



## MAJOR CAUSES OF ORGAN AND CARCASS CONDEMNATIONS OF CATTLE AND THEIR ASSOCIATED FINANCIAL LOSS AT THE TAMALE ABATTOIR, GHANA

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### Abstract

A cross-sectional study was conducted from January to December, 2016 to identify the major causes of carcass and organ condemnation, sources of cattle with disease incidence and to estimate direct economic losses due to carcass and organ condemnation at the Tamale Abattoir. Post-mortem examination was used to identify the gross pathological changes. The study revealed that, out of 13725 cattle slaughtered, 276 (2%) had various disease conditions that resulted in the condemnation of the carcass or organ. There was an association between months of the year and diseases incidence, as the Cramers  $V$  value was significant ( $V = 0.68$ ,  $P < 0.001$ ,  $df = 11$ ). One whole carcass (0.007%) was condemned due to Lumpy Skin Disease (LSD) with 376 organs condemned. Tuberculosis (TB) caused the highest number of organ condemnation with 40.63%, followed by Contagious Bovine Pleuropneumonia (CBPP) (28.53%), Abscesses (10.66%), Fracture (5.19%), Enteritis (3.75%), LSD (2.6%), Mange (1.7%), Mastitis (1.7%), Jaundice (1.15%) and gangrene (1.15%). Majority (29%) of cattle with ill-health conditions were from the Gushegu District, followed by Tamale metropolis (21%), Savelugu (16.7%), Karaga (6.9%) North Gonja (6.9%), Mion (6.5%) and East Gonja (4.3%). The rest were Tolon (3.3%), Kumbungu (1.8%), Central Gonja (1.4%), Yendi municipal (3%), West Mamprusi (0.72%) and East Mamprusi (0.4%). Based on the results of source of cattle and diseases incidence, the Cramers  $V$  value of the Chi-square goodness – of – fit was not significant ( $V = 0.247$ ,  $P = 0.103$ ,  $df = 210$ ). The total direct economic loss due to organ and carcass condemnation was GHc14, 955.00 for 2016 period. It was concluded that TB and CBPP caused the highest number of organs condemned resulting in financial loss to the Tamale abattoir.

**Keywords:** Cattle, Animal Diseases, Carcass and Organ Condemnation, Abattoir

### Introduction

Livestock plays a direct role in generating food and income, being a valuable asset and serving as a store of wealth (FAO, 2009). They also provide draught power as well as manure to maintain soil fertility. The production of cattle in Ghana consists of an open grazing system where animals are herded daily to graze natural pasture from the early hours of the day and then return to the kraal in the evening (Bismark, 2015). According to Hoddinott (2006) cattle production is a form of insurance, providing the family with assets that can be sold in times of crisis. In addition to the on-farm employment, the cattle sector supports thousands of jobs in the wider agro-industry, including meat processing, input suppliers, transport and veterinary services (Alan, 2013). However, in northern Ghana, productivity of the

livestock remains low due to poor management practices, irregular feed supply due to seasonal changes, adverse climatic conditions, inadequate veterinary staff and presence of infectious diseases (Alton *et al.*, 2010). Diseases cause economic losses in the cattle industry, mainly through mortality, organ and carcass condemnation, reduced production of meat and increase expenditure for animals' treatments (Rahmeto *et al.*, 2008). The production loss to the livestock industry worldwide is estimated at more than 900 million USD annually (Ezana, 2008; Abebe and Yilma, 2012).

According to Jemal and Kebede (2016) an abattoir as a building for butchering can be a source of valuable information on the incidence of animal disease and condition. Some of which may be zoonotic. Abattoir

inspections might offer a useful tool for animal health monitoring and serve as a data source for epidemiological investigation. Abattoirs are used for the purposes of surveillance against animal and zoonotic diseases with a view to protect both man and animals from these diseases (WHO 2006; Swai and Schoonman, 2012). Abattoirs are also helpful in early detection of livestock and poultry diseases of economic and public health significance (Raji *et al.*, 2010). Surveillance at the abattoir allows for all animals passing into the human food chain to be examined for unusual signs, lesions or specific diseases (Erick *et al.*, 2012).

