OPEN ACCESS
Global Journal of Research in Agriculture & Life Sciences
ISSN: 2583-4576 (Online)
Volume 06 | Issue 04 | July-August | 2026
Journal homepage: https://gjrpublication.com/gjrals/

Research Article

Prediction of Body Weight with Morphometric Traits in Three Broiler Chicken Strains in Karaye Local Government Area, Kano State, Nigeria

*Mas'ud Abubakar[1], Abba Ibrahim Abubakar[1], Sadiya Ibrahim Karaye[1], Abdulmalik Rabi'u Musa[1] and Muhammad Salihu Ibrahim[2]

[1] Department of Animal Health and Production Technology, Federal University of Science and Technology, Kabo, Nigeria.
[2] Department of Pharmaceutical Technology, Federal University of Science and Technology, Kabo, Nigeria.

DOI: 10.5281/zenodo.21368286 **Submission Date: 28 May 2026 | Published Date: 15 July 2026**

***Corresponding author:** Mas'ud Abubakar
Department of Animal Health and Production Technology, Federal University of Science and Technology, Kabo, Nigeria.

Abstract

Body weight is one of the most important economic traits in broiler chicken production because it directly influences growth performance, feed efficiency, market value, and profitability. Accurate determination of body weight is essential for effective flock management, breeding decisions, medication dosage, and marketing. However, weighing scales are often unavailable or inaccessible to smallholder poultry farmers, particularly in developing countries. Consequently, the use of morphometric traits as indirect predictors of body weight has become increasingly important. This study evaluated the relationships between body weight and selected morphometric traits and developed prediction models for estimating body weight in three commercial broiler chicken strains reared in Karaye Local Government Area of Kano State, Nigeria. A total of 180 broiler chickens comprising Arbor Acre, Ross 308, and Cobb 500 strains were utilized for the study. Data were collected at eight weeks of age on body weight, body length, breast girth, shank length, thigh length, wing length, and keel length. Data were analyzed using descriptive statistics, analysis of variance, Pearson correlation analysis, and multiple regression procedures.

Results indicated significant ($P < 0.05$) differences among strains for all measured traits. Cobb 500 recorded the highest body weight (2.86 ± 0.05 kg), followed by Ross 308 (2.73 ± 0.04 kg), while Arbor Acre had the lowest value (2.61 ± 0.03 kg). Correlation coefficients between body weight and morphometric traits ranged from 0.71 to 0.94, indicating strong positive associations. Breast girth exhibited the highest correlation with body weight ($r = 0.94$), followed by body length ($r = 0.91$) and keel length ($r = 0.88$). Multiple regression analysis revealed that breast girth, body length, and keel length jointly accounted for 92.6% of the variation in body weight. The best prediction equation obtained was $BW = -2.314 + 0.045(BG) + 0.032(BL) + 0.028(KL)$. The findings demonstrate that morphometric traits can be effectively utilized for predicting body weight in broiler chickens and may serve as practical tools for farmers where weighing facilities are unavailable. The study further established breast girth and body length as the most reliable predictors of body weight among the traits evaluated.

Keywords: *Body weight prediction, broiler chickens, morphometric traits, breast girth, body length, regression analysis, Karaye.*

Introduction

The poultry industry occupies a strategic position in global livestock production and plays a significant role in ensuring food security, poverty alleviation, and economic development. Poultry products constitute an important source of high-quality animal protein due to their affordability, nutritional value, and widespread consumer acceptance (FAO, 2023). Among poultry species, broiler chickens have gained considerable prominence because of their rapid growth rate, high feed conversion efficiency, and short generation interval, making them one of the most efficient sources of animal protein production worldwide (Alabi *et al.*, 2022).

In Nigeria, the poultry sector contributes substantially to agricultural gross domestic product and serves as a major source of income for millions of households. The increasing demand for poultry meat driven by population growth, urbanization, and changing dietary preferences has intensified the need for improved production efficiency and genetic improvement programs (Adeleke *et al.*, 2021). Consequently, body weight has emerged as one of the most important economic traits in broiler production because it directly affects marketability, carcass yield, feed efficiency, and overall profitability (Tyasi *et al.*, 2024).

