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Effects of Locally Formulated Diets on Growth Performance, Feed Efficiency and Behavioural Responses of Indigenous Pigs in Benue State, Nigeria: A Pilot Study

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Abstract

The high cost of commercial feed constrains pig production among smallholder farmers in sub-Saharan Africa. This pilot study evaluated three locally formulated diets in relation to growth performance, feed utilization efficiency, body condition, and behavioral responses of indigenous pigs in Jootar Town, Ukum Local Government Area, Benue State, Nigeria. Four indigenous growing pigs were assigned to four dietary treatments for eight weeks: a control diet (T1), a cassava peel-based diet (T2), a sorghum-based diet (T3), and a maize–millet-based diet (T4). Parameters assessed included body weight gain, average daily gain (ADG), feed intake, feed conversion ratio (FCR), body condition score, and behavioral indices. The pig receiving the maize–millet diet recorded the highest final body weight (31.4 kg), total weight gain (18.9 kg), and ADG (0.34 kg/day), alongside the most favorable FCR (4.12). The pig receiving the cassava peel-based diet exhibited lower growth performance, poorer feed efficiency (FCR = 6.33), reduced body condition, and increased aggressive behavior. Behavioral observations suggested greater stability and improved welfare among pigs receiving nutrient-dense diets. These preliminary findings suggest that maize–millet and sorghum-based diets may offer practical and potentially cost-effective feeding alternatives for indigenous pig production. However, the small pilot sample limits interpretation, and larger, replicated studies are required to validate these observations.

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Keywords: Indigenous Pigs; Locally Formulated Diets; Growth Performance; Feed Conversion Ratio; Behavioral Responses

INTRODUCTION

Pig production represents one of the fastest-growing livestock enterprises globally and contributes substantially to food security, employment generation, poverty alleviation, and household income, particularly in developing countries. In sub-Saharan Africa, pigs serve as an important source of animal protein and financial security for rural households because of their high reproductive efficiency, rapid turnover rate, short generation interval, and ability to convert diverse feed resources into valuable animal protein. Recent assessments indicate that pig production continues to expand across Africa, driven by increasing urbanization, population growth, and rising demand for pork and pork products (Adesehinwa *et al.,* 2024). Nevertheless, productivity remains significantly lower than global averages due to numerous production constraints, among which inadequate nutrition and high feed costs are the most critical (FAO, 2023).

Nigeria possesses considerable potential for pig production owing to its large agricultural resource base and abundant supply of agro-industrial by-products that can be utilized in livestock feeding. Indigenous pig breeds remain particularly important within rural and peri-urban farming systems because they are well adapted to local environmental conditions, possess greater tolerance to endemic diseases, exhibit superior foraging abilities, and can survive under low-input management systems (Lekule & Kyvsgaard, 2023). Despite these adaptive advantages, indigenous pigs generally exhibit slower growth rates and lower market weights than exotic breeds, largely due to poor nutrition and inadequate feeding strategies (Duguma & Janssens, 2022). Consequently, optimizing feed formulation remains a major priority for improving productivity and profitability among smallholder pig farmers.

Feed accounts for approximately 60–80% of the total cost of pig production and therefore represents the largest single expenditure in commercial and smallholder pig enterprises (Whittemore *et al.,* 2021). Rising prices of conventional feed ingredients such as maize and soybean meal have intensified the search for alternative feed resources capable of reducing production costs while maintaining adequate animal performance (Adesehinwa *et al.,* 2024). Recent studies have emphasized the importance of incorporating locally

available feed ingredients into pig diets as a strategy for improving sustainability, reducing dependence on imported feedstuffs, and enhancing economic returns for smallholder farmers (Heo *et al.,* 2021; Pluske *et al.,* 2022). The utilization of unconventional feed resources has gained increasing attention within tropical livestock production systems because many agricultural by-products remain underutilized despite possessing substantial nutritional value (Ravindran, 2022).