The Veterinary Service Division (VSD) in Ghana has a policy to subject all livestock slaughtered in approved abattoirs to post mortem examination before the meat is passed for consumption in order to control the spread of zoonotic diseases such as bovine tuberculosis from cattle and other livestock to humans (Atiadeve *et al.*, 2014). The findings in the abattoir can be affected by factors such as the degree of veterinary supervision and critical appraisal of abnormalities by the person carrying out the survey (Okoli, 2001).

Several studies have been conducted through abattoir survey to determine the causes of carcass and organ condemnation and their associated financial loss in various abattoirs (Atawalna *et al.*, 2015; Ochi *et al.*, 2015). In a recent study of cattle in the Bolgatanga Municipal Abattoir, organs and whole carcasses condemned were as a result of parasitic and bacterial diseases and caused about GHC31,645.00 (US\$8790.28) financial loss (Atawalna *et al.*, 2015). However, there is little information on the prevalence of cattle diseases as well as economic losses associated with organs and carcass condemnations in Tamale Abattoir.

This study therefore sought to identify the main diseases that cause organs and carcass condemnation of cattle slaughtered at the Tamale abattoir and the associated economic loss.

## **Materials and Methods**

### ***The Study Area***

Tamale abattoir is located in Shishegu a suburb of Tamale Metropolis. The metropolis lies between latitudes 9° 15' and 9° 30' N and between longitudes 0° 45' and 10° W, at an altitude of 183.3m above sea

level. The area is characterized by guinea savannah with two main seasons; erratic rain from April to October with 1000mm of rainfall and a short dry season from November to March. As a result, the city is poorly endowed with surface water, with only a few seasonal streams that dry up during the dry season (Chagomoka *et al.*, 2015).

### ***Study Design and Data collection***

A cross-sectional study was conducted for 2016 (January to December) period. The cattle with disease incidence were identified and categorized into the district, municipal or metropolis or origin. The carcass and organs of cattle slaughtered in the abattoir during the study period were examined and those with pathological lesions that cause their condemnation were recorded. The major causes of whole carcass and organ condemnation and direct economic losses due to carcass and organ condemnation was estimated.

Cattle dealers and butchers were interviewed to provide data on source of cattle with disease incidence. Average prices of carcass and organs were obtained from beef sellers.

Data was collected on daily basis (7:00 am to 1:00 pm). All cattle slaughtered at Tamale abattoir during the study period were considered. The carcasses were subjected to post mortem inspection to check for pathological lesions after evisceration. The whole carcass or organs condemned due to the presence of pathological lesion were thoroughly examined by palpation, visual or incision which was then differentiated and judged according to the guidelines of meat inspection for developing countries (FAO, 1994).

### ***Economic Loss Assessment***

The average market price of carcass and organs (GHC / Kg) was established in a market survey at 15 meat shops in Tamale Metropolis. Organs and carcass that were rejected were considered as losses. The direct financial loss due to whole carcass and organ condemnation was estimated using the equation by Ogurinde and Ogurinde, (1980);  $DAL = \sum AC * AP * CR$ .

Where DAL = Direct annual financial loss due to carcass condemnation; AC = Annual slaughter rate

at the abattoir; AP = Average price of condemned carcass/organ at the market; CR = Carcass condemnation rate at the abattoir.

