FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 10 No. 23, December, 2026, pp 10 – 16
DOI: https://doi.org/10.33003/fjs-2026-1023-6228

Retrospective Study of Bovine Foetal Wastage at The Akure Semi-Mechanised Abattoir, Ondo State, Southwestern Nigeria

[*1]Nasir Maryam, [2]Abdulkareem B. Hikmot, [3]Idris O. Nahimah, [4]Olutekunbi O. Omosubomi, [4]Babalola A. Karimot, [3]Ayodele A. Titilayo, [5]Aliyu Abubakar, [6]Okafor O. Taiwo, [6]Olodun A. Oloruntoba, [6]Omoba A. Nathaniel

[1]Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, University of Ilorin, Nigeria.
[2]Department of Veterinary Medicine, Faculty of Veterinary Medicine, University of Ilorin, Nigeria.
[3]Department of Veterinary Microbiology, Faculty of Veterinary Medicine, University of Ilorin, Nigeria.
[4]Department of Veterinary Public Health and preventive Medicine, Faculty of Veterinary Medicine, University of Ilorin, Nigeria.
[5]Department of Veterinary Medicine, Faculty of Veterinary Medicine, University of Maiduguri, Nigeria.
[6]Ministry of Agriculture and Forestry, Akure, Ondo State, Nigeria.

*Corresponding authors' email: nasirmaryam551@gmail.com

Received: 11 Oct. 2026
Accepted: 06 Nov. 2026
Published: 10 Nov. 2026

ABSTRACT
Slaughter of pregnant cows results in foetal wastage, with implications for animal welfare and the economic productivity of cattle production. This study assessed the prevalence, pattern and potential economic impact of foetal wastage at the Akure Semi-Mechanised Abattoir, Ondo State, Nigeria, over a six-year period (2020–2025), using abattoir meat inspection records. Of the 44,733 cows slaughtered during the study period, 3,568 foetal wastage cases were recorded, giving an overall prevalence of 7.98%, equivalent to approximately one foetal wastage case for every 13 cows slaughtered. Foetal wastage prevalence varied over the study period, compared with 2020, the odds of foetal wastage were higher in 2024 (OR 1.33, 95% CI 1.18–1.50) and 2025 (OR 1.31, 95% CI 1.17–1.47) (P<0.001). Prevalence varied significantly by month (P<0.001), lowest from February to April (3.83-5.77%) and highest from May to November (9.05-11.06%), peaking in June (11.06%), when grouped by season it was higher in the wet (8.72%) than the dry season (6.54%) (P<0.001). The 3,568 foetuses represented a crude estimated economic loss of ₦713.6 million (approximately US$538,000). The findings demonstrate that foetal wastage is a persistent problem at the Akure abattoir. Strengthening antemortem pregnancy screening, improving coordination among veterinary personnel, cattle owners and livestock traders may help reduce the occurrence of foetal wastage.

Keywords: Foetal wastage, Akure abattoir, prevalence, Retrospective study. Nigeria.

INTRODUCTION

Globally, livestock contribute to about 30% of agriculture, provide about 34% of the protein supply, and are important sources of micronutrients, including iron and zinc, which the human body needs (Consalez et al., 2022; *Food and Agriculture Organization of the United Nations.*, 2025; Rueda García et al., 2024). Nevertheless, livestock production is constrained by factors that affect herd productivity and reproductive performance (Adebowale et al., 2020; More, Bicout, et al., 2017). Pregnant food animals are still being slaughtered in abattoirs in many parts of the world (Adelakun et al., 2019; Dauda et al., 2025; Raimi et al., 2017). Although the magnitude varies from one country to another (Nabasirye et al., 2024). Many African countries have reported higher prevalence, resulting in economic losses and threatening food security (Adebowale et al., 2020). Foetal wastage accounts for about 20%–25% of the decline in livestock numbers in sub-Saharan Africa and results in a consequent decrease in available dietary animal protein for Africa's fast-growing population, posing a public health issue (Dunka et al., 2017; More et al., 2017; Nabasirye et al., 2024).

Nigeria's livestock population of about 19.5 million cattle, 38.5 million sheep, and 57.4 million goats is insufficient to meet the ever-growing demand of over 200 million people(Adebowale et al., 2020; Danladi et al., 2024; Njoga et al., 2021). Although the Food and Agriculture Organization in 2013 recommended a protein dietary intake of 41.9kg per person for healthy human development, most individuals' intake is less than 9kg, which is around 20% of the recommendation (Bakari et al., 2025; Jajere et al., 2023). The human population in Nigeria is estimated to grow at 3.5% annually, while livestock resources are projected to grow between 0.8% and 2.9% annually (Okorie-Kanu et al., 2018). This may continue to worsen as the fast-growing Nigeria population is expected to further increase the gap between demand and domestic supply (Njoga et al., 2021). The decrease in the available lands for farming, and loss of future livestock replacement stock, exacerbated by foetal wastage due to the slaughter of pregnant female animals in many Nigerian abattoirs, will also contribute greatly to the reduction in the animal protein pool (Adebowale et al., 2020; Bakari et al., 2025; Dauda et al., 2025; Jajere et al., 2023).

