A PROJECT TOPIC

ON

PHENOTYPIC CHARACTERISTICS OF WEST AFRICAN DWARF (WAD) GOAT ((Capra aegagrus hircus [L])") IN THREE (LGA) OF EKITI STATE

BY

FATOBA IYANU EMMANUEL

ASC/13/0967

February, 2019

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A PROJECT SUBMITTED TO

THE FACULTY OF AGRICULTURE, DEPARTMENT OF ANIMAL PRODUCTION AND HEALTH, FEDERAL UNIVERSITY OYE-EKITI, EKITI STATE, NIGERIA.

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DECLARATION

I, FATOBA IYANU EMMANUEL humbly declare this work entitled PHENOTYPIC CHARACTERISTIES OF WEST AFRICAN DWARF (WAD) GOAT (Capra aegagrus hircus [L]) carried out in the department of Animal Production and Health, Faculty of Agriculture, Federal University Oye- Ekiti, under the supervision of Prof A.A Aganga, DR A.H Ekeocha and DR F.A Adejoro. I further wish to declare that to the best of my knowledge, it contains no materials previously published or written by another person nor material which to a substantial extent has been accepted for any other degree or diploma of any university of institute of higher learning except where due acknowledgement has been made.

FATOBA IYANU E.

Name

15/03/2019

Signature/Date

CERTIFICATION

This is to certify that this thesis titled "**PHENOTYPIC CHARACTERISTIES OF WEST AFRICAN DWARF (WAD) GOAT (Capra aegagrus hircus [L])**" was carried out by **FATOBA IYANU EMMANUEL** with **Matric Number: ASC/13/0967** in the department of Animal Production And Health, Federal University Oye –Ekiti, Ekiti State in partial fulfilment of the requirement for the award of Bachelor of Agriculture in the Department of Animal Production And Health.

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DEDICATION

This project work is dedicated to the Almighty God, who is the Author and Finisher of my Faith, my source of strength and great provider and all in all. I also dedicate this report to my parents PAST. Mr. and Mrs Fatoba and my Brothers and Sisters for their love and support.

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Abstract

Studies were carried out in three local government area in Ekiti state (Ado,Oye and Ikole LGA) to determine the phenotypic characteristic of West African Dwarf(WAD) goats. One hundred and thirty-two (132) West African Dwarf (WAD) Goats comprising sixty six (66) females and sixty six (66) males were randomly selected for the study. The aim was to document the body characteristics of the WAD goats in three Local government in (Ekiti State) and also to determine the effect of sex on the body characteristics. The experimental design was Randomized complete block design (RCBD) and means were separated using Tukey's test. Results showed that the body linear measurements for male and female goats varied between 64.00cm, 50.00cm, 46.00cm, 52.00cm, 11.00cm, 10.00cm, 7.00cm for females and 44.00cm, 43.00cm, 35.00cm, 37.00cm, 9.00cm, 8.00cm, 4.00cm for males for heart girth (HG), body length (BL), wither height (WH), rump height (RH), Tail length (TL), Ear length (EL), and Horn length (HL) respectively.

The analysis of variance (ANOVA) for the seven quantitative traits considered in this study showed different levels of significance ranging from P= 0.05 to P= 0.01. Two traits (BL, TL) showed significant *(P<0.05)* difference among the goats. There is highly significant (P<0.01) difference between the male and female goat for HG.

Location showed no significant difference *(P<0.05)* for HG, BWT, WH, RH, EL and HL whereas there is significant difference *(P<0.05)* in the BL and TL of goats measured in the three locations with animals in Ado having significantly *(P<0.05)* higher BL (46.86cm) and animals in Ikole having significantly *(P<0.05)* higher TL (8.68cm) than those in Oye (43.84cm and 7.86cm) respectively.

Sex showed highly significant *(P<0.05)* difference in the male and female goat for the following traits: HG (50.26 : 60.84), BWT (13.87 : 23.44), WH (38.45 : 43.79), RH (40.41 : 45.79), BL (41.77 : 49.44), TL (7.07 : 8.79), EL (8.24 : 9.74) and HL (4.76 : 5.95) with the female consistently showing superiority.

Location and sex interaction showed no significant difference (P>0.05) in all the quantitative traits measured. Coefficient of variation (CV %) for all the traits ranges from low (10%) to high (41%). The CV% was low for RH (9.81%), WH (10.20%), BL (12.61%), HG (13.84%), EL (14.83%), and TL (16.58%). The CV% was high for the BWT (37.40%) and HL (41.39%).

