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Assessment on Economic Losses due to Animal Health and Production Constraints in Jimma Town Intensive Dairy Farms, Jimma, Ethiopia

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ABSTRACT

A single-visit-multiple subject formal survey technique was used to collect data from 75 small-scale dairy farming households which were selected at random and were interviewed using pre-tested, semi-structured questionnaire. Seventy-three (97.3%) dairy farming was practiced under intensive management system. Among the selected dairy farms, only (33.3%) were kept in good hygienic condition. Artificial insemination was common (69.3%) breeding system practiced in the most dairy farms of studying area. This study discovered that, only few dairy farms (2.7%) undergo periodic vaccination. It was appeared from the study that morbidity loss of animals was primarily caused by mastitis which calculated (42.7%), black leg (32%), lumpy skin disease (21.3%), milk fever (17.3%), heart water (10.7%) and foot rote (5.3%) in order of their decreasing order. The results of this survey revealed that mastitis was ranked as number one disease of dairy animals while foot rote was list reported disease in study area. Morbidity loss of production and productivity was estimated to financial loss of (812,600 birr) per year. Not only morbidity loss, in some farms, mortality was also common problems of study area. Mainly common disease such as heart water (6.7%), milk fever (5.3%), back leg (2.7%) and lumpy skin disease (1.7%) were major cause of mortality in few farms. This in turn estimated to the financial loss of (625,000 birr). Eventually, overall annual financial loss as a result of mortality and morbidity were estimated to be (1,437,600 birr). The outbreak of lumpy skin disease and blacklegs could be controlled through improving veterinary services with respect to adequate vaccination and heart water (seasonal tick infestation) would be alleviated by spraying. The aim of the study was to assess assessment on economic losses due to animal health and production constraints in Jimma town intensive dairy farms, Jimma, Ethiopia.

Keywords: Mastitis, Black leg, Lumpy skin disease, Milk fever, Heart water, Jimma town, and Foot rot.

1. INTRODUCTION

Globally, the livestock sector accounts for 40 percent of agricultural gross domestic product (GDP), employs 1.3 billion people and creates livelihoods for one billion of the world's poor (FAO, 2003). As incomes increase; demand for larger food variety grows. Demand for higher value and quality foods such as meat, eggs, and milk increased, compared with food of plant origin such as cereals. These changes in consumption, together with sizeable population growth, have led to greater increases in the total demand for animal products in various developing countries, and this trend will continue (FAO, 2003). Policies and investments in the livestock area are effective when they take into account the numerous fields of livestock farming. These fields include monetary and non-monetary profit for producers and other actors along the value chain, such as income,

food, draft power and insurance. They also include public health, and environmental dimensions, such as the availability of protein for proper nutrition and health, the use of cow dung for fertilizing soil, or the negative impacts of zoonotic diseases on public health and the environmental effects (FAO, 2003).

In sub Saharan Africa live stock plays a crucial role in economic development of the countries and living standard of rural communities by serving as source of income in which their production accounts for approximately 30% of the total agricultural GDP and 16% of national foreign currency earning and for food (IBC, 2004). Ethiopia is one of the few countries in the world with high live stock potential (Samanta, 2020). The live stock population of the countries comprises about 31 million of cattle, 23 million of sheep, 18 million Goat, 7 million of equines, 1.2 million camels, 53 million poultry and immense bee and fisheries (CSA, 2013; Abrar *et al*., 2020). This population ranked Ethiopia, first from Africa and tenth from the world in live stock population. However, their productivity is low despite their large population due to vary constraints such as production diseases, poor nutrition, poor management practices and low productive performance of the indigenous breeds (Lobago *et al*., 2006). The production diseases of the dairy cow are a manifestation of the cow's inability to cope with the metabolic demands of large production, and they continue to be a cause of economic losses to the dairy firm and an animal welfare concern (Mulligan and Doherty, 2008). Production diseases comprised of diseases associated with imbalances between the ratio of input of important dietary nutrients and the output of the production such as milk fever, ketosis, hypomagnesemia and mastitis, etc (Radostits *et al*. 2000). The high yielder cows are more susceptible to mastitis as compared to low milk producer (Sharma, 2003; Md *et al*., 2014).