### **Study Animal**

The study animals were only cattle presented for slaughter at the Tamale abattoir. The cattle were brought from Tamale metropolis and its surrounding districts and municipalities such as Gushegu, Tolon, Karaga, Central Gonja, East Gonja, North Gonja, East Mamprusi, West Mamprusi, Mion, Kumbungu, Savelugu Nanton and Yendi municipalities to the abattoir irrespective of sex, age, breed and the type of cattle production system. A total of 13725 cattle were slaughtered during the period of the study (January to December 2016) and were examined following post-mortem inspection procedure by competent veterinary officers stationed at the abattoir. The procedure of post mortem inspection of organs according to Guatamala (2011) is as follows;

### **Methods of organ and carcass examination**

#### **• The Head**

Detailed examination of lymph nodes located in the head region such as submaxillary retropharyngeal and parotid by incision. The cheek and the masseter muscles are inspected by deep incision. The tongue was visually assessed and palpated for any abnormality whilst the mouth and eyes were visually inspected. Abnormalities such as calcification, haemorrhagic, hypertrophy, abscess and cyst in the masseter muscle are found during inspecting of the head which are caused by tuberculosis, septicemia, lymphomatosis, bacteria and *cysticercusbovis*.

#### **• Lungs**

The lungs were visually assessed, palpated and incised. The trachea and bronchi as well as bronchial and mediastinal lymph nodes were opened by incision and examined for abnormalities such as respiratory system congestion, parasites, alveolar breakage, edema, tuberculosis, digestive content, pneumonia, abscess and red or grey hepatisation.

#### **• Heart and pericardium**

The heart and pericardium were visually assessed and incised by cutting through the interventricular septum to expose the ventricular chambers. Adherences in the pericardium, congestion, pericarditis and cysts were the abnormalities observed.

#### **• Liver**

The caudate lobe of the liver was incised to expose the bile duct. This was visually assessed for abscesses, teleangiectasia liver fluke and jaundice.

#### **• Spleen**

The spleen was assessed visually and palpated for change in color and any form of inflammation.

#### **• Alimentary tract**

Visual inspection of the tract and mesentery accompanied by palpation of the gastric and mesenteric lymph node was carried out. Millitary lesions, abscesses and presence of parasites were used to ascertain the existence of abnormalities.

#### **• Kidneys**

These were inspected by visual, palpation and incision. Some of the abnormalities are cyst, petechial haemorrhages and pus and may cause by hydronephrosis and parasites.

#### **• Lymph nodes**

Lymph nodes such as prescapular, mesenteric, supra-mammary and hepatic are inspected by visual, palpation and incision techniques. Enlargement, haemorrhages, abscess and calcification are some of the abnormalities which are caused by infections and systemic diseases.

### **Data Analysis**

Data collected were summarized using descriptive statistics and then analysed with Chi-square and Cramers V in SPSS (Version 21).

### **Results**

Number of cattle slaughtered for 2016 period on monthly basis is shown in table 1.

**Table 1: Cattle slaughtered per month for 2016 period at Tamale Abattoir**

MONTH	DIAGNOSIS				TOTAL	%
	HEALTHY	%	ILL-HEALTH	%		
January	1258	98.8	15	1.2	1273	9.28
February	1241	98.8	14	1.1	1255	9.14
March	1169	98.8	14	1.2	1183	8.62
April	1171	99.1	11	0.9	1182	8.62
May	1201	98.8	20	1.6	1221	8.90
June	1060	97.7	25	2.3	1085	7.91
July	966	97.5	25	2.5	991	7.22
August	1041	96.1	42	3.9	1083	7.89
September	948	96.1	33	3.4	981	7.15
October	1046	98.5	16	1.5	1062	7.74
November	1196	98.4	40	3.2	1236	9.01
December	1152	98.2	21	1.8	1173	8.55
<b>TOTAL</b>	<b>13,449</b>	<b>98.0</b>	<b>276</b>	<b>2.0</b>	<b>13,725</b>	<b>100</b>

*Percentage (%)*

The highest absolute slaughter percentage was recorded in January and September had the least. About 98% of the cattle were without any organ condemned and the whole carcasses were fit for consumption while the remaining were partly or wholly condemned as a result of ill-health. There was

a significant association ( $V = 0.68$ ,  $P < 0.001$ ,  $df = 11$ ) between months and disease infection. The measured effect size indicated a medium level of association ( $V = 0.68$ ). The highest ill-health cases were recorded in August, followed by September while the least number of cases occurred in April.