The lack of implementation of the Meat Edict of 1968, which prohibits the slaughter of pregnant animals for meat in Nigeria has also contributed to this harsh practice (Okorie-Kanu et al., 2018). The practice of slaughtering pregnant food animals is unethical as it wastes foetuses and females of reproductive age (Uko et al., 2024; Wakayo & Abrham, 2021; Zubairu et al., 2022). The slaughtering of a pregnant cow also eliminates a reproductive unit capable of producing subsequent calves, while the wastage of female foetuses also indicates the loss of the future reproductive herd (More et al., 2017; Zubairu et al., 2022). This waste is an economic loss that threatens the sustainability of the livestock industry and

undermines livestock production and food security in Nigeria. In Nigeria, the slaughter of pregnant female cattle and the foetal wastage has been reported by several authors across the six geopolitical zones. South West (Adebowale et al., 2020; Raimi et al., 2017), South East (Njoga et al., 2026), South South(Uduak & Samuel, 2014), North Central (Dauda et al., 2025; Dunka et al., 2017), North West (Bakari et al., 2025; Zubairu et al., 2022), and North East (Jajere et al., 2023; Mshelia et al., 2015; Uko et al., 2024).

Although many abattoirs across Nigeria report data on foetal wastage, there is a paucity of information on foetal wastage in cattle at the Akure abattoir in Ondo State, where a large number of cattle are slaughtered annually. In view of this consideration, this study was designed to assess the prevalence of foetal wastage, seasonal variation and potential economic losses in slaughtered cattle at the Akure abattoir in South-Western Nigeria over a six-year period (2020 to 2025). The data provided in the present study would provide a basis to strategic interventions aimed at ensuring the highest quality of animal welfare standards and efficient livestock production practices.

MATERIALS AND METHODS

Study Area

The study was conducted at the Akure Semi-Mechanised Abattoir, Ondo State, South-Western, Nigeria. Akure lies within the humid rainforest zone of South-Western Nigeria, at latitude 7°15′N and longitude 5°15′E (Odetoyin et al., 2020). The estimated population of the area is about 744,000 (Adebayo et al., 2024). The mean annual relative humidity is over 58%, while the mean annual temperature is 26.7°C (Oloruntade et al., 2024). The region features a humid climate characterized by a prolonged rainy season spanning from March/April to October/November. This wet period is interrupted by a brief mid-season dry spell, commonly referred to as the "August Break" or monsoon drought—occurring between July and August, while the primary dry season extends from November through February or March (Oloruntade et al., 2024).

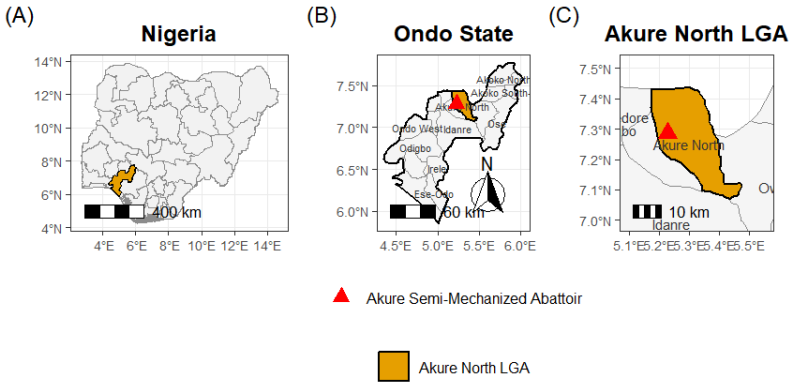


Figure 1: Map of the Study Site; Akure Semi Mechanized Abattoir, Ondo State, Nigeria (Design using R version 4. 3. 5.)

Study Design and Data Compilation from Abattoir Records

A retrospective study of foetal wastage among cows slaughtered at the Akure Semi-Mechanised Abattoir was conducted using records covering a six-year period from January 2020 to December 2025. Data were extracted from the abattoir record books kept at the Veterinary Public Health Office located within the abattoir. During routine post-mortem inspection, veterinarians working at the abattoir routinely examined slaughtered cattle and recorded cases of foetal wastage observed during evisceration of pregnant cows. These routine examinations and documentation were conducted during the regular working hours of 6:30 am to 11:00 am. The records included the total number of cattle slaughtered, numbers of cows slaughtered, and the number of foetuses recovered and recorded as foetal wastage.

