FACULTY OF AGRICULTURE AND ANIMAL SCIENCES

DEPARTMENT OF ANIMAL PRODUCTION AND MANAGEMENT

FINAL YEAR PROJECT

ESTIMATION OF COST OF LIVER LOST DUE TO FASCIOLIASIS IN SOROTI AND KATAKWI DISTRICTS

By

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DECLARATION

I AYESIGAMUKAMA EMMANUEL declare that this dissertation is mine and it has never been submitted in any university or institution for the award of any academic qualification.

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DEDICATION

I dedicate this thesis to my supervisor, examiners, my parents Mrs. Akugizibwe Jessy and Miss. Agondeze Grace, all my brothers Moses, Asaba, Pythagoras and Zechariah not forgetting my fellow students and friends who have supported me in prayers, finance and all other aspects where they have been with me. I also dedicate this thesis to Mildred, thank you so much.

ACKNOWLEDGEMENT

It has been long since I started this journey, I take this great opportunity to thank the almighty God who has made it for us, and I also want to extend my appreciation to all my relatives, friends' classmate and lecturers who have helped me to make it up to this level. I have also cited other people's research papers to acknowledge their effort towards this research.

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LIST OF ABBREVATIONS

AU$ Australian Dollar

BCS Body Condition Score

BUAC Busitema University Arapai Campus

DEL Direct Economic Loss

KGS kilograms

UGX Uganda Shillings

USD United States Dollar

WHO World Health Organisation

ABSTRACT

Fascioliasis is a parasitic infection of livestock caused by liver flukes of the genus Fasciola. It affects the health and productivity of animals causing economic losses due to liver condemnation and reduced meat quality. More than $3.2 billion USD per year is lost in the whole world due to Fascioliasis and during post mortem inspections in animals slaughter areas the infested liver with Fascioliasis is the most condemned organ, this requires all measures to reduce these economic losses. This study aimed to estimate the cost of liver lost due to Fascioliasis in Soroti and Katakwi abattoirs of Uganda, where the disease is endemic. A cross-sectional survey was conducted on 246 cattle conveniently selected from Soroti and Katakwi abattoirs. Liver samples were collected at slaughter and examined for the presence and intensity of fluke infestation, the infected liver was weighed on the digital weighing scale and weight was recorded. The cost of liver lost was calculated based on the market price of liver and the weight reduction due to infection. The prevalence of Fascioliasis was 75.7% in Soroti and 47.1% in Katakwi. The cost of liver lost was estimated at 6,776,627million UGX per year for Katakwi and 173,798,400million UGX per year for Soroti. The average economic loss per cattle was 10,274 UGX and 25,607 UGX in Katakwi and Soroti abattoir respectively with the liver weight loss being 37.245kgs and 148.505kgs in Katakwi and Soroti respectively. Cattle aged 2 to 3years had a high infection rate compared to those aged 4years and above, animals originating from Katakwi sub-county had a high infection and economic loss with Anopete sub-county having the lowest in Katakwi and in Soroti, katera sub-county had a high infestation and economic loss while Toroma sub-county had the lowest economic loss. The study concluded that Fascioliasis is a serious economic problem for livestock farmers in the study area and recommended the implementation of effective control measures such as deworming with the appropriate drugs and providing clean water to animal. Further studies should be made to assess the potential and the risks of people being infected by Fascioliasis.

CHAPTER ONE

INTRODUCTION

1.0 General introduction

This chapter includes the background of the study, statement of the problem, main objective of the study, specific objectives, research questions, justification of the study, scope of the study, and significance of the study.

1.1 Background to the study

Fascioliasis caused by Fasciola species is found in five continents of the world where Africa is inclusive and the disease is recognized as a neglected human disease by WHO, It's predominantly said to be endemic in developing countries where Uganda is part (Zerna *et al.,* 2021). Consumption of animal proteins provides humans with nine essential amino acids and contributes a relatively high nutrient profile in the diet of humans where meat passed for consumption is inspected and certified with veterinarians who keep records of slaughtered animals (Njoga *et al.,* 2023).

According to Fang *et al*. (2022) Fascioliasis is a foodborne zoonotic parasitic disease that has been identified to cause significant health problems and economic importance affecting most livestock animals more especially cattle and sheep. Two species of Fasciola that is to say *Fasciola hepatica* and *Fasciola gigantica* affect livestock though *F. gigantica* is the most abundant species of cattle. However, the two species have been identified for causing severe liver illnesses to both livestock animals and to humans (Othman *et al.,* 2023). Fasciola affects the liver organ of animals thus being called liver flukes meaning flukes of the liver (Nyirenda *et al.,* 2019). The liver is a good source of proteins and vitamins such as riboflavin, B12, vitamin A, and copper. It is the largest organ in the body that is believed to be the most preferred due to its softness as reported by (Rassol *et al.,* 2020).

According to Arbabi *et al*. (2018) distribution of Fascioliasis is reported to be in 51 nations in the world, they also urge that it is due to *Fasciola hepatica* which infect a large number of animals. Fasciola infects a broader category of animals like cattle, sheep, goats and others both non-

domesticated and those that are domesticated including humans, the bovine Fascioliasis (*Fasciola gigantica*) mostly causes economic losses through the condemnation of the infected liver according to Zewde *et al.* (2019), other costs are attributed to death, decrease in milk, wool, meat and expenses of buying drugs. The life cycle of Fasciola involves the water snail belonging to family lymnaeidae, it's intermediate hosts, herbivores and mammals (man) as a definitive host (Fang *et al.,* 2022).

1.2 Statement of the problem

There is an estimate loss of more than $3.2 billion USD per year in the whole world due to Fascioliasis (Opio *et al.,* 2021). During post mortem inspections in animal slaughter areas, the daily parasitic infection is majorly Fascioliasis found in liver making it the most condemned organ (Taha *et al.,* 2023*)*. Being a zoonotic disease, all measures to obtain details and records for this disease of public health concern are essential in curbing health problems created and losses through proper inspection and record keeping for traceability and epidemiological data bank for diseases by veterinarians (A. Mahmoud *et al.,* 2023).

