Quest Journals
Journal of Research in Agriculture and Animal Science
Volume 9 ~ Issue 3 (2022) pp: 15-22
ISSN(Online) : 2321-9459
www.questjournals.org

Research Paper

Estimation of Body Weight Using Linear Body Measurements of Fulani Ecotype Chickens In The South Western Nigeria

[1]NWEKE-OKOROCHA, G.O, [2]GUNN, H. H
[1]*Department of Animal Production and Health, Federal University of Technology, Akure, Ondo State. Nigeria.*
[2]*Department of Animal Science, Rivers State, University, Port Harcourt, Rivers State, Nigeria.*
Corresponding Author: Nweke-Okorocha, O.G. Department of Animal Production and Health, Federal University of Technology Akure, Nigeria

ABSTRACT
Data on body weight and linear body measurement such as shank length (SL), breast girth (BG), wing length (WGL), shank circumference (SC),drumstick length (DSL), drumstick circumference (DSC), nose to shoulder length (NTSL),neck circumference (NEC), shoulder to tail length (NTTL), body length (BL), height at withers (HAW), comb length (COML) and wattle length (WTL) were taken every two weeks from 90 Fulani ecotype chickens raised for 16 weeks under intensive management system. Data collected were subjected to least squares means, correlations, linear and quadratic regression analyses using SAS 9.2 version 2008. Results indicates that the male sex was significantly different ($p<0.05$) for body weight and linear body measurements and had higher least squares means than the female. The correlation coefficients showed that there were positively high to very high significant relationships ($p<0001$) between the body weight and linear body measurements [DSL and SL (r=1.00), BW and HAW (r=0.91), SL and HAW (r=0.93), WTL and COML (r=0.98),SL and HAW (r=0.93)]especially from 10 to 16 weeks. Prediction using simple linear and quadratic functions of body weight from linear body measurements showed that SL (R^2=83), SC(R^2=79), DSL (R^2=80), WGL (R^2=, STTL, TL, BL, BG and HAW) were the best linear part to predict body weight at 4, 8, 12 and 16weeks respectively. Thus this study reveals that meaningful improvements can be made through selection of pair of traits that were positively and significantly related andthat easily measured parts can be fitted into regression functions to predict body weight.
***KEYWORDS**: Fulani ecotype chicken, Body weight, Body measurements, Prediction*

***R**eceived 03 Mar, 2022; **R**evised 14 Mar, 2022; **A**ccepted 16 Mar, 2022 © The author(s) 2022.*
P**ublished with open access at **www.questjournals.org

I. INTRODUCTION

The local or indigenous chickens are commonly known domestic fowls, found scavenging around the vicinities of the rural communities in most developing countries. They account for the majority of poultry products in Nigeria. The local chicken flocks usually comprise between 5-20 birds kept by one family, managed often by women for their personal income (FAO, 1996).Indigenous chicken serves as an immediate source of meat and income to the rural dwellers when money is needed for urgent family needs. Local or Indigenous chicken constitutes a significant contribution to human livelihood and food security (Gondwe, 2004). Fayeye *et al*, (2005) described local or indigenous chicken as a pool of heterogeneous individuals which differ in adult body size, weight and plumage.Fulani eco-type is one of the indigenous chickens, With reference to the individual weight of the ecotypes, Fulani ecotype is considered to be heavy breed while other ecotypes namely Yoruba ecotype and the Eastern ecotype are referred to as light breeds.

A number of conformation traits are known to be good indicators of body growth and market value of chickens apart from body weight. Poultry breeders have tried to establish the relationship that exist between body weight and linear body parameters such as shank length, breast girth, drumstick length, neck length, truck length and shank length.The live body weight of any animal is an important variable that determines the market value of the animal (Kabir*et al*., 2006). Report on body weight and linear body measurements have been documented and found useful in qualifying body size and shape (Ibe, 1989; Ibe and Ezekwe, 1994). Linear measurements are less subjected to short term changes as in body weight and allow comparisons of growth in

different parts of the body. Linear body measurements have been used to predict live weights in poultry (Okon *et al*., 1997, Gueye *et al.*, 1998), rabbits (Chineke, (2005), goat (Hassan and Ciroma, 1992), sheep (Chineke, 1996). The use of shank length to predict live body weight in poultry is particularly important where scales are not readily available as in the case in most African rural farming communities and meat markets (Mani*et al.*, 1991, Nesamvumi*et al.*, 2000). The objective of this study was, therefore, to examine the relationship between body weight and linear body measurements in Fulani ecotype chickens in South Western Nigeria so as to develop an equation for predicting body weight from linear body measurements.