Foetal Wastage Prevalence

Prevalence indices for foetal wastage were computed on a monthly, annual, seasonal, and overall basis, expressed as percentages, using the following formulae:

Monthly Prevalence (%) = (Number of foetal wastages recorded in a given month ÷ Total number of cows slaughtered in that month) × 100

Annual Prevalence (%) = (Number of foetal wastages recorded in a given year ÷ Total number of cows slaughtered in that year) × 100

Seasonal Prevalence (%) = (Number of foetal wastages recorded in a given season ÷ Total number of cows slaughtered in that season) × 100

Overall Prevalence (%) = (Total number of foetal wastages recorded across the study period ÷ Total number of cows slaughtered across the study period) × 100

These indices allowed foetal wastage trends to be compared across months, seasons, and years over the six-year study period.

Estimation of Potential Economic Losses Associated with Foetal Wastage

The economic losses arising from foetal wastage were estimated using the formula:

TEL = N × P (100% survival rate)

TEL represents the total economic loss, **N** denotes the total number of foetuses wasted during the study period, and **P** represents the average market value of a matured calf (₦200,000) based on prevailing local market prices stated by the cattle traders in Akure, Ondo State. The same price was used to estimate the economic loss for the six years. This method, which estimates the potential earnings that would have accrued had the foetuses been carried to term, born, and raised to maturity, is consistent with the approach (Ahmad et al., 2023; Dunka et al., 2017).

Statistical Analysis

Data for this study were extracted from abattoir records of 2020 to 2025 at Akure semi-Mechanised abattoir and was entered using Microsoft office excel®2021. Analysis were done using IBM SPSS® Statistics package, version 23 (IBM Corp., Armonk, NY, USA). The results were presented using descriptive statistics and figures showing the annual, monthly and seasonal distribution of foetal wastage and slaughtered cow. The association between foetal wastage and year, month and season was assessed using the chi-square test. P<0.05 were considered statistically significant. Unadjusted Odds ratios (OR) with 95% confidence intervals (CI) were calculated from a 2×2 tables of cows with and without foetal wastage for year, month and season.

RESULTS AND DISCUSSION

The result in Table 1 shows the annual distribution of cow slaughtered and foetal wastage from 2020 to 2025. Over the period, 44,733 cows were slaughtered and 3,568 foetal wastage giving an overall foetal wastage prevalence of 7.98% (CS: FW of 13:1). Foetal wastage had the highest prevalence of 9.82% and 9.67% in 2024 and 2025 respectively, 2025 recording the highest number of cows slaughtered (9,365) and 2020 recorded the least (6,618) as shown in figure 2. Compared with 2020, the odds of foetal wastage were lower in 2023 (OR 0.70, 95% CI 0.61–0.80) and higher in 2024 (OR 1.33, 95% CI 1.18–1.50) and 2025 (OR 1.31, 95% CI 1.17–1.47), while 2021 and 2022 did not differ from 2020.

Table 1: Yearly Distribution of Number of Cows Slaughtered and Foetal Wastage in Akure Semi Mechanized Abattoir from 2020-2025

Year	Number Of Cows Slaughtered	Number Of Foetal Wastage	CS:FW	Foetal Wastage (%)	Or (95% Ci)
2020	6618	500	13:1	7.56	1.00
2021	7380	547	13:1	7.41	0.98 (0.86–1.11)
2022	7347	552	13:1	7.51	0.99 (0.88–1.13)
2023	7068	380	19:1	5.38	0.70 (0.61–0.80)
2024	6955	683	10:1	9.82	1.33 (1.18–1.50)
2025	9365	906	10:1	9.67	1.31 (1.17–1.47)
TOTAL	44733	3568	13:1	7.98	–

CS: FW – Ratio of cows slaughtered to foetal wastage; OR – odds ratio (reference category: 2020); CI – confidence interval

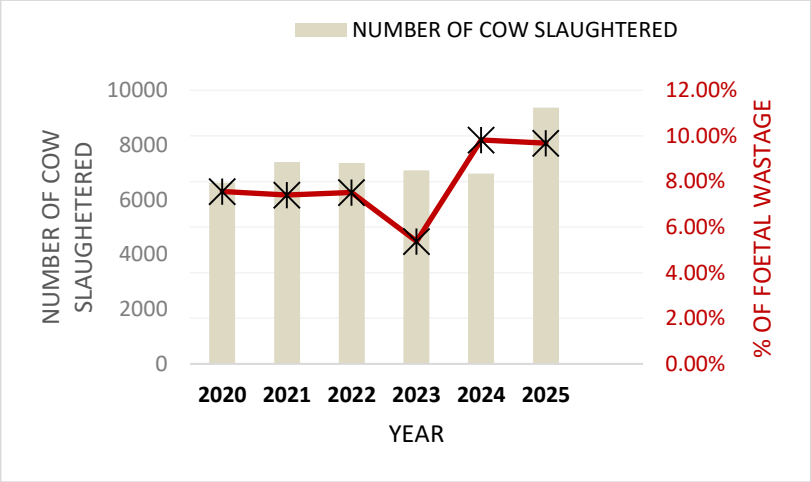


Figure 2: Yearly Distribution of Number of Cows Slaughtered and Foetal Wastage in Akure Semi Mechanised Abattoir from 2020-2025

Table 2 shows that foetal wastage varies noticeably across the months. The lowest wastage prevalence was recorded in February (4.46%) and march (3.83%). June and July recorded the highest foetal wastage rate (11.06%), (10.96%) respectively as shown in figure 3. Compared with March, the odds were highest in June (OR 3.13, 95% CI 2.55–3.83) and July (OR 3.09, 95% CI 2.53–3.78) and were not significantly different in February (OR 1.17, 95% CI 0.92–1.49).

