



A survey of the reproductive performance of smallholder piggeries fed different feeds in Makurdi Benue State, Nigeria

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Abstract

This study evaluated the reproductive performance of smallholder piggeries fed different feed formulations in Makurdi metropolis. The proximate analysis of the feeds used was conducted and a total of 100 farms were surveyed. The gestation period of sows on commercial feed (114.61 ± 0.50 days), commercial mixed with compounded (111.42 ± 14.37 days) and compounded (113.32 ± 2.87 days) were not affected ($p > 0.05$). The number of services per pregnancy in sows on commercial feed (1.29 ± 0.47), commercial mixed with compounded (2.06 ± 7.80), and compounded (2.05 ± 7.80) were also not different ($p > 0.05$). Litter size was significantly lower ($p < 0.05$) in sows on commercial feed (15.68 ± 3.67) than those on compounded mixed with commercial (17.43 ± 2.69) and compounded (21.49 ± 5.75). Piglet mortality was significantly higher ($p < 0.05$) in sows on compounded feed (7.64 ± 2.24) than in those on compounded mixed with commercial (4.54 ± 1.26) and commercial (1.91 ± 0.89). The abortion rate was significantly higher ($p < 0.05$) in sows fed on compounded feed (7.50 ± 1.02) than those on commercial mixed with compounded (5.83 ± 1.26) and commercial (1.40 ± 0.98); stillbirth was also higher ($p < 0.05$) in sows on compounded feed (10.21 ± 4.76) than commercial mixed with compounded (5.48 ± 1.49) and commercial (0.96 ± 0.81). Sows on compounded feed had a higher incidence of uterine prolapse (6.49 ± 1.97), than those on commercial mixed with compounded feed (2.11 ± 1.25) and commercial feed (1.06 ± 0.78). Retained placenta was lower in sows fed on commercial feed (1.46 ± 0.97) than those on commercial mixed with compounded feed (4.95 ± 1.96) and compounded feed (4.79 ± 2.21). In conclusion, sows on compounded feed had good litter sizes than those on commercial and commercial mixed with compounded feed. It also, recorded the highest reproductive problems, followed by those on commercial mixed with compounded feed.

Keywords: Feed, Piggery, Reproduction, Smallholder, Sow

Introduction

Pig farming is a viable and profitable enterprise that can be easily adopted by smallholder farming systems. Pigs can be easily integrated into small- and marginal-scale farming systems and fed with by-products from crops that cannot be consumed or used more efficiently by small-scale farmers (Jaya *et*

al., 2022). In developing nations, the piggery sector directly empowers the rural poor, particularly women. Besides providing nutrition and contributing to food security, pig farming acts as insurance for the weaker section of society against agricultural failures (Jaya *et al.*, 2022). Nigeria is a major pig producer in

the West African Sub-region, producing about 9 of the 14 million pigs reared in the Sub-region (Ajibo *et al.*, 2020). In Nigeria, pig production activities are concentrated in the South, particularly in the Southeast, due to religious and cultural proscriptions to pig production and pork consumption in some parts of the North (Nwanta *et al.*, 2011).

There are about 10 million Nigerian households in rural and semi-urban areas involved in pig farming (World Bank, 2017). Swine production may have not just supported the economic well-being of these families but also improved the animal protein deficit in the country. The shortfall in the provision of animal protein in Nigeria may be attributed to the low rate of food-animal production, with the human population growth rate (Nkwocha *et al.*, 2010).

Reproductive performance in pigs is determined solely by the number of piglets weaned per sow per year (Abonyi *et al.*, 2012). The number can be influenced by certain reproductive parameters such as litter size, number of farrowings per sow per year, and number of piglets farrowed alive per sow per year (Abah *et al.*, 2019). Other parameters include percentage pre-weaning mortality, inter-farrowing interval, age at first farrowing and weaning to conception interval (Koketsu *et al.*, 2017). The cost of feed is a major constraint in the piggery industry; hence, pig farmers have resorted to the self-formulation and compounding of feed with available raw materials, which may pose a threat to pig productivity. This study was, therefore, designed to evaluate the reproductive performance of smallholder piggery fed on different feed formulations and also common reproductive problems associated with these feeds.