According to Joan *et al*. (2015) there is a cost of 231 Billion UGX lost annually in Kampala city abattoir due to liver condemnation and liver condemned was at 84% higher than in any other organ and the number of recorded cases were higher than those of previous years. It's therefore upon the above data that this research study aims at estimating the cost of liver lost due to Fascioliasis in Soroti city abattoir and Katakwi to give a financial basis on the impact of the disease on financial losses encountered by traders.

1.3 The main objective of the study

To estimate the cost of liver lost due to Fascioliasis in the districts of Katakwi and Soroti.

1.4 Specific objectives

1. To establish the demographic pattern of Fascioliasis in the districts of Katakwi and Soroti.
2. To estimate the quantity of liver lost due to Fascioliasis in the districts of Katakwi and Soroti.
3. To estimate the cost of liver lost due to Fascioliasis in the districts of Katakwi and Soroti.

1.5 Research questions

1. What is the demographic pattern of Fascioliasis in the districts of Katakwi and Soroti?
2. What is the quantity of liver lost due to Fascioliasis in the districts of Katakwi and Soroti?
3. What is the cost of liver lost due to Fascioliasis in the districts of Katakwi and Soroti?

1.6 Justification of the study

The condemnation of the liver, weight loss and reduced productivity because of liver fluke infections has contributed a great loss in the world in terms of money *(Torbehbar & Houshmand,* 2021). Reduced prices are always attached to infected liver, mostly condemned, and burnt which leads to no or low-income gain. The study will attract attention and create awareness of livestock farmers, policymakers, and other animal product dealers to help them reduce Fascioliasis infections in animals since awareness is the first step in solving Fascioliasis.

1.7 Scope of the study

My research was carried out in eastern Uganda in Katakwi and Soroti districts' main abattoirs to give an assessment on cost of liver lost due to Fascioliasis. The study was carried out in the period of November to December 2023

1.8 Significance of the study

The study aids to understand part of the economic consequences of Fascioliasis disease to support in improving the productivity and to sustain the livestock industry.

It will help policy makers to measure the impact of the disease and develop effective management strategies such as coming up with different controls and preventive measures of the disease.

CHAPTER TWO

LITERATURE REVIEW

2.0 General introduction

This chapter includes biology of the study which explains about what Fascioliasis is, morphology of Fascioliasis, the lifecycle of Fascioliasis, animals affected by Fascioliasis, the sites affected, the financial losses and treatment of Fascioliasis.

2.1 Biology of Fascioliasis

2.2 What is Fascioliasis?

Fascioliasis is a zoonotic water borne disease that is caused by snail, a flatworm parasite called Liver fluke which affects the liver organ and bile duct of ruminant animals and man (Nukeri *et al.,* 2022). According to Calvani & Šlapeta, (2021) the species of Fasciola include *Fasciola hepatica, Fasciola gigantica* and *Fasciola hybrid.* The common species of Fasciola are *Fasciola hepatica* and *Fasciola gigantica* (Girma & Hailu, 2023).

2.3 Morphology of liver fluke

The liver fluke is leaf-shaped about 3 cm long and 1.5 cm wide with a brown to pale grey colour, the mature liver fluke has two suckers the anterior one called oral sucker that is around the mouth and the posterior one called acetabulum at the ventral side which are for attachment, the surface of the body is covered with spines (Alemneh, 2019). The length *Fasciola gigantica* is 7.5 cm and this specie is found to have the similar shape to the cone (Girma & Hailu, 2023).

2.4 Life cycle of Fascioliasis

The adult fluke lay eggs, in the bile the eggs reach the intestines and are passed out in faeces into water or on pasture, in water, eggs are then embryonated they hatch into miracidium which penetrates the water snail that is the intermediate host, when it's inside this host the, miracidium develops into sporocyst then into redia and then to cercaria which completes the stages in the snail, the cercaria is encyst as meta cercaria on the pasture where its picked up and eaten by animals including human being who act as the definitive host (Girma & Hailu, 2023).

Metacercariae cross the duodenal wall, then actively moves via peritoneal cavity to the bile ducts by penetrating the capsule of the liver to the liver Cells (Seyedrasouli *et al.,* 2023).

2.5 Animals affected by Fascioliasis.

The disease are regarded as zoonotic meaning it affects man and animals that include cattle, shoats, donkeys, buffalos, rabbits and other wild ruminants (Isah, 2019).

2.6 Sites

The flukes are found in the liver, bile duct and gallbladder (Itefa *et al.,* 2022). In man, immature flukes can enter the blood stream where they can be taken to different body parts like the heart, lungs, blood vessel, spleen and inguinal lymph nodes though this is not common in ruminant animals (Seyedrasouli *et al.,* 2023).

2.7 The financial losses

These financial losses are caused by the condemnation of the liver and the reduced productivity of the animals (Torbehbar & Houshmand, 2021). The condemnation is due to the destruction of the meat by causing fibrous exudates on the capsular surface, hemorrhagic spots and necrosis on the cut surfaces of liver parenchyma, post necrotic scarring and granulation (Regasa, 2022).

Globally, in South-East Asia, Fascioliasis caused financial losses which ranged between AU$4 billion and AU$11 billion annually according to (Dermauw *et al.,* 2021). Fascioliasis was found to be causing a huge loss in farm animals that exceeds 3 billion dollars each year, this was noticed in 300 million cattle and 250 million sheep all over the world (Arbabi *et al.,* 2018). Within the years of 2013-2019 in slaughtered animals in Indonesia, a Prevalence rate of Fascioliasis in male animals was found at 92.0% and in female animals it was found at 89.3% (Kusumarini *et al.,* 2020).

Regionally here in Africa, In the active survey carried out in Lokoloko Abattoir in Wau, South Sudan, showed that partial condemnation of the liver due to Fascioliasis contributed a loss of 6.3 million South Sudan pound for the average weight of 1,550 kilograms of the meat condemned (Taha *et al.,* 2023).In the research carried out at Abu Simbel Abattoir, Aswan Governorate,

Egypt the cost of liver lost due Fascioliasis when a kilogram was valued at USD 4.69 was USD 173554.21(Rassol *et al.,* 2020). According to the research made, a total amount of 335,697.1USD was lost through liver condemnations annually as a result of Fascioliasis infection in livestock animals in Ethiopia (Tadesse & Acklock, 2023).