II. MATERIALS AND METHODS

Location of the study

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of Federal University of Technology, Akure, Nigeria. Akure is situated on 350.52m above sea level at Latitude 7º 25ºN and Longitude 5º 19º E. The vegetation of the area is that of the Rainforest characterized by hot and humid climate. The mean annual rainfall is about 1500m and the rain pattern is bimodal with short break in August with mean annual relative humidity of 75%.

Experimental birds/Breeding programme

Ninety Day old chicks of Fulani ecotype chickens were used for the study. The 90 day old chicks collected from a reputable Farm for this experiment were brooded and managed under intensive care for 16 weeks. All the experimental birds were fed with the best commercial feed from day old to 16 weeks. Fresh water was provided adequately and all the necessary vaccines and medications were given to the birds. Body weight and linear measurement changes were recorded every two weeks till the 16week. Measurements of body weight and linear body parts were carried out fortnightly till 16 weeks. The body weight was measured in gramme using Scout II electronic sensitive scale (5 kg capacity). The linear body parts were measured using tape rule in centimeters. Body weight *(g)* was measured as total weight of individual chicken. Body length was measured as distance from the tip of the beak over the head through body trunk to the tail., Height at withers is measured with tape from the foot to the shoulder blade, Breast girth was determined by winding a tape rule around the region of the breast, Shank length was measured as the distance from the foot pad to the hock joint. Shank circumference was taken at the middle of the left shank of each bird using a tape, wing length was measured by stretching the wing and the measurement taken from humorous – coracoids junctions to the tip of the digit while the drumstick length was measured from the tip of the hock joint to the ball joint of femur. Drumstick circumference is measured winding a tape rule round the middle of the drumstick, the wattle size (length) is measured as length from the topmost part below the beak to the end of the wattle and the comb size was measured as length along the base, from the beak end to the end of the comb.

STATISTICAL ANALYSIS

Data collected on body weight and linear body measurements of the Fulani ecotype chickens used in this study were subjected to genetic and phenotypic correlations and linear and quadratic regression analyses using SAS Statistical package 9.2 Version 2008.

STATISTICAL MODELS

The data collected on body weight and linear body measurements were subjected to genetic and phenotypic correlations and linear regression and quadratic regression analyses.

$Y = B + \beta X$ …… (1) Simple regression model

$Y=B + \beta X + X^2$……. (2) Quadratic regression model

Where Y = dependent variable (body weight)

X = independent variables (SL, BG, WGL, STL, BL, NTTL, SC, DSL, DSC, NTSL, NEC. HAW, WTL,)

B = the intercept

β = the slopes

III. RESULTS AND DISCUSSION

Correlation coefficients describe the degree of relationship between body weight and linear body measurements of Fulani ecotype chickens. The degree of association between the body weight and linear measurement in genetic and phenotypic correlations were same and positively low to high from 4 to 8 weeks of age. The coefficients of correlations observed were (r = 0.21 - 0.95, r = 0.39 - 0.99) for 4 and 8 weeks respectively, which were significantly ($p<0.05$) positive between nose to shoulder and shank length, nose to shoulder and drumstick length, nose to shoulder and trunk length, nose to shoulder and breast girth but highly significant ($p<0.05$) and positive for other relationships (Tables 1 & 2). At 12 weeks of age, the genetic and phenotypic correlations between body weight and linear body measurements indicated positively moderate to