Table 2: Frequency of occurrence of disease leading to organ and carcass condemnation of cattle from different locations

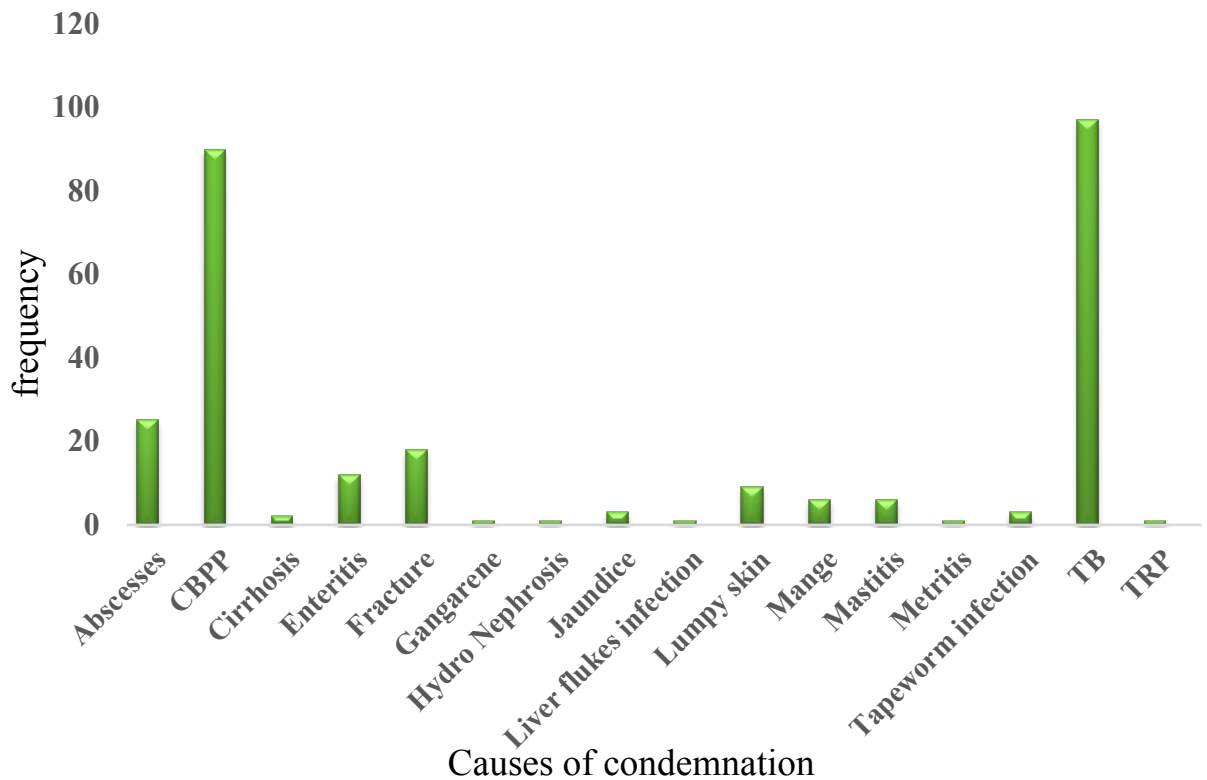
<b>Location</b>	Gushegu	Karaga	W. Mamprusi	Tamale	Savelugu	E. Gonja	Kumbungu	Tolon	Mion	N. Gonja	Yendi	C. Gonja	E. Mamprusi
<b>Abscess</b>	21	-	-	-	1	-	-	3	-	-	-	-	-
<b>CBPP</b>	24	10	-	25	15	5	-	1	2	8	-	-	-
<b>Enteritis</b>	3	-	-	5	-	1	1	-	1	1	-	-	-
<b>Fracture</b>	3	-	-	2	3	-	1	1	2	4	-	2	-
<b>jaundice</b>	1	-	-	-	2	-	-	-	-	-	-	-	-
<b>LSD</b>	4	-	-	1	1	2	1	-	-	-	-	-	-
<b>Mange</b>	1	-	-	4	-	-	-	-	1	-	-	-	-
<b>Mastitis</b>	-	1	-	2	2	-	1	-	-	-	-	-	-
<b>TB</b>	17	8	2	18	20	3	1	4	12	6	3	2	1
<b>Metritis</b>	-	-	-	1	-	-	-	-	-	-	-	-	-
<b>TWI</b>	3	-	-	-	-	-	-	-	-	-	-	-	-
<b>TRP</b>	1	-	-	-	-	-	-	-	-	-	-	-	-
<b>Cirrhosis</b>	1	-	-	-	1	-	-	-	-	-	-	-	-
<b>Gangrene</b>	-	-	-	-	-	1	-	-	-	-	-	-	-
<b>HN</b>	-	-	-	-	1	-	-	-	-	-	-	-	-