Out of the 3460 animals (cattle) that had Fascioliasis infection in Nigeria, contributing to a total of 2927partial liver condemnations and 533total liver condemnations in addition to the previous 361condemnations contributed a big loss in terms of liver in the country (Izevbuwa & Otote, 2022). In southern and eastern parts of Africa Fascioliasis prevalence was found to be high in cattle with a percentage of 14.5%, 10.9% in sheep and 9.4% in goats (Malatji *et al.,* 2020).

Nationally here in Uganda, according to the study carried out by Joan *et al*. (2015) at Kampala city abattoir in central Uganda showed that the abattoir lost 231 Billion Ugandan shillings due to total condemnation of liver infected by Fascioliasis. In eastern part of Uganda, as a parasite, Fascioliasis contributes 11.82% out of the parasitic infections of the gastro intestines in Sironko district (Namutosi *et al.,* 2020). The Fascioliasis prevalence rate here in Soroti abattoir was found at 80.6% and in Katakwi was found at 50.0% (Fred, 2014).

2.8 Treatment of Fascioliasis.

With all the losses caused by Fascioliasis, there are proven drugs for the treatment of this diseases, the drugs include Rafoxanide, Closantel, Albendazole and Triclbendazole (Nota, 2023).

CHAPTER THREE

MATERIALS AND METHODS

3.0 General introduction

This chapter entails the description of studied geographical area, research designs, research approach, description of the population, sampling strategies, data collection methods, data quality control, measurements, and data analysis.

3.1 Description of the study area

The study was carried out in Soroti and Katakwi district abattoirs, the districts are located in eastern part of Uganda in Teso sub-region, the latitude of Soroti is 1.713181 and longitude is 33.606385. Katakwi district coordinates are 01 54N, 34 00E (figure 1).

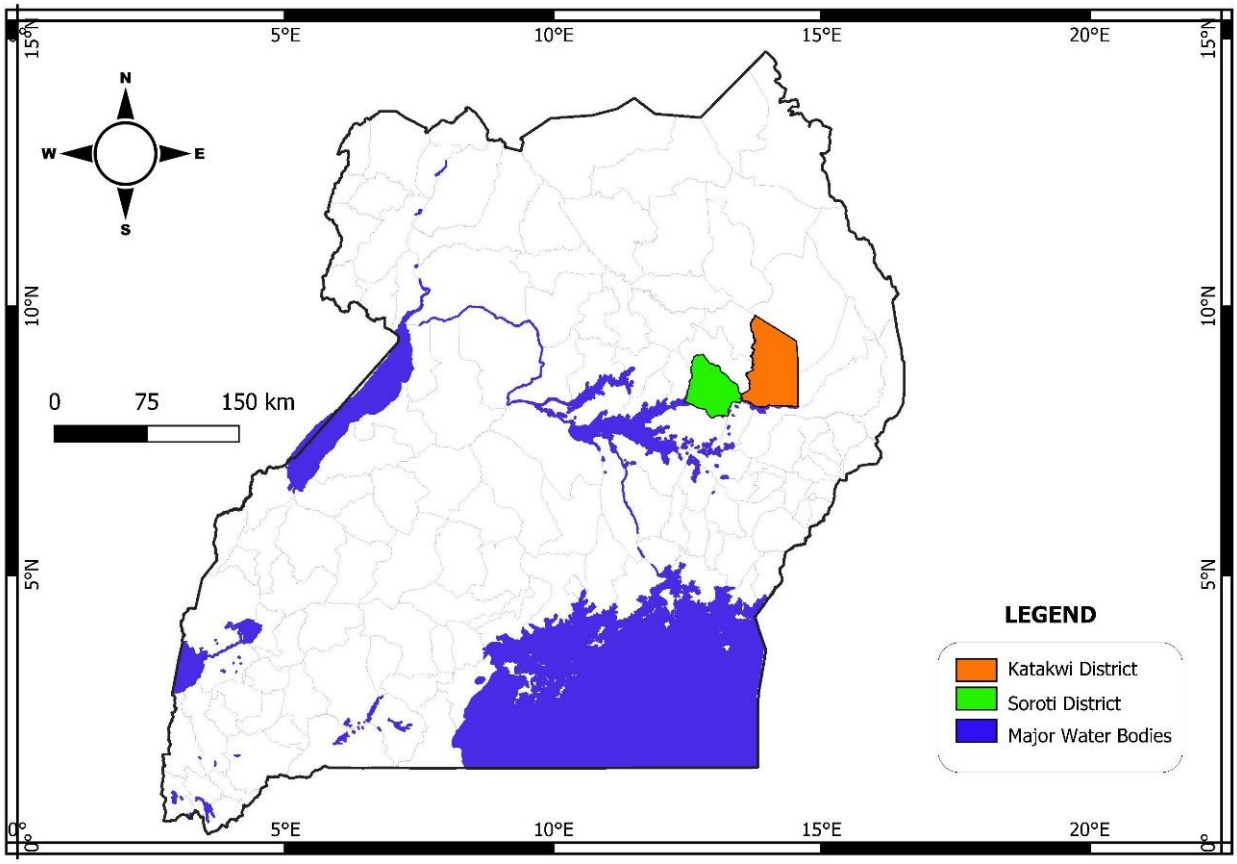


Figure 1: Map of Uganda showing the study districts.

3.2 Research design

The research study was a survey carried out for 37days to conduct data collection. Through post-mortem inspection of animals, information on inspection date, sex of the animal, the weight of the condemned liver and the price of liver were collected.

3.3 Research approach

The study was both qualitative and quantitative in a way that the quality of liver was classified into two; the poor quality which is condemned for human consumption and the good quality that is recommended for human consumption. For this case the main interest was the condemned liver that was infected with Fascioliasis. The measurement of liver weight in kilograms was determined to qualify the study as quantitative.

3.4 Description of the population

The study targeted cattle that were slaughtered in the Soroti and Katakwi abattoirs within the period of November to December 2023, data was collected in 32days and 5days in Katakwi and Soroti respectively.

