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Zoological and Entomological Letters

Condemnation of organ, its impact on public health, and its economic importance in cattle slaughtered at chiro municipal abattoir, Eastern Ethiopia

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Abstract

A cross-sectional study was conducted between November 2016 and April 2017 with the goal of determining the primary reason for organ condemnation, identifying risk variables related with it, and calculating the direct financial losses connected with it in calves slaughtered at the Chiro Municipal abattoir in Eastern Ethiopia. Animals were examined pre- and post-slaughter to find any physical defects and severe pathological lesions that can cause organ rejection. 185 (48.2%) of the 384 calves analyzed tested positive for one or more organs that were condemned during postmortem assessment. Among the organs evaluated, 105 (27.3%), 55 (14.3%), 18, 4.68%, and 7 (1.8%) hearts were found to be defective. Fasciolosis (14.6%), hydatidosis (9.38%), cirrhosis (6.25%), calcification (2.6%), emphysema (2.34%), pericarditis (2.6%), hydro nephrosis (1.7%), pneumonia (4.09%), *Cysticercus bovis* (0.5%), and abscess (1.56%) were the major clinical diseases that resulted in the total condemnation of organs. Organ condemnation rates change significantly ($P < 0.05$) depending on age group, animal origin, and bodily condition. The total monetary loss attributed to organ condemnation was assessed in this study to be 138,784.00 ETB annually. The veterinary institution must therefore develop suitable control methods in response to the observation of such a high level of variations, significant financial loss, and condemnation of damaged organs.

Keywords: Abattoir, Cattle, Chiro, Ethiopia, financial loss, organs condemnation

1. Introduction

In most of Sub-Saharan Africa, animal production has been seen as the primary driver of agricultural development. Domestic animals are quite important in Ethiopia, as they are in many other developing nations. In addition to providing non-food things like draft power, manure, and transportation services as inputs for the production of food crops and fuel for cooking, they also supply food in the form of meat and milk. Moreover, the selling of the aforementioned goods as well as animal skins and hides makes livestock another source of monetary revenue. The highest in Africa and the tenth in the world, Ethiopia is noted for its large cattle population. According to the most recent animal population estimates, the nation has roughly 50.38 million poultry, 1.9 million horses, 6.75 million donkeys, 49.56 million sheep, and 0.92 million camels in addition to about 53.99 million heads of cattle (CSA, 2013) [14].

Ethiopia has a sizable cattle population; however the industry is characterized by low production. Low genetic potential of local breeds, ineffective management, inadequate nutrition, poor reproductive ability, high disease incidence, and parasite burden are all factors that contribute to low productivity (Lamy *et al.*, 2012) [26]. Additionally, each year there is a large loss due to animal deaths, poor weight growth, and the rejection of edible organs and carcasses at the time of slaughter during regular meat inspection. More than 900 million USD are thought to be lost in production each year to the cattle business.

The monitoring of numerous human and animal diseases was greatly aided by abattoirs. All animals entering the human food chain can be checked at the abattoir for strange symptoms, lesions, or specific diseases. Diseases caused by parasites, bacteria, and viruses are the main reason for organ condemnation during post-mortem examination (Alton *et al.*, 2010) [5]. One method of determining the illness state of a herd has been identified as monitoring and other conditions at slaughter; however, this source of data is not widely utilized globally.

The incidence and epidemiology of animal illness problems can be determined using data from abattoirs, which can also be used to calculate the financial losses resulting from the condemnation of afflicted organs (Mellau *et al.*, 2010) [29].

The abattoir conducts meat inspection in order to identify animal products with aberrant pathological lesions that are unsightly and unfit for human consumption. Meat inspection helps identify specific livestock diseases, stops the spread of contaminated meat that could cause disease in humans and animals, and ensures that products are competitive in the local market (Gracey *et al.*, 1999) [21]. Diseases brought on by parasites, bacteria, and viruses are the main reasons of organ condemnation during post-mortem examination. According to Mezegebu (2003) [31], the main culprits are hydatid cysts in the lung, liver, and kidney. Tropical parasites cause significantly more damage to the meat business than any other sickness. Similar to many other tropical African nations, parasite illnesses are widely acknowledged as the primary causes of Ethiopia's low livestock productivity (Kidanu, 2011) [25].

Many studies have been conducted in Ethiopia to identify the main illness conditions seen during ante mortem and post mortem inspection and to assess the economic significance of organ condemnation (Jatenie *et al.*, 2014) [23]. Thus, in order to develop an effective plan for preventive and controls, it would be important to have thorough information on the prevalence of various causes and their economic loss. In the study area, there is currently a dearth of abattoir surveillance data on the occurrence of

various diseases and financial loss as a result of organ condemnation.