Table 2: Monthly Distribution of Cows Slaughtered and Foetal Wastage in Akure Semi Mechanized Abattoir from 2020-2025

Month	Number of Cows Slaughtered	Number of Foetal Wastage	CS:FW	Foetal Wastage (%)	Or (95% Ci)
January	3909	249	16:1	6.37	1.71 (1.38–2.12)
February	3455	154	22:1	4.46	1.17 (0.92–1.49)
March	3424	131	26:1	3.83	1.00
April	3590	207	17:1	5.77	1.54 (1.23–1.92)
May	3841	365	11:1	9.50	2.64 (2.15–3.24)
June	3517	389	9:1	11.06	3.13 (2.55–3.83)
July	3861	423	9:1	10.96	3.09 (2.53–3.78)

Month	Number of Cows Slaughtered	Number of Foetal Wastage	CS:FW	Foetal Wastage (%)	Or (95% Ci)
August	3877	352	11:1	9.08	2.51 (2.04–3.08)
September	3702	335	11:1	9.05	2.50 (2.03–3.08)
October	3719	372	10:1	10.00	2.79 (2.28–3.43)
November	3754	346	11:1	9.22	2.55 (2.08–3.14)
December	4084	245	17:1	6.00	1.60 (1.29–1.99)
TOTAL	44733	3568	13:1	7.98	–

CS: FW – Ratio of cows slaughtered to foetal wastage; OR – odds ratio (reference category: March); CI – confidence interval

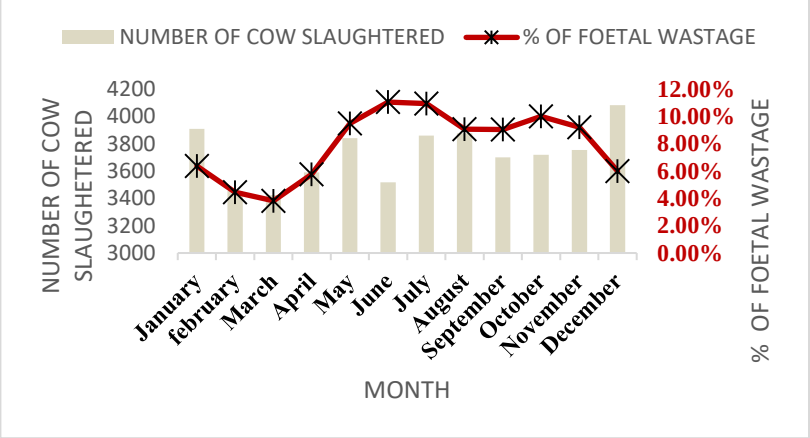


Figure 3: Monthly Distribution of Cows Slaughtered and Foetal Wastage in Akure Semi Mechanized Abattoir from 2020-2025

Table 3 shows the seasonal variation of foetal wastage. A total of 994 foetuses were wasted in the dry season with a prevalence of 6.54% while 2574 foetuses were wasted in wet season with prevalence of 8.72% as shown in figure 4. Foetal wastage was more prevalent in wet season than dry season. The odds were 1.36 times higher in the wet season than in the dry season (95% CI 1.27–1.47). The dry season used in this study was from November to February while the wet season was from March to October

Table 3: Seasonal Variation of Cows Slaughtered and Foetal Wastage in Akure Semi Mechanized Abattoir from 2020-2025

Season	Number Of Cows Slaughtered	Number Of Foetal Wastage	Cs:Fw	Foetal Wastage (%)	Or (95% Ci)
WET	29531	2574	11:1	8.72	1.36 (1.27–1.47)
DRY	15202	994	15:1	6.54	1.00
TOTAL	44733	3568	13:1	7.98	–

CS: FW – Ratio of cows slaughtered to foetal wastage; OR – odds ratio (reference category: dry season); CI – confidence interval