3.5 Identification of breeds

The breeds were identified as local breeds and cross breeds, animals that had features such as straight symmetrical long and large horns which is a feature of Ankole cattle, pronounced hump and small dewlap which are features of Zebu, curved medium sized horns which is a feature of Nganda cattle were all considered to be local breeds. Animals that had distinct black and white markings a feature of Holstein-fresian, coat colour which is fawn with white markings and yellow skin which are features of Guernsey were considered to be cross breeds.

3.6 Sampling strategies

The sampling strategy was convenience sampling.
The sample size was determined basing on Leslie Kish Formula (**1965),**

$$\mathrm{n} = \frac{(z\boldsymbol{\alpha})^{2}\, p \times \mathrm{q}}{(\mathrm{d})^{2}}$$

$$n = \frac{(1.96)^2\ 0.80 \times 0.20}{(0.05)^2}$$

n=245.86

Sample size (n) =246 animals.

The determination was done at 95% confidence level, with 80% of liver cost expected to be lost.

3.7 Data collection methods

The study involved observation and recording methods. Direct economic loss (DEL) formula was used for estimating financial losses.

DEL=$nw * Av.P/kg$ (Ejeh *et al.*, 2015), where *n* stands for total number of condemned liver, *w* stands for average weight of the liver and Av.P/kg stands for average price per kg of whole non-condemned liver.

Materials used included; data collection form, note book, pen, weighing scale for measuring liver weight, smart phone, gumboots and over-all as body protective gears, inspection knife for incising and trimming the liver.

3.8 Data quality control

Data usage is limited to the university for research purposes, any other body or individual who wish to use it, will first seek permission from the authorities first.

3.9 Measurements

Tools for use in measuring included: Model FF 1976 digital price computing scale, pen, data collection form.

3.10 Data analysis

The data collected was analyzed using Microsoft Excel; descriptive statistics was used to calculate the cost of liver lost due to Fascioliasis at 95% confidence level.

CHAPTER FOUR

RESULTS

4.1 Demographic characteristics

Out of the total 123 diagnosed cattle from each district, 92(74.8%) were males and 31(25.2%) were females in Katakwi, Soroti district had 99(80.5%) males and 24(19.5%) females. The ages of the animals under study ranged from 1 to above 4 years. In Katakwi district, cattle in age group 1, 2, 3, 4 and above 4 were 3%, 24%, 44%, 25% and 4% respectively. In Soroti district, the age group 1, 2, 3, 4 and above 4 was 0%, 7%, 34%, 31% and 28% respectively. Majority of cattle in Katakwi (44%) and Soroti (34%) district were 3 years old. Most cattle slaughtered in both districts were local breeds. Of these, 93 (37.8%) were un-condemned while 141(57.3%) were condemned for liver consumption. Majority of the animals slaughtered from Katakwi abattoir were originating for Katakwi (87.0%) and Napak (11.4%) district. Amuri (16.3%), Serere (9.8%), Katakwi (7.3%) and Soroti (41.5%) districts where the major origin of the animals slaughtered from Soroti abattoir

Table 1: Demographic data of studied cattle

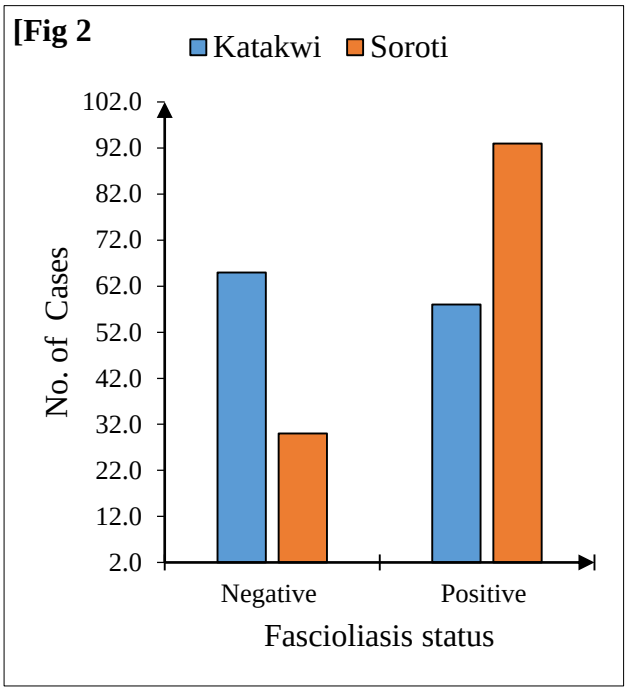
Parameter	Category	No. of Un-condemned (%)	No. of Condemned (%)
Age (year)	1	3(1.2)	1(0.4)
	2	29(11.8)	8(3.3)
	3	43(17.5)	53(21.5)
	4	16(6.5)	53(21.5)
	>4	4(1.6)	36(14.6)
Breed	Cross	2(0.8)	10(4.1)
	Local	93(37.8)	141(57.3)
Sex	Female	23(9.3)	32(13)
	Male	72(29.3)	119(48.4)

4.2 Effect of Fascioliasis on Direct Economic Loss

Results on number of infected and non-infected livers, mean liver weight, mean body conditioning score, and direct economic loss is shown in table 2. The number of prevalence of Fascioliasis in livers for every slaughtered cattle was significantly higher in Soroti (75.6%) than Katakwi (47.1%). A liver without Fascioliasis infestations weighed on average 2.61 kg and 3.39 kg in Katakwi and Soroti district respectively. Cattle with uninfected liver had a higher average body condition score compared to the infected ones in both districts. The current approximate price of 1 kg of liver is 16,000 Ugx in both districts. During the period of study, a total of 123 cattle were slaughtered at the abattoirs from each district. Of these only 58 livers (47.1%) with average weight of 0.64 kg (37.12 Total kgs) in Katakwi and 93 livers (75.6%) with average weight of 1.60 kg (148.8 Total kgs) in Soroti were condemned due to Fascioliasis infection. This resulted to an average financial loss of approximately 10,274 Ugx and 25,607 Ugx per infected animal in Katakwi and Soroti respectively.

