



# Prevalence and economic inference of small ruminant foetal wastage at the Kusami Abattoir Ltd (Kasse)

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**Abstract**— Postmortem survey of small ruminant pregnancy wastage was conducted at Kumasi Abattoir Ltd, Kaase. Abattoir visits and investigations were conducted on 16 randomly selected abattoir working days. All mature ewes and does slaughtered on selected abattoir working days (mean = 71.69 animals/day) were included in the study, giving a total of 1,147 animals (301 ewes and 846 does). The reproductive tracts of study animals were collected at slaughter line and the uterus were grossly inspected for pregnancy. Thereafter, uterine body and horns were longitudinally incised to check the lumen for a visible fetus. The type of pregnancy (single or twin) was recorded and crown-rump length (CRL) of the largest fetus was demarcated on a piece of string and measured on a standard measuring tape. The length of gestation was estimated using the formula; Developmental Age (Days) =  $2.1(Y+17)$ , where Y = the CRL in “cm”. A survey was conducted within the premises of the Kumasi abattoir to estimate the average prices of matured small ruminants to calculate the prevailing market value of small ruminants. The potential economic impact of small ruminant abattoir fetal wastage was estimated by calculating the gross economic value and net economic value forgone due to loss of potential offspring. Kumasi Abattoir Annual Off-take was estimated to be 26,095 small ruminants where 73.8% were does and 26.2% were ewes. Pregnant does slaughtered had 37.2% of them carrying single foetus and 12.5% carrying twin foetus whereas pregnant ewes slaughtered had 28.9% carrying single foetus and 9.3% carried twin foetus. Total pregnancy wastage recorded had 3.7% early pregnancy and 96.3% mid-pregnancy with no late pregnancy recorded. Economic losses due to pregnancy wastage was estimated to be from GHS 2,755,140.80 to 3,534,791.80. The greater amounts of foetal waste encountered, places a substantial risk not only to the livestock production sector, but also to the economy of the nation.

**Keywords**—abattoir, small ruminants, pregnancy losses, economy.

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## INTRODUCTION

Small ruminant production represent a basis of animal protein and economic refuge for the rural poor and almost 30% of the entire meat consumed in the semi-arid sector are from small ruminants (Wilson, 1982).

High propagative performance is a precondition for every effective livestock production program. Certainly, there is no lactation if birth does not arise, no meat and fibre if continued existence cannot be safeguarded. It is not astonishing that, regular selection is focused towards suitability or the capacity of all creatures to live and to continue their own kind. Where farm resources are rigorously inadequate as it is habitually the situation in Sub Saharan Africa, reproduction failure is the main sign of declined output.

There is low small ruminant productivity witnessed in Ghana just like other African countries and is inhibited by numerous factors such as disease, poor management, little

or no veterinary care, low genetic prospective of native livestock, absence of state policy direction, low value of feeds and reproductive wastages (Adama *et al.*, 2011; Bisimwa *et al.*, 2018). All these dynamics have forced livestock production to persist at a subsistence level (Okorie *et al.*, 2018). Furthermore, due to increasing request for animal protein coupled with increasing population, poverty, and disease situation of small ruminants, farmers trade off their animals without bearing in mind their stage of fertility followed by inadequate meat inspection practices (Mshelia *et al.*, 2015). Thus, foetuses are frequently wasted during postmortem examination and that threatens the growth of the livestock industry, giving low value meat to patrons, and epitomize a serious difficulty for animal ethics (FAO, 2006).

Abortion and/or pre-natal mortality associated with specific genital infections (Noakes *et al.*, 2001) and postnatal offspring mortality represent major bottlenecks to small ruminant productivity. The challenge is often

exacerbated by the widespread practice of pregnant female slaughter in poorer regions of the world (Sanusi *et al.*, 2006; Tizhe *et al.*, 2010).

Slaughter of pregnant animals could be driven by economic forces (Kheradmand *et al.*, 2006) or result from inefficient ante-mortem inspection systems in use (Abassa 1995; Grandin, 2004). The practice threatens the sustainable supply of animal protein in developing countries (Singleton and Dobson 1995; Goossens *et al.*, 1998; Lawton 2000; Ngbede *et al.*, 2012) including Ghana.