On the ANOVA table, the highest mean was recorded for HG (55.56cm), followed by BL (45.61cm), RH (43.30cm), and WH (41.12cm). The lowest mean was recorded for HL (5.36cm), TL (8.24cm), EL (8.99cm), and BWT (18.65kg).

Pearson correlation analysis showed that body weights could be predicted accurately from HG, and BL, WH and RH.

The study strongly indicates that the HG was successfully used for predicting BWT of WAD goats measured in the three LGA's and the information obtained in this research would be useful for phenotypic characterization of WAD goats and proffer assistance to breeders when conducting management selection and preservation programs.

Key words: WAD Goats, body weight, linear measurements.

Word count: 493

Table of contents

Chapter 0ne

Chapter two

Chapter three

Chapter four

Chapter five

Chapter six

List of Tables

List of figures

List of plate

CHAPTER 1

INTRODUCTION

Goats are of great economic importance in many developing countries, most especially for the rural farmers as majorly a source of income, and in developed countries, for the production of high-quality products and also for sustainable development of rural areas (Pariset *et al.* 2009). Goat production in Nigeria majorly plays an important role in the economic improvement of rural farmers and has also help in reducing the poor state of rural dwellers. The protein intake of an average Nigeria is estimated at 45.5g per head per day, this is lower compared with the Food and Agricultural Organization's recommended minimum intake of 70g per head per day, of which 50% (35g) should be of animal source (*FAOSTAT, 2008).*

There is this problem of inadequacy in the supply of animal protein across the nation due the inadequacy in production of live stocks such as: poultry, goat, cattle, pig, sheep, rabbit etc. Thus, there is therefore, the need to increase their production so as to enhance the supply of animal protein through meat consumption, and this could be accomplished through maximum use of promising indigenous animals such as goat. *Gambo et al. (2004)* reported that among the cheapest and mostly affordable protein source for this ever increasing population is mainly the poultry products and chevrons (goat meat).

Goat belongs to the family Bovidae, and there are over 300 distinct breeds of goat. Goats are known to be one of the oldest domesticated species of animal, and have been useful for various purposes such as milk, meat, hair, and skins over much of the world. In 2011, there were more than 924 million live goats around the globe, according to the UN Food and Agriculture

Organization. In 15 countries of the West humid zone, 38 percent of about 38 million goats are considered to belong to the WAD (*Gall, 1994*).

The West African Dwarf (Capra aegagrus hircus [L])") WAD goats are the predominant breed of goats in ekiti state; they are widely distributed across the rainforest belt of Southern and western Nigeria which serves as source of living to many impoverished family, most especially local/rural communities of West Africans. Raising of West African dwarf goat as serves as one of the major animal husbandry practice and in turn a source of income to the rural farmers. West African dwarf goat (WAD) as also help to reduce the level of rural dwellers poverty, only the production has not been really encouraging due to finance, proper management and adequate skills for their production. The WAD has variations in their coat colours usually black, although patched; pied, and occasionally all-white and all brown animals can be seen. The breed is well adapted to humid environment and are resistant to trypanosomiasis because it can survive well in tsetse fly areas. They are mostly found among households and small-scale farmers in varying numbers where they serve as a source of employment, food and income generation. The breed displays wide phenotypic variations in both quantitative and qualitative traits (Odubote, 1994). Characterization is necessary to realize the potential of native breeds of animals (Alderson, 1999). Improvement programmes are therefore necessary to increase and sustain the productivity of goats in the humid tropics in order to meet the demand of ever increasing human population for animal protein.

The growth performance of an animal is a function of its genetic merit and the environment. It is therefore a pre-requisite that knowledge of environmental influences and magnitude of their effects should be known in genetic improvement and decision making that can enhance

productivity. This study therefore seeks to examine the growth performance of WAD goats reared in three local government area in Ekiti-state. (Birteeb *et al, 2015).*

1.1 PROBLEM STATEMENT

It has being discovered that most of the farmers rearing west African goat in Ekiti state mostly engage in free-range, this affect the production and growth of the animal because the animal are exposed to adverse effect such as predators and stealing. More-so it makes it difficult to carry out experimental or research work on the animal most especially during the day because the animal is on free-range. Little progress has been recorded in the breed improvement.