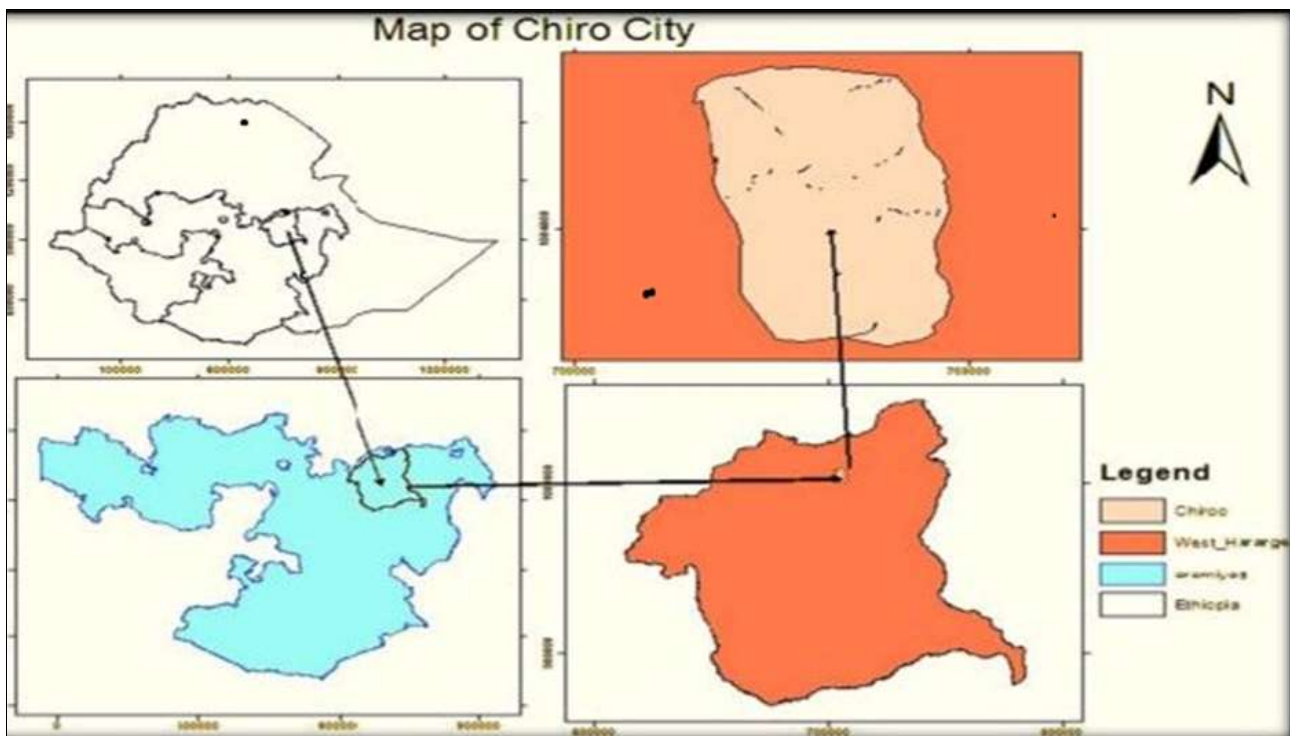
The goal of the current investigation was therefore:

- To determine the main reasons why organs are condemned in animals slaughtered at the Chiro Municipal Abattoir.
- To determine the study area's potential risk factors for organ condemnation.
- To determine the precise amount of money lost directly as a result of the condemned organs used in Chiro Municipal Abattoir cattle slaughter.

2. Materials and Methods

2.1 Study area description

The study was conducted in Chiro municipal abattoir from November, 2016 to April, 2017. Chiro is a capital town of West Hararge zone, which is located 326 km far away from capital city of Ethiopia, Finfinnee. The district has 40 rural peasant associations and one urban administration. The weather climate of the woreda is characterized by four main seasons in a year. The dry April and long rainy season that extend from July to the end of November. The district has daily mean a temperature ranging from 27.5-38.5 °C and rain fall ranging from 900-1800 mm. The agro ecological zone of the district can be categorized into, high land which portion 8%, midland 38% and lowland 54%. Its altitude ranges between 2500 m 3748 m above sea level. The livestock populations of the district are cattle 92656, goat 67962, sheep 37594, horse 403, mule 234, donkey 15404, camel 626 and poultry 105,253.