Disease has various negative impacts on dairy production in different ways such as premature death, loss of body weight, fertility, reduced yield of milk and reduced capacity for activities and almost all the diseases have more effects on overall production efficiency of animals (Dessalegn, 2017; Sharif *et al*., 2019). In Ethiopia, the aggregate annual economic reduces from animal diseases through direct mortality and reduced yield and reproductive performance were calculated at US$ 150 million (Berhanu, 2002). In urban and peri-urban commercial dairy industries, feed accounts for more than two third of the running cost. This is because livestock's are stall fed all the times with purchased feed and fodder. Moreover, the system is highly intensive and profit motivated, the animals are fed large amount of concentrates to get more milk (Dessalegn, 2017; Haile, 2020).

In Ethiopia dairy feed resources are mainly from natural pasture, crops residues and agroindustry by products. The availability of feed resources depends on season. However, concentrate feeds, crop residues and conserved forage (hay), are used both in wet and dry seasons. The majority of urban farms used concentrate as a supplement for dairy cattle which is less practiced in peri-urban farms. However, a by-product local beverage was commonly used as supplement to local cows both in urban and peri-urban areas. As the matter of fact, this form of production system has been carried out in different parts of Ethiopian country in which Jimma town is one of it. Though there is increased in milk production from crossbred cattle, often does not satisfy the increasing demand of milk due to different constraints, of which disease is one of the major factors (Jannat *et al*., 2020). The major objectives of this study were: to investigate major cattle disease affecting dairy cattle and their production in Jimma town and to find out the economic significance of the disease in the study area.

2. Review of Literature

2.1. Overview of the Dairy Sector in Ethiopia

Ethiopia is reported to be endowed with the greater livestock population in Africa. According to the 2010 report of the Central Statistical Agency (CSA) the cattle population was calculated at about 50.9 million (CSA, 2010a). In spite of such a substantial potential, the dairy area is not upgraded to the expected level. The annual yield rate in milk production of 1.2 percent falls behind the annual human population yield estimated at 3 percent (GRM International, 2007). The traditional milk production approach, which is dominated by indigenous breeds of low genetic

potential for milk production, accounts for about 97 percent of the state total annual milk production (Felleke, 2003).

Both the urban and peri-urban systems are situated near Addis Ababa and regional towns and take the benefits of the urban markets. The urban milk system made of 5,167 small, medium and large dairy industries producing about 35 million liters of milk annually. Of the total urban milk production, 73 percent is sold, 10 percent is left for own consumption, 9.4 percent goes to calves and 7.6 percent is processed into butter, sweet and ayib (cheese) but in terms of marketing, 71 percent of the farmers sell milk directly to customers. The dairy field in Ethiopia can also be categorized based on market orientation, scale, and production capacity. Doing so identifies three major production approaches: traditional smallholders privatized state farms, and urban and peri-urban systems (Gebrewold *et al*. 2000). Milk and milk products form part of the diet for many Ethiopians. They consume dairy products either as fresh milk or in fermented or soured form (Fellke and Geda, 2001)

The low cattle productivity in tropics is attributed to poor genetic potential, malnutrition, in adequate management practices, large incidence of disease and parasitic burden which cause huge live stock morbidity and mortality (Tyagi and Sing, 1999). Disease of dairy animals that cause morbidity and mortality are the major problem faced in racing dairy cattle which occurs as a result of complex interaction of the regulating practices and environment, infectious and the animal itself. These sources 'annual losses of billions of dollars, a huge portion of which is attributable a treatment costs and decrease feed efficiency and growth value (Radostits *et al*, 2003). Major health challenges of dairy cattle were incorporate of ketosis, hypocalcaemia, metritis, retained fetal membranes, LSD, bloating, mastitis, and uterine prolapsed. All of these diseases are ivolved to one another, with complicated source and effect mechanisms in place (Nigussu *et al*, 2015).