high (r = 0.59 - 1.00, r = 0.54 - 1.00) association (Table 3). At 16 weeks the genetic and phenotypic correlations were positively high to very high correlation coefficients (r = 0.69 - 1.00, r = 0.71 - 1.00) (Table 4). Both genetic and phenotypic correlation had the highest positively strong relationships between the shank length and drumstick length which agreed with the report of Momoh and Kershima 2008; Yahaya *et al.* 2012 and Alabi*et al*. (2012) that high positive correlations existed between body weight and linear body measurements in broilers and naked neck chickens of South Africa respectively. The positively low to high correlations and close similarity observed in the genetic and phenotypic correlations from 4 to 8 weeks indicated that the Fulani eco type chickens were under additive genetic control and could also be as a result of uniformly high heritability since correlations between the environment would then exert little effect on the phenotypes (Cheverud,
1982; Boag, 1983; Grant, 1983 and Merila and Gustafsson, 1993). Positively high to very high genetic and phenotypic correlations at 16 weeks indicated that body weight is a measure of overall body growth which is the sum total of increases in sizes of different structural components (Ibe and Nwakalor, 1987), It also suggested that these traits were under the same gene action (pleotropism) which implied that selection of one trait would bring about a corresponding improvement in the other traits as correlated response. This relationship might be used in selection programme for genetic improvement of Nigerian indigenous chickens. The genetic and phenotypic correlations in this study were similar to the values reported by Deeb and Lamon (2002); Badubi *et al*. (2006); Raji *et al*. (2009); Ige (2013

Table 1 Genetic (G) and Phenotypic (P) correlation coefficients between body weight and linear body measurements (cm)
at 4 weeks. Upper diagonal= Phenotypic correlations, Lower diagonal = Genetic correlations.

	WGL	SL	DSL	NTSL	TL	STTL	BG	BW
WGL		0.86***	0.82***	0.21*	0.83***	0.32*	0.82***	0.85***
SL	0.88***		0.95***	0.21*	0.85***	0.23*	0.83***	0.86***
DSL	0.82***	0.94***		0.20^{ns}	0.80***	0.23^{ns}	0.79^{***}	0.79***
NTSL	0.16^{ns}	0.20^{ns}	0.17^{ns}		0.24*	0.43*	0.22*	0.23*
TL	0.83***	0.85***	0.80***	0.23*		0.35*	0.89***	0.85***
STTL	0.25*	0.19^{ns}	0.20^{ns}	0.43***	0.32*		0.35*	0.31*
BG	0.80***	0.86***	0.80***	0.17^{ns}	0.91***	0.30*		0.79***
BW	0.86***	0.89***	0.83***	0.21*	0.86***	0.22*	0.83***	

Ns=Non Significant (p>0.05) *=Significant (p<0.05) ***= Highly Significant (p<0.001).
WL= Wing length, SL= Shank length, DSL= Drumstick length, NTSL= Nose to shoulder length, STTL= Shoulder to tail length, TL= Trunk length, BG= Breast girth, BW= Body weight

Table 2 Genetic and phenotypic correlation coefficients between body weight (g) and linear measurements (cm) at 8
weeks. Upper diagonal= Phenotypic correlations, Lower diagonal = Genetic correlations

	WGL	SL	DSL	NTSL	TL	STTL	BG	BW
WGL		0.72***	0.72***	0.41***	0.54***	0.60***	0.71***	0.71***
SL	0.86***		0.99***	0.46***	0.72***	0.78***	0.90***	0.88***
DSL	0.86***	0.99***		0.46***	0.71***	0.77***	0.90***	0.87***
NTSL	0.44***	0.45***	0.46***		0.40***	0.53***	0.51***	0.52***
TL	0.85***	0.86***	0.86***	0.39***		0.60***	0.73***	0.69***
STTL	0.69***	0.72***	0.72***	0.49***	0.67***		0.76***	0.81***
BG	0.86***	0.89***	0.89***	0.48***	0.89***	0.67***		0.91***
BW	0.88***	0.87***	0.86***	0.44***	0.86***	0.72***	0.89***	

***= Highly Significant (p<0.001).
WL= Wing length, SL= Shank length, DSL=Drumstick length, NTSL= Nose to shoulder length, STTL= Shoulder to tail length, TL= Trunk length, BG= Breast girth, BW= Body weight.