It also raises serious ethical questions for consumers deprived of the accurate information to distinguish the grade of animals converted to the meat they eat (Fayemi and Muchenje 2013). Effective pregnancy detection systems are lacking in most Ghanaian abattoirs (Abassa 1995), which opens room for substantial fetal wastage due to the slaughter of pregnant small ruminants. This phenomenon is also observed in cattle (Mutwedu *et al.*, 2019) and pigs (Paul, Kevin, Caleb and Linus 2018).

The slaughter of pregnant small ruminants has questioned the efficiency of ante-mortem inspections at the abattoir, demonstrated the necessity for well-equipped Veterinary services for improved herd health management and has discouraged the efforts of the livestock husbandry system in increasing animal production to meet the growing demand for animal protein by the increasing human population (Chaudhari and Paul-Bokko 2000; Adass *et al.*, 2010; Ngbede *et al.*, 2012). This study was conducted to evaluate the extent of fetal wastages and to assess the economic losses associated with it at the Kumasi abattoir, Kaase, Ghana.

## MATERIALS AND METHODS

### Study area

This study was carried out at Kumasi Abattoir Limited, Kaase in the Ashanti region of Ghana. The abattoir is located at 6°39'36.6" N latitude and 1°36'15."W longitude, within the Kaase industrial area, Kumasi.

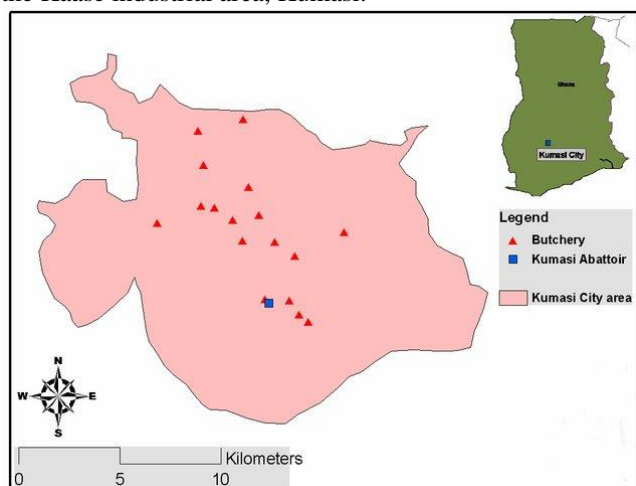


Figure 1: Study area and locations of Kumasi Abattoir.  
Source: Frimpong *et al.* (2012)

### Examination protocol and data collection

Postmortem survey of small ruminant pregnancy wastage was conducted for 16 days at Kumasi abattoir Ltd, Kaase. Abattoir visits and investigations were conducted on 16 randomly selected abattoir working days. All mature ewes and does slaughtered on selected abattoir working days (mean = 71.69 animals/day) were included in the study, giving a total of 1,147 animals (301 ewes and 846 does). The reproductive tract of study animals was collected at slaughter line and the uterus was grossly inspected for pregnancy. Thereafter, uterine body and horns were longitudinally incised to check the lumen for a visible foetus. The type of pregnancy (single or twin) was recorded and crown-rump length (CRL) of the largest fetus was demarcated on a piece of string and measured on standard measuring tape. The length of gestation was estimated using the formula proposed by Richardson's (Noakes *et al.*, 2001) as outlined below.

$$\text{Developmental Age (Days)} = 2.1(Y+17) \quad (1)$$

Where Y = the CRL in "cm".

Based on the estimated gestation length, pregnancy was classified as early (less than 50 days), mid (50 to 100 days) or late (more than 100 days) stage.

A survey was conducted within the premises of the Kumasi abattoir to estimate the average prices of matured small ruminants to calculate the prevailing market value of small ruminants termed in this study as current Kumasi market value (CKMV).

### Economic analysis

The potential economic impact of small ruminant abattoir fetal wastage was estimated by calculating the gross economic value (GEV) and net economic value (NEV) forgone due to loss of potential offspring as proposed by Noakes *et al.* (2001) follows-

$$\text{GEV} = (\text{SPI} \times \text{AO} + \text{TPI} \times \text{AO}) \times \text{CKMV}$$

$$\text{NEV} = \text{NPORM} \times \text{CKMV}$$

Where; **SPI** – Single pregnancy Incidence, **TPI** – Twin Pregnancy Incidence, **AO** – Annual Off take, **CKMV** - Current Kumasi Market Value and **NPORM** – Number of Potential Offspring's Reaching Market. Kumasi Abattoir Annual Off take (AO) = Average daily off-take (71.69) x Number of annual working days (7 days x 52 weeks = 364 days). That is; 71.69 x 364 = **26,095 animals**

Current Kumasi Market Value (CKMV) of a mature small ruminant estimated to range between GHS 245.60 – 315.10 according to market survey values.