Nutritional imbalances, deficiencies, or erratic management of feeding programs for dairy cows can made large numbers and different types of health problems generally categorized as metabolic disorders. Most per parturient abnormalities have some metabolic element as a component of the cause of clinical disease. Te metabolic disturbance of milk fever can be measured through low serum calcium concentrations. Negative energy value, fat mobilization and subsequent elevations in ketone body concentrations play a contributing role in the expression of fatty liver diseases, clinical ketosis, and abomasal displacement. A negative energy balance may also enlarge the risk of retained placenta, metritis, and mastitis through reduce immune function (Nigussu *et al*., 2015). Therefore, the efficient production of livestock that produces milk is a major concern of the society (Radostits *et al*., 2000).

3. MATERIALS AND METHODS

3.1 Description of study area

The research was conducted in Jimma town of Oromia Regional state, south western Ethiopia. Jimma town is situated at 355km south western of Addis Ababa. The area lie down between a latitude of 7°41'N and longitude of 36°50'E and has an advance of 1704 meters above sea bed. The sector is characterized by a humid tropical weather of heavy annual rainfall that ranges from 1200-2000 mm per year. About 70% of the total annual rainfall is accepted during rainy season, which lasts from the end of May to early September. The mean annual maximum and minimum temperature ranges from 25°C-30°C and 7°C-12°C. Jimma zone has an estimated livestock population of 2,016,823 cattle, 942,908 sheep, 288,411 goats, 74,574 horses 49,489 donkeys and 1,139,735 poultry. According to 2007 Census, this Zone has a total human population of 2,486,155, of whom 1,250,527 are men and 1,235,628 women (CSA, 2013).

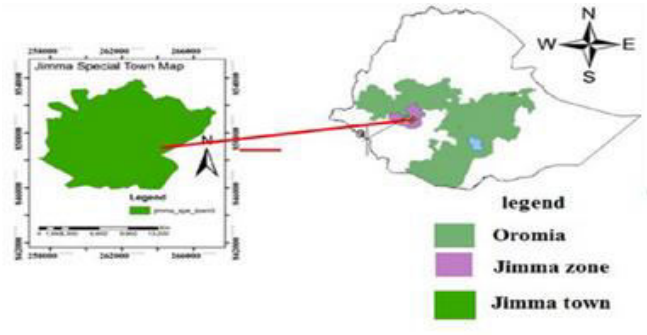

Fig 1: Map of Jimma town.

3.2 Study design and methods

A cross-sectional questionnaire survey was conducted to collect data from November 2018 to March 2019 in Jimma town intensive dairy farms. Purposive and simple random sampling techniques were used to select study area and study population, respectively. The selected intensive dairy farm owners of Jimma town were interviewed concerning major animal diseases; mortality, morbidity loss or decline of production and overall economical loss due to these problems and farm attributes, such as: management system, hygienic practices etc. Face-to-face interview was employed to farm owners by using a semi-structure questionnaire.

3.3 Source population and study population

For this study, all dairy farms kept under intensive and semi intensive management system in Jimma town were source population and randomly selected dairy farms were our study population. According to the information obtained from Jimma town Livestock and Fishery's office, total numbers of intensive dairy farms in this study area were 143 from 145. Thus, a total of 75 dairy farms were selected and included in this study.

3.4 Sample size determination and sampling technique

Sample size was determined according to the methods, which depended on scope of the study, time, logistics, and the amount of valuable information gotten from individual participants. Simple random sampling technique was employed to select the study dairy farms. Thus, a total of 75 dairy farms were randomly selected and farm owners were interviewed to obtain valuable information.

3.5 Data collection

The selected farms owners were interviewed by using semi structured questionnaire as method. Owners and animal bio-data such as demography, major animal diseases frequently encountered, mortality, morbidity, loss of production, overall economic loss undergone and farm management system practiced were collected. Respondents provide us information based on what their veterinarian told them, records they have at hand (rare) and from their experience on animal disease. In addition to questionnaire survey a regular follow up on some selected dairy farms were also conducted throughout the study period to know major animal diseases observed in the study area.