Table 2: Economic loss due to Fascioliasis in Katakwi and Soroti districts

District	**No.of infected livers**	**Average weight of liver trimmed(kgs)**	**Average BCS**	**Average DEL per cattle**
Katakwi	58	0.64	2.88	10,274
Soroti	93	1.60	2.94	25,607



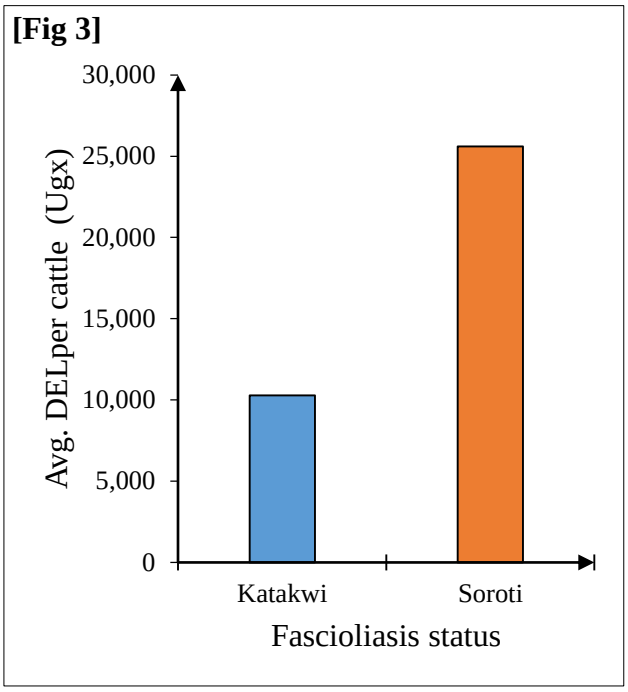
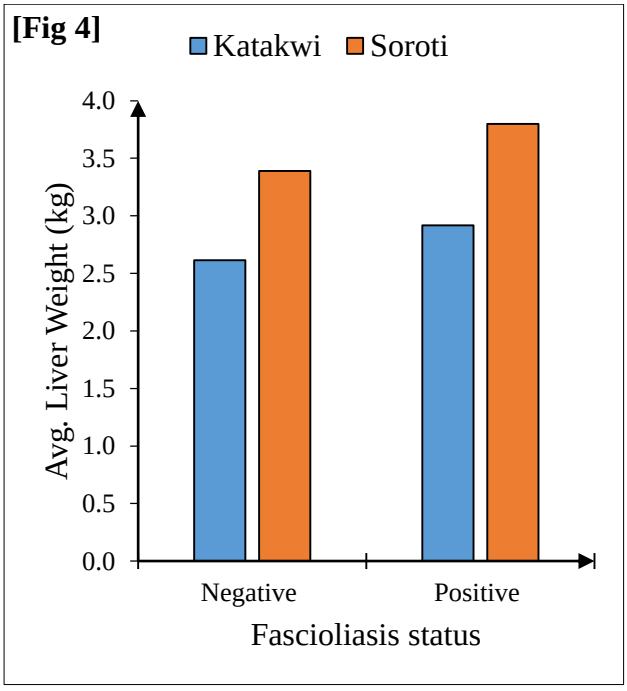


Figure 2: Number of cases due to Fasciolosis in Katakwi and Soroti abattoirs

Figure 3: Average Direct Economic Loss due to fasciolosis in Katakwi and Soroti abattoirs



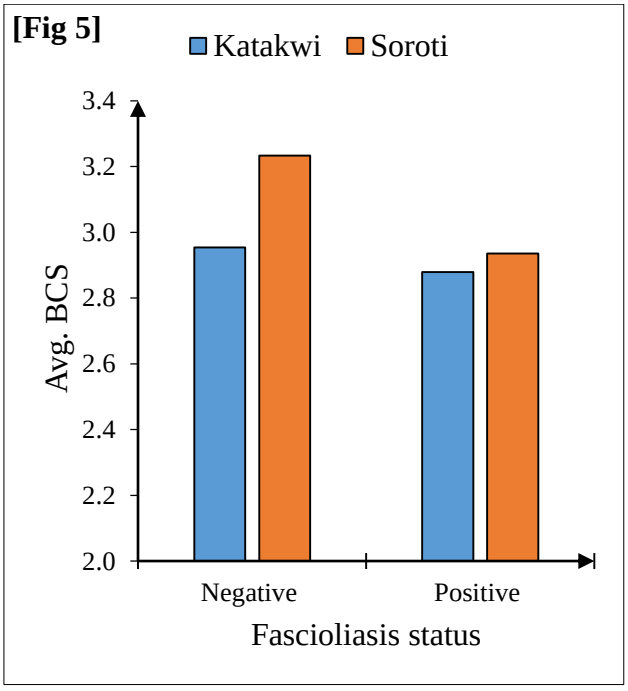


Figure 4: Average Liver Weight due to Fascioliasis in Katakwi and Soroti abattoirs

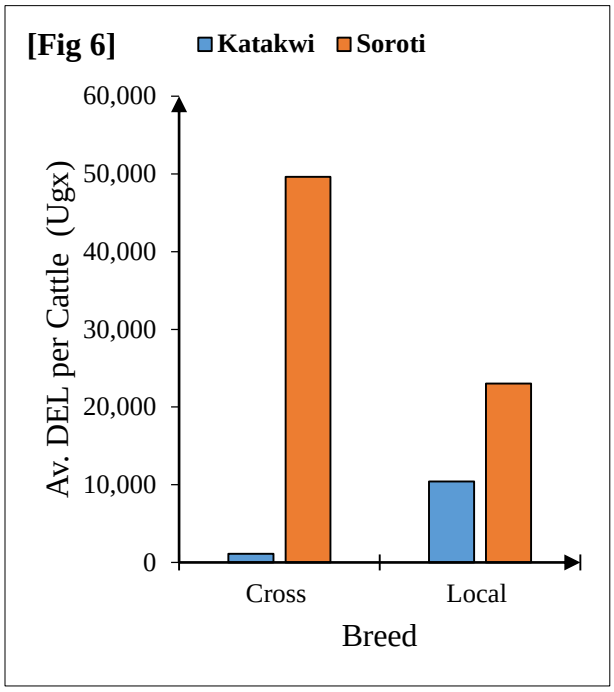
Figure 5: Average Body Condition Score due to Fascioliasis in Katakwi and Soroti abattoirs