1.2 HYPOTHESIS

1. H_o: There is no significant different in all the traits observed

   H_a: There is significant different in the traits observed

2. H_o: The traits does not show significant based on sex of the animal

   H_a: The traits show significant different based on the sex of the animal

1.3 JUSTIFICATION

Knowledge of the phenotypic characteristics is of great importance in goat production. The growth performance of an animal is a function of its genetic merit and the environment. It is therefore a pre-requisite that knowledge of environmental influences and magnitude of their effects should be known in genetic improvement and decision making that can enhance productivity. The ability of the producers and buyers to relate the live animal's measurement to

Growth characteristics is essential for optimum production and value-based trading system. This ability will also adequately reward livestock farmers Rather than the middlemen that tend to gain more profit in Livestock production business, especially in developing countries (Afolayan *et al.*, 2006). This study therefore seeks to examine the phenotypic characteristics of West Africa dwarf goat.

Body measurements have been used in animals to contrast variation in size and shape and to estimate body weight. Weight is a very important factor in selection and production of goats. Morphological characters provide useful information to detect genetic structure and individual breed's potentiality due to the intrinsic relationship among all biological characters. The knowledge of the extent of genetic variation in populations is essential for the development of appropriate breeding goals and programmes of goat populations (Dossa *et al.* 2007). Morphological and physiological animal selection can constitute an effective system to the breed preservation and improvement (Nsoso *et al.* 2004; Araujo *et al.* 2006; Sowande *et al.* 2010).

1.4 Specific objectives

The objective of this study therefore, is to investigate the extent of variation in phenotypic characteristics of the West African dwarf goat in three towns in Ekiti state.

1. To determine different body measurements of male and female WAD Goat in the three (3) Local Government Areas (LGA).
2. To determine the effect of sex on body weight of west African dwarf goat
3. To know the economic importance of west African dwarf (WAD) goats
4. To determine goat measurement using tape rule and the heart girth measurement.

CHAPTER 2

LITERATURE REVIEW

2.1 PRODUCTION OF WEST AFRICAN DWARF (WAD) GOAT

The West African Dwarf (WAD) goats are the most predominant breeds in the Southern part of Nigeria, which favours high prevalence of trypanosomiasis because this eco-zone is infected with tsetse fly, however the WAD breeds of goats thrives well and reproduce with twins and triplet births in the ecological niche (Adeloye, 1998). The West African Dwarf (WAD) goat is a common and popular breed in Ghana. WAD is a major component of the indigenous livestock genetic resources especially in the rural communities of Ghana. This breed is well adapted to, and produces and reproduces under the local environmental conditions although its productivity is generally low compared to its counterparts in other parts of the world. Uncontrolled breeding coupled with attempts by breeders and farmers to improve the performance of the indigenous African breeds through the introduction of exotic animals and crossbreeding practices are gradually leading to the erosion and complete masking of important survival traits, such as disease resistance associated with indigenous livestock as well as the extinction of certain breeds (Gizaw *et al* 2011). The characterization of African small ruminant populations will play a major role in the maintenance of these autochthonous genetic resources as the basis for future improvement at both the production and the genetic levels (Birteeb *et al* 2012).

Goats constitute the largest group of small ruminant livestock in Nigeria totaling about 53.8 million and also constituting 6.2 percent of the World's goat population (FAOSTAT, 2011).

Surveys have shown that up to 85 percent of rural households, poor farmers and smalltime business people of all age groups and sexes keep goat (FDLPCS, 2007). The ability of goats to tolerate harsh climates, the presence of trypanotolerance in some breeds (Salako, 2004), suitability to traditional systems on account of small size, short generation interval (Abdul-Aziz, 2010) and ability to thrive on poor quality diets provided by scarce grazing on marginal lands (Adedeji *et al.*, 2011) all combine to make small ruminants strategic to increasing livestock productivity in rural agricultural systems (Adedeji *et al.*, 2011).

There is then a need to study variations among their populations via breed characters so as to facilitate their efficient utilization (Salako and Ngere, 2002). The ability of the producers and buyers to relate the live animal's measurement to growth characteristics is essential for optimum production and value-based trading system. This ability will also adequately reward livestock farmers rather than the middlemen that tend to gain more profit in Livestock production business, especially in developing countries (Afolayan *et al.*, 2006). Body size of the adult goats of any breeds is the indication of the heart girth, body length, height at wither and height at rump. Among these major linear body measurements, heart girth is widely used to classify physical characteristic breeds of goat (Solomon, 2009). Characterizing the indigenous goats phenotypically is one of the cheapest, indirect and alternative ways of improving their productivity (Odubote, 1994).