The number of Potential Offspring Reaching Market (NPORM) was estimated by discounting small ruminant pregnancy loss of up to 10.6% (Abassa, 1995) and postnatal

### Statistical Analysis

Descriptive statistics [% , Mean± standard error (se)] was used to summarize study findings. Chi square test and one way ANOVA were used to assess variations related to categorical and numerical variables. Significant difference was fixed at  $p \leq 0.05$ .

## RESULTS AND DISCUSSIONS

The results of Pregnancy investigations in Does and Ewes are presented in table 1. More goats (846) were slaughtered than sheep (301) during the study period and this agrees with what was reported by Ahemen and Zahraddeen (2010) and Bokko (2011). This suggests that there is high preference and consumption of chevon in Ghana and the fact that goats can tolerate and adapt to a wide range of climatic conditions and a variety of feedstuff throughout the year. About 315 goats and 87 sheep had single fetus pregnancy, while 106 goats and 28 sheep had twin pregnancy. The results in this study show that more does ( $n=846$ ; 73.8%) than ewes ( $n=301$ ; 26.2%) were slaughtered. Out of the slaughtered female small ruminants (1147), 611 (53.3%) were not pregnant and 538 (46.7%) were detected to be pregnant and out of that, 35.1% had single pregnancy and 11.7% had twin pregnancy. The higher degree of female small ruminants slaughtered in this study is similar to other studies carried out by Bokko 2011; Borji *et al.*, 2011 and Simenew *et al.*, 2011.

The proportions of pregnant ewes and does slaughtered were 38.2% and 49.7% respectively, which indicated the incidence of pregnancy wastage in small ruminants. In a slaughterhouse survey of small ruminants in the Gambia, 60% of the 1,248 does slaughtered over one year were pregnant (Goossens *et al.*, 1998), higher than what was observed in this study.

Summary of post-mortem gestation stage estimation of small ruminants is presented in table 2. Out of 513 pregnancies recorded, 19 (3.7) of them were estimated early gestation with a mean CRL (CM) of 5.24(±0.136) and 494 (96.3%) were estimated as mid-gestation with a mean CRL (CM) of 15.9(±0.21). The gestational days varied significantly ( $P < 0.001$ ) between mean values for early (48.6 days) and mid (68.8 days) gestational days respectively. The mean rate of foetal wastage of 49.7% in goats and 38.2% in sheep recorded in this study is lesser than the recorded rates of 57% in goats reported by Muhammad *et al.* (2009). Out of the total pregnancies recorded in this study, 3.7% constituted early pregnancy ( $\leq 50$  days gestation) and 96.3% represented mid-pregnancy (50-100 days gestation). The implication is that for every 2.14 adult female small ruminant slaughtered, 1 foetus is aborted. The cause for the rates witnessed in this study might be that pregnancy detections are not regularly done for the period of anti-mortem examination in the slaughterhouse due to several reasons including inadequate infrastructure and staff capabilities in conducting pregnancy judgment, which is in line with Swai *et al.* (2015).

Majority of local sheep breeds possess coarse and wavy wool whereas local goat breeds have smooth and often short hair coats (Kassahun and Solomon, 2008), and according to Tamirat *et al.* (2015) such skin coat pattern could be allowing easier detection of pregnancy in leaner appearing does as compared to the ewes having more concealed abdomen.

The ever growing slaughter of pregnant small ruminants in their different stages of pregnancy has some added intentions other than absence of competency on Pregnancy Judgment (PJ) or gross inexperience. It is also likely that livestock farmers/or dealers sell pregnant small ruminants because, phenotypically they look weightier and presentable and therefore sell at enhanced prices as opposed to non-pregnant small ruminants. Economic resource constraints in spells of difficulty such as in the dry season might stimulate the haphazard sale of female small ruminants for slaughter.