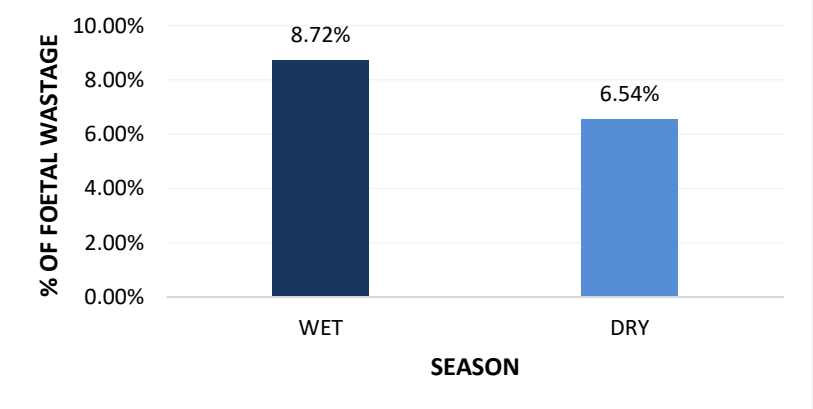


Figure 4: Seasonal Variation of Cows Slaughtered and Foetal Wastage in Akure Semi Mechanized Abattoir from 2020-2025

Estimation of Potential Economic Losses Associated with Foetal Wastage

Foetal wastage represents a potential source of economic loss to cattle producers due to the loss of potential calves before they reach marketable age. In the present study, 3,568 cases of foetal wastage were recorded over the six-year study period. Using a crude estimated market value of ₦200,000 per mature calf based on cattle trader prices, these losses corresponded to an estimated economic loss of ₦713.6 million if there is 100 percent survival of the calves. According to Central Bank of Nigeria, the current official-market data are around ₦1,328.78/US$1 as at September 2026, the estimated ₦713.6 million is approximately US$538,000.

Discussion

The overall foetal wastage prevalence of 7.98% recorded in this six-year retrospective study is lower compared to reports from other Nigerian abattoirs, though a wide range was documented across the country and the wider West African sub-region. Studies conducted at the Lafenwa abattoir in Ogun State recorded a foetal wastage rate of about 12.65% (Adebowale et al., 2020). A recent eleven-year retrospective study at the Jalingo abattoir in Taraba State also recorded a foetal wastage rate of about 12.2% (Uko et al., 2024), and a survey at the Kano main abattoir in North-Western Nigeria recorded as well a cattle-specific prevalence of 8.2 %, (Bakari et al., 2025). Subsequently, foetal wastage has been recorded in other African countries like a study by (Nabasirye et al., 2024) in Ugandan abattoir where an overall prevalence of 21.9% was recorded. Another slaughterhouse survey in Bukavu, Democratic Republic of Congo, found that 26.3% of cows slaughtered were pregnant (Mutwedu et al., 2019), In a study by Zitterer & Paulsen, (2021) in Austria, a prevalence of 6.4% was recorded in a one year retrospective study. The prevalence difference in each studies could be due to differences in cattle source, herd management practices, market dynamics and the rigour of ante-mortem pregnancy screening across study locations.

The statistically significant association between year and foetal wastage ($P<0.001$), with the highest prevalence recorded in 2024 (9.82%) and 2025 (9.67%), is similar to the trend reported by (Adebowale et al., 2020) where foetal wastage and female cattle slaughter increased significantly over time. This increase over time may be due to economic hardship, feed and pasture scarcity linked to insecurity and farmer-herder conflicts in parts of Nigeria, and growing pressure on herders to reduce breeding stock, including pregnant cows, for immediate cash. It could also partly reflect increased market at Akure abattoir itself, since more cattle, and by extension more pregnant cows, were slaughtered in 2025 than in any other year of the study.

Several factors documented elsewhere in Nigeria was similar to the pattern observed at Akure. A survey in South-Eastern Nigeria identified ignorance of the animal's pregnancy status, high demand for beef, buyer preference for large-bodied animals, feed scarcity during drought and economic hardship as the leading reasons for slaughtering pregnant cows (Njoga et al., 2021), while a comparable abattoir study in Bukavu, Democratic Republic of Congo, similarly linked the high level of slaughter of pregnant cows to inefficient livestock management practices and called for stronger veterinary inspection and legislation to curb the problem (Mutwedu et al., 2019). In most Nigerian production systems, cattle are reared extensively by pastoralists with little formal education, no controlled breeding programmes and no on-farm diagnostic facilities for early pregnancy detection, so pregnancy status is rarely known before an animal reaches the point of sale or slaughter. Nigeria's 1968 Meat Edict prohibits the slaughter of pregnant female animals except on veterinary advice(Adenuga & Montowska, 2023). Weak enforcement at markets, holding grounds and abattoirs, including Akure, allows the practice to persist.

The monthly and seasonal variation observed in this study, with the lowest wastage in February (4.46%) and March (3.83%) and the highest in June (11.06%) and July (10.96%), and an overall higher prevalence in the wet season (8.72%) than the dry season (6.54%), is consistent with reports that foetal wastage in Nigerian cattle fluctuates with season, although the direction of the effect differs across locations. A seven-year retrospective study at the Maiduguri abattoir similarly reported the highest foetal wastage during the rainy season, from August to early November, a pattern the authors linked to farming-related stress and economic hardship during this period (Jajere et al., 2023). In contrast, the eleven-year retrospective study at Jalingo abattoir found slightly higher foetal wastage in the dry season than the rainy season (Uko et al., 2024), while a six-year retrospective study at Hadeja abattoir in Jigawa State similarly recorded significantly higher foetal wastage in the dry season than the rainy season, a pattern the authors linked to feed scarcity, declining body condition and greater disease pressure on breeding stock as the dry season progressed (Zubairu et al., 2022). A four-year retrospective study at the Kumasi Abattoir in Ghana similarly found significantly higher foetal wastage in the dry season than the rainy season (73.8% vs. 26.2% of wastage cases), with an additional rise in December linked to increased festive-season slaughter demand (Atawalna et al., 2013). The wet-season peak recorded at Akure may possibly be because of greater pasture availability encouraging higher overall cattle turnover, physiological and nutritional stress associated with the transition from the dry to the wet season and stress-related emergency slaughter or condemnation.