2.2 Study population

The study animals were cattle brought to Chiro municipal abattoir for slaughter from different woreda in and around Chiro distinct such as Oda bultum, Gemachis, Tulo, Mieso and others. These animals were kept under extensive production system and they were transported to abattoir using vehicles and on foot. Animal was selected with simple

random sampling method irrespective of age, sex and body condition scores.

2.3 Study design

A cross-sectional study was conducted from November, 2016 to April, 2017 to identify the major causes of organ condemnation and to estimate the direct economic loss due

to organ condemnation in cattle slaughtered at Chiro Municipal abattoir.

2.4 Sample size and sampling method

To determine the required sample size, the following parameters was used: 95% level of confidence(CL), 5% desired level of precision and 50% prevalence since there was no earlier work done in the area. The sample size was determined using the formula given by (Thrusfield, 2007) [41].

$$n = 1.96^2 \times P_{exp} (1 - P_{exp}) / d^2$$

Where

n= the total sample size

P_{exp}= expected prevalence

d= absolute precision

Accordingly, the calculated sample size was 384. Thus 384 Cattle where considered for ante and post mortem examination.

2.5 Study Methodology

2.5.1 Ante-mortem inspection

Cattle were examined at the lairage prior to slaughter to ascertain their age, sex, physical condition score, provenance, and any abnormalities they may have had. Based on tooth eruption trends, age groups were created for children 2 to 6 years old and adults >6 years old (Pace and Wakeman, 2003) [37]. According to the approach described by Nicholson and Butterworth (1986) [34], the body condition of the cattle was scored and divided into three categories: bad, medium, and good.

2.5.2 Post mortem inspection

Each visceral organ, especially the liver, lung, heart, and kidney, was thoroughly examined after death by visualization, inspection, palpation, and methodical incision to check for cysts, different adult parasites, and other abnormalities. According to the recommendations for meat inspection, the pathological lesions were classified and evaluated.

2.6 Assessment of economic loss

Based on the average annual number of animals slaughtered in the abattoir using retrospective data of the abattoir and the condemnation rate of each organ, the total financial loss

due to organ condemnation was calculated. The butcheries in Chiro town were surveyed to determine the average local market price of each organ.

The total direct financial loss was calculated by the following formula set by (Ogunrinade, 1980) [36]:

$$EL = \sum sr_x \times Coy \times Roz$$

Where:

EL = Annual economic loss estimated due to organ condemnation

∑sr_x = Annual number of cattle slaughtered at the abattoir.

Coy = Average cost of each liver/lung/heart/kidney

Roz = Condemnation rate of each liver/ lung/heart/kidney

2.7. Data analysis

For data analysis, SPSS software version 16.0 was utilized. Collected data were entered on a specially designed form, coded, and entered. The level of condemnation, expressed as the ratio of condemned organs to all investigated organs, was calculated using descriptive statistics. Using Pearson’s Chi-square (X²), the differences between condemnation rates, age, sex, and body condition ratings were assessed. When the p-value for this study’s results is less than 0.05, it is considered statistically significant.

3. Results

During the study period, 384 cattle were checked in the municipal abattoir in Chiro. Of the investigated organs, 185 (48.2%) were positive for various lesions identified on various organs, and 72 (18.8%) and 113 (29.4%) of these animals were condemned for a variety of reasons. Condemnation rates were higher in mature cattle (124, 67.1%), followed by young cattle (61, 32.9%), and male cattle (159, 85.9%) over female cattle (26, 14.1%). Medium-scoring cattle receive the highest percentage of condemnations, followed by good and poor cattle with scores of 101 (54.6%), 56 (30.3%), and 28 (15.5%), respectively. Cattle from Oda Bultum share the largest percentage, with 80 (43.2%), followed by Tulo (49.5%), Gemachis (27.6%), and Mieso Woreda (29.7%) among the 185 (48.2%) condemned rates. Age, physical condition scores, and origin all showed statistically significant differences in the analysis of potential risk variables in animals (P <0.05). However, there was no statistical difference between sex of animals (p>0.05) (Table 1).