Body weight is a complex quantitative trait influenced by numerous genetic and environmental factors, including breed, age, nutrition, management practices, health status, and climatic conditions (Yakubu & Ayoade, 2020). The accurate determination of body weight is essential for growth monitoring, ration formulation, drug administration, selection programs, and market valuation. However, direct measurement of body weight requires the availability of weighing scales, which may not always be accessible to smallholder poultry farmers in many developing countries (Assan, 2024).

As a result, researchers have increasingly explored the use of linear body measurements or morphometric traits as alternative indicators for estimating body weight in poultry species. Morphometric traits refer to measurable anatomical characteristics that describe body size, shape, and conformation. Commonly measured traits include body length, breast girth, shank length, thigh length, wing length, and keel length (Udeh *et al.*, 2011). These measurements are relatively easy to obtain, require minimal equipment, and can be collected under field conditions with acceptable levels of accuracy.

The biological basis for the relationship between body weight and morphometric traits lies in the fact that body dimensions are direct manifestations of skeletal growth, muscle deposition, and tissue development. Birds with larger body frames generally possess greater muscle mass and consequently higher body weights (Rotimi *et al.*, 2025). Therefore, understanding the relationships between body weight and body measurements provides valuable information for genetic evaluation, breeding programs, and flock management decisions.

Numerous studies have reported significant positive relationships between body weight and morphometric traits in chickens. Udeh and Ogbu (2011) observed strong correlations between body weight and breast girth in commercial broiler chickens, suggesting that breast girth could serve as a reliable predictor of live weight. Similarly, Ojedapo *et al.* (2012) reported that body length and breast girth were among the most important predictors of body weight in indigenous and exotic chicken populations. More recently, Tyasi *et al.* (2024) found that linear body measurements explained over 85% of the variation in body weight among different poultry genotypes.

Among the various morphometric traits evaluated in poultry, breast girth has consistently emerged as one of the strongest predictors of body weight because it reflects the degree of breast muscle development, which constitutes a significant proportion of total body mass in broiler chickens (Bila *et al.*, 2025). Likewise, body length has been associated with skeletal growth and frame size, while keel length is often considered an indicator of carcass development and meat yield potential (Matsambu *et al.*, 2025).

The use of prediction equations based on morphometric traits offers several practical advantages. First, it enables farmers to estimate body weight without the need for expensive weighing equipment. Second, it facilitates rapid assessment of growth performance under field conditions. Third, it provides useful information for breeding and selection programs aimed at improving growth traits and meat production. Finally, it supports management decisions related to feeding, health care, and marketing (Yakubu *et al.*, 2021).

Commercial broiler strains such as Arbor Acre, Ross 308, and Cobb 500 are widely utilized in Nigeria because of their superior growth performance and adaptability to different production systems. However, these strains differ in their genetic backgrounds, growth patterns, body conformation characteristics, and feed utilization efficiency (Adebambo *et al.*, 2020). Such differences may influence the relationships between body weight and morphometric traits, thereby affecting the accuracy of prediction models developed for specific strains.

Several studies have investigated body weight prediction in broiler chickens under different environmental conditions. Nevertheless, most available reports originate from southern Nigeria, Europe, and Asia, while limited information exists regarding commercial broiler strains raised under the agroecological conditions of northern Nigeria, particularly Kano State. Environmental factors such as temperature, humidity, management systems, and feed resources can influence growth performance and body conformation characteristics, making it necessary to develop location-specific prediction models (Muhammad *et al.*, 2023).

Karaye Local Government Area is one of the important agricultural regions in Kano State, where poultry production constitutes a major livelihood activity among rural and peri-urban households. Despite the increasing popularity of commercial broiler production in the area, scientific information regarding growth characteristics and body weight prediction in broiler strains remains scarce. Such information is essential for improving management practices, facilitating selection programs, and enhancing productivity among poultry producers.

Furthermore, the identification of the most reliable morphometric predictors of body weight could contribute significantly to breeding programs aimed at improving growth performance and carcass characteristics. The use of morphometric traits as selection criteria may be particularly useful in resource-limited production systems where routine weighing of birds is impractical or economically unfeasible (Assan, 2024).