<b>LFI</b>	1	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	80	19	2	58	46	12	5	9	18	19	3	4	1	
<i>West (W), East (E), Central (C), North (N), Contagious Bovine Pleuropneumonia (CBPP), Lumpy Skin Disease (LSD), Tuberculosis (TB), Tape Worm Infection (TWI), Traumatic Reticulo-pericarditis (TRP), Hydronephrosis (HN), Liver flukes Infection (LFI), Frequecy (Freq)</i>														

From Table 2, cattle slaughtered at the Tamale abattoir were generally sourced from 13 districts. There was no association ( $V = 0.247$ ,  $P = 0.103$ ,  $df = 210$ ). between the various diseases diagnosed and location. Majority (80 of ill-health cases were from Gushegu while the least (1) was from East Mamprusi district (Nalerigu). The highest number of cattle with

CBPP cases was from Tamale metropolis, followed by Gushegu and then Savelugu, while the least was from Tolon. Also, majority of TB cases were from Savelugu, followed by Tamale, Gushegu and the least was from Kumbungu, Tolon and East Mamprusi. All the districts that contributed cattle to the abattoir had at least one case of TB.

**Causes of carcass and organ condemnation**



**Figure 1: Major causes of carcass and organ condemnation**

Diseases were identified during the post mortem inspection as the major causes of carcass and organ condemnations in the Tamale abattoir for 2016 period. Out of the 276 ill-health cattle, majority had TB followed by CBPP and least from metritis, liver flukes infection, hydronephrosis and gangrene as the minor causes (figure 1).

**Table 3a: Estimated financial loss due to organ and carcass condemnation in cattle for 2016 period**

<b>Carcass/Organ</b>	<b>Disease</b>	<b>Percentage condemnation (%)</b>	<b>Unit Price (GHC)</b>	<b>Financial Losses (GHC)</b>
<b>Whole carcass</b>	Lumpy skin disease	1 (0.007)	1500	<b>1500</b>
<b>Lungs</b>	CBPP	99 (0.72)	30	2970
	TB	85 (0.62)	30	2550
	Abscess	10 (0.07)	30	300
	Gangrene	2 (0.015)	30	60
<b>Total</b>		<b>196 (1.43)</b>		<b>5880</b>
<b>Liver</b>	TB	37 (0.27)	72	2664
	Jaundice	3 (0.022)	72	216
	Cirrhosis	2 (0.015)	72	144
	Liver flukes Inf.	1 (0.007)	72	72
	Abscess	8 (0.058)	72	576
<b>Total</b>		<b>51 (0.37)</b>		<b>3672</b>
<b>Spleen</b>	TB	16 (0.12)	12	192
	Gangrene	1 (0.007)	12	12
	Jaundice	1 (0.007)	12	12
<b>Total</b>		<b>18 (0.13)</b>		<b>216</b>
<b>Intestines</b>	Enteritis	12 (0.087)	50	600
	Gangrene	1 (0.007)	50	50
	Tape worm inf.	3 (0.022)	50	150
<b>Total</b>		<b>16 (0.12)</b>		<b>800</b>