3.6 Quality control

To get reliable information available literatures were r eviewed properly. Semi structured questionnaire was prepared and translated to local languages clearly. The data were coded, entered to excel sheet, transferred to SPSS, checked for any errors, cleaned and analyzed appropriately.

3.7 Data analysis

The collected data was checked for completeness, cleaned and entered in to Microsoft excel sheet. The analysis was employed using SPSS version 20 statistical software package. Descriptive statistics was used to determine the most important animal diseases, mortality, morbidity and the overall estimated economic losses encountered. Pearson's Chi-square (χ^2) test was used to evaluate the statistical significance. P-value less than 0.05 at 5% level of significance and 95% CI was considered as significant.

3.8 Ethical consideration

Letter of permission was obtained from Jimma University College of Agriculture and Veterinary Medicine and given to Jimma town Livestock and Fishery's office and Jimma town Dairy co-operative office. Dairy owners were informed by the head of the Dairy cooperative office and the list of dairy owners was gotten from these two offices. The aim of the research was clearly described to the selected farm owners and asked for their voluntarily participation in this study.

3.9 Study limitations

As it is survey based study, some dairy owners were not eager to give information regarding their dairy farm. A few works have been done previously to discover and to overcome with the problem of dairy farms in the study area thus, there was scarcity of information. Lack well marked of records keeping at the farms, as a result owners might have forgotten and present only information what he/she could remember.

4. RESULTS

4.1 Background Information

From the total of 75 dairy farm owners' interviewed, 73.3% and 26.7% were male and female, respectively. Most (64.0%) of respondents who involved in dairy farming activities were 40 and above age groups and the rest were aged less than forty years old (36%). Academically, (30.7%) were attended primary school, (57.3%) of them went secondary school and (12.0%) high institutional graduate (**Table 1**).

Table 1: Demographic characteristics of study participants.

Description	Category	Frequency	Percent (%)
Sex	Male	55	73.3
	Female	20	26.7
Age	<40 year	27	36.0
	40 & above	48	64.0
	Illiterate	0	0.0
Level of education	Primary	23	30.7
	Secondary	43	57.3
	College/ University	9	12.0

Seventy-three (97.3%) dairy farming was practiced under intensive management system however, (2.7%) was kept under semi-intensive management system. Among the selected dairy farms visited only (33.3%) were kept in good hygienic condition. Artificial insemination was common (69.3%) breeding system practiced. Only few (2.7%) dairy farms undergo periodic vaccination (**Table 2**).

4.2 Major Cattle Diseases Frequently Occurred in the Dairy Farms

The below **Table 3** shows the repeatedly occurred diseases reported in the study area. The following common diseases were reported based on the respondent's perception and their indigenous knowledge on disease sign and sick animals diagnosed during the study period.

Accordingly, mastitis was ranked as first (42.7%), followed by black leg (32%), lumpy skin disease (21.3%), milk fever (17.3%), heart water (10.7%) and Foot rot (5.3%) in decreasing order. Foot rot was the list reported disease.

Table 2: Farming system practiced and the hygienic condition of the farms.

Description	Category	Frequency	Percent (%)
Farming system	Intensive	73	97.3
	Semi-intensive	2	2.7
Hygienic condition of the farm	Good	25	33.3
	Fair	34	45.3
	Poor	16	21.3
Breeding system practiced	AI	52	69.3
	Both natural & AI	23	30.7
Periodic vaccination program	Yes	73	97.3
	No	2	2.7

Table 3 : Major cattle disease encountered in the dairy farms.