Beyond the immediate loss of individual foetuses, the scale of wastage recorded over the six years, 3,568 foetuses from 44,733 cows slaughtered, represents a substantial drain on future herd replacement and national cattle stock. As observed at the Lafenwa and Kano abattoirs, this level of loss undermines efforts to expand domestic beef production and improve food security, given Nigeria's already low per capita animal protein intake relative to global averages (Adebowale et al., 2020; Bakari et al., 2025). Each pregnant cow slaughtered removes not only the dam's future reproductive output but also her calf, compounding the shortfall in replacement stock over successive breeding cycles. There are also welfare and food-safety dimensions to this practice: foetuses are capable of experiencing stress and pain from the second half of gestation, and slaughtering pregnant, often stressed or diseased, animals can compromise meat quality and increase the risk of transmitting zoonotic pathogens present in the reproductive tract during dressing and evisceration (Njoga et al., 2021).

The 3,568 cases of foetal wastage recorded during the six-year study period represented an estimated economic loss of ₦713.6 million (approximately US$538,000), corresponding to an average annual loss of about ₦118.9 million (US$89,500). This substantial economic loss highlights the broader production implications of foetal wastage, as the loss of viable foetuses represents a reduction in potential herd replacement and future cattle production. The scale of the economic loss estimated in the present study is consistent with substantial losses reported in other parts of Nigeria. Dunka, et al., (2017) estimated a total loss of ₦174.98 million (US$571,830.07) over five years in Jos, equivalent to

approximately ₦34.97 million annually, while Ahmad et al., (2023) reported an annual loss of ₦47.28 million in Kano. In the Federal Capital Territory, Dauda et al. (2025) estimated a loss of ₦79.14 million (US$83,300) within one year, whereas Adebowale et al. (2020) reported total and annual losses of ₦1.14 billion (US$2.94 million) and ₦94.53 million (US$234,546.14), respectively, in Ogun State. Differences in the reported losses may reflect variations in study duration, cattle throughput, local cattle prices, and the methods used to estimate foetal value. The economic burden demonstrated in the present study reinforces the importance of preventive measures at both farm and abattoir levels with strict enforcement of existing regulations, appropriate penalties for non-compliance.

Limitations of Study

As a retrospective analysis of abattoir records, the findings depend on the completeness and accuracy of routine documentation at Akure abattoir, and factors such as the breed, parity, gestational trimester, sex of the foetuses wasted and underlying cause of pregnancy loss in individual animals were not captured. Under-reporting is also possible where foetuses are removed or disposed of before formal inspection which may have caused the dip in foetal wastage recorded in 2023. Despite these limitations, the study provides a useful baseline for monitoring foetal wastage at the Akure abattoir.

CONCLUSION

This study found that foetal wastage varied over the six-year study period, with differences across months and seasons and the highest prevalence recorded in 2024 and 2025. The loss of viable calves also has financial implications for cattle owners and the livestock industry and may reduce the number of calves available for herd replacement. Pregnancy checks before slaughter, better enforcement of existing regulations, and increased awareness among cattle owners, traders and butchers could help reduce the slaughter of pregnant cows. The use of affordable rapid pregnancy tests and proper abattoir record-keeping may also improve early detection and monitoring. Regular monitoring of foetal wastage at the Akure abattoir and other slaughter facilities in Ondo State is recommended to help reduce the loss of calves and the related economic costs.

Acknowledgement

The authors gratefully acknowledge the Veterinary Division, Ministry of Agriculture and Forestry, Ondo State, Nigeria, for providing access to the data used in this study.