**Table 3b: Estimated financial loss due to organ and carcass condemnation in cattle for 2016 period**

<b>Carcass/Organ</b>	<b>Disease</b>	<b>Percentage condemnation (%)</b>	<b>Unit Price (GHC)</b>	<b>Financial Losses (GHC)</b>
<b>Hind limb</b>	Fracture	18 (0.13)	24	432
	Abscess	6 (0.042)	24	144
<b>Total</b>		<b>24 (0.17)</b>		<b>576</b>
<b>Uterus</b>	TB	2 (0.015)	9	18
	Metritis	1 (0.007)	9	9
<b>Total</b>		<b>3 (0.022)</b>		<b>27</b>
<b>Skin</b>	Mange	6 (0.042)	80	480
	LSD	8 (0.058)	80	640
<b>Total</b>		<b>14 (0.10)</b>		<b>1120</b>
<b>Udder</b>	Mastitis	6 (0.042)	48	288
	Abscess	5 (0.036)	48	240
<b>Total</b>		<b>11 (0.08)</b>		<b>528</b>
<b>Rumen</b>	TRP	1 (0.007)	20	20
	Enteritis	1 (0.007)	20	20
<b>Total</b>		<b>2 (0.015)</b>		<b>40</b>
<b>Hams. Muscle</b>	Inj. Abscess	7 (0.051)	80	<b>560</b>
<b>Total</b>		<b>7 (0.015)</b>		
<b>Pericardium</b>	TRP	1 (0.007)	6	<b>6</b>
<b>Testicle</b>	Abscess	1 (0.007)	10	<b>10</b>
<b>Diaphragm</b>	TB	1 (0.007)	8	<b>8</b>
<b>Kidneys</b>	HDN	1 (0.007)	12	<b>12</b>
<b>Carcass condemned (number)</b>		<b>1 (0.007)</b>		
			<b>Grand total</b>	

<b>Number of Organs condemned</b>	<b>346 ( 2.52)</b>		<b>14955.00 (3494.16 USD)</b>
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*GHc = Ghanaian cedi, USD = United States Dollar, 1 USD = GHc 4.28*

The causes of carcass and organ condemnation and their associated estimated financial losses in cattle are presented in Table 3a and 3b. Out of 13725 cattle slaughtered, only 1 (0.007%) whole carcass was condemned with the rest 346 (2.52%) being condemned on the basis of organ abnormalities. The most infected and therefore condemned organ was lungs, followed by liver, hind limb, spleen, intestines,

skin, hamstring muscles, uterus, rumen, and kidneys (Table 3a and 3b). Pericardium, testicle and diaphragm were condemned due to gross abnormalities found to be unfit for domestic markets and human consumption.

The whole carcass was condemned as a result of suspected Lumpy Skin Disease (LSD). The pathological conditions responsible for lung condemnation were CBPP, TB, Abscess and Gangrene. Tuberculosis, Jaundice, Abscess and Liver

fluke infection were identified as the cause of liver condemnation. Spleen was condemned as a result of TB, Gangrene and jaundice. Condemnation of intestines were due to enteritis, gangrene and tapeworm infection. Hind limb was trimmed as a result of Fracture and Abscess. Mange and LSD were the causes of skin condemnation. Uterus was condemned as a result of TB and Metritis infection. Rumen was condemned due to Traumatic Reticulo-pericarditis (TRP) and Enteritis. Mastitis and Abscess caused udder condemnation. Hamstring muscle was trimmed as a result of injection abscesses. Pericardium was condemned as a result of TRP abscesses, TB and HN were identified as the causes of testicle, diaphragm and kidney condemnations respectively.