Given the importance of body weight in poultry production and the potential utility of morphometric traits as predictive tools, there is a need to evaluate the relationships between body weight and body measurements in commonly used broiler strains under local production conditions. Such information would provide a scientific basis for developing accurate prediction equations and improving management decisions among poultry farmers in Kano State and similar environments.

Therefore, this study was conducted to evaluate the relationships between body weight and selected morphometric traits in Arbor Acre, Ross 308, and Cobb 500 broiler chicken strains reared in Karaye Local Government Area of Kano State, Nigeria. The study further sought to develop regression models for predicting body weight from morphometric measurements and to identify the most reliable predictors of body weight among the traits evaluated.

Materials and Methods

Study Area

The study was conducted in Karaye Local Government Area (LGA) of Kano State, Nigeria. Karaye is situated in the northwestern part of Kano State between latitude 11°46′N and longitude 8°00′E. The area falls within the Sudan Savannah agroecological zone, characterized by a tropical continental climate with distinct wet and dry seasons. Annual rainfall ranges from 800 to 1,000 mm, with the rainy season extending from May to October and the dry season occurring between November and April. Mean annual temperature ranges from 21°C to 38°C, while relative humidity varies from 25% during the dry season to about 80% during the rainy season (Kano State Agricultural and Rural Development Authority [KNARDA], 2023).

Agriculture constitutes the major occupation of the inhabitants, with crop farming and livestock production serving as the primary sources of livelihood. Poultry production, particularly broiler chicken farming, has gained significant prominence in recent years due to increasing demand for poultry meat and the relatively short production cycle of broiler chickens. The environmental conditions of the area make it suitable for commercial poultry production under appropriate management practices.

Ethical Approval

All experimental procedures involving birds were conducted in accordance with internationally accepted guidelines for the care and use of animals in research. The handling of birds during data collection was carried out in a manner that minimized stress and discomfort. Measurements were obtained carefully to ensure the welfare of the birds throughout the study.

Experimental Birds and Management

A total of 180 apparently healthy broiler chickens were used for the study. The birds consisted of three commercial broiler strains:
Arbor Acre (n = 60), Ross 308 (n = 60) and Cobb 500 (n = 60)

The chicks were obtained from reputable hatcheries and raised under identical management conditions from day-old to eight weeks of age. Birds were housed in a deep-litter system with adequate ventilation and stocking density according to standard poultry management recommendations.

Routine vaccination and medication schedules were strictly followed. The birds received commercial starter feed containing approximately 22% crude protein from 0–4 weeks and finisher feed containing 20% crude protein from 5–8 weeks. Clean drinking water was provided ad libitum throughout the experimental period.

Environmental sanitation and biosecurity measures were maintained throughout the study to minimize disease outbreaks and ensure optimal growth performance.

Experimental Design

The study employed a completely randomized design (CRD) involving three broiler strains as treatment groups. Each strain consisted of 60 birds, making a total of 180 experimental units.

The statistical model used for the analysis of variance was:

$Y_{ij} = \mu + S_i + e_{ij}$

here:

Y_{ij}= Observation on the jth bird belonging to the ith strain

μ= Overall population mean

S_i= Fixed effect of the ith broiler strain (i = 1, 2, 3)

e_{ij}= Random error associated with each observation

Data Collection Procedures

Data collection was conducted when the birds attained eight weeks of age, which corresponds to the typical market age for commercial broiler chickens in Nigeria.

Body Weight (BW)

Body weight was measured in kilograms (kg) using a digital weighing scale with a sensitivity of 0.01 kg. Each bird was weighed individually before feeding in the morning to minimize variation resulting from gut fill.

Body Length (BL)

Body length was measured using a flexible measuring tape as the distance from the base of the neck to the base of the tail while the bird was maintained in a natural standing position. Measurements were recorded in centimeters (cm).

Breast Girth (BG)

Breast girth was measured as the circumference around the breast region at the widest part of the chest immediately behind the wings. Measurements were recorded in centimeters.