Body measurements and live weights taken on live animals have been used extensively for a variety of reasons both in experimental work and in selection practices (Lawrence and Fowler 2002). Body measurements have been used to evaluate breed performance and to characterize animals. In addition, they have been used as a means of selecting replacement animals

(Sowande and Sobola 2008). The knowledge of morphological body measurements of goats could be exploited to aid adequate management and production of goats. Afolayan *et al* (2006) stated that the accuracy of functions used to predict live Weight or growth characteristics from live animal measurements is of immense financial contribution to livestock production enterprise. Several researchers have shown that body measurements provide great convenience for the prediction of body weight without weighbridges or scales (Birteeb and Ozoje 2012; Okpeku *et al* 2011; Yakubu 2009; Pesmen and Yardimci 2008; Adeyinka and Mohammed 2006; Afolayan *et al* 2006). Knowing the morphological measurements of WAD goats will be very useful for good animal management, including understanding medication doses, adjusting feed supply, monitoring growth and choosing replacement males and females (Slippers *et al* 2000).

2.2 Characteristics of west African dwarf goat

West African dwarf goat is known to display a wide range of phenotypic variations in Coat colour which can be (black, brown, white, pied, mottled, mixed, etc.; (Odubote 1994a; Ozoje and Mbgere, 2002), presence or absence of wattles (none, unilateral or bilateral) and super Numerary (extra) teats in adult females (which could be two, three or four extra teats; Odubote, 1994b). WAD goats are highly prolific, and can be bred all year round, with up to three parturitions in two years under good management system. They are hardy, with the ability to thrive and survive under harsh environmental conditions of heat and humidity, they have the ability to digest a broad range of diets and resistance to high-humidity pathogens and, tolerant of gastro-intestinal nematodes.

Their height is 30-50cm, and 20-30 Kg in weight, tending to be larger towards the savanna zone they are able to feed on short grasses and browse on foliage not eaten by other ruminants and they are inquisitive in search of food. It has characteristic of short legs and 'blocky' body, very hardy, good meat and prolific, frequently producing twins or triplets.

(Odubote, 1991). Growth rate and milk yield are very low, it is kept for meat production. According to (Yakubu *et al* 2010a), characterization of local genetic resources depends on the knowledge of the variation of morphological traits, which have played a very fundamental role in classification of livestock based on size and shape of the animal. Size and conformation are important characteristics in meat animals especially ruminants. Traditionally, animals are usually assessed visually, which is a subjective method of judgment (Abanikannda *et al;* 2002).Morphological or phenotypic characterization has been suggested and used to describe and classify breeds of farm animal species (FARM-Africa, 1996; Lanari *et al.*, 2003; Traore *et al.*, 2008). Morphological data are cheap and easy to obtain, in comparison to molecular data.

2.3 The different body conformations and possible factors affecting them

2.3.1 Heart Girth (HG): This is also refers to as the chest circumference or the chest girth. It measurement is very important because of its high level of heritability (Alade *et al.,* 2008) and also help in estimation of the body weight (Khan and Issani, 1994, Topal and Macit, 2004). Heart girth is measured as the circumference of the body at a point immediately behind the forelimbs, and perpendicular to the body axis using tape rule in centimeter.

Isaac and Ibrahim, (2006) also reported that chest girth showed the highest correlation for both sexes. Their report was an indication that chest girth is best used in estimating body weight of

the animal more than any of the other linear body measurement. Isaac and Ibrahim, (2006) concluded that although chest girth has the highest correlated trait to body weight, combining it with other linear body measurement (height at withers and body length in a stepwise multiple regression) will produce the best predication equation for body weight. Chest girth was possible to estimate the body weight due to the relatively larger contribution in body weight by chest girth (consisting of bones, muscles and viscera), Thiruvenkadan (2005).