The condemnation due to the carcass caused GHc1500 financial loss (Table 3). The lung caused the highest financial loss followed by the liver. Pericardium caused the least financial loss

**Table 4: Estimation of financial loss due to disease diagnosed**

<b>Causes of condemnation</b>	<b>Carcass or organ condemned</b>		<b>Financial loss</b>	
	<b>Number</b>	<b>(%)</b>	<b>Amount (GHc )</b>	<b>(%)</b>
<b>TB</b>	141	40.63	5432	36.32
<b>CBPP</b>	99	28.53	2970	19.86
<b>Lumpy Skin Disease</b>	9	2.60	2140	14.31
<b>Abscesses</b>	37	10.66	1830	12.24
<b>Enteritis</b>	13	3.75	620	4.15
<b>Mange</b>	6	1.73	480	3.21
<b>Fracture</b>	18	5.19	432	2.89

<b>Mastitis</b>	6	1.73	288	1.93
<b>Jaundice</b>	4	1.15	228	1.52
<b>Tapeworm infection</b>	3	0.86	150	1.00
<b>Cirrhosis</b>	2	0.58	144	0.96
<b>Gangrene</b>	4	1.15	122	0.82
<b>Liver flukes infection</b>	1	0.29	72	0.48
<b>TRP</b>	2	0.58	26	0.17
<b>Hydronephrosis</b>	1	0.29	12	0.08
<b>Metritis</b>	1	0.29	9	0.06
<b>Total</b>	<b>347</b>	<b>100</b>	<b>14,955.00</b>	<b>100</b>

Tuberculosis has caused the highest financial loss followed by CBPP. Metritis caused the lowest financial loss.

### Discussion

Out of the 13,725 cattle slaughtered, 346 organs had various pathological lesions resulting in their condemnations and this is similar to the findings of Ahmed *et al.* (2012).

The high slaughter percentage in January may be due to the fact that January was off festive season and so many households depend on the abattoir for meat supply. The lower slaughter rate recorded in September could be attributed to the fact that many households had more meat at home for consumption and did not buy meat from the abattoir. September coincided with Eid al-Adha also called “the month of Sacrifice” of which many Muslim households slaughtered rams to mark the festival.

Notably, August is the peak of the rainy season in northern Ghana so the highest ill-health cases in that month may imply that there is an association between disease occurrence and climatic factors. This agrees with the findings of Gale *et al.* (2009).

Gushegu district contributed majority of ill-health cases. This may be due to the fact that, Gushegu has

a highly popular cattle market and majority of cattle dealers and butchers source more cattle from there because they believe cattle prices are cheap as compared to other locations. The many ill-health cases from Tamale metropolis may be due to urbanization where cattle are reared in far communities from the town making it difficult to access early veterinary services. The least number of ill health was from East Mamprusi district (Nalerigu) and this may result from two scenarios, either few cattle were sourced from there due to long distance, or most cattle from that area were healthy.

The incidence of TB from every location is a clear indication that TB is widely spread. This means that TB and CBPP are still a problem in many districts of Northern region and may be due to the fact that both TB and CBPP are difficult to detect early by the farmers and the veterinarians at sub-clinical stage in cattle (Atiadeve *et al.*, 2014). Also, farmers resort to selling the cattle to butchers when they realize that the cattle are wasting at the clinical stage upon unsuccessful treatment leading to the detection of the

diseases at abattoir level. However, TB is a zoonotic disease that needs critical attention at the abattoir (Ali, 2015).

### ***Causes of carcass and organ condemnations***

Incidence of disease can cause carcass condemnation as observed in this study. This agrees with reports of Ahamed and Dasouki (2013) where carcasses were condemned as a result of lumpy skin disease. However, Atawalna *et al.* (2015) reported that *Cysticercosis bovis*, jaundice, tuberculosis were the causes of carcass condemnation. Also it was reported that CBPP and TB were the main causes of carcass condemnation (Jarikre *et al.*, 2014).