4.3 Effect of Fascioliasis on economic loss based on sub counties, breed, sex, and age in Katakwi and Soroti district.

From table 3, cross breed animals had a higher average economic loss (49,617 Ugx) in Soroti where as in katakwi abattoir cross breeds animals had the lowest average economic loss (1,200 Ugx). Additionally, male cattle had a higher average economic loss of 11,694 Ugx in Katakwi while Soroti exhibited a higher average financial loss of 27,165 Ugx. Furthermore, analysis showed that as age of the cattle increases, financial loss also increases in both districts. However, a higher financial loss was observed in Soroti compared to Katakwi. No financial loss was observed at age of 1 year in Soroti. According to figure 11, the sub-counties of origin with highest total economic loss due to Fascioliasis in Soroti abattoir included Katera (79,760 Ugx), Kalaki (71,840 Ugx) and Kapujan (71,120 Ugx) whereas Katakwi abattoir had Katakwi (91,907 Ugx), Ongongoja (55,360 Ugx) and Kapujan (52, 560 Ugx) Sub counties.

Table 3: Fascioliasis on economic loss based on breed, sex, and age in Katakwi and Soroti district.

Parameters	Category	Average Economic Loss per Cattle (Ugx)	
		Katakwi	Soroti
Breed	Cross	1,200	49,617
	Local	10,435	23,003
Sex	Female	6,202	18,729
	Male	11,694	27,165
Age (years)	1	1,200	0
	2	3,577	14,480
	3	10,420	18,317
	4	10,400	24,710
	>4	20,240	33,981



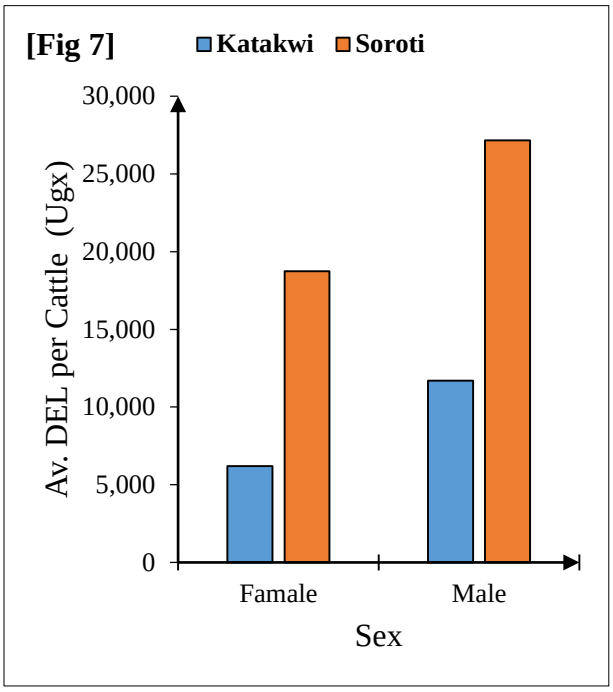
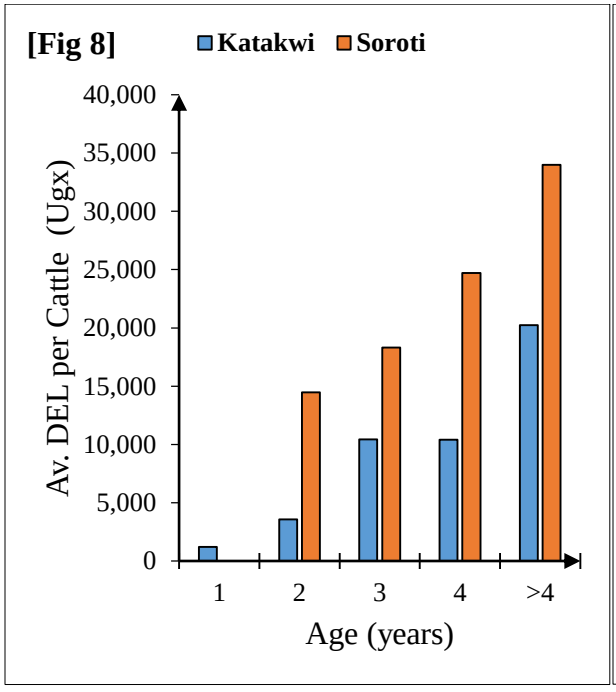


Figure 6: Effect of DEL due to breed in Katakwi and Soroti abattoir
Figure 7: Effect DEL due to sex in Katakwi and Soroti abattoir



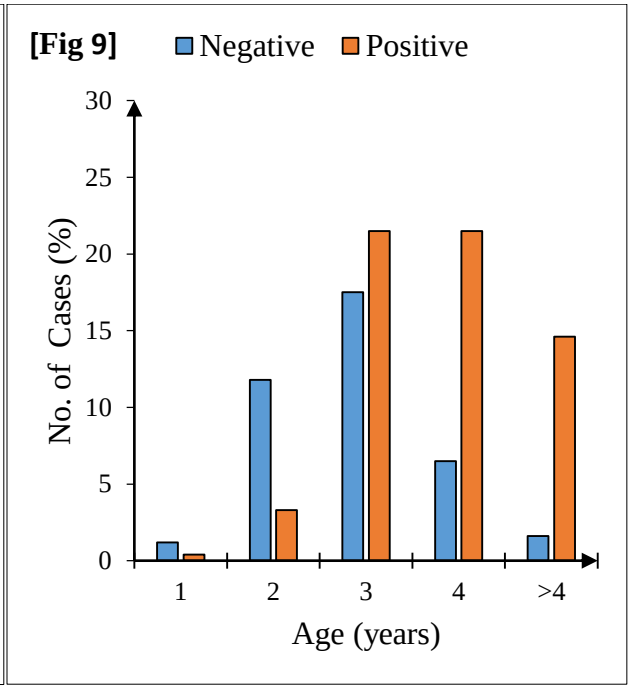


Figure 8: Effect of DEL due to age in Katakwi and Soroti abattoir
Figure 9: Prevalence of Fascioliasis cases according to age