### Economic analysis

The gross economic value (GEV) of annual pregnancy loss at Kumasi abattoir was roughly estimated from GHS 3,749,084 to 4,810,001.50. Accounting for prenatal pregnancy loss rate of 10.6% (Abassa, 1995) and postnatal lamb/kid mortality rate of 17.8% (Abassa, 1995), logically predicted under Sab-Saharan situations, net economic value (NEV) purely attributed to pregnant slaughter at Kumasi abattoir Ltd was estimated from GHS 2,755,140.80 to 3,534,791.80

$$\text{GEV} = [(\text{SPI} \times \text{AO}) + (\text{TPI} \times \text{AO})] \times \text{CKMV}$$
$$[(35.1\% \times 26,095) + (11.7\% \times 26,095 \times 2)] \times \text{GHS } 245.60 \text{ to } 315.10$$
$$(9,159 + 6,106) \times \text{GHS } 245.60 \text{ (Sheep) to } 315.10 \text{ (Goats)} =$$

GHS 3,749,084 to 4,810,001.50

$$\text{NEV} = \text{NPORM} \times \text{CKMV}$$
$$15,265 \text{ fetus} - 13,647 \text{ born} - 2,429 \text{ lamb/kid lost} = 11,218$$
$$\text{offspring reach market} \times \text{CKMV}$$
$$11,218 \times \text{GHS } 245.60 \text{ (Sheep) to } 315.10 \text{ (Goats)} =$$

GHS 2,755,140.80 to 3,534,791.80

The financial repercussions of fetal wastage in this study point to economic and production losses. Assessing the economic impact of slaughtering pregnant ewes and does at Kumasi abattoir, where an average ewe and doe cost GHS 245.6 and 315.1 resulted in economic loss of GHS 2,755,140.80 and 3,534,791.80 respectively for 1 year. These economic losses are necessary to reveal the amount of money lost to foetal wastage in one slaughterhouse in Ghana. Similar financial losses were recorded in Taraba State in Nigeria (Chama *et al.*, 2019), Ethiopia (Urga and Yohanis, 2021) and in Tanzania (Swai, *et al.*, 2015). The indiscriminate slaughters of pregnant animals seen in this study have shown to be occurring nationwide. This undermines the implementation of effective ante-mortem inspection regulations in Ghanaian abattoirs. Such scenarios reflect risks of broader indiscriminate pregnant livestock

slaughter in the country. By contrast, pregnant maternal slaughter in developed regions was often tied to economic reasons like harvesting medicinal pregnancy hormones, salvaging expenses when meat prices drop, etc. (Fayemi and Muchenje, 2013).

The result of this study when estimated for cattle, sheep, goats and pigs in the 16 regions of Ghana could demonstrate a huge financial loss to the state due to foetal

wastage. This gross production loss if not curbed is presumably going to affect the security of future animal protein sources when human population increases as predicted by FAO (Zakia and David 2016). The greater amounts of foetal waste encountered, places a substantial risk not only to the livestock production sector, but also to the economy of the nation.

Table 1: Postmortem Pregnancy Investigation in Ewes and Does

Species	Pregnancy status			Total
	Not pregnant	Single fetus	Twin fetus	
Sheep	186 (61.8)	87 (28.9)	28 (9.3)	301 (26.2)
Goat	425 (50.3)	315 (37.2)	106 (12.5)	846 (73.8)
<b>Total</b>	<b>611 (53.3)</b>	<b>402 (35.1)</b>	<b>134 (11.7)</b>	<b>1147</b>

Values in parenthesis are percentages

Table 2: Summary of Post-Mortem Gestation Stage Estimation

Gestation stage	Frequency: N (%)			CRL (CM)	Gestation length (Days)
	Total	Ewe	Doe	Mean ± SE	Mean ± SE
Early	19 (3.7)	3(0.6)	16(3.1)	5.24(±0.136)	48.6(±0.33)
Mid	494(96.3)	107(20.9)	387(75.4)	15.9(±0.21)	68.8(±0.45)
				P<0.001	P<0.001

## CONCLUSIONS

Post-mortem survey of reproductive tracts of mature female small ruminants at Kumasi abattoir indicated high levels of foetal wastage. Small ruminant pregnancy wastage appears mainly attributable to lack of effective early pregnancy detection procedures. The level of foetal wastage is a risk to the livestock sector and the economy of the nation.

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