In this study, CBPP was identified to have caused only lung condemnation while TB caused lung, liver, spleen, uterus and diaphragm condemnation. Carcass condemnation due to disease condition may probably depend on the type of disease and whether the condition is localized or generalized. This corroborates the findings of Jarikre *et al.* (2014) who also identified CBPP and TB as major causes of organ condemnations. Also, the disease conditions that caused organ condemnation in this study conforms with the findings of Atawalna *et al.* (2015) who reported that, the pathological conditions responsible for organ condemnation were fasciolosis, abscess and jaundiced carcass, tuberculosis, nonspecific pneumonia, CBPP, hydronephritis and abscess and traumatic reticulo-pericarditis. Also, it has been reported (Phiri, 2006) that fascioliasis, cirrhosis, necrosis, abscesses, hydatidosis, CBPP, tapeworm infection, hydronephrosis and haemorrhages as the causes of organ condemnation in 3 abattoirs in the Western Province of Zambia. However, the present study did not identify nonspecific pneumonia, hydatidosis, necrosis and haemorrhages as causes of organ condemnation. Perhaps different geographical locations and prevailing climatic condition favour different disease conditions.

The lung was the most condemned organ in the Tamale abattoir. This agrees with Ahmed *et al.* (2012) and Shiferaw *et al.* (2016).

The main gross pathological changes that cause lung rejection in this study were CBPP and TB which is similar to the findings of Atawalna *et al.* (2015).

However, Berbersa *et al.* (2016) identified pneumonia, hydatidosis, and emphysema as the causes of lung condemnation.

The observation of CBPP as the main cause of lung condemnation agrees with the findings of Phiri (2006). However, Ochi *et al.* (2015) identified TB as the main cause of lung condemnation.

In the present study livers were condemned as a result of TB, jaundice, cirrhosis, liver fluke infection and abscess. This finding is similar to the works of so many authors (Salifou *et al.*, 2013; Ochi *et al.*, 2015; Atawalna *et al.*, 2015; and Berbersa *et al.*, 2016).

Tuberculosis and jaundice being the main causes of spleen condemnation in this study is similar to the works of Ochi *et al.* (2015). However, splenomegaly and splenitis could cause spleen condemnation (Ahamed *et al.*, 2012; Muritu, 2015; and Berbersa *et al.*, 2016).

The causes of intestines condemnation in this study differ from the report of Salifou *et al.* (2013) in which tuberculosis and oesophagostomiasis were the main causes of intestines seizure. Atawalna *et al.* (2015) identified pimply gut lesions as the main cause of intestine condemnation.

### ***Financial loss as results of carcass and organ condemnations***

The financial loss in the present study is lower than the findings of Atawalna *et al.* (2015) in the Bolgatanga municipal abattoir where GHC31,645.00 (8790.27 USD) was lost due to carcass and organ condemnations. Berbersa *et al.* (2016) revealed that the annual direct financial loss due to organ condemnation in cattle slaughtered at Hawassa municipal abattoir was estimated to be 15,843.89 USD. Also, Ahmed and Dessouki (2013) reported that, the estimated annual loss from carcasses condemnation at Ismailia abattoir was 637.50 USD due to Lumpy Skin Disease (LSD) but in the current study the financial loss caused by LSD was lower and amounted to GHC1500.00 (350.47 USD) as a result of carcass condemnation. The difference in the financial loss estimated in various abattoirs may be due to the variation in the prevalence of disease, mean annual number of cattle slaughtered in different abattoirs which was higher in Bolgatanga Municipal

abattoir and Hawassa Municipal abattoir. It may also be due to variation in the retail market price of the carcass and organs at various locations.

### **Financial loss caused by disease**

In this study, TB caused the highest financial loss. This may be due to the fact that, TB infected many organs such as lung, liver spleen, uterus and diaphragm resulting in their condemnation. CBPP was next to TB and caused the condemnation of only lung. In most CBPP cases in the present study, it affected unilateral lung and in few cases affected both.

### **Conclusion**

From the results of this study, the following conclusions were made.

- ❖ The main diseases conditions of cattle that caused carcass and organ condemnation were TB, CBPP, Abscesses, Enteritis, LSD, Fracture and Mastitis.
- ❖ The direct financial loss due to carcass and organ condemnations was estimated at GHC 14,955.00 (3494.16 USD).

### **Recommendation**

Tuberculosis and CBPP remained the major disease conditions at the abattoir level and poses a threat to public health. Stringent measures should be taken to eliminate these conditions to ensure public health safety.

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