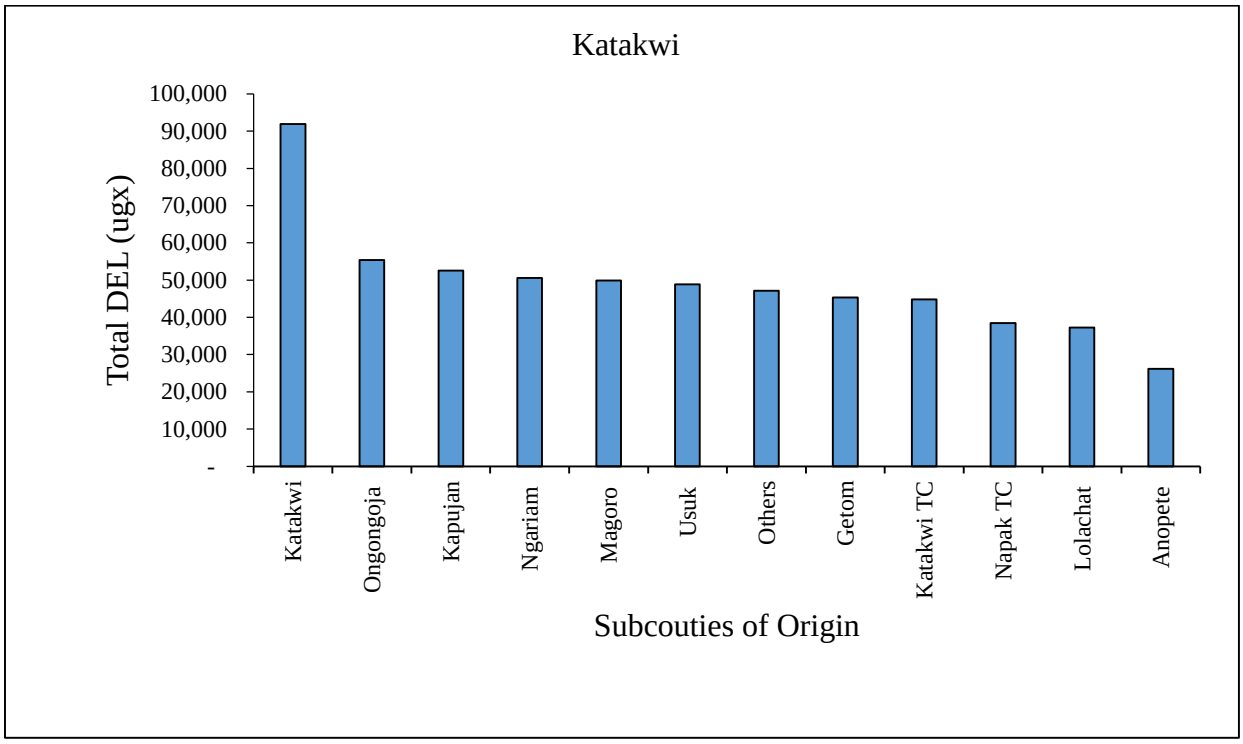


Figure 10: Effect of DEL in Katakwi abattoir basing on sub-county of origin.

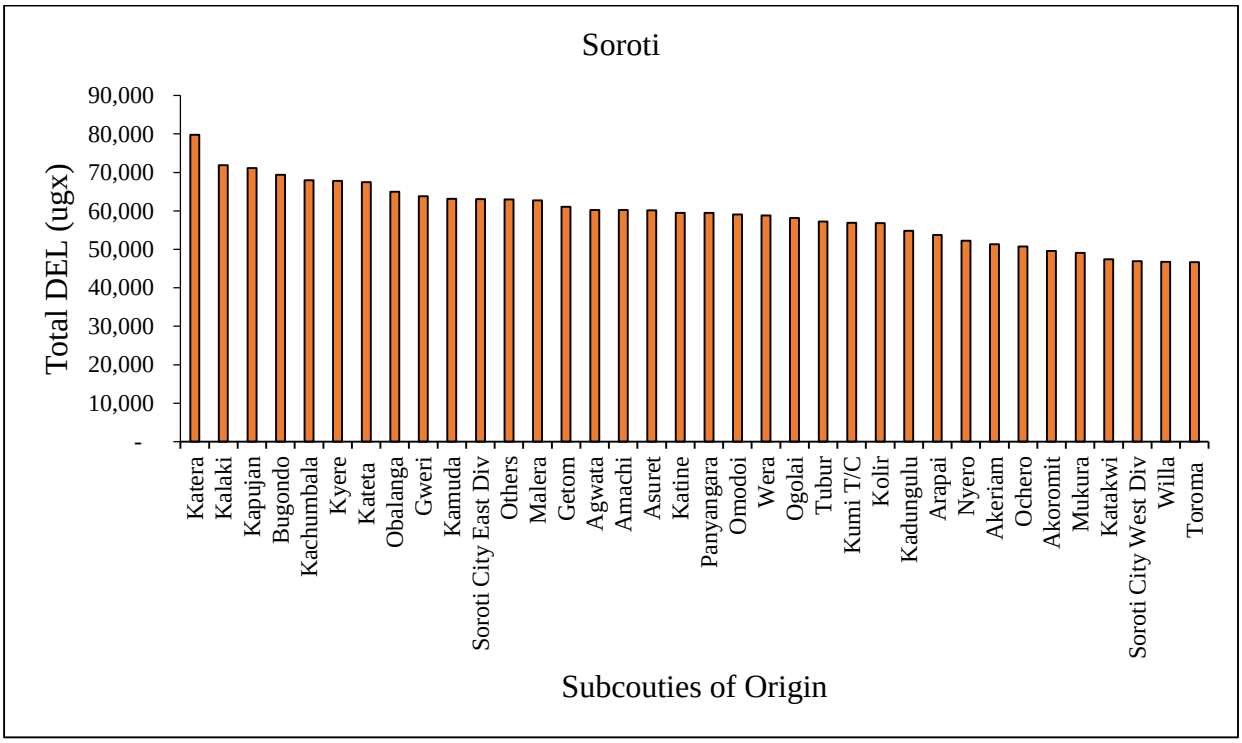


Figure 11: Effect of DEL in Soroti abattoir basing on sub-county of origin.