2.3.2 Body weight (BWT): knowledge on weight assessment is very important to animal production and management. Body measurements had been used successfully to predict body weight by several authors in many breeds of goats; Sahel goats of Nigeria (Mohammed and Amin, 1997), Red Sokoto goats (Hassan and Ciroma,1992; Akpa *et al.*,1998a), West Africa Dwarf goat (Mayaka *et al.*, 1995) and Nguni goats (Slipper *et al.*, 2000). According to Otoikhian *et al.* (2008), there is a positive correlation between increases in body parameters measured with weight gain. This means that animals at different age groups have differences in body measurements and Body weight (Osinowo *et al.*, 1989; Otoikhian *et al.*, 2006). Ngere *et al;* (1984) and Osuhor *et al;* (2002) reported heavier weights for adult bucks compared with does while Ojedapo *et al.* (2007) reported heavier body weight for does in West African Dwarf goats.

Body weight of an animal can be easily estimated with the use of the heart girth measurement. According to Otoikhian *et al;* (2008), result recorded that up to 74.4% of body weight can be assessed without having to weigh the goat. Various studies have also shown that there are high and significant correlations between height at withers, heart girth and body weight at 1-2years of age suggesting that either of these variables or their combination could provide a good

Estimate for predicting live weight in Red Sokoto goat at an early age (Hassan and Ciroma, 1990). The major factors affecting body weight is Age and sex of the animal, Fajemilehin and Salako (2008).

2.3.3 Wither height (WH): This is measured as the distance between the most dorsal points of the withers to the ground level. According to Thiruvenkadan (2005), there is high correlation between the withers and the body weight.

2.3.4 Body length (BL): This is measured as the distance from the external occipital protuberance to the base of the tail. Ojedapo *et al.* (2007) and Akpa *et al.*, (2009) reported a high and positive correlation between body length and weight in West Africa Dwarf and Red Sokoto goats respectively.

2.3.5 Coat colour (CC): The WAD goats has various colour patterns majorly the black, brown, black and white, brown and white, etc. The possible effects of coat colour pigmentations on morphological traits was discussed by several authors (Akpa *et al.*,1998a, Ozoje and Kadri, 2001).

2.4 Specific importance of body measurement in Goat production

Body size and shape measured objectively could improve selection for growth by enabling the breeder to recognize early maturing and late maturing animals of different sizes. Measurement of various body conformations are of value in judging quantitative characteristics of meat animals and are also helpful in developing suitable selection criteria. Body measurements and live weights taken on live animals has been used extensively for a variety of reasons both in experimental work and in selection practices (Lawrence and Fowler 2002).

Body measurements have been used to evaluate breed performance and to characterize animals. In addition, they have been used as a means of selecting replacement animals (Sowande and Sobola 2008).

It is of utmost importance to know the phenotypic and/or genetic parameters of the animal for adequate characterization of the animal into it breed. (Mwacharo *et al.*, 2006). Phenotypic characteristics are important in breed identification and classification. The first step of the characterization of local genetic resources is to assess variation of morphological traits (Delgado *et al.*, 2001). In Nigeria, morphometric differentiation of indigenous small ruminant populations has been restricted to the use of analysis of variance (Fajemilehin & Salako, 2008). However, such type of analysis has limited power, and multifactorial analyses of morphological traits are more appropriate to assess phenotypic variation within and between goat populations; and to appropriately discriminate different goat types because of the joint consideration of all measured morphological variables (Lanari *et al.*, 2003; Zaitoun *et al.*, 2005; Dossa *et al.*, 2007; Traore *et al.*, 2008).

The ability of the producers and buyers to relate the live animal's measurement to growth characteristics is essential for optimum production and value-based trading system. This ability will also adequately reward livestock farmers rather than the middlemen that tend to gain more profit in Livestock production business, especially in developing countries (Afolayan *et al.*, 2006). A study of linear body measurements on most farms in the tropics is important because most farmers lack weighing scales and the education to understand their manipulations (Gerald, 1994). Linear body measurements can be used as a way of estimating weight and

Market value in terms of cost of the animals since most farmers lack weighing scale and education to understand their manipulation (Gerald, 1994).

2.5 Livestock's and the environment

According to Kiwuwa (1992), the broad genetic variability of African small ruminant breeds enables them to survive under stressful environmental conditions, including high disease incidence, poor nutrition, and high temperature. Goat generally survive a wide range of environments, extending from tropical to cool temperate climates (Zelalem and Fletcher, 1993)

According to Aina (2012), Land degradation and environmental damages that are associated with livestock production are majorly due to population pressure which is associated with inappropriate livestock management practices and policies; Livestock-related environmental problems is different in both the developed and developing worlds, Most environmental challenges are related to poverty and policies in developing countries.