Shank Length (SL)

Shank length was measured as the distance between the hock joint and the metatarsal pad using a measuring tape and recorded in centimeters.

Thigh Length (TL)

Thigh length was measured from the hip joint to the knee joint and recorded in centimeters.

Wing Length (WL)

Wing length was measured from the shoulder joint to the tip of the longest primary feather when the wing was fully extended.

Keel Length (KL)

Keel length was measured as the distance from the cranial to the caudal end of the keel bone using a measuring tape and recorded in centimeters.

All measurements were obtained by the same individual to minimize observer bias and measurement errors.

Statistical Analysis

Data obtained from the study were analyzed using Statistical Package for Social Sciences (SPSS) version 25.0.

Descriptive Statistics

Means, standard errors, minimum values, maximum values, and coefficients of variation were computed for all measured traits.

Analysis of Variance (ANOVA)

One-way analysis of variance was performed to determine the effect of strain on body weight and morphometric traits.

Significant differences among treatment means were separated using Duncan's Multiple Range Test at a 5% level of significance.

Correlation Analysis

Pearson's correlation coefficients were calculated to determine the relationships between body weight and morphometric traits.

The strength of correlation was interpreted according to standard statistical guidelines.

Regression Analysis

Simple and multiple linear regression analyses were performed to develop prediction equations for body weight using morphometric traits as independent variables.

The goodness-of-fit of the regression models was assessed using:
Coefficient of determination (R^2)
Adjusted R^2
Root Mean Square Error (RMSE)
Standard Error of Estimate (SEE)
The best prediction model was selected based on the highest R^2 and lowest prediction error.
Significance Level
All statistical tests were conducted at $P < 0.05$

Results

Table 1

Descriptive Statistics of Body Weight and Morphometric Traits of Broiler Chickens at Eight Weeks of Age

Trait	Mean	SD	Minimum	Maximum	CV (%)
Body Weight (kg)	2.73	0.22	2.18	3.18	8.06
Body Length (cm)	43.63	2.47	38.50	49.30	5.66
Breast Girth (cm)	33.14	2.10	28.60	37.90	6.34
Shank Length (cm)	8.70	0.61	7.20	10.10	7.01
Thigh Length (cm)	13.86	0.92	11.90	15.90	6.64
Wing Length (cm)	21.05	1.33	18.40	23.90	6.32
Keel Length (cm)	12.66	0.88	10.70	14.80	6.95

Table 2

Least Squares Means (±SE) of Body Weight and Morphometric Traits of Three Broiler Strains

Trait	Arbor Acre (n=60)	Ross 308 (n=60)	Cobb 500 (n=60)	SEM	P-value
Body Weight (kg)	$2.61^c \pm 0.03$	$2.73^b \pm 0.04$	$2.86^a \pm 0.05$	0.04	<0.001
Body Length (cm)	$41.22^c \pm 0.55$	$43.75^b \pm 0.48$	$45.91^a \pm 0.63$	0.58	<0.001
Breast Girth (cm)	$31.15^c \pm 0.42$	$33.04^b \pm 0.51$	$35.22^a \pm 0.57$	0.47	<0.001
Shank Length (cm)	$8.21^c \pm 0.13$	$8.74^b \pm 0.14$	$9.16^a \pm 0.12$	0.12	<0.001
Thigh Length (cm)	$12.83^c \pm 0.16$	$13.92^b \pm 0.18$	$14.84^a \pm 0.20$	0.18	<0.001
Wing Length (cm)	$19.74^c \pm 0.22$	$21.06^b \pm 0.25$	$22.34^a \pm 0.27$	0.21	<0.001
Keel Length (cm)	$11.84^c \pm 0.15$	$12.61^b \pm 0.16$	$13.52^a \pm 0.19$	0.15	<0.001

Means within rows bearing different superscripts differ significantly ($P < 0.05$).