Materials and Methods

Location of study area

The study was conducted in Makurdi metropolis, the state capital of Benue State. Benue State is one of the 36 states in Nigeria. It is located in North Central Nigeria and has a tropical climate with two distinct seasons: rainy and dry seasons. Makurdi is a lowland area in the Guinea savannah vegetation zone of Nigeria with annual rainfall ranges from 1270 to 1397 mm and average annual temperature ranges from 22.43 to 33.41°C (Abu, 2002). Its coordinates are 7° 43' 50" North and 8° 32' 10" East and is defined by a 26km radius with the Benue River and its tributaries covering a substantial area of the town (Dauda *et al.*, 2009).

Selection of pig farms surveyed

A sampling frame of 100 piggeries was selected for the survey based on the willingness of the farm owners to partake in the study and the accessibility of the farms. In the final analysis, 50 piggeries were selected from the North bank and 50 piggeries from the South bank of Makurdi Local Government Area. All the farms surveyed were household/backyard piggeries. Twenty-eight (28) farms used commercial feed, 24 farms used commercial mixed with compounded feed and 48 farms used compounded feed. The available breeds on these farms are Large White, Duroc and Landrace (Table 1).

Data collection

A structured closed-ended questionnaire was prepared and distributed (one per farm) to the farm owners who were knowledgeable in the daily activities of the farms. Questions on the questionnaire border on the reproductive, fertility indices and reproductive problems of pigs reared. The researchers adopted a face-to-face interview format during the survey and verified information advanced by the respondents from their farm records (where available). For respondents who are limited in their ability to read or understand the English language, the content of the questionnaire was communicated in vernacular, and their responses were recorded accordingly. The study lasted for 6 Months (January to May 2023).

Research animals

The breeds of pigs used for this study were the Large White, Duroc and the Landrace a total of 100 farms with 272 sows (76 Large White, 46 Duroc and 150 Landrace) all sows were used. The animals were under an intensive system of management.

Feed analysis

Samples of different feeds encountered include commercial, commercial mixed with compound and compounded. Feed was formulated and compounded using (maize, maize bran, rice bran, limestone, bone meal, and palm kernel cake) and the open market and some from the farm. Feed samples were collected once during the research period and proximate analysis was carried out by the method described by Onweuke (2005).

Data analysis

Completed copies of the questionnaires were retrieved for collation and analysis of the data. Subsequently, the collated data were analyzed by one-way ANOVA using a Statistical Package for Social Science (SPSS) version 10. Post Hoc Multiple

Comparison Test was used to determine the significant difference, value $P < 0.05$ or $P = 0.05$ was considered statistically significant.

Results

Different feed formulations fed to these sows were subjected to proximate analysis, and the result is presented in Table 2. The results showed that the formulation using (maize, maize bran, rice bran, limestone, bone meal, and palm kernel cake) has the highest protein content (19.63%), followed by the formulation with (maize, Rice Bran, Palm Kernel Cake, Limestone, bone meal mixed with commercial feed 17.19%), then commercial feed (13.94%). The commercial feed with the lowest protein content has the highest nitrogen-free extract (49.51%) and the lowest ash (7.71%) than those with high protein content (Table 2).

The results of this study show that the gestation period of sows fed with commercial feed was (114.61 ± 0.50 days), commercial mixed with compounded (111.42 ± 14.37 days) and compounded (113.32 ± 2.87 days) were not significantly different ($P > 0.05$). Age at first service was significantly longer in sows fed on commercial feed (5.56 ± 0.52 months) than commercial mixed with compounded (4.10 ± 0.63 months) and compounded (4.13 ± 0.67 months) ($P < 0.05$). Commercial mixed with compounded feed (4.10 ± 0.63 months) and compounded (4.13 ± 0.67 months) ($P > 0.05$). The number of services per pregnancy was not significantly different ($P > 0.05$) in sows fed with commercial feed (1.29 ± 0.47), those on commercial mixed with compounded (2.06 ± 7.80) and compounded (2.05 ± 7.80) ($P > 0.05$). There was no significant difference between sows on commercial

mixed with compounded (2.40 ± 0.67) and compounded feed (2.48 ± 0.75) ($P > 0.05$). The number of farrows per year did not differ significantly among commercial (1.59 ± 0.59), commercial mixed with compounded (1.62 ± 0.49) and compounded feed (1.62 ± 0.49) ($P > 0.05$). Litter size was significantly higher in sows fed on compounded (21.49 ± 5.75), followed by those on compounded mixed with commercial (17.43 ± 2.69), and then those on commercial feed (15.68 ± 3.67) ($P < 0.05$). Piglet survival rate did not differ among sows on commercial feed (95.31 ± 1.26), commercial mixed with compounded (95.37 ± 1.58) and compounded (95.55 ± 1.49) ($P > 0.05$), Table 3. Piglet mortality was significantly higher in sows fed on compounded feed (7.64 ± 2.24) followed by those compounded mixed with commercial (4.54 ± 1.26) and then those on commercial (1.91 ± 0.89) ($P < 0.05$), Table 3. The results of this study show that the abortion rate was significantly higher in sows on compounded feed (7.50 ± 1.02), followed by commercial mixed with compounded (5.83 ± 1.26) and then commercial (1.40 ± 0.98) ($P < 0.05$).