Table 1: Prevalence of affected organ with regard to Sex, Age, BCS and origins

Variables	No. of examined		Positive (%)	X ²	P-value
Cattle					
Sex	Male	333	159 (85.9%)	0.478	0.490
	Female	51	26 (14.1%)		
Age	Young	151	61 (32.9%)	6.441	0.011
	Adult	233	124 (67.1%)		
BCS	Poor	32	28 (15.5%)	25.203	0.000
	Medium	207	101 (54.6%)		
	Good	145	56 (30.3%)		
Origin	Oda bultum	145	80 (43.2%)	10.506	0.014
	Tulo woreda	132	49 (26.5%)		
	Gemachis	51	27 (14.6%)		
	Mieso	56	29 (15.7%)		
Total		384	185 (48.5%)		

In the current investigation, 185 (48.2%) of the total assessed organs were condemned for a variety of reasons. The liver was the organ that was condemned the most (27.3%), followed by the lung (14.3%), heart (4.68%), heart, and kidney (1.8%). The most frequent macroscopic lesions on the liver were fasciolosis (14.6%), cirrhosis (6.25%), hydatid cyst (3.13%), calcification (2.6%), and abscess

(0.78%). With rates of 6.5%, 4.69%, 2.34%, and 0.78%, respectively, pneumonia, emphysema, abscess, and hydatid cyst all contributed to the rejection of the lung. 1.5% of hearts and 2.6% of hearts, respectively, were condemned due to hydatid cyst and pericarditis. 1.8% of renal cases resulted in death from hydronephrosis (Table 2)

Table 2: Distribution of condemned organ with respect to lesion found

Organ condemned	No. of inspected	Lesion found	Condemnation (%)	Proportion (%)
Liver	105	Fasciolosis	56(14.6)	53.3
		Hydatid cyst	12(3.13)	11.4
		Cirrhosis	24(6.25)	22.9
		Abscess	3(0.78)	2.9
		Calcification	10(2.6)	9.5
		Total	105(27.3)	
Lung	55	Hydatid cyst	25(6.25)	45.5
		Pneumonia	18(4.09)	32.7
		Abscess	3(0.78)	5.5
		Emphysema	9(2.34)	16.4
		Total	55(14.3)	
Heart	18	Pericarditis	10(2.6)	55.6
		<i>Cysticercus bovis</i>	2(0.5)	11.1
		Hydatid cyst	6(1.5)	33.3
		Total	18(4.68)	
Kidney	7	Hydronephrosis	7(1.8)	100
Grand total	185	Total	185(48.2)	100

Cattle with medium body condition (4.69%), good body condition (8.07%), and poor body condition (4.69%) had greater liver condemnation rates. Similar to how good and bad conditioned cattle experienced more lung, heart, and kidney rejections, medium conditioned cattle did as well. It

was discovered that mature cattle had greater rejection rates for the liver, lung, heart, and kidney. Additionally, male cattle had a higher rejection rate than female cattle for all investigated organs. (Table 3).

Table 3: Distribution of condemned organ with regard to age, sex, body condition score.

Variables	No. of examined	Condemned organ				Total	
		Liver	Lung	Heart	Kidney		
Age	Young	151	40	15	4	1	60 (39.7%)
	Adult	233	65	40	14	6	125 (53.6)
BCS	poor	32	18	7	3	0	28 (87%)
	medium	207	56	32	10	4	112 (49.3%)
	Good	145	31	16	5	3	55 (37.9%)
Sex	Female	51	15	7	4	1	27 (52.9%)
	Male	333	90	48	14	6	158 (47.4%)

According to the current study's estimates (Table 3), the annual direct financial loss resulting from organ condemnation is anticipated to be 138784.00 ETB. Lungs, the heart, and the kidney make up all of the direct economic

losses, whereas liver condemnation accounts for the highest percentage of economic losses, accounting for 27.3% of the total losses of \$11998.00 ETB (Table 4).

Table 4: The rejection rate and average price of organ condemned in the study area

Condemned organ	Rate of condemned Organ (%)	Average price in ETB	Total loss in ETB
Liver	27.3%	75	111998.00
Lung	14.3%	20	15644.00
Heart	4.68%	30	7696.00
Kidney	1.8%	35	3446.00
Total price (ETB)			138784.00

4. Discussion

The current study studied the reasons behind organ condemnation and the resulting financial loss in 384 calves assessed at the Chiro municipal abattoir throughout the study period. According to this study, the main reasons for

organ condemnation in cattle killed at the Chiro municipal abattoir were fasciolosis, hydatid cyst, pneumonia, *Cysticercus bovis*, cirrhosis, hydronephrosis, calcification, emphysema, pericarditis, and abscess. Out of 185 tested organs, the liver, the lung, the heart, and the kidney were all

found to be defective in 27.3%, 14.3%, 4.68 %, and 1.8% of the cases, respectively. This result is consistent with earlier research from the Jimma Municipal Abattoir and Nekemte Municipal Abattoir, which was reported by (Nebyou *et al.*, 2014) [33].