Table 3 Genetic and phenotypic correlation coefficients between body weight (g) and linear measurements (cm) for 12

	WGL	SL	SC	DSL	DSC	NTSL	NEC	STTL	BG	BL	HAW	BW
WGL		0.86***	0.80***	0.86***	0.69***	0.79***	0.67***	0.78***	0.74***	0.84***	0.85***	0.81***
SL	0.86***		0.86***	1.00***	0.68***	0.73***	0.64***	0.80***	0.80***	0.83***	0.89***	0.89***
SC	0.76***	0.81***		0.86***	0.80***	0.70***	0.69***	0.77***	0.79***	0.79***	0.84***	0.85***
DSL	0.86***	1.00***	0.81***		0.68***	0.73***	0.64***	0.80***	0.80***	0.83***	0.90***	0.89***
DSC	0.62***	0.64***	0.78***	0.64***		0.54***	0.69***	0.64***	0.71***	0.67***	0.71***	0.70***
NTSL	0.83***	0.78***	0.74***	0.78***	0.59***		0.55***	0.69***	0.63***	0.82***	0.75***	0.79***
NEC	0.66***	0.66***	0.69***	0.66***	0.70***	0.63***		0.63***	0.66***	0.68***	0.63***	0.59***
STTL	0.81***	0.85***	0.81***	0.84***	0.65***	0.74***	0.63***		0.76***	0.89***	0.80***	0.82***
BG	0.75***	0.79***	0.81***	0.79***	0.68***	0.71***	0.68***	0.79***		0.82***	0.80***	0.84***
BL	0.84***	0.86***	0.81***	0.86***	0.66***	0.83***	0.68***	0.90***	0.86***		0.86***	0.86***
HAW	0.85***	0.88***	0.82***	0.88***	0.69***	0.78***	0.65***	0.82***	0.79***	0.87***		0.92***
BW	0.81***	0.89***	0.86***	0.89***	0.66***	0.82***	0.63***	0.86***	0.85***	0.88***	0.91***	

weeks of age. Upper diagonal= Phenotypic correlations, Lower diagonal = genetic correlations
***= Highly Significant (p<0.001).
WL= Wing length, SL= Shank length, SC= shank circumference, DSL= Drumstick length, DC= Drumstick circumference, NTSL= Nose to shoulder length, STTL= Shoulder to tail length, BL= Body length, BG= Breast girth, COML= Comb length, WTL= Wattle length, HAW= Height at withers, BW= Body weight.

Table 4 Genetic and phenotypic correlation coefficients between body weight (g) and linear measurements (cm) for 16