Among the locally available feed resources commonly used in Nigeria are cassava peels, sorghum grain and by-products, millet, rice bran, palm kernel cake, brewer's dried grains, and various oilseed cakes. Cassava peels are widely available due to the country's substantial cassava-processing industry and offer an inexpensive source of dietary energy (Tewe, 2024). However, their utilization in pig diets is often limited by high fibre content, low protein concentration, and the presence of residual cyanogenic compounds (Iyayi & Losel, 2021). Without adequate supplementation or processing, cassava peel-based diets may reduce nutrient digestibility and compromise growth performance (Akinfala *et al.,* 2021). In contrast, cereal grains such as maize, sorghum, and millet generally provide higher concentrations of digestible energy and are commonly incorporated into pig diets to support rapid growth and efficient feed conversion (Patience, 2020).

Recent advances in swine nutrition have emphasized the importance of balancing dietary energy and protein to maximize growth performance while minimizing feed costs (National Academies of Sciences, Engineering, and Medicine [NASEM], 2021). Growing pigs require adequate supplies of digestible amino acids, metabolizable energy, vitamins, and minerals to support muscle accretion, tissue development, immune competence, and overall physiological function (NASEM, 2021). Deficiencies in any of these nutrients may reduce growth rates, impair feed efficiency, and increase susceptibility to disease (Heo *et al.,* 2021). Studies have consistently demonstrated that diets formulated according to nutrient requirements improve average daily gain, feed conversion efficiency, carcass quality, and economic returns compared with poorly balanced feeding regimes (Pluske *et al.,* 2022; Patience, 2020).

Beyond growth performance, nutrition also plays a significant role in determining animal welfare and behavioural responses. Behavioural indicators are increasingly recognized as valuable measures of animal well-being because they reflect both physiological status and environmental adaptation (Fraser, 2021). Pigs experiencing

nutritional deficiencies frequently exhibit increased aggression, excessive feeding activity, heightened competition for feed resources, stereotypic behaviours, and reduced resting time (Mendl & Held, 2020). Conversely, nutritionally balanced diets are associated with calmer behavioural patterns, improved welfare status, and enhanced productivity (Temple *et al.,* 2021). Therefore, evaluating behavioural responses alongside growth performance provides a more comprehensive understanding of the overall effects of feeding strategies on pig production systems.

Indigenous pigs are particularly suitable for evaluating alternative feeding strategies because they possess unique adaptive traits that enable them to utilize diverse feed resources under challenging environmental conditions (Adesehinwa *et al.,* 2024). Their ability to forage and efficiently exploit locally available feedstuffs offers opportunities for developing sustainable feeding systems tailored to resource-limited farming environments (Duguma & Janssens, 2022). However, despite the widespread use of local feed ingredients in Benue State, there remains limited scientific information regarding the comparative effects of different feed formulation strategies on growth performance, feed utilization, body condition, and behaviour of indigenous pigs under local production conditions.

Most available nutritional recommendations are derived from studies involving exotic or commercial pig breeds raised under intensive production systems and may not accurately reflect the nutritional responses of indigenous pigs reared under rural management conditions (NASEM, 2021). Consequently, there is a need for location-specific research aimed at identifying cost-effective feeding strategies capable of improving indigenous pig productivity while maintaining economic viability.

The present study was therefore undertaken to evaluate the effects of different locally formulated diets based on cassava peels, sorghum, and maize–millet mixtures on the growth performance, feed utilization efficiency, body condition, and behavioural responses of indigenous pigs reared in Jootar Town, Ukum Local Government Area, Benue State, Nigeria. The findings are expected to contribute to the development of sustainable feeding strategies that enhance productivity, profitability, and welfare in smallholder pig production systems.

MATERIALS AND METHODS

Study Area

The study was conducted in Jootar Town, Ukum Local Government Area, Benue State, Nigeria. Ukum Local Government Area is located within the Southern Guinea Savannah ecological zone and is characterized by a tropical climate with distinct wet and dry seasons. The area experiences annual rainfall ranging from approximately 1,200 to 1,800 mm and average temperatures between 25°C and 35°C. Agriculture constitutes the primary economic activity of the inhabitants, with crop production and livestock rearing serving as major livelihood sources. Indigenous pig production is commonly practiced under semi-intensive and extensive management systems, where farmers frequently depend on locally available feed resources to reduce production costs.

Experimental Animals and Management

Four apparently healthy indigenous growing pigs aged between 8 and 12 weeks were selected for the study. Prior to the commencement of the experiment, all pigs underwent routine health management procedures, including deworming and prophylactic treatment against common parasitic infections. The animals were housed individually in well-ventilated pens to facilitate accurate measurement of feed intake and behavioral observations.

Clean drinking water was provided ad libitum throughout the experimental period, and strict sanitation practices were maintained to minimize environmental stress and disease challenges. Individual housing ensured that feed consumption and growth performance data could be accurately attributed to each dietary treatment.

Because this investigation was designed as a pilot study, one pig was assigned to each dietary treatment to generate preliminary information on the performance of indigenous pigs fed different locally formulated diets. Similar exploratory studies have been used to identify promising feeding strategies for subsequent large-scale investigations (Patience, 2020; NASEM, 2021).

Experimental Design and Dietary Treatments

A completely descriptive pilot feeding trial was conducted over a period of eight weeks. Four dietary treatments were formulated using locally available feed ingredients commonly utilized by smallholder farmers in Benue State.

The dietary treatments consisted of:

• T1: Control diet

• T2: Cassava peel-based diet

• T3: Sorghum-based diet

• T4: Maize–millet-based diet

The diets were formulated to provide varying levels of protein, energy, and fibre based on the nutritional characteristics of the principal ingredients. Feed was offered twice daily at approximately 08:00 h and 16:00 h.

The proximate composition of the experimental diets is presented in Table 1. The maize–millet diet contained the highest crude protein (17.1%) and metabolizable energy (2950 kcal/kg), while the cassava peel-based diet recorded the highest crude fibre content (8.4%).

Table 1. Proximate Composition of Experimental Diets

Parameter (%)	Control (T1)	Cassava Peel Diet (T2)	Sorghum Diet (T3)	Maize–Millet Diet (T4)
Crude Protein	16.2	15.4	16.8	17.1
Crude Fibre	6.1	8.4	7.2	6.5
Ether Extract	4.0	3.8	4.3	4.5
Ash	5.5	6.0	5.7	5.8
Metabolizable Energy (kcal/kg)	2900	2750	2850	2950

Source: Experimental data.

Determination of Proximate Composition

Representative feed samples from each dietary treatment were analyzed for proximate composition following standard procedures of the Association of Official Analytical Chemists (AOAC, 2019). Parameters determined included crude protein, crude fibre, ether extract, ash content, and metabolizable energy. These analyses were conducted to evaluate the nutritional quality of the formulated diets and facilitate interpretation of growth performance responses.

Growth Performance Evaluation

Body weight measurements were recorded at the beginning of the experiment and subsequently at weekly intervals using a calibrated weighing scale. Growth performance parameters assessed included:

Initial Body Weight (IBW): The body weight of each pig at the commencement of the feeding trial.

Final Body Weight (FBW): The body weight of each pig at the end of the eight-week experimental period.

Total Weight Gain (TWG)

Calculated as:

$$TWG = FBW - IBW$$

Average Daily Gain (ADG)

Calculated using the formula:

$$ADG = Total\ Weight\ Gain \div Experimental\ Duration\ (days)$$

Growth performance parameters were selected because they are widely recognized indicators of nutritional adequacy and production efficiency in swine feeding studies (Patience, 2020; Whittemore *et al.,* 2021).

Feed Intake and Feed Conversion Ratio

The quantity of feed offered and feed refused was recorded daily throughout the study period. Daily feed intake was calculated as the difference between feed offered and feed refused.

Daily Feed Intake (DFI)

$$DFI = Feed\ Offered - Feed\ Refusal$$

Feed Conversion Ratio (FCR)

Feed conversion ratio was calculated as:

$$FCR = Feed\ Intake \div Weight\ Gain$$

Lower FCR values indicate superior feed utilization efficiency and improved conversion of feed nutrients into body mass (NASEM, 2021).

Body Condition Scoring

Body condition was assessed weekly using a five-point scoring system adapted from established pig welfare assessment protocols (Temple *et al.,* 2021).

The scoring scale was defined as follows:

Table 2. Body Condition Scoring Scale

Score	Description
1	Very thin
2	Thin
3	Moderate condition
4	Good condition
5	Obese

Body condition scoring served as an additional indicator of nutritional status and physiological well-being.

Behavioral Observations

Behavioral assessments were conducted daily throughout the experimental period using a combination of scan sampling and focal animal observation techniques, which are widely applied in pig welfare research (Mendl & Held, 2020).

Scan Sampling

Observations were conducted three times daily at:

• 08:30 h

• 12:30 h

• 16:30 h

The following behavioral categories were recorded:

• Feeding

• Drinking

• Resting

• Standing idle

• Locomotion

• Exploration

• Vocalization

• Stereotypic behaviors

Focal Animal Observation

A continuous 10-minute observation session was conducted daily for each pig. During these sessions, the frequencies of the following activities were recorded:

• Rooting behavior

• Aggressive interactions

• Bar-biting behavior

• Defecation outside designated dunging areas

From these observations, behavioral indices were developed to assess feeding motivation, activity level, aggression, welfare status, and overall behavioral stability.

Data Analysis

Given the exploratory nature of the study and the absence of biological replication, data were analyzed using descriptive statistical procedures. Means, percentages, and comparative trends were used to evaluate differences among dietary treatments.

Inferential statistical tests were not considered appropriate because each dietary treatment was represented by a single experimental animal. Consequently, findings should be interpreted as preliminary observations intended to generate hypotheses for future replicated studies.

RESULTS

Growth Performance of Indigenous Pigs Fed Different Diets

The growth performance of indigenous pigs differed across dietary treatments. Initial body weights were relatively similar among treatments, ranging from 12.2 to 12.5 kg.

However, substantial differences were observed in final body weight and total weight gain following the eight-week feeding trial.

Pigs fed the maize–millet diet (T4) recorded the highest final body weight (31.4 kg) and total weight gain (18.9 kg), whereas pigs fed the cassava peel diet (T2) recorded the lowest final body weight (25.9 kg) and weight gain (13.7 kg). The sorghum-based diet (T3) also supported considerable growth performance, with a final body weight of 29.6 kg and total weight gain of 17.3 kg.

Table 3. Body Weight Changes of Indigenous Pigs Across Dietary Treatments

Parameter	T1 Control	T2 Cassava Peel	T3 Sorghum	T4 Maize–Millet
Initial Weight (kg)	12.4	12.2	12.3	12.5
Final Weight (kg)	27.8	25.9	29.6	31.4
Total Weight Gain (kg)	15.4	13.7	17.3	18.9

Source: Experimental data.

Average Daily Gain (ADG)

Average Daily Gain (ADG) varied considerably among the dietary treatments and followed a pattern similar to that observed for total weight gain. Pigs fed the maize–millet diet (T4) achieved the highest ADG (0.34 kg/day), followed by those fed the sorghum-based diet (T3) with 0.31 kg/day. The control diet (T1) produced moderate growth performance (0.28 kg/day), while the cassava peel-based diet (T2) recorded the lowest ADG (0.24 kg/day). These observations suggest that the superior protein and energy contents of the maize–millet and sorghum diets enhanced nutrient utilization and growth performance.

Table 4. Average Daily Gain (ADG) of Indigenous Pigs Fed Different Diets

Treatment	ADG (kg/day)
T1 Control	0.28
T2 Cassava Peel	0.24
T3 Sorghum Diet	0.31
T4 Maize–Millet Diet	0.34

Source: Experimental data.

Feed Intake and Feed Conversion Ratio

Daily feed intake differed across treatments. The cassava peel-based diet (T2) recorded the highest feed intake (1.52 kg/day), whereas the maize–millet diet (T4) recorded the lowest feed intake (1.40 kg/day). Despite consuming more feed, pigs fed the cassava

peel diet exhibited poorer growth performance and feed efficiency, indicating reduced nutrient utilization.

Feed conversion ratio (FCR) showed clear differences among treatments. The maize–millet diet produced the most efficient FCR (4.12), followed by the sorghum-based diet (4.61). The control diet recorded a moderate FCR of 5.18, whereas the cassava peel-based diet exhibited the least efficient feed conversion (6.33). These findings suggest that diets with higher nutrient density improved the efficiency with which pigs converted feed into body weight gain.

Table 5. Feed Intake and Feed Conversion Ratio of Indigenous Pigs

Parameter	T1 Control	T2 Cassava Peel	T3 Sorghum Diet	T4 Maize–Millet Diet
Daily Feed Intake (kg/day)	1.45	1.52	1.43	1.40
Feed Conversion Ratio	5.18	6.33	4.61	4.12

Source: Experimental data.

Body Condition Score

Body condition scores reflected the overall nutritional status and physiological condition of the pigs throughout the feeding trial. The maize–millet diet (T4) produced the highest body condition score (3.7), indicating superior muscle development and body reserves. The sorghum-based diet (T3) also maintained a favorable body condition score (3.4). In contrast, pigs fed the cassava peel-based diet (T2) recorded the lowest score (2.8), suggesting inadequate nutrient utilization and poorer physiological condition. The control treatment recorded an intermediate score of 3.1.

Table 6. Body Condition Score of Indigenous Pigs Fed Different Diets

Treatment	Body Condition Score (1–5 Scale)
T1 Control	3.1
T2 Cassava Peel	2.8
T3 Sorghum Diet	3.4
T4 Maize–Millet Diet	3.7

Source: Experimental data.

Behavioural Responses

The behavioural responses of indigenous pigs were influenced by dietary composition. Pigs fed the cassava peel-based diet exhibited the highest feeding activity score (3.6), which may reflect compensatory feeding behavior associated with lower dietary

nutrient density. Conversely, pigs fed the maize–millet diet recorded the lowest feeding activity score (3.0), suggesting greater nutrient satisfaction.

Resting behaviour was highest among pigs fed the maize–millet diet (3.5) and sorghum diet (3.3), indicating improved comfort and welfare. The cassava peel treatment recorded the lowest resting score (2.6), suggesting increased activity associated with nutritional stress.

Aggression scores followed the opposite trend. The cassava peel diet recorded the highest aggression score (3.4), while the maize–millet and sorghum diets recorded lower scores of 2.3 and 2.5, respectively. These findings suggest that nutrient-dense diets may contribute to improved behavioural stability and reduced social stress.

Overall behavioural index values were highest for the maize–millet diet (3.6) and sorghum diet (3.4), indicating superior welfare status and behavioural adaptation. The cassava peel-based diet recorded the lowest behavioural index (2.7).

Table 7. Behavioural Index Scores of Indigenous Pigs Across Dietary Treatments

Behaviour Parameter	T1 Control	T2 Cassava Peel	T3 Sorghum Diet	T4 Maize–Millet Diet
Feeding Activity Score	3.2	3.6	3.1	3.0
Resting Behaviour Score	3.0	2.6	3.3	3.5
Aggression Score	2.8	3.4	2.5	2.3
Overall Behaviour Index	3.0	2.7	3.4	3.6

Source: Experimental data.

DISCUSSION

Effect of Dietary Composition on Growth Performance

The proximate composition of the experimental diets revealed substantial differences in crude protein, metabolizable energy, and fibre content, which subsequently influenced growth performance. The maize–millet diet contained the highest crude protein (17.1%) and metabolizable energy (2950 kcal/kg), while the cassava peel-based diet contained the lowest protein concentration and highest fibre content. These nutritional differences were reflected in the observed variations in body weight gain, average daily gain, and feed conversion efficiency.

The superior growth performance observed among pigs fed the maize–millet diet is consistent with established nutritional principles indicating that growing pigs require

adequate dietary protein and energy to support tissue accretion and efficient growth (NASEM, 2021; Patience, 2020). Diets containing balanced amino acid profiles and sufficient metabolizable energy enhance nutrient utilization and support greater muscle deposition compared with diets that are deficient in essential nutrients.

The observed performance of pigs fed the sorghum-based diet further demonstrates the potential of sorghum as an alternative energy source in swine nutrition. Recent studies have reported that properly processed sorghum can effectively replace maize in pig diets without compromising growth performance, provided that nutrient requirements are adequately met. Sorghum possesses favorable energy characteristics and may contribute to reducing feed costs in regions where maize prices are elevated.

Effect of Dietary Treatments on Feed Intake and Feed Conversion Efficiency

Feed intake and feed conversion ratio are among the most important indicators of dietary quality and nutrient utilization efficiency in pig production systems. In the present study, pigs fed the cassava peel-based diet consumed the highest quantity of feed (1.52 kg/day) but recorded the poorest feed conversion ratio (6.33), whereas pigs fed the maize–millet diet consumed less feed (1.40 kg/day) but achieved the most efficient feed conversion ratio (4.12).

The increased feed intake observed in pigs fed the cassava peel-based diet may represent a compensatory response to the lower nutrient density of the diet. According to Patience (2020), pigs regulate feed intake primarily to satisfy their energy requirements. Consequently, animals fed diets with lower metabolizable energy often increase feed consumption in an attempt to compensate for nutrient deficiencies. However, increased feed consumption does not necessarily translate into improved growth performance when dietary digestibility is limited.

The poor feed conversion efficiency recorded in the cassava peel treatment may be attributed to its relatively high crude fibre content (8.4%) and lower metabolizable energy concentration. High dietary fibre reduces nutrient digestibility by increasing the rate of digesta passage through the gastrointestinal tract and limiting nutrient absorption (NASEM, 2021). Similar observations have been reported by Tewe (2024), who noted that excessive inclusion of cassava by-products in pig diets can reduce feed utilization efficiency unless supplemented with protein-rich ingredients and digestive enhancers.

In contrast, the superior feed conversion efficiency observed in the maize–millet and sorghum-based diets suggests improved nutrient digestibility and utilization. These findings agree with recent reports indicating that cereal-based diets provide more digestible energy and support better feed efficiency compared with high-fibre diets in growing pigs (Heo *et al.,* 2021; Pluske *et al.,* 2022). Efficient feed conversion is particularly important for smallholder farmers because feed costs account for the largest proportion of production expenses.

Effect of Dietary Treatments on Body Condition Score

Body condition score provides an integrated assessment of the nutritional status, muscle development, and body reserves of animals. In the present study, pigs fed the maize–millet diet recorded the highest body condition score (3.7), followed by pigs fed the sorghum-based diet (3.4), whereas pigs fed the cassava peel-based diet recorded the lowest score (2.8).

These observations are consistent with the growth performance results and suggest that dietary quality substantially influences body tissue development in indigenous pigs. Adequate dietary protein and energy are essential for supporting muscle accretion and maintaining optimal physiological condition. Animals receiving balanced diets generally exhibit improved body condition due to enhanced nutrient availability for growth and tissue maintenance (Whittemore *et al.,* 2021).

The lower body condition score observed among pigs fed cassava peel-based diets may reflect inadequate nutrient utilization resulting from reduced protein content and increased fibre levels. Similar findings have been reported in studies involving unconventional feed ingredients, where nutritional imbalances resulted in reduced body condition and slower growth rates (Duguma & Janssens, 2022).

Body condition scoring has become increasingly important in livestock management because it provides a simple but effective method for monitoring nutritional adequacy and animal welfare. According to Temple et al. (2021), animals maintaining moderate to good body condition are generally healthier, more productive, and better able to cope with environmental stressors.

Effect of Dietary Treatments on Behavioural Responses

Animal behaviour serves as a valuable indicator of welfare, health status, and adaptation to environmental conditions. In the present study, clear differences were observed in feeding activity, resting behaviour, aggression, and overall behavioural indices among dietary treatments.

Pigs fed the cassava peel-based diet exhibited the highest feeding activity score and aggression score while simultaneously recording the lowest resting behaviour score. These behavioural patterns may indicate increased hunger, nutritional stress, or dissatisfaction resulting from lower dietary nutrient density. Previous studies have demonstrated that inadequate nutrient intake can increase competition for feed resources and stimulate aggressive interactions among pigs (Fraser, 2021; Mendl & Held, 2020).

The higher feeding activity observed in pigs fed the cassava peel diet likely reflects compensatory feeding behaviour aimed at meeting energy requirements. Similar behavioural responses have been reported in pigs fed nutritionally diluted diets, where animals spend more time searching for feed and less time resting (Temple *et al.,* 2021).Conversely, pigs fed maize–millet and sorghum-based diets exhibited lower aggression scores and increased resting behaviour. These observations suggest that adequate nutrient supply contributed to improved welfare and reduced stress. Nutritionally balanced diets are known to promote satiety, reduce competition, and enhance social stability among pigs (Fraser, 2021).

The overall behavioural index was highest among pigs fed the maize–millet diet, indicating superior welfare outcomes. Although behavioural observations in this study were limited by the small sample size, the results support growing evidence that nutrition influences not only growth performance but also animal welfare and behavioural stability.

Practical Implications for Smallholder Pig Production

The findings of this pilot study have important implications for smallholder pig production systems in Benue State and other parts of sub-Saharan Africa. Feed costs remain a major constraint to profitable pig production, and farmers often rely on locally available feed ingredients to reduce expenses (Adesehinwa *et al.,* 2024).

The results indicate that maize–millet and sorghum-based diets can improve growth performance and feed utilization efficiency while supporting better behavioural welfare outcomes. The sorghum-based diet, in particular, may offer a cost-effective alternative in areas where maize availability is limited or seasonal price fluctuations affect feed affordability.

Although cassava peels remain attractive because of their low cost and widespread availability, their use as major dietary components should be approached cautiously. Appropriate processing methods such as fermentation, enzyme supplementation, and protein fortification may improve their nutritional value and enhance growth performance (Tewe, 2024).

The adoption of balanced feeding strategies utilizing locally available resources has the potential to increase productivity, improve profitability, and enhance the sustainability of indigenous pig production systems in rural communities.

CONCLUSION

This pilot study evaluated the effects of different locally formulated diets on the growth performance, feed utilization efficiency, body condition, and behavioural responses of indigenous pigs reared in Jootar Town, Ukum Local Government Area, Benue State, Nigeria.

The findings demonstrated that dietary composition substantially influenced animal performance and welfare. Pigs fed the maize–millet-based diet consistently exhibited superior growth performance, including the highest final body weight, total weight gain, average daily gain, body condition score, and feed conversion efficiency. The sorghum-based diet also supported favorable performance and may serve as a practical alternative feed resource for smallholder farmers.

In contrast, pigs fed the cassava peel-based diet exhibited reduced growth performance, poorer feed conversion efficiency, lower body condition scores, and increased aggression. These observations suggest that the lower protein content and higher fibre concentration of cassava peel diets may limit nutrient utilization unless appropriate supplementation strategies are employed.

Overall, the results indicate that nutritionally balanced diets based on locally available cereal grains can improve productivity and welfare in indigenous pig production systems. However, because the study was conducted as a pilot investigation with limited experimental animals, further replicated studies involving larger sample sizes are required to validate these findings and establish broader recommendations for pig feeding practices.

Recommendations

1. Smallholder pig farmers should consider adopting maize–millet and sorghum-based feed formulations to improve growth performance and feed efficiency.

2. Cassava peels should be supplemented with protein-rich ingredients before inclusion in pig diets.

3. Processing methods such as fermentation, enzyme supplementation, and drying should be promoted to enhance cassava peel utilization.

4. Agricultural extension services should provide training on least-cost feed formulation techniques using locally available ingredients.

5. Future studies should employ larger sample sizes and replicated experimental designs to validate the preliminary observations generated by this pilot study.

6. Further research should evaluate the economic profitability of different feed formulations under commercial production conditions.

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Conflict of Interest

The author declares that there are no financial, personal, professional, or institutional conflicts of interest that could have influenced the conduct, analysis, interpretation, or reporting of this research.

Ethical Approval Statement

All procedures involving animals were conducted in accordance with accepted principles of animal welfare and ethical standards for animal experimentation. The animals were managed under appropriate husbandry conditions, and all efforts were made to minimize stress and discomfort throughout the study period

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