Table 3

Pearson Correlation Coefficients Between Body Weight and Morphometric Traits

Trait	Correlation Coefficient (r)
Body Length	0.91***
Breast Girth	0.94***
Shank Length	0.71***
Thigh Length	0.82***
Wing Length	0.79***
Keel Length	0.88***

***$P < 0.001$

Table 4

Stepwise Multiple Regression Models for Predicting Body Weight in Broiler Chickens

Model	Prediction Equation	R^2	Adj. R^2	RMSE
1	BW =-0.84 + 0.10(BG)	0.884	0.882	0.154
2	BW =-1.73 + 0.07(BG) + 0.03(BL)	0.913	0.910	0.910
3	BW =-2.314 + 0.045(BG) + 0.032(BL) + 0.028(KL)	0.926	0.921	0.087

Discussion

Effect of Strain on Body Weight and Morphometric Traits

The least squares mean of body weight and morphometric traits of Arbor Acre, Ross 308, and Cobb 500 broiler strains at eight weeks of age are presented in Table 2. The results revealed significant ($P < 0.05$) differences among the three broiler strains for all measured traits. Cobb 500 recorded the highest body weight (2.86 ± 0.05 kg), followed by Ross 308 (2.73 ± 0.04 kg), while Arbor Acre exhibited the lowest body weight (2.61 ± 0.03 kg).

Similarly, Cobb 500 consistently recorded superior values for body length, breast girth, shank length, thigh length, wing length, and keel length compared with Ross 308 and Arbor Acre strains. The observed superiority of Cobb 500 suggests enhanced growth potential and body conformation characteristics relative to the other strains under the prevailing environmental and management conditions.

The significant differences among strains indicate the existence of substantial genetic variation influencing growth performance and body development. Since all birds were raised under identical management conditions, the observed differences could largely be attributed to inherent genetic factors controlling growth rate, skeletal development, muscle deposition, and nutrient utilization efficiency.

The significant strain effect observed for body weight agrees with the findings of Adebambo *et al.* (2020), who reported substantial differences in growth performance among commercial broiler strains raised under tropical conditions. Genetic improvement programs in modern broiler breeding have focused heavily on increasing growth rate, feed conversion efficiency, and carcass yield. Consequently, different commercial strains possess varying growth potentials that are expressed through differences in body weight and body dimensions (Norris *et al.*, 2021).

The superior body weight exhibited by Cobb 500 in the present study may be attributed to its intensive selection for rapid growth and muscle accretion. Commercial breeding companies have continually improved Cobb genetics through selection for economically important traits such as breast muscle yield, feed efficiency, and growth rate (Aviagen, 2024). These improvements often translate into greater body weight and larger body dimensions compared with other commercial strains.

The significantly larger body length observed in Cobb 500 indicates superior skeletal growth and frame development. Body length is widely regarded as an important indicator of growth potential because it reflects overall body conformation and structural size (Yakubu & Ayoade, 2020). Birds possessing longer body frames generally have greater capacity for muscle deposition and consequently attain higher live weights.

The significantly higher breast girth values observed in Cobb 500 may reflect enhanced breast muscle development. In broiler chickens, breast muscles constitute a substantial proportion of total carcass weight and contribute directly to economic returns. Therefore, the larger breast girth measurements recorded in Cobb 500 are consistent with the higher body weights obtained for this strain.

The differences observed in shank length and keel length further suggest variations in skeletal development among strains. Skeletal traits are important because they provide the structural support necessary for muscle growth and weight gain (Tyasi *et al.*, 2024). Birds with larger skeletal dimensions are generally capable of supporting greater muscle mass, thereby achieving superior growth performance.

These findings support previous reports indicating that commercial broiler strains differ significantly in growth characteristics and body conformation traits due to differences in genetic background and breeding objectives (Assan, 2024; Bila *et al.*, 2025).

Relationship Between Body Weight and Morphometric Traits

The Pearson correlation coefficients between body weight and morphometric traits are presented in Table 3. All morphometric traits exhibited positive and highly significant ($P < 0.001$) correlations with body weight.

Breast girth demonstrated the strongest association with body weight ($r = 0.94$), followed by body length ($r = 0.91$), keel length ($r = 0.88$), thigh length ($r = 0.82$), wing length ($r = 0.79$), and shank length ($r = 0.71$).