REFERENCES

Adebayo, V. A., Titus Adeniyi, O., Morayo Busayo, A., & Halimat Adeola, A. (2024). Prevalence of Gastrointestinal Parasite in Four Goat Breeds Slaughtered in Two Major Abattoirs in Akure, Ondo State, Nigeria. Asian Journal of Research in Animal and Veterinary Sciences, 7(1), 9–16. https://doi.org/10.9734/ajravs/2024/v7i1280

Adebowale, O. O., Ekundayo, O., & Awoseyi, A. A. (2020). Female cattle slaughter and foetal wastage: A case study of the Lafenwa abattoir, Ogun state, Nigeria. Cogent Food & Agriculture, 6(1), 1809308. https://doi.org/10.1080/23311932.2020.1809308

Adelakun, O. D., Akinseye, V. O., Adesokan, H. K., & Cadmus, S. I. B. (2019). Prevalence and Economic Losses Due to Bovine Tuberculosis in Cattle Slaughtered at Bodija Municipal Abattoir, Ibadan, Nigeria. Folia Veterinaria, 63(1), 41–47. https://doi.org/10.2478/fv-2019-0006

Adenuga, B. M., & Montowska, M. (2023). The Nigerian meat industry: An overview of products' market, fraud situations, and potential ways out [pdf]. Acta Scientiarum Polonorum Technologia Alimentaria, 22(3), 305–329. https://doi.org/10.17306/J.AFS.2023.1157

Ahmad, M. Y., Hanga, H. R., & Abdulwahab, K. S. (2023). FOETAL WASTAGE IN KANO CENTRAL ABATTOIR AND ITS IMPACT ON THE NIGERIAN ECONOMY. FUDMA Journal of Agriculture and Agricultural Technology, 8(2), 175–179. https://doi.org/10.33003/jaat.2022.0802.23

Atawalna, J., Emikpe, B., Shaibu, E., Mensah, A., Eyarefe, O. D., & Folitse, R. D. (2013). Incidence of fetal wastage in cattle slaughtered at the Kumasi Abattoir, Kumasi, Ghana. © IDOSI Publications, 2013, 11 (4).

Bakari, A. H., Habibu, S. M., Saulawa, M. A., Yusuf, M. S., Da'u, F., & Nagoma, A. U. (2025). Assessment of Fetal Wastage and its Economic Implication among Ruminant Animals Slaughtered at Kano Main Abattoir, North-Western Nigeria. 13 No. 3.

Consalez, F., Ahern, M., Andersen, P., & Kjellevold, M. (2022). The Effect of the Meat Factor in Animal-Source Foods on Micronutrient Absorption: A Scoping Review. Advances in Nutrition, 13(6), 2305–2315. https://doi.org/10.1093/advances/nmac089

Danladi, J., Kwaghe, A. V., Olasoju, T., Ibrahim, H. I., Buba, M. I., Dakogi, A. Y., & Vakuru, C. T. (2024). Prevalence, trends, and magnitude of bovine tuberculosis in slaughtered cattle across States in Nigeria, 2020-2022: A retrospective study. PAMJ-One Health, 15. https://doi.org/10.11604/pamj-oh.2024.15.20.45323

Dauda, I. D., Binhambali, A., Jibril, A. H., Idris, Z. O., & Akorede, F. R. (2025). Economic impact of fetal wastage and common diseases, along with their incidence rates and seasonal variations, at an abattoir in FCT, Nigeria. PLOS ONE, 20(2), e0310806. https://doi.org/10.1371/journal.pone.0310806

Dunka, H. I., Buba, D. M., Gurumyen, Y., Oragwa, O. A., D, O., Department of Veterinary Theriogenology and Production, Faculty of Veterinary Medicine, University of Jos, Plateau State, Nigeria., N, P., & Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, University of Jos, Plateau State, Nigeria. (2017). ECONOMIC LOSSES ASSOCIATED WITH THE SLAUGHTER OF PREGNANT ANIMALS IN JOS ABATTOIR. International Journal of Advanced Research, 5(7), 1047–1052. https://doi.org/10.21474/IJAR01/4813

Food and Agriculture Organization of the United Nations. (2025). [Food balance sheets 2010–2023.]. https://openknowledge.fao.org/handle/20.500.14283/cd7162en

Jajere, S. M., Mohammed, S., Jidda, D., & Emmanuel, E. T. (2023). Fetal Wastages Among Food-producing Animals Slaughtered at Maiduguri Abattoir: Prevalence, Causes and Economic Implications. Sahel Journal of Veterinary Sciences, 20(3), 46–52. https://doi.org/10.54058/saheljvs.v20i3.403

More, S., Bicout, D., Botner, A., Butterworth, A., Calistri, P., Depner, K., Edwards, S., Garin-Bastuji, B., Good, M., Gortazar Schmidt, C., Michel, V., Miranda, M. A., Saxmose Nielsen, S., Velarde, A., Thulke, H., Sihvonen, L., Spoolder, H., Stegeman, J. A., Raj, M., … Winckler, C. (2017). Animal welfare aspects in respect of the slaughter or killing of pregnant livestock animals (cattle, pigs, sheep, goats, horses). EFSA Journal, 15(5). https://doi.org/10.2903/j.efsa.2017.4782

Mshelia, G., Maina, V., & Aminu, M. (2015). Foetometrics and Economic Impact Analysis of Reproductive Wastages in Ruminant Species Slaughtered in North-Eastern Nigeria. Journal of Animal Production Advances, 5(4), 645. https://doi.org/10.5455/japa.20150216024050