	WGL	SL	SC	DSL	DSC	NTSL	NEC	STTL	BL	HAW	BG	COML	WTL	BW
WGL		0.91***	0.85***	0.91***	0.86***	0.84***	0.83***	0.89***	0.91***	0.92***	0.86***	0.77***	0.77***	0.88***
SL	0.90***		0.92***	1.00***	0.84***	0.81***	0.84***	0.87***	0.88***	0.94***	0.86***	0.76***	0.74***	0.90***
SC	0.86***	0.92***		0.93***	0.85***	0.79***	0.82***	0.87***	0.85***	0.89***	0.85***	0.73***	0.72***	0.89***
DSL	0.90***	1.00***	0.92***		0.84***	0.81***	0.84***	0.87***	0.88***	0.94***	0.86***	0.76***	0.74***	0.90***
DSC	0.87***	0.83***	0.84***	0.84***		0.78***	0.82***	0.82***	0.85***	0.84***	0.80***	0.75***	0.76***	0.83***
NTSL	0.83***	0.79***	0.77***	0.79***	0.79***		0.85***	0.82***	0.89***	0.84***	0.79***	0.77***	0.77***	0.80***
NEC	0.85***	0.84***	0.79***	0.84***	0.81***	0.82***		0.81***	0.83***	0.84***	0.79***	0.79***	0.79***	0.86***
STTL	0.87***	0.85***	0.86***	0.85***	0.84***	0.80***	0.79***		0.94***	0.90***	0.89***	0.70***	0.71***	0.91***
BL	0.88***	0.85***	0.84***	0.85***	0.86***	0.90***	0.82***	0.93***		0.93***	0.87***	0.76***	0.77***	0.89***
HAW	0.91***	0.93***	0.87***	0.93***	0.86***	0.83***	0.84***	0.89***	0.91***		0.89***	0.80***	0.79***	0.95***
BG	0.84***	0.86***	0.87***	0.86***	0.82***	0.77***	0.81***	0.89***	0.85***	0.90***		0.73***	0.75***	0.91***
COML	0.73***	0.74***	0.69***	0.74***	0.71***	0.73***	0.76***	0.70***	0.74***	0.79***	0.73***		0.96***	0.76***
WTL	0.72***	0.72***	0.69***	0.72***	0.76***	0.73***	0.76***	0.70***	0.75***	0.77***	0.72***	0.91***		0.76***
BW	0.89***	0.89***	0.87***	0.89***	0.83***	0.78***	0.84***	0.90***	0.88***	0.94***	0.92***	0.79***	0.76***	

weeks of age. Upper diagonal= Phenotypic correlations, Lower diagonal = genetic correlations
***= Highly Significant (p<0.001).

WL= Wing length, SL= Shank length, SC= shank circumference, DSL= Drumstick length, DC= Drumstick circumference, NTSL= Nose to shoulder length, STTL= Shoulder to tail length, BL= Body length, BG= Breast girth, COML= Comb length, WTL= Wattle length, HAW= Height at withers, BW= Body weigh

Estimate of parameters in simple linear and quadratic functions fitted for body Weight and linear body measurement

The prediction equation relating body weight and linear body measurements of Fulani eco type chickens are shown in Table 5 to 7. Body weight and linear body measurements had significant (P<0.001) associations. At 4 weeks, the values of the coefficients of determination (R^2) ranged from 61.31 to 73.81, 62.31 to 75.40) for linear and quadratic functions respectively with shank length (R^2= 73.81, 75.40) showing the highest coefficient of determination (R^2). At 8 weeks the values of the coefficient of determination (R^2) ranged from 67.01 to 82.42, 75.89 to 82.77, with the wing length (R^2= 82.42, 80.50) and breast girth (R^2= 82.56, 82.77) having the highest coefficient of determination. At 16 weeks, the values of the coefficient of determination (R^2) ranged from 64.36 to 89.46, 64.86 to 89.46 with the height at withers having the highest coefficient of determination (R^2= 89.46) and the result corroborated with result of Deeb and Lamon (2002); Raji*et al*. (2009) and Ige (2014).

The very high association of body weight and shank length, drumstick length, breast girth, wing length, and body length in the entire models tested might possibly be due to polygenes affecting body traits which also significantly influence the overall development. This is suggesting that improvement in live weight of some strain of chicken will lead to improvement of other traits (Deeb and Lamon, 2002). Ige (2014) reported that there was relatively large contribution to body weight by breast girth and the body parts consisting of bones, muscles and viscera.

The consistent high coefficient of determination (R^2) values obtained in linear and quadratic functions indicated that shank length, wing length, height at withers , breast girth, trunk length and the drumstick length could be the best used to predict body weight in Fulani eco type and other indigenous chickens. Raji *et al.* (2009) reported highest coefficient of determination value for breast girth, body length, wing length and wing length in linear regression model. Ige (2014) reported that easily measurable body part such as breast girth (chest girth) and body length helped in determination of body weight. In this study shank length, wing length, height at withers, breast girth, trunk length and the drumstick length were the best for estimation of body weight.