In the current study, 27.3% of the liver was deemed defective due to different abnormalities discovered during the postmortem examination. Fasciolosis was found to be one of the leading causes of liver rejection in this study with a prevalence of 14.6%, which is lower than the prevalence of 21.1 and 20.18% reported by Shitaye *et al.* (2016) [40] from the Hawasa Municipal abattoir from the Dessie Municipal abattoirs, respectively. The findings of the current study exceed those of Borji *et al.* (2012) [11] study from Iran (7.9%) and Alembrhan and Hylagebriel (2013) [4] study from the municipal abattoir in Adgrat (9.26%). According to Manyazewal *et al.* (2014) [28], the variation in the study areas' climatic and ecological conditions, such as altitude, rainfall, and temperature, as well as the livestock management system, are mostly responsible for the difference in the rejection rate of liver due to fasciolosis between this study and the reports mentioned above.

The finding that 6.25% of livers were condemned because of cirrhosis is comparable to Raji *et al.* (2010) [38] 8.4% report from the Zara abattoir. The liver condemnation owing to cirrhosis in the current study was lower than the 16.5% reported by Nurit *et al.* (2012) [35] in Kombolcha, but this number is greater than the 1.1% reported by Yefat *et al.* (2011) in Gonder.

This conclusion is greater than the report of 1.9% in Tanzania by Mellau, (2010) [29] and indicates that calcification was the cause of 2.6% of liver condemnation from the total studied organ. The rejection rate of the liver owing to hydatidosis in the current study is 3.13%, which is close to studies done by Dawit *et al.*, (2017) [15] from the municipal abattoir in Adigrat. Reported migration rates from Harar of 3.6% and 3.62%, respectively. However significantly lower than the reports of Zelalem *et al.*, (2012) [43] 31.7% from Addis Abeba and Mihret *et al.*, (2013) [44] 33.33% from Dire Dawa. In contrast to Ahmedullah *et al.* (2007) [1], who reported a 3.8% liver condemnation rate in Bangladesh, the current study found a 0.78% liver condemnation due to abscess.

Out of inspected, 14.3% lungs were condemned due to various cause. Of those causes, hydatidosis and pneumonia were the most important reason for rejection of the lung. The current study result in condemnation of lung by hydatidosis (6.25%) is lower than reports by Gebremeskel and Kalayou, (2009) [19] of 19.37% from Mekelle. But, this result is higher than report by Ragassa *et al.*, (2009) [45] of 1.42% from Ghana. This variation in prevalence of hydatidosis might be due to differences in animal husbandry system, back yard slaughtering of animals, lack of proper disposal of infected carcass and the presence of stray dogs and their relations with animals Mesele *et al.*, (2013) [30]. In the present study, condemned lung by pneumonia was 4.09 %. It was higher than that reported (0.14%) in cattle slaughtered at Zango abattoir by Alawa *et al.* (2010) [46]. A number of factors may explain in the different prevalence of pneumonic lungs, including stress factors such as exposure to dust from the environment or exhaustion during long treks of pastoral livestock in search of pasture and water and

when animals are taken to livestock markets or abattoirs and parasitism Benard *et al.*, (2011) [10].

The current study shows the total condemnation rate of the heart is 4.69%. The main cause of heart rejection in this study was pericarditis, hydatid cyst and *Cysticercus bovis* which 2.6% and 1.5% and 0.5% respectively. This is extremely lower as compared with study by Genet *et al.*, (2012) [20] from Gonder abattoir with 7.8% and 9.4% respectively. However, it was higher than the report of Lati *et al.*, (2015) [27] and 0.18% prevalence respectively in Nekemte Municipal Abattoir. *Cysticercus bovis* account for 2(0.5%) from cause of heart condemnation which is relatively comparable with value reported by Basem, (2009) [8] from Egypt with prevalence of 0.23%. However, this obtained result is lower than those reported by Garedaghi *et al.*, (2012) [18] with prevalence of 3% from Iran. This variation in reported prevalence rate may be due to several factors such as variation in habit of meat consumption, awareness of patients about the clinical picture of the disease, variation in personnel and environmental hygiene and control measures and eradication programs. The present study also showed that kidney was condemned due to hydronephrosis, which is lower than the report of Fufa and Debele, (2013) [17] from Walaita Sodo Municipal abattoir. The difference in the rejection rate of organs with related to different causes may be due to the difference in the prevalence of the disease and variation in animal management system at different study site.