Diseases	Frequency	Percent (%)
Mastitis	32	42.7
Blackleg	24	32.0
Lumpy Skin Disease	16	21.3
Milk Fever	13	17.3
Cow driosis (Heart Water)	8	10.7
Foot rot	4	5.3

4.3 Estimated losses due to mortality and morbidity of dairy Cattle

Based on recorded data and information obtained from respondents, huge financial loss as a result of high morbidity and low mortality rate was encountered at study area. Accordingly, within the last 8 months (September-April) an estimated loss of 812,600 birr was recorded due to high morbidity rate (loss of production, cost of drugs and professionals) while that of mortality loss was estimated to be 625,000 birr (**Table 4**).

Table 4: Estimated losses recorded due to mortality of the dairy animals.

Diseases	Frequency	Percent (%)	Estimated loss
Mastitis	0	0.0	-
Blackleg	2	2.7	40,000 birr
Lumpy Skin Disease	1	1.3	65,000 birr
Milk Fever	4	5.3	250,000 birr
Heart water (Ehrlichiosis)	5	6.7	270,000
Foot rot	0	0.0	0
Total			**625,000**

As illusterated on the **Fig 2** below, morbidity loss among focused farms were reported by high rate. The muximmum fancial loss among the visited farm was recorded (27000 birr) while the minimum loss was (3500). High financial loss was nornally recorded in the big dairy farms with the many number of dairy cattle population. Numerically, an averigecal mobidity loss during study time was ranges between (3700-27000 birr) of financial loss. Those farms with few number of dairy cows frequently spends minimum expenses for disease, mortality, morbidity and over all economic losses. Unfortunately, most of visited farms have no well marked record keeping regardig with the disease, mortality, morbity, production and productivity loss. Howevere, under such condition respondants explained their estimated loss instead of accurate financial loss.

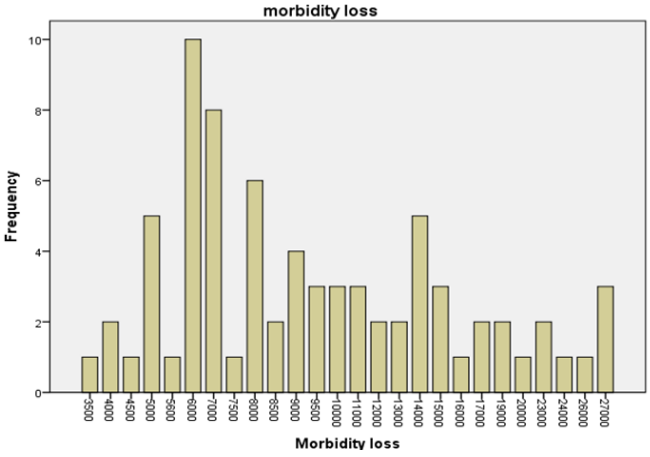

Fig 2: Estimated losses resulted from morbidity.

5. DISCUSSION

Our study indicate that majority of the respondents (73.3%) were male, while 2.7% were female. This result showing that dairying in Jimma town is mainly male domain was agrees with the works reported by (Belay and Yisehak, 2012) which was (75.9%) were male and (24.1%) were female. In the present study area, majority of respondents were found to be secondary school (57.3%) completed, whereas 30.7% were attended primary school, and (12.0%) high institutional graduate, which is more or less in agreement with the findings of Belay *et al*. (2012) who reported 24.1%, 35.5% and 7.4% of the farmers had secondary school, college and university education, respectively which shows that majority of the farmers in the study area were educated. This result indicates that most of dairy farm owners in the study area were completed their secondary and primary school education while a few number of dairy farm attendant completed their university education.

In contrary to this study (Asaminew and Eyassu, 2009) reported low educational level of households of dairy farm attendant in Bahir Dar Zuria and Mecha Woredas, North western Ethiopia. From a total of 75 dairy farms surveyed (97.3%) were kept under intensive management system and housed with different floor type like natural soil, timber, and stone (cemented). The feeds on which the animals are fed include cut and carry natural grass, hay, crop residue and brewery by-products, commercial and on farm formulated concentrate feeds. Artificial insemination was common breeding system used however, in case of artificial insemination failures; natural breeding was practiced as optional means (Israel, 2019).