Table 5 Estimate of parameters in simple linear and quadratic functions fitted for body Weight and linear body measurements at 4 weeks

Parameters	Function	Prediction equation	RMSE	R^2%	Significance
WGL	Linear	Y= -152.63 + 31.54WGL	15.27	72.03	<0.001***
	Quadratic	Y= -413.75 + 75.91WGL – 1.63WGL^2	15.29	72.28	<0.001***
SL	Linear	Y= 8.17 + 42.28SL	14.77	73.81	<0.001***
	Quadratic	Y= -377.70 + 177.59SL - 11.73SL^2	14.40	75.40	<0.001***
DSL	Linear	Y= -14.21 + 39.25DSL	17.85	61.31	<0.001***
	Quadratic	Y= -331.57 + 133.66DSL – 6.72DSL^2	17.83	62.31	<0.001***
TL	Linear	Y= -90.73 + 25.08TL	15.37	71.67	<0.001***
	Quadratic	Y= 270.00 + 51.91TL – 0.99TL^2	15.41	71.83	<0.001***
BG	Linear	Y= -39.90 + 21.78BG	17.79	62.02	<0.001***
	Quadratic	Y= -638.98 + 110.37BG – 3.25BG^2	16.68	67.02	<0.001***

***= Significant (p<0.001).

RMSE = Root mean standard error; R^2 = coefficient of determination, Y= body weight, WGL=wing length, SL= shank length, SC= shank circumference, DSL= drumstick length, DSC = drumstick circumference, STL= shoulder to tail length, BG= breast girth length, BL= body length, NEC = neck circumference, NTS= nose to shoulder, HAW= height at withers

Table 6 Estimate of parameters in simple linear and quadratic functions fitted for body Weight and linear body measurements at 8 weeks

Parameters	Function	Prediction equation	RMSE	R^2%	Significance
WGL	Linear	Y= -265.52 + 49.77WGL	50.15	82.42	<0.001***
	Quadratic	Y= 961.58 – 130.31WGL + 6.34WGL^2	52.47	80.50	<0.001***
SL	Linear	Y= -288.24 + 108.06SL	56.99	76.74	<0.001***
	Quadratic	Y= -710.56 + 210.63SL – 6.13SL^2	56.87	77.10	<0.001***
DSL	Linear	Y= -408.16 + 109.27DSL	58.01	75.89	<0.001***
	Quadratic	Y= -1149.93 + 268.88DSL – 8.47DSL^2	57.65	76.46	<0.001***
TL	Linear	Y= -258.21 + 44.99TL	86.00	67.01	<0.001***
	Quadratic	Y= -3386.61 + 361.96TL – 7.8TL^2	60.42	74.14	<0.001***
BG	Linear	Y=-655.06 + 69.21BG	49.34	82.56	<0.001***

	Quadratic	$Y= -57.14 + 2.57BG + 1.84BG^2$	49.32	82.77	<0.001***

***= Significant (p<0.001).

RMSE = Root mean standard error; R^2 = coefficient of determination, Y= body weight, WGL=wing length, SL= shank length, SC= shank circumference, DSL= drumstick length, DSC = drumstick circumference, STL= shoulder to tail length, BG= breast girth length, BL= body length, NEC = neck circumference, NTS= nose to shoulder, HAW= height at withers.

Table 7 Estimate of parameters in simple linear and quadratic function fitted for body and weight linear body measurements at 16 weeks.