The positive nature of the correlations indicates that increases in body dimensions were accompanied by corresponding increases in body weight. The high magnitude of the correlation coefficients suggests that the measured morphometric traits are reliable indicators of growth performance in broiler chickens.

The strong positive correlations observed between body weight and all measured morphometric traits indicate that body dimensions are closely associated with growth and development in broiler chickens. This finding corroborates earlier studies reporting significant relationships between body weight and linear body measurements in poultry species (Udeh & Ogbu, 2011; Ojedapo *et al.*, 2012; Tyasi *et al.*, 2024).

The strongest correlation was observed between body weight and breast girth (r = 0.94). This result is biologically plausible because breast girth reflects the extent of pectoral muscle development, which contributes substantially to total body mass in broiler chickens. Modern broiler breeding programs place considerable emphasis on breast meat yield, resulting in increased breast muscle deposition and stronger associations between breast girth and body weight (Norris *et al.*, 2021).

The high correlation coefficient obtained in the present study is consistent with values reported by Ojo *et al.* (2010), who observed correlation coefficients ranging from 0.89 to 0.95 between breast girth and body weight in commercial broiler chickens. Similarly, Matsambu *et al.* (2025) reported that breast girth was the most important predictor of body weight among several morphometric traits evaluated in broiler populations.

Body length also exhibited a very strong positive relationship with body weight (r = 0.91). This finding suggests that birds possessing longer body frames tend to attain greater live weights. Body length reflects skeletal growth and structural development, both of which influence the capacity for muscle deposition and weight gain (Yakubu *et al.*, 2021).

The strong relationship between body length and body weight observed in this study agrees with the findings of Rotimi *et al.* (2025), who reported that body length accounted for a substantial proportion of the variation in growth performance among broiler chickens. Similarly, Assan (2024) identified body length as one of the most reliable indicators of body weight in commercial poultry genotypes.

Keel length exhibited a strong positive correlation with body weight (r = 0.88). The keel bone serves as the attachment site for major breast muscles; therefore, birds with longer keels often possess larger breast muscles and greater body weights. This observation is consistent with the reports of Bila *et al.* (2025), who identified keel length as a significant determinant of body weight and carcass yield in broiler chickens.

The moderate-to-high correlations observed for thigh length, wing length, and shank length indicate that these traits also contribute to body weight variation. However, their predictive abilities were lower than those of breast girth and body length. This may be because these traits represent specific body regions rather than overall body size and muscle development.

The positive relationships observed among all traits suggest that selection for improved morphometric characteristics may indirectly result in increased body weight. Such information is particularly valuable in breeding programs where direct measurement of body weight may be difficult or expensive.

Prediction of Body Weight from Morphometric Traits

The regression models developed for predicting body weight from morphometric traits are presented in Table 4. The regression analysis showed that breast girth alone explained 88.4% of the variation in body weight. Incorporation of body length increased the coefficient of determination to 91.3%, while the addition of keel length further improved prediction accuracy to 92.6%.

The final model:

BW = -2.314 + 0.045(BG) + 0.032(BL) + 0.028(KL) was identified as the best prediction equation due to its highest R^2 value and lowest RMSE.

The high coefficients of determination obtained in the regression models indicate that morphometric traits can accurately predict body weight in broiler chickens. The final model explained 92.6% of the variation in body weight, suggesting excellent predictive performance.

The substantial contribution of breast girth to the prediction model confirms its importance as the primary determinant of body weight. The fact that breast girth alone accounted for 88.4% of the variation in body weight demonstrates its potential usefulness in field situations where only a single measurement can be obtained.

The improvement in prediction accuracy following the inclusion of body length and keel length indicates that body weight is influenced by multiple aspects of body development, including skeletal growth and muscle deposition.

Therefore, combining several morphometric traits provides a more comprehensive assessment of growth performance than reliance on a single trait.

The R^2 value obtained in this study compares favorably with those reported by Tyasi *et al.* (2024), who recorded coefficients of determination ranging from 0.85 to 0.93 in poultry populations. Similarly, Bila *et al.* (2025) reported R^2 values exceeding 0.90 when breast girth and body length were used jointly to predict body weight in commercial broiler chickens.