Stillbirth was also significantly higher in sows on compounded feed (10.21 ± 4.76), followed by commercial mixed with compounded (5.48 ± 1.49) and then commercial (0.96 ± 0.81) ($P < 0.05$). Sows on compounded feed recorded the highest incidence of uterine prolapse (6.49 ± 1.97), followed by those on commercial mixed with compounded feed (2.11 ± 1.25), whereas those on commercial feed (1.06 ± 0.78) recorded the lowest incidence. ($P < 0.05$). Incidence of retained placenta was significantly lower in sows fed on commercial feed (1.46 ± 0.97) than

Table 1: Breeds of pig used and the location of the farms

S/N	Breeds	Number	Sex	Location (7° 43' 50" North and 8° 32' 10" East)
1	Large White	76	F	North Bank and South Bank
2	Duroc	46	F	North Bank and South Bank
3	Landrace	150	F	North Bank and South Bank

Table 2: Proximate analysis of the different feed samples used by the farmers

S/N	Feed Sample	Dry matter (%)	Crude protein (%)	Crude fibre (%)	Ether Extract (%)	Ash (%)	Nitrogen-free extract (%)
1	Maize, rice bran, palm kernel cake, limestone, bone meal and commercial	91.33	17.19	11.47	5.83	10.37	46.47
2	Maize, maize bran, rice bran, limestone, bone meal, palm kernel cake	89.86	19.63	11.48	8.58	10.51	39.66
3	Commercial	90.58	13.94	13.10	6.33	7.71	49.51

Table 3: Reproductive performance based on Type of feed

S/N	Feed Type	Age at 1 st service (month)	Number of services/pregnancies	Gestation period	Number of farrows per year	Litter size	Piglet survival rate	Piglet Mortality
1	Commercial	5.56±0.52 ^b	1.29±0.47 ^b	144.61±0.50	1.59±0.59 ^a	15.68±3.67 ^a	95.31±1.26 ^a	1.91±0.98 ^a
2	Commercial + compounded	4.10±0.63 ^a	2.06±7.80 ^b	111.42±4.37	1.62±0.49 ^a	17.43±2.69 ^b	95.37±1.58 ^a	4.54±1.26 ^b
3	Compounded	4.13±0.67 ^a	2.05±7.80 ^b	113.32±2.87	1.61±0.49 ^a	21.49±5.75 ^c	95.55±1.49 ^a	7.64±2.24 ^c

^{a,b,c} Means with different alphabet superscripts in the same column are different (P < 0.05)

Table 4: Reproductive problem based on feed type

S/N	Feed Type	n	Abortion rate	Still birth	Uterine Prolapse	Retained Placenta
1	Commercial	27	1.40±0.98 ^a	0.96±0.81 ^a	1.06±0.76 ^a	1.46±0.92 ^a
2	Commercial compounded	58	5.83±1.26 ^b	5.48±1.49 ^b	2.11±1.25 ^b	4.95±1.96 ^b
3	Compounded	58	7.50±1.02 ^c	10.20±4.76 ^c	6.49±1.97 ^c	4.79±2.21 ^b

^{abc} Means with different alphabet superscripts in the same column are different (P < 0.05). MSD = Mean Standard Deviation

those on commercial mixed with compounded (4.95 ± 1.96) and compounded (4.79 ± 2.21) (P<0.05). However, there was no significant difference between sows on commercial mixed with compounded feed (4.95 ± 1.96) and compounded (4.79 ± 2.21) (P>0.05), Table 4.

Discussion

One of the main goals of pig production is to wean at least 20 piglets from a sow per year. This requires an improvement in the area of nutrition and diet composition, management and husbandry techniques, for this reason our study focused on the different feed used by the farmers and the reproductive performance of their sows. There is no much information on the effect of compounded feed on the reproductive performance of pigs in Benue State. This study shows that compounded feed used by the farmers contained crude protein of 17.19 and 19.63% higher than the 13.5% to 15% crude protein recommended for sow.