2.6 Adaptation of Goats to their environment

West African (WAD) goat possess small body size that enables them to that freely to their environment, they also demonstrate broad feeding habits, they are adapted to unfavorable environmental conditions and their short reproductive cycle provide goats with comparative advantage over other species to suit the circumstances of especially resource poor livestock keepers (Gurmessa *et al.*, 2011b). Goats are majorly potential browsers and highly selective feeders with a strategy that enables them to thrive and produce even when feed resources are scarce, except bushes and shrubs, appear to be non-existent.

West African dwarf (WAD) goat has the ability to tolerate harsh climatic condition, they are trypanotolerance (Salako, 2004), they are suitable for traditional systems of production as a result of small body size, and short generation interval (Abdul-Aziz, 2010) they can survive under poor quality diets provided by scarce grazing on marginal lands (Adedeji *et al.*, 2011) all combine to make small ruminants strategic to increasing livestock productivity in rural agricultural systems (Adedeji *et al.*, 2011).

2.7 Table showing various hearth girth measurements for small ruminants (sheep and goat) used to determine the body weight

Heart girth		Body weight		Heart girth		Body weight	
(i)	(m)	(Ib)	(kg)	(in)	(cm)	(lb)	(kg)
10 ¾	27.3	5	2.3	18 ¾	47.6	25	11.3
11 ¼	28.6	5½	2.5	19¼	48.9	27	12.2
11 ¾	29.9	6	2.7	19 ¾	50.2	29	13.2
12 ¼	31.1	6½	3	20 ¼	51.4	31	14.1
12 3/	32.4	7	3.2	20 ¾	52.7	33	15
13 ¼	33.7	8	3.6	21 ¼	53.9	35	15.9

13 ¾	34.9	9	4.1	21 ¾	55.3	37	16.8
14 ¼	36.2	10	4.5	22 ¼	56.5	39	17.7
14 ¾	37.5	11	5	22 ¾	57.8	42	19.1
15 ¼	38.7	12	5.4	23¼	59.1	45	20.4
15 ¾	40	13	5.9	23 ¾	60.3	48	21.8
16 ¼	41.3	15	6.8	24¼	61.6	51	23.1
16 ¾	42.7	17	7.7	24 ¾	62.9	54	24.5
17¼	43.8	19	8.6	25¼	64.1	57	25.8
17 ¾	45.1	21	9.5	25 ¾	65.4	60	27.2
18 ¼	46.4	23	10.4	26 ¼	66 7	63	28.6

Heart girth		Body weight	
(in)	(cm)	(lb)	(kg)
26¾	67.9	66	29.9
27¼	69.2	69	31.3
27¾	70.5	72	32.7

28 ¼	71.7	75	34
28¾	73	78	35.4
29 ¼	74.3	81	36.7
29 ¾	75.6	84	38.1
30¼	76.8	87	39.5
30¾	78	90	40.8
31 ¼	79.4	93	42.2
31¾	80.7	97	44
32 ¼	81.9	101	45.8
32 ¾	83.2	105	47.6
33¼	84.5	110	499
33¾	85.7	115	52.2
34 ¼	87	120	54.4
34 ¾	88.3	125	56.7
35 ¼	89.5	130	59
35 ¾	90.8	135	61.2

36¼	92.1	140	63.5
36 ¾	93.4	145	65.8
37 ¼	94.6	150	68.1
37 ¾	95.9	155	70.3
38 ¼	97.2	160	72.6
38 ¾	98.4	165	74.8
39¼	99.7	170	77.1
39 ¾	101	175	79.4
40¼	102.2	180	81.6
40 ¾	103.5	185	83.9
41 ¼	104.8	190	86.2
41¾	106.1	195	88.4

Source: Sinn (1983)

2.8 Advantages of goat production

According to (Anaeto *et al* 2010), He described some advantages of goat as: a source of working machinery for man by grazing and browsing on pastures and farm residues thereby reducing weed infestations and less cost of weeding and also reduce feed cost of production, they also make use of crop residues and forages which cattle find difficult to use. Goats possess

short generation interval and are early maturing for about eight month for better breeding results, and their production is not affected by any traditional or religious taboo, products such as meat milk and wool can be derives from their production and their rearing has been one of major source of generating income for rural farmers, Also as a good protein source for human consumption.