The low RMSE value obtained for the final model indicates minimal prediction error and further confirms the reliability of the developed equation. Models with low prediction errors are desirable because they provide more accurate estimates of body weight under practical farming conditions (Yakubu *et al.*, 2021).

From a practical perspective, the prediction equation developed in this study offers a simple and cost-effective alternative to direct weighing. Farmers can estimate body weight using a measuring tape, thereby reducing the need for weighing equipment and facilitating management decisions related to feeding, medication, marketing, and selection.

The findings also have implications for genetic improvement programs. Since breast girth, body length, and keel length exhibited strong associations with body weight, these traits could serve as useful selection criteria in breeding programs aimed at improving growth performance in broiler chickens.

The results of this study demonstrated that morphometric traits provide reliable indicators of body weight and can be effectively utilized for growth evaluation and management of broiler chickens under the environmental conditions of Karaye Local Government Area, Kano State.

Conclusion

The present study evaluated the relationships between body weight and selected morphometric traits in three commercial broiler chicken strains (Arbor Acre, Ross 308, and Cobb 500) reared under the environmental conditions of Karaye Local Government Area, Kano State, Nigeria. The results demonstrated the existence of significant ($P < 0.05$) strain differences in body weight and all measured morphometric traits, indicating substantial genetic variation among the broiler strains.

Cobb 500 exhibited superior performance for body weight and all morphometric characteristics evaluated, followed by Ross 308, while Arbor Acre recorded the lowest values. These findings suggest that Cobb 500 possesses greater genetic potential for growth and body development under the prevailing management and environmental conditions.

The study further revealed strong positive and highly significant relationships between body weight and all measured morphometric traits. Breast girth exhibited the strongest association with body weight ($r = 0.94$), followed by body length ($r = 0.91$) and keel length ($r = 0.88$). These findings indicate that birds with larger body dimensions tend to attain higher body weights.

Regression analysis demonstrated that morphometric traits can serve as reliable predictors of body weight in broiler chickens. The best prediction model incorporating breast girth, body length, and keel length explained 92.6% of the variation in body weight, highlighting the effectiveness of these traits for estimating body weight under field conditions.

The prediction equation: $BW = -2.314 + 0.045(BG) + 0.032(BL) + 0.028(KL)$ was identified as the most accurate model and may be utilized for practical body weight estimation where weighing facilities are unavailable.

Finally, the findings confirm that morphometric measurements provide a simple, inexpensive, and reliable means of estimating body weight in broiler chickens and can contribute significantly to flock management, genetic improvement programs, improve accuracy in medication dosage and feed allocation, support better marketing, profitability and production efficiency in commercial poultry enterprises.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Poultry farmers should routinely measure breast girth and body length as practical indicators of growth performance.
2. The regression equation developed in this study should be adopted for body weight estimation in commercial broiler production systems where weighing scales are unavailable.
3. Breeding programs should consider incorporating breast girth, body length, and keel length as auxiliary selection criteria for growth improvement.
4. Extension agencies should train poultry farmers on the use of morphometric measurements for growth monitoring and management decisions.

5. Future studies should evaluate the predictive ability of morphometric traits at different ages and under diverse production environments.
6. Further investigations involving larger sample sizes and additional commercial strains should be conducted to validate and refine the prediction models developed in this study.
7. Genomic and molecular approaches may be integrated with morphometric evaluations to improve the accuracy of body weight prediction and selection programs.

Acknowledgements
The authors acknowledge the support of poultry farmers and farm attendants in Karaye Local Government Area who facilitated data collection during the course of the study. Appreciation is also extended to colleagues and technical staff whose contributions enhanced the successful completion of this research.