CHAPTER FIVE

DISCUSSION

5.1 Discussion

This marks the initial scientific study on economic cost of cattle liver lost attributed to Fascioliasis in the abattoirs of both Katakwi and Soroti Uganda. In this current investigation, the economic impact was limited to direct losses linked to condemned livers, which were examined in abattoirs and deemed unsuitable for human consumption. The condemnation of infested livers was the direct cause of economic loss in livestock farming (Obialigwe *et al.*, 2023). The rate of Fascioliasis infestation was at 58livers and 93livers in Soroti and Katakwi respectively of the cattle bodies that were inspected. In the study carried out in Russia showed that the economic loss due to liver damages by Fascioliasis totaled to 3,680 rubles from the 23 animal liver that were condemned (Sciences, 2020).

This research demonstrated a notable correlation between the BCS and infection with Fascioliasis. Fasciola infestation was high in animals with a BCS of 3 at the time of slaughter, affecting 31.7% and 55.2% in Katakwi and Soroti respectively. These findings align with the results obtained by Hambal *et al.* (2020) indicating that the predominant liver fluke identified was *Fasciola gigantica* (56.3%), affecting animals with a suboptimal BCS (3) the study indicates a positive correlation between Fascioliasis and Body Condition Score, this could also be attributed to the highest number of animals in these districts having a BCS of 3.

The economic loss was low 6202Ugx, 18729Ugx in females and 1169Ugx, 27165Ugx in males in Katakwi and Soroti respectively, this is attributed to the low number of female slaughtered animals examined than the male animals in both Katakwi and Soroti abattoirs this aligns with the study which showed that bulls are usually brought to the Abattoir for slaughter than cows which is in the tradition of cattle producers in many locations (Fatima *et al.*, 2023) similarly there is a high number of male animals slaughtered compared to female animals in all the two abattoirs.

The study in Katakwi showed that 58 out of 123(47.1%) livers examined were infected with Fascioliasis, in the similar way this study correlates with the 47.1% (312/663) of the animals that

were examined infested with Fascioliasis at Mettu Municipal Abattoir, Southwest Ethiopia Zeleke *et al.* (2014) this is due to availability of a suitable habitat for the snail intermediate hosts.

Our findings also indicated that young cattle aged 2–3 years old exhibited a higher infection rate (21.5%) with *Fasciola spp*. compared to animals aged 4 years and above. This study contradicts with the research carried out by Fatima *et al.* (2023) that showed high infestation rates at the age of > 4 years, (52.95%), followed by 2 years (39.62%) and 3 years (25.00%) this difference can be attributed to the few number of animals aged 3years that were examined.

The study found out that the prevalence was high in local breeds compared to cross breed in both Soroti and Katakwi this study matches with the study made by Minani *et al.*(2023) that showed a low prevalence 12.5% in cross breeds.

The study reveals an average weight of 0.64 kg in Katakwi and an average weight of 1.60 kg in Soroti per liver condemned due to Fascioliasis infestation, this high amount in Soroti compared to Katakwi was also brought about by the trimmed skills of the inspectors in addition to severity of the infection.

The research showed an approximate economic loss of 10,274 Ugx and 25,607 Ugx per infected animal in Katakwi and Soroti respectively which is higher than the economic losses which were found out at lira municipality abattoir in northern Uganda by Opio *et al.* (2021) of 5,000 UGX per animal, this difference can be attributed to the lower price of liver 10000per kg in Lira than that of 16000per kg in Soroti and Katakwi. This study also unveiled abattoir losses totaling 595,920 UGX (Katakwi) and 2,376,080 UGX (Soroti) in 32 and 5 days study period, stemming from liver condemnation due to Fasciola spp. infestation. Extrapolating this figure over a year, the equivalent annual loss would amount to 6,799,447 UGX and 173,453,840 UGX in Katakwi and Soroti respectively. This financial loss is different in both abattoirs. The difference in financial loss could be attributed to higher daily slaughter rate in the Soroti abattoir compared to the Katakwi abattoir, possibly reflecting a lower population of meat consumers in Katakwi district. In the related study carried out in south Africa in three abattoir had a total economic loss of 3456.2 USD Jaja *et al.* (2017), these differences in financial loss could be attributed to the

sampling scope, as the study in south Africa involved more abattoirs, whereas my study focused only two.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Our study found that cost losses due to Fasciola spp were 595,920Ugx in Katakwi and 2,376,080Ugx in Soroti district. These losses were linked to high infestation rates obtained from the surrounding swamps. The economic losses were high in cross breeds compared to the local breeds this could be attributed to high chances of exposure to areas infested with Fasciola. There was an average weight of 0.64 kg in Katakwi and an average weight of 1.60 kg in Soroti per liver condemned, this difference is due to the high intensity of infection in Soroti than Katakwi. The economic loss was low in females than males in both Katakwi and Soroti because of the high number of male animals slaughtered in both abattoirs.

This study also demonstrated a noteworthy association between the age of the animal and the BCS, as well as infestation with Fasciola spp. in cattle. Continuous liver inspection should be performed since the infection was significantly high in the areas to avoid human infection by liver flukes.

6.2 Recommendation

To prevent more economic losses and human infection by liver flukes, continuous liver inspection should be implemented, particularly in the area where the economic loss was observed to be significantly high.

There is a need to enhance livestock extension services provided by the veterinary authorities in Majorly in Katere and katakwi Sub-Counties to diminish the occurrences of bovine Fascioliasis.

Further studies should be conducted in this area to evaluate the zoonotic risk and assess the potential for human infestation with Fascioliasis.

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APPENDIX 1: Research budget

ACTIVITY	AMOUNT (shs)
Proposal preparation (printing)	25,000
Transport	200,000
Accommodation and feeding	200,000
Protective gears (gloves and masks)	40,000
Digital Weighing scale	300,000
Data analysis	150,000
Research write-ups (printing)	15,000
TOTAL AMOUNT	**930,000**

APPENDIX 2: Work plan

PERIOD	ACTIVITY
From September to late October	Proposal preparations
From 2rd November to 23rd December	Data collection in Katakwi district.
24th December to 28th December	Data collection in Soroti district
From 4th January to 10th January	Data analysis
From 15th January to 29th February	Research write-up

APPENDIX 3: Pictures

Picture taken during weighing of the liver

Picture taken during age determination by toothing method