There was no regular vaccination program but, only two (2) dairy farms carry out periodic vaccination. Farmers call veterinary professionals or took their animals for treatment when ever diseases occurred. This result is in agreement to (Belay and Yisehak, 2012). The result of the current study indicate that Mastitis, Black leg, Lumpy skin disease, Milk fever, Heart water and Foot rot were found to be the major dairy cattle health and production problem. These diseases occurred with 42.7%, 32%, 21.3%, 17.3%, 10.7% and 5.3% frequencies, respectively. Mastitis

was reported to be the most severe disease of high pre valent in the studied area resulting in decreased milk yield, milk discard and high treatment and a high financial loss due to morbidity was also presented in (**Fig 1**). The high percentage of mastitis (42.7%) documented in the current study is higher than findings reported by Fasil and Juta (2016) in Gondar town (20.4%), by Workineh *et al.* (2002) in Debre Zeit (21%); in Dire Dawa Administrative Council and Eastern Hararghe Zone (19.8%); by Hunderra *et al*. (2005) in and around Sebeta (16.1%); by Nibret *et al.* (2012); in and around Mekelle (6.55%).

However, our finding is comparable to Kerro and Tareke (2003) who reported a prevalence of (37%) in selected areas of southern Ethiopia and Belay and Yisehak (2012) who reported prevalence of (35.2%) several years ago at the same study area. The variation of the current result with the different research reports could be due to the animal factor, poor hygiene, farming practices employed, and presence of causative agents in the favorable environment and housing and bedding condition differences. The frequency of Lumpy skin disease recorded in this study (21.3%) was lower than the results of Birhanu (2012), who reported (51%) and (37%) in Afar and Tigray Region, respectively and Fasil and Juta (2016), who reported (30.1%) in Gondar tow. This difference could be due to the season, production system and breed variation. The occurrence of milk fever (17.3%), found in the present study is in close agreement with (17.5%) reported by Fasil and Juta (2016) in Hawassa town and lower than the finding (30.2%) by Samuel *et al*. (2012) in Gondar town.

This difference could be due to the difference of study area, environmental factors, level of production and also most importantly due to malnutrition or poor feeding management. In this study area, respondents reported that loss of the animal due to Heart water (6.7%), Milk fever (5.3%), Blackleg (2.7%) and Lumpy skin disease (1.7%) was found to be the great problem. The mortality rate of the dairy cows due to Milk fever in the current study area is in line with (5.6%) reported by Belay and Yisehak (2012) in the same study area. However, higher (16.7%) mortality of lactated animal due to Lumpy skin disease and lower mortality (1.9%) due to Heart water was documented in the previous study. According to this study, Blackleg was reported to be the most reason for the mortality (32.0%) of heifers. The highest cause of dairy cattle loss was due to Ehrlichiosis (heart water) which might be due to the presence of tick (vector) in the study area. Estimated losses of 812,600 birr and 625,000 birr due to morbidity and mortality respectively were recorded in the last 8 months in the study area (Rahman *et al*., 2019).

6. CONCLUSION AND RECOMMENDATIONS

Major animal's disease is common constraints of dairy farm production across the globe. Always dealing with this problem is one of effective ways of maximizing production and productivity of the animals. From this point of view, this paper has been written to overcome common problem of the animal's disease in dairy farm and to create community awareness regarding with dairy farm management. It appeared from the study that mastitis, lumpy skin disease, milk fever, blackleg and heart water were the major diseases affecting dairy cattle production in the study area. It could be suggested that problem of mastitis would be alleviated through proper animal management, cleanliness and good hygiene on dairy farms and practices of mastitis control measures such as udder disinfection and dry-cow therapy. The outbreak of lumpy skin disease and blacklegs could be controlled through improving veterinary services with respect to adequate vaccination and heart water (seasonal tick infestation) would be alleviated by spraying. Main preventive principles against milk fever were Oral calcium drenching around calving, intravenous treatment with calcium solutions and proper feed management.

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8. CONFLICTS OF INTETEST

The authors declare there is no conflict of interest to publish the present research work.

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