The result of this study shows that the gestation period did not differ significantly between the sows fed commercial, commercial mixed with compounded and compounded feeds. This finding is consistent with the study of Ikeuchi *et al.* (2017) and Eskildsen *et al.* (2020), who reported that there was no difference in gestation length between sows fed different levels of protein. This could be because

gestation period of sow does not allow long variation like other animal species despite the litter size.

Age at puberty was longer in sows fed on commercial feed, this finding is inconsistency with the study by Akpakpa *et al.* (2014) and Singh *et al.* (2015), who reported that commercial feeds were associated with earlier puberty and with the report of Omonijo *et al.* (2019), who reported that there was no significant difference in age at puberty. These differences could be as a result of breed difference and quality of feed use to feed the sows and high protein content of compounded feed. Number of services per pregnancy was few in sows fed on commercial feed, this finding did not agree with the report of Omonijo *et al.* (2019), who reported no difference between sows fed on commercial and compounded feeds. This variation could be due to method of service, semen quality, and expertise.

Litter size was higher in the sows on compounded feed, followed by a combination of commercial and compounded feed and then commercial feed. This study corroborates the study by Okunade *et al.* (2010), who reported that sows fed on compounded feed had higher litter sizes than sows fed on commercial feed or a combination of commercial and compounded feed. This is likely due to the fact that compounded feed is more tailored to the specific needs of the sows, and it can be adjusted to provide them with optimal levels of nutrients at different stages of their pregnancy. However, it is inconsistent

with the study of Aletor *et al.* (1998), who reported that litter size was higher in sows fed on commercial feed than compounded feed. This difference could be as a result of climatic factor and variation in the source of feed ingredients and micronutrients.

Piglet survival rate did not differ in sows fed on compounded feed, commercial and commercial mixed with compounded feed. This study disagrees with the study of Smith *et al.* (2023) who reported that piglets fed on a compounded feed had a significantly higher survival rate (93.3%) than those fed on a commercial feed (86.7%); and the findings of Aderemi *et al.* (2012) who reported that piglet survival rate was lower in sows fed on compounded feed than those fed on commercial feed. This variation could be due to the quality of feed used and the management practices surrounding the piglets by the farmer. The result of this study shows that abortion was higher in the sows fed on compounded feed and commercial mixed with compounded feed than those on commercial feed, this finding is consistency with the study of Okunade *et al.* (2010), who reported that compounded feed is more likely to contain improper ratio of the micro and macro nutrient. Nutrient imbalances can also lead to abortion. But it is inconsistent with the study of Adedokun *et al.*, 2009, who reported that the prevalence of abortion was higher in sows fed on commercial feed, compared to compounded feed. The high prevalence of abortion in sows fed with commercial feed may be due to the presence of mycotoxins produced by fungi as a result of poor feed storage or other management practices.

Stillbirth was higher in sows fed on compounded feed and a combination of commercial and compounded feed. This study disagrees with the studies of Williams *et al.* (2022), Jones *et al.* (2023) and Smith *et al.* (2023), who reported that sows fed on compounded feed have fewer cases of stillbirth. This could be due to high nutrient quantity in compounded feed that increases litter size. High litter size increases the chances of stillbirth Egbodo *et al.* (2016).

Sows fed on compounded feed and the combination of compounded and commercial feed had higher incidences of uterine prolapse than those fed on commercial feed, this finding corroborates the study of Emenalom *et al.* (2020), who reported that sows fed on compounded feed had a high risk of uterine prolapse than sows fed on commercial feed. This could be due to an unbalanced ratio of the micro and macro nutrients in the composition of compounded feed and the high litter size that prolongs parturition time. But disagrees with the study of Nwosu *et al.*

(2023) who reported that uterine prolapse was higher in sows fed with commercial feed than those on compounded feed, which might be due to the management and other factors rather than feed. Retained placenta in sows fed on compounded feed and the combination of commercial and compounded feed was higher than those fed commercial feed. This finding is inconsistent with the study of Omede & Ogbuewu (2011), who reported that retained placenta was higher in sows fed with commercial feed than those fed with compounded feed. This variation could be due to in balance in certain minerals and vitamins in different feed formulations.

In conclusion, sows on compounded feed had better litter sizes than those on commercial and commercial mixed with compounded feeds. However, it recorded the highest reproductive problems, followed by those on commercial mixed with compounded feed.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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