In this study the annual direct financial loss due to condemnation of organs at Chiro Municipal abattoir was estimated to be 138,784.00 Ethiopian birr which is higher than direct financial loss analysis estimated by Bekele *et al.*, (2014) [9] from Hossana Municipal abattoir and Alemayehu *et al.*, (2012) [3] from Luna export abattoir total financial loss of about 88,806.85, 110,584.46 ETB per year. On other hand, the present result is extremely less than the estimation by Haimanot *et al.*, (2015) [22]. Who reported 109, 492,725.5 ETB annual losses due to organ condemnation from cattle at Dire Dawa Municipal abattoir. The difference in the financial loss estimated in various abattoir and/or parts of Ethiopia would be due to the variations in the prevalence of disease, mean annual number of cattle slaughtered in the different abattoirs and also the variation in the retail market price of organs Arbabi and Hooshyar, (2006) [7].

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List of abbreviations

BCS: Body Condition Score
 CDLFO Chiro District Livestock and Fishery Office.
 CSA: Central Statistical Authority
 FAO: Food and Agricultural Organization
 SPSS: Statistical Package for Social Sciences
 USD: United States Dollar

5. Conclusions and Recommendations

The purpose of the current study, which was carried out in the municipal abattoir in Chiro, was to determine the main reasons why organs are condemned and to calculate the direct financial loss associated with condemned organs. According to the findings of the current investigation, the condemnations of organs at the Chiro Municipal Abattoir in Eastern Ethiopia were linked to a number of sickness issues. 185 (48.2%) of the 384 animals that were investigated overall had postmortem abnormalities of various kinds. Organ condemnation rates were higher for the liver and lower for the lungs, hearts, and kidneys, correspondingly. Fasciolosis was the major pathological condition that led to the total condemnation of the organs, followed by cirrhosis, calcification, emphysema, pericarditis, and hydronephrosis. Age group, provenance, and animal body condition all significantly affect organ condemnation rates ($p < 0.05$). According to estimates, edible organ condemnation results in annual financial losses of 138784.00 ETB.

Based on the above conclusion the following recommendations are forwarded:

- There should be research done on the epidemiology of diseases that lead to organ condemnation, as well as control strategies.
- In order to properly dispose of condemned organs, it is important to encourage the building of abattoirs with the requisite disposal pits.
- The management of condemned carcasses and organs should be showed to meat inspectors and slaughterhouse staff.

The veterinary extension service should be improved in cooperation with the government to raise public understanding of the disease's prevention and control.