Mutwedu, V. B., Buuma, B. K., Mushagalusa, A. C., Bisimwa, N. P., Cirezi, N. C., Mugumaarhahama, Y., & Ayagirwe, R. B. B. (2019). Prevalence and economic losses of calf fetal wastage in ELAKAT public slaughterhouse of Bukavu, Democratic Republic of Congo. Veterinary World, 12(10), 1644–1649. https://doi.org/10.14202/vetworld.2019.1644-1649

Nabasirye, S., Baluka, S. A., & Sengooba, A. (2024). Prevalence and economic losses associated with foetal wastage in abattoir. Veterinary Medicine and Science, 10(1), e1343. https://doi.org/10.1002/vms3.1343

Njoga, U. J., Njoga, E. O., Nwobi, O. C., Abonyi, F. O., Edeh, H. O., Ajibo, F. E., Azor, N., Bello, A., Upadhyay, A. K., Okpala, C. O. R., Korzeniowska, M., & Guiné, R. P. F. (2021). Slaughter Conditions and Slaughtering of Pregnant Cows in Southeast Nigeria: Implications to Meat Quality, Food Safety and Security. Foods, 10(6), 1298. https://doi.org/10.3390/foods10061298

Njoga, U. J., Njoga, E. O., & Oguttu, J. W. (2026). Maternal slaughter and foetal wastage in Nigerian municipal abattoirs: Prevalence, drivers, economic losses and One Health implications. One Health, 23, 101508. https://doi.org/10.1016/j.onehlt.2026.101508

Odetoyin, B., Adeola, B., & Olaniran, O. (2020). Frequency and Antimicrobial Resistance Patterns of Bacterial Species Isolated from the Body Surface of the Housefly (Musca domestica) in Akure, Ondo State, Nigeria. Journal of Arthropod-Borne Diseases. https://doi.org/10.18502/jad.v14i1.2715

Okorie-Kanu, O. J., Ezenduka, E. V., Okorie-Kanu, C. O., Anyaoha, C. O., Attah, C. A., Ejiofor, T. E., & Onwumere-Idolor, S. O. (2018). Slaughter of pregnant goats for meat at Nsukka slaughterhouse and its economic implications: A public health concern. Veterinary World, 11(8), 1139–1144. https://doi.org/10.14202/vetworld.2018.1139-1144

Oloruntade, A. J., Oguntunde, P. G., & Alao, F. (2024). Effects of Length of Monsoon Drought on the Annual Yield of Cocoa in Akure, Southwestern Nigeria. FUOYE Journal of Engineering and Technology, 9(3), 525–529. https://doi.org/10.4314/fuoyejet.v9i3.24

Raimi, C. . O., Oduguwa, B. . O., & Bamgboye, F. . O. (2017). SLAUGHTERED CATTLE AND REASONS FOR SLAUGHTERING COWS IN EMBER MONTHS AT LAFENWA ABATTOIR IN ABEOKUTA, NIGERIA. European Journal of Agriculture and Forestry Research, 5(1).

Rueda García, A. M., Fracassi, P., Scherf, B. D., Hamon, M., & Iannotti, L. (2024). Unveiling the Nutritional Quality of Terrestrial Animal Source Foods by Species and Characteristics of Livestock Systems. Nutrients, 16(19), 3346. https://doi.org/10.3390/nu16193346

Uduak, A., & Samuel, A. B. (2014). Incidence of foetal wastage and its economic implications in cattle slaughtered at Abak slaughter house Abak, Akwa-Ibom State (Pt 65-68).

Uko, I. B., Obialigwe, T. F., Nyifi, S. A., Ekechukwu, K. C., & Tanimu, E. (2024). Prevalence of Foetal Wastage in Jalingo Abattoir: A Retrospective Study. Sahel Journal of Veterinary Sciences, 21(1), 39–43. https://doi.org/10.54058/saheljvs.v21i1.439

Wakayo, B. U., & Abrham, Y. (2021). Prevalence and associated economic loss of fetal wastage in small ruminants slaughtered at Addis Ababa municipality abattoir, Ethiopia. Ethiopian Veterinary Journal, 25(1), 110–127. https://doi.org/10.4314/evj.v25i1.7

Zitterer, I., & Paulsen, P. (2021). Slaughter of Pregnant Cattle at an Austrian Abattoir: Prevalence and Gestational Age. Animals, 11(8), 2474. https://doi.org/10.3390/ani11082474

Zubairu, A. H., Haruna, U., Iliyasu, D., Mustapha, A. R., Lawan, F., Mustapha, M., Adamu, L., & Muhammad, S. T. (2022). Retrospective Study of Cattle Fetal Wastage at Hadeja Abattoir, Jigawa State: Economic Implication and Seasonal Variation. Sahel Journal of Veterinary Sciences, 19(1), 31–34. https://doi.org/10.54058/saheljvs.v19i1.303

©2026 This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International license viewed via https://creativecommons.org/licenses/by/4.0/ which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is cited appropriately.