation, pregnancy, fertility problem partly because the animal health care system rely heavily on veterinary measures used.

Regarding the feeding of dairy cattle in the study areas mixed concentrate, roughage and minerals were the major source of feed as indicated by (62.9%) of the respondents. However, the proportion of the feed formulation was only done on the bases of personal perception, experience and cost of feed rather than its contents, therefore, around (85.1%) of respondents were found not to practice or to use an irregular ration formulation. In line with this finding, Tessema (2003) has reported that dairy farm owners or workers must have a general knowledge and good attitude about feedstuff and the nutrients need of animals to begin ratio formulation in farms. Similarly, Solomon (2004) have also reported that animals cannot be expected to produce at their greatest potential unless they properly fed with a balanced ration of proteins, carbohydrates, fats, minerals, vitamins, and water. It was so far stated that farm owners should use the recommended standards, feed composition tables and also must understand the daily animal's requirement for maintenance and production to properly design a balanced ration (Perry, 1993).

During the assessment, (96.3%) of respondents indicated that the source of water is tap water where us (2.7%) of the respondents indicated that the source of water in the

various season. The majority (81.5%) of the respondents indicated that their cattle are getting water twice per day whereas (12.9%) and (3.7%) of them stated that water was given to their cattle three times and once per day respectively. This finding is in agreement with that of Birhanu *et al.*, (2007).

This study revealed that animal health service, AI service, and heat detection were the most important constraints of dairy production in the study area. The present study was comparable with the findings of Bishu *et al.*, (2016) who reported that the availability and costs of feeds, diseases and low veterinary service were noted as major constraints in Hossana town, Ethiopia.

The respondents said that diseases were impacting dairy production in many ways such as reduced body weight, reduced growth rate, low milk production and reproductive performance, mortality and high treatment cost and this agree with Tesfaye (1991) who reported that poorly fed animals develop low disease resistance because the animal health care system relies heavily on veterinary measures and management systems similar to the finding of Girma (2008).

In the current study area, feed and feeding shortage was a major problem in both dry and wet season although (50%) of interviewed farmers associated the livestock feed shortage with the dry season.

In the wet seasons, they are readily available and purchased from compounds of government offices, schools, and military camps and from individuals.

At the same time, the present finding showed that non availability of fodder around the year, high costs of feeding, inadequate knowledge about feeding, market problems, financial problems are some of the challenges encountered by the dairy sector within the region.

Simultaneously poor soil fertility and markedly reduced seasonal rainfall variation, leading to fluctuations both in terms of quantity and quality feed of animal. Periodic shortfalls in feed availability, especially during the dry season were the major constraints to livestock productivity, land scarcity, labor cost and dairy animal and dairy product cost was also stated. In agreement with these findings, these were also mentioned as constraints which affected business dependency on the farm animals mainly, shortage of feed, diseases, high-cost feed, market problems as documented by Getachew (2002) and Tefera (2008).

## **Recommendations**

According to the present findings, dairy production was found to be an important enterprise, investment and have the potential to be economically viable and greatly contribute to food security, improved family nutrition and income and employment generation in and around Mekelle. However, feed shortages, as well as high cost of feed, the occurrence of disease, lack of timely AI, financial and marketing problems, were the main constraints limiting dairy production in the study area. Similarly, the overall indigenous knowledge of the dairy farm owners and workers in the study was found to be not satisfactory. Although the respondents were used a mixed type feed, they still fail to mention the proper ration formulation of the mixed feed. This is a failure of balancing the feedstuffs used to satisfy the animal's requirement. Though intervened farm owners and respondents had different educational status and farm working experience, it was found that the working experience has a lot play with management practice and knowing health problems in general. The respondents' ability to list down some of the challenges faced by a dairy farm and state the health problems and management procedures they use to follow was relatively better. The health problems, management problems and diseases control measure were found in the current study were general, economically tolerable and can achieve good health problems. Therefore, based on the above conclusion the following recommendations are forwarded:

Regular health management and proper formulation of ration mandatory to reduce the problems encountered in different production systems of the dairy farms.

Dairy farm workers should have to get regular scientifically updated training programs on dairy farm management and strategic control measures of diseases.

Further research should be conducted on constrains of dairy cattle so that proper control and preventive measures will be devised.

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