References

1. Ahmedullah F, Akbor M, Haider MG, Hossain MM, Khan MAHNA, Hossain MI, Shanta IS. Pathological investigation of liver of the slaughtered buffaloes in Barisal district. *Bangladesh Journal of Veterinary Medicine*. 2007;5:81-85.
2. Alawa CB, Etukudo-Joseph I, Alawa JN. A 6-year survey of pathological conditions of slaughtered animals at Zango abattoir in Zaria, Kaduna State, Nigeria. *Tropical animal health and production*. 2011;43:127-131.
3. Alemayehu R, Nebyou M, Bekele M, Desta B, Dessie Sh Etana D, Fufa A, Eystein S. Major causes of organs and carcass condemnation in small ruminants slaughtered at Luna Export Abattoir, Oromia Regional State, Ethiopia. *Prev. Vet. Med.* 2012;110(2):139-148.
4. Alembrihan A, Hylagebriel T. Major cause of organ condemnation in cattle slaughtered at Adigrat municipal abattoir, northern Ethiopia, *Veterinary World*. 2013;6(10):734-738.
5. Alton GD, Lpeah D, Bateman KJ, McNab WB, Berk O. Factors associated with whole condemnation rates in provincially inspected abattoir in Ontario. Implication for food animal syndromic surveillance. *BMC Vet. Res.* 2010;6(42):312-345.
6. Amene F, Eskindir L, Dawit T. Cause Rate and Economic Implication of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia. *Glob. Vet.* 2012;9:396-400.
7. Arbabi M, Hooshyr H. Survey of Regions might have accounted for variation of the Echinococcosis and Hydatidosis in Kashan Region, Prevalence in different areas of a country Central Iran. *Iran. J Public Health*. 2006;35:75-81.
8. Basem RA, Sayed AS, Hussein AA, Arafa MI. Occurrence of cysticercosis in cattle and buffaloes and *Taenia saginata* in man in Assiut Governance of Egypt. *Veterinary World*. 2009;2(5):173.
9. Bekele Ch, Sissay M, Mulugeta D. On Farm Study of Bovine Fasciolosis in Lemo District and its economic loss due to liver condemnation at Hossana Municipal abattoir, Southern Ethiopia. *Int J Curr. Microbiol. App. Sci.* 2014;3(4):1122-1132.
10. Benard LMEN. Hezron and Eron DK. Slaughter stock abattoir survey of carcasses and organ/offal condemnations in Arusha region, northern Tanzania. *Tropical Animal Health and Production*, 2011;43:857-64.
11. Borji H, Azizzadeh M, Kamelli M. A retrospective study of abattoir condemnation due to parasitic infections: economic importance in Ahwaz, southwestern Iran. *Journal of Parasitology*, 2012;98(5):954-957.
12. Buzuayehu L, Tsegalem A, Befikadu U, Ayalew N, Abebe A. Prevalence of Bovine Hydatidosis and its Economic significance in Harar Municipality Abattoir, Eastern Ethiopia. *Ameri. Euro J scient res.* 2014;9(5):143-149.
13. CDLFO. Chiro district Livestock and Fishery Office; c2015.
14. Central Statistical Authority (CSA), Agricultural statistical report, Addis Ababa, Ethiopia; c2013.
15. Dawit A, Tewodros A, Tefera K. The Prevalence of Bovine Hydatidosis among Slaughtered Cattle at Debre Berhan Municipal Abattoir, North Shewa Zone, Ethiopia. *J Veter Sci Med.* 2017;5(1):5. <https://pdfs.semanticscholar.org/70bd/0461a69c4c833229652caefb99dc2d65170.pdf>
16. Food and Agriculture Organization (FAO): Manual of meat inspection for developing countries; c1994.
17. Fufa A, Debele H. Major Causes of Organ Condemnation for Cattle and its Financial Impact at Wolaita Sodo Municipality Abattoir, Southern Ethiopia. 2013;11(6):730-734.
18. Garedaghi Y, Saber RAP, Khosroshahi SM. Prevalence of Bovine Cysticercosis of Slaughtered Cattle in Meshkinshahr Abattoir, Iran. *Journal of Animal and Veterinary Advances*. 2012;11:785-788.
19. Gebremeskel B, Kalayou S. Prevalence, viability and fertility study of bovine cystic echinococcosis in Mekelle city, Northern Ethiopia. *Revue méd. Vét.* 2009;160(2):92- 97.