CHAPTER 3

MATERIALS AND METHODS

3.1 Research site

The study was conducted in three local government areas (LGA'S) in Ekiti-state, (Ikole, Ado and Oye Ekiti local governments). Majorly markets and from small scale farmers. Ekiti state is a tropical climatic zone with two major seasons which are the raining season (between April-October) and the dry season from (November-march). The temperature ranges between 21° and 28°C with High relative humidity Wikipedia (2018). **Ikole** is located on latitude/longitude: 07^0 $47^153.76^{11}N$ $05^030^152.17^{11}E$, **Decimal coordinates**: 7.798266 5.514493 (7.7983 N, 5.5145 E) and **Altitude** of 557.06m. **Oye** is located on latitude/longitude: 07^0 $47^152.55^{11}N$ $05^019^142.78^{11}E$ **Decimal coordinates**: 7.797931 5.328551 (7.7979 N, 5.3286 E) and **Altitude** of 546.91m. **Ado** is located on latitude/longitude: 07^0 $37^115.9996^{11}N$ $05^013^117.0004^{11}E$ **Decimal coordinates**: 7.612411 5.237139 (7.6124 N, 5.2371 E) and **Altitude** of 431m.

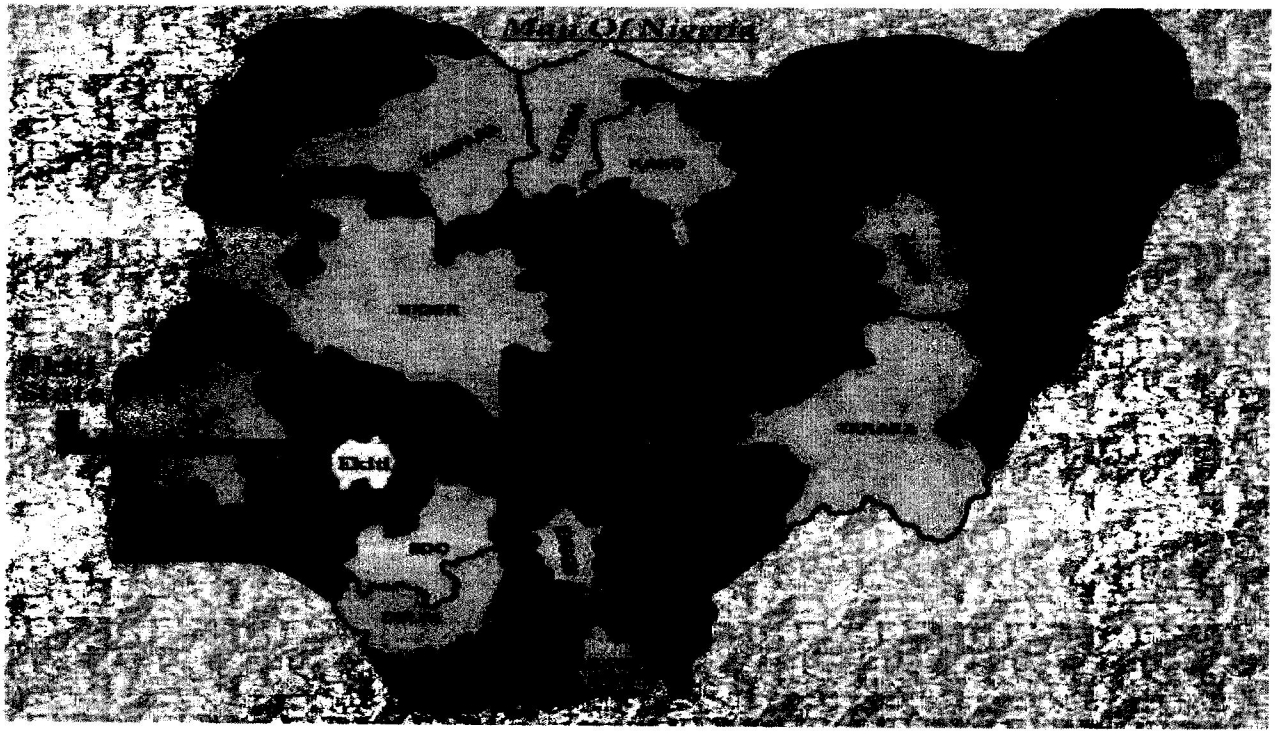

Figure 3