Parameters	Function	Prediction equation	RMSE	R^2%	Significance
WGL	Linear	Y= -1448.13 + 12.99WGL	112.60	77.96	<0.001***
	Quadratic	$Y= -1373.20 + 115.71WGL + 0.17WGL^2$	113.25	77.96	<0.001***
SL	Linear	Y= -675.59 + 157.18SL	105.80	80.53	<0.001***
	Quadratic	$Y= 285.80 – 8.86SL + 7.07SL^2$	105.35	80.93	<0.001***
SC	Linear	Y= -810.73 + 382.98SC	110.80	73.63	<0.001***
	Quadratic	$Y= 297.48 – 29.24SC + 40.36SC^2$	110.37	79.06	<0.001***
DSL	Linear	Y= -826.01 + 156.56DSL	106.30	80.10	<0.001***
	Quadratic	$Y= -1065.0 +225.77DSL – 3.82DSL^2$	105.82	80.76	<0.001***
DSC	Linear	Y= -988.55 + 196.65DSC	135.50	67.68	<0.001***
	Quadratic	$Y= 1060.48 – 185.01SDC +18.02DSC^2$	134.68	68.83	<0.001***
NTSL	Linear	Y= -1974.64 + 167.30NTSL	143.10	64.36	<0.001***
	Quadratic	$Y= -1334.13 + 124.82NTS + 0.58DSC^2$	143.00	64.86	<0.001***
NEC	Linear	Y=- -810.09 + 192.88NEC	120.30	74.83	<0.001***
	Quadratic	$Y= 1412.76 - 276.94NEC + 25.95NEC^2$	120.94	74.86	<0.001***
STTL	Linear	Y= -2159.34 + 135.44STL	98.90	82.99	<0.001***
	Quadratic	$Y= -3251.38 +250.54STL – 2.86STL^2$	97.58	83.64	<0.001***
BL	Linear	Y= -2012.92 + 72.29BL	109.50	79.12	<0.001***
	Quadratic	$Y= -796.87 + 18.59BL + 0.54BL^2$	108.24	79.87	<0.001***
BG	Linear	Y= -1618.42 + 96.57 BG	100.40	82.46	<0.001***
	Quadratic	$Y= 1549.78 – 133.22BG + 4.33BG^2$	93.57	84.95	<0.001***
HAW	Linear	Y= -1537.60 + 69.37HAW	77.80	89.46	<0.001***
	Quadratic	$Y= -1950.14 + 101.09HAW – 0.54HAW^2$	77.43	89.46	<0.001***

***= Significant (p<0.001).

RMSE = Root mean standard error; R^2 = coefficient of determination, Y= body weight, WGL=wing length, SL= shank length, SC= shank circumference, DSL= drumstick length, DSC = drumstick circumference, STL= shoulder to tail length, BG= breast girth length, BL= body length, NEC = neck circumference, NTS= nose to shoulder, HAW= height at withers.

IV. CONCLUSIONS

Selection of body weight in poultry, improvement of Nigerian local chickens and selection for one or a combination of traits of economic importance in Fulani ecotype chickens can be done preferably at 12 to 16 weeks of age at which positively high correlation existed between economically important traits. The linear regression and quadratic functions indicated that the SL, DSL, BG and HAW were the best linear body parameters to be used to predict body weight of Fulani ecotype chickens. In areas like the rural setting where weighing balance or scale may not be readily available, tailoring tape can be used to measure linear body parts and thereafter be used to estimate body weight of Nigerian local chickens using the prediction equations developed through this study.

REFERENCES

[1]. Alabi, O.J., Ngambi, J.W., Norris, D, and Egena S.S.A. (2012).Comparative study of three indigenous chicken breeds of South Africa body weight and linear body measurement.Agricultural Journal. Volume 7(3):220-225.

[2]. Badubi, S.S., Rakereng, M. and Marume, M. (2006).Morphologgical characteristics and feed resources available for indigenous chickens in Botswana. Livestock Research for Rural Development, 18 (1) http://www.cipav.org.co/irrd18/1/badu1800.htm

[3]. Boag, P.T. (1983). The heritability of external morphology in darwin's ground finches (Geospiza) of Isla Daphne Minor Galapagos. Evolution. Volume 37:877-894.

[4]. Cheverud, J.M. (1982). Phenotypic, genetic and environmental morphological integration in cranium.Evolution 36:499-516.

[5]. Chineke, C.A. (1996). Relationships between body measurement and live body weight of Yankassa ewes at various ages. Applied tropical Agriculture. Volume 1: 34-37.

[6]. Chineke, C.A. (2005). The relationship among body weights and linear dimensions in rabbit breeds and crosses. Journal of Animal and veterinary Advances. Volume 4(9):775-784.

[7]. Deeb, N. and Lamon, S.J. (2002).Genetic architecture of growth and body composition in unique chicken population.Journal of Heredity. Volume 93: 107-118

[8]. FAO, (1996).Adre-Mayer Research on assistance to Africa women in village chicken production.

[9]. Fayeye, T.R., Adeshiyan A.B and Olugbami A.A. (2005). Egg traits, Hatchability and early growth performance of the Fulani Ecotype chicken.Livestock Research for Rural Development. Volume 17(8): 56-60

[10]. Gondwe, T.N.P. (2004). Characterization of local chicken in low input-low output production systems: is there scope for appropriate production and breeding strategies in Malawi. (PHD Thesis, Georg-August University Gottigen, Germany).

[11]. Grant, P.R. (1983). Inheritance of size and shape in a population of Darwins finches. Proc.R.Sot. London. B. 220:219-236.

[12]. Gueye, E.H.F. (1998**).** Village egg and fowl meat production in Africa.Journal of World Poultry Science.Volume 54: 73-86.

[13]. Hassan, A. and Ciroma, A. (1992).Body weight measurement relationships in Nigerian red Sokoto goats.In small ruminant research and development in Africa.Rey.B, Lebbie, S.H.B and Reynolds, L. (Ed). Proceedings of the 1st biennial conference of the small ruminant research network, ILRAD, Nairobi, Kenya, 10-14th Dec, ILCA (International livestock center for Africa), Nairobi, Kenya, pg. 491-497

[14]. Ibe, S. N. (1989). Measurement of size and confirmation in commercial broilers.Journal Animal Breeding and Genetics. Volume 21pg 51-58.

[15]. Ibe, S. N. and Ezekwe, A. G. (1994).Quantifying size and shape differences between Muturu and N"Dama breeds of cattle.Nigerian Journal of Animal Production. Volume1(8): 1-5.

[16]. Ibe, S.N. and Nwakalor(1987).Growth pattern performance in broilers influence of genotype and management on isometry of growth.Poultry science. Volume 66: 1274-1284

[17]. Ige, A.O, (2014). Estimation of genetic parameters in Yoruba and Fulani ecotype chickens of Nigeria.International Journal of Agriculture and Biosciences. Volume 3(1):26-32

[18]. Ige, A.O. (2013). Relationship between body weight and growth traits of cross bred Fulani ecotype chicken in derived Savannah Zone of Nigeria. International journal of applied Agricultural and Agricultural research.pg 157-166.

[19]. Kabir, M, Oni O.O., Akpa G.N. and Adeyinka, I.A. (2006). Heritability estimates and the interrelationship of body weight and shank length in Rhode island red and white chickens. Pakistan Journal of Biological science. Volume 9:2892-2896

[20]. Merila, J. and Gustafsson, L. (1993).Inheritance of size and shape in a natural population of collared flycatchers, ficedulaalbicotlis.Journal of evolution biology. Volume 6: 375-395.

[21]. Momoh, O.M. and Kershima, D.E. (2008) Linear body measurements as predictors of body weight in Nigerian local chickens. Asset series A. Volume.8(2): 206 – 212

[22]. Nesamvumi, A.E., Malaudzi, J., Ramanyimi, N.D. and Taylor, G. (2000).Estimation of body weight in Ngunu-type cattle under communal conditions.South African journal of Animal science.volume 30 (supplement). http:/www.sasas.co.za/sajas.html

[23]. Okon, B., Ogar, I.B. and Mgbere, O.O. (1996).Interrelationship of live body measurement of chickens in a humid tropical environment.Nigeria Journal of Animal Production. Volume 24(1):7-12.

[24]. Raji, A.O., Igwebuike, J.U. and Usman, M.T. (2009).Zoometrical body measurements and their relation with live weight in matured local miscovy ducks in Borno State Nigeria.ARPN Journal Agriculture and Biological Science. Volume 4(3)

[25]. Yahaya, H.K., Ibrahim, H. and Abdusalam, S. (2012). Correlation between body weight and body conformation of two broiler strains under the same dietary treatment.International journal of Animal and veterinary Advances.Volume 4(3):181-183.