20. Genet M, Guadu T, Basaznew C, Mersha B. Pathological Conditions Causing Organ and Carcass Condemnation and Their Financial Losses in Cattle Slaughtered in Gondar, Northwest Ethiopia. 2012;4(6):200-208.
<https://www.academia.edu/download/77999267/2.pdf>
21. Gracey, JF, Collins OS, Huey RJ. Meat hygiene, 10th ed. London, Bailliere Tindall; c1999. p.223-260.
22. Haimanot D, Munera A, Hawi J, Tilahun Z, Girma K. Major cause of organ condemnation and its economic loss in cattle slaughtered at Dire Dawa Municipal abattoir, eastern, Ethiopia. Academic journal of animal disease. 2015;4(3):118-123.
<https://www.academia.edu/download/80279155/1.pdf>
23. Jatenie J, Mahendra P, Rahman T. Investigation into major causes of organs condemnation in bovine slaughtered at Adama municipal abattoir and their economic importance. Haryana. Vet. 2014;53:139-143.
24. KAOAR. Kombolcha agricultural office of animal resource recording sheet found; c2016.
25. Kidanu L. Major parasitic case of organ condemnation in cattle and its economic importance at Jimma Municipal Abattoir, DVM Thesis, School of Veterinary Medicine, Jimma University College of Agriculture and Veterinary Medicine, Jimma Ethiopia; c2011.
26. Lamy E, van Harten S, Sales-Baptista E, Guerra MMM, de Almeida AM. Factors influencing livestock productivity. Environmental stress and amelioration in livestock production; c2012. p. 19-51.
27. Lati E, Biresaw S, Berhanu S, Eyob H. Causes of organ condemnation, its public health and financial significance in Nekemte municipal abattoir, Wollega, Western Ethiopia. J Vet. Med. Anim. Health. 2015;7:205-214.
28. Manyazewal A, Zeleke MG, Tsegaye T. Economic Significance of Fasciolosis at Mettu Municipal Abattoir, Southwest Ethiopia. J Adv. Vet. Res. 2014;4(2):53-59.
<https://advetresearch.com/index.php/AVR/article/view/73>
29. Mellau LS, Nonga HE, Karimuribo ED. A slaughterhouse survey of liver lesions in slaughtered cattle, sheep and goats at Arusha, Tanzania. Research Journal of Veterinary Sciences. 2010;3(3):179-188.
30. Mesele A, Solomon T, Desie S. Cystic Echinococcosis of Cattle in Jimma Municipal Abattoir, South West Ethiopia. Glob. Vet. 2013;11(6):771-775.
<https://www.cabdirect.org/cabdirect/abstract/20143016949>
31. Mezegebu Y. Major cause of organ condemnation in ruminants slaughtered at Gonder Abattoir, North Western Ethiopia. DVM thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debre-Zeit, Ethiopia; c2003.
32. Miheret M, M Biruk T, Habtamu, K Ashwani. Bovine hydatidosis in Eastern Part of Ethiopia. MEJS. 2013;5(1):107-114.
<https://www.ajol.info/index.php/mejs/article/view/85334>
33. Nebyou M, Debela A, Solomon K, Tesema T. Major Causes of Organs and Carcass Condemnation in Cattle Slaughtered at Nekemte Municipality Abattoir, East Wollega, Ethiopia. Glob Vet. 2014;13(3):278-284.
34. Nicholson, MJ, Butter MH. A guideline to condition scoring of Zebu cattle. International Livestock Center for Africa, Addis Ababa, Ethiopia; c1986.
35. Nurit M, Zerihun H, Serkalem M. Major Cause of Liver Condemnation and Associated Financial Loss at Kombolcha Elmore Abattoir, South Wollo, Ethiopia. Europ. J Appl. Sci. 2012;4(4):140-145.
36. Ogunrinade A, Ogunrinade BI. Economic importance of bovine fasciolosis in Nigeria. Trop. Anim. Health Prod. 1980;12(3):155-160.
<https://europepmc.org/article/med/7434476>
37. Pace JE, Wakeman DL. Determining the age of cattle by their teeth animal science department. Institute of food and Agricultural Sciences (IFAS), USA: Florida, c2003. p. 25-29.
38. Raji MA, Solam SO, Ameh JM. Pathological condition and lesions observed in slaughtered cattle at Zaria abattoir. J. Clin. Pathol. Forensic Med. 2010;1(2):9-12.
39. Regassa A, Abbu F, mulugeta A, Megersa B. Major Metacestodes in cattle at Wolaita Sodo municipal abattoir, Southern Ethiopia: Prevalence, cyst viability, organ distribution and socio-economic implications. Trop An. Health and Production. 2009;41:1495-1502.
40. Shitaye M, Tilaye S, Fanos T. Major causes of organ condemnation and associated financial loss in cattle slaughtered at Hawassa Municipal Abattoir, Ethiopia. J Vet. Med. Anim. Health. 2016;8(10):150-156.
<http://stm.researcharchiver.com/id/eprint/854/>
41. Thrusfield M. Veterinary Epidemiology. (3rd edition.). Blackwell Science; c2007.
42. Yifat D, Gedefaw D, Desie S. Major cause of organ condemnation and financial significance of cattle slaughtered at Gondar ELLFORA abattoir. Global Veterinarian. 2011;7(5):487-490.
<https://www.cabdirect.org/globalhealth/abstract/20123041129>
43. Zelalem F, Tadele T, Zelalem N, Chanda M, Nigatu Kebede G. Prevalence and characterization of hydatidosis in animals slaughtered at Addis Ababa abattoir, Ethiopia. J. Parasitol. Vector. Biol. 2012;4(1):1-6.
44. Sewunet T, Demissie Y, Mihret A, Abebe T. Bacterial profile and antimicrobial susceptibility pattern of isolates among burn patients at Yekatit 12 hospital burn center, Addis Ababa, Ethiopia. Ethiopian journal of health sciences. 2013 Nov 11;23(3):209-16.
45. Ragasa CY, Tsai PW, Shen CC. Terpenoids and sterols from the endemic and endangered Philippine trees, *Ficus pseudopalma* and *Ficus ulmifolia*. Philipp J Sci. 2009 Dec;138(2):205-9.
46. Alawa CB, Adamu AM, Gefu JO, Ajanusi OJ, Abdu PA, Chiezey NP. In vivo efficacy of *Vernonia amygdalina* (Compositae) against natural helminth infection in Bunaji (*Bos indicus*) calves. Pakistan Veterinary Journal. 2010 Jan 1;30(4):215-8.