Conflict of Interest
The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

References
1. Adebambo, O. A., Ikeobi, C. O. N., Ozoje, M. O., & Adenowo, J. A. (2020). Genetic variation and growth performance in commercial broiler strains. Nigerian Journal of Animal Production, 47(2), 45–56.
2. Adeleke, M. A., Peters, S. O., Ozoje, M. O., Ikeobi, C. O. N., Bamgbose, A. M., & Adebambo, O. A. (2021). Growth characteristics and body conformation traits in poultry species. Tropical Animal Health and Production, 53(4), 312–321.
3. Alabi, O. J., Yakubu, A., & Musa, I. S. (2022). Poultry production and food security in sub-Saharan Africa. Poultry Science Journal, 10(1), 25–39.
4. Assan, N. (2024). Predicting body weight of chicken genotypes using linear body measurements. Applied Tropical Agriculture, 29(2), 112–121.
5. Aviagen. (2024). Ross 308 broiler performance objectives. Aviagen Group.
6. Bila, M., Hassan, A., & Yusuf, M. (2025). Prediction of body weight in Ross 308 broiler chickens using morphometric traits. South African Journal of Animal Science, 55(1), 45–56.
7. FAO. (2023). World livestock statistics and poultry production outlook. Food and Agriculture Organization of the United Nations.
8. Fayeye, T. R., Ayorinde, K. L., Ojo, V., & Adeshiyan, A. B. (2018). Relationship between body measurements and live weight in chickens. Nigerian Journal of Genetics, 32(1), 15–24.
9. Ige, A. O., Ojedapo, L. O., & Olayeni, T. B. (2019). Correlation studies among body measurements and body weight in broiler chickens. Journal of Animal Science Advances, 9(4), 245–253.
10. KNARDA. (2023). Meteorological and agricultural statistics of Kano State. Kano State Agricultural and Rural Development Authority.
11. Matsambu, H. L., Chikwanha, O. C., & Dzama, K. (2025). Prediction of body weight from morphometric traits in broiler chickens. Veterinaria, 74(2), 120–131.
12. Muhammad, A., Suleiman, A., & Lawan, M. A. (2023). Poultry production systems in northern Nigeria: Opportunities and challenges. Journal of Agricultural Extension and Rural Development, 15(3), 101–109.
13. Norris, D., Brown, D., Moela, A. K., Selolo, T. C., & Mabelebele, M. (2021). Growth performance and carcass characteristics of commercial broiler strains. South African Journal of Animal Science, 51(4), 467–476.
14. Ojedapo, L. O., Amao, S. R., & Ameen, S. A. (2012). Prediction of body weight from linear body measurements in chickens. Agricultural Science Research Journal, 2(1), 44–48.
15. Ojo, V., Fayeye, T. R., Ayorinde, K. L., & Olojede, H. (2010). Relationship between body weight and morphometric traits in commercial broiler chickens. International Journal of Poultry Science, 9(7), 653–657.
16. Rotimi, E. A., Adebayo, A. O., & Bello, A. A. (2025). Correlation and path analysis of body weight and morphometric traits in poultry. Alexandria Journal of Agricultural Sciences, 70(4), 55–68.
17. Tyasi, T. L., Bopape, P. M., & Mathapo, M. C. (2024). Relationship between body weight and linear body measurements in poultry populations. Open Journal of Animal and Feed Research, 14(4), 218–224.
18. Udeh, I., & Ogbu, C. C. (2011). Principal component analysis of body measurements in commercial broiler chickens. Tropical Animal Health and Production, 43(3), 635–638.
19. Udeh, I., Ugwu, S. O. C., & Oganah, O. M. (2011). Predicting body weight using morphometric traits in chickens. Animal Research International, 8(1), 1360–1365.
20. Yakubu, A., & Ayoade, J. A. (2020). Application of body measurements in poultry breeding and selection. World's Poultry Science Journal, 76(2), 354–366.
21. Yakubu, A., Salako, A. E., & Ige, A. O. (2021). Morphological characterization and growth evaluation in poultry species. Poultry Science, 100(5), 101245.

CITATION
Abubakar, M., Abubakar, A. I., Karaye, S. I., Musa, A. R.& Ibrahim, M. S. (2026). Prediction of Body Weight with Morphometric Traits in Three Broiler Chicken Strains in Karaye Local Government Area, Kano State, Nigeria. Global Journal of Research in Agriculture & Life Sciences, 6(4), 36–44. https://doi.org/10.5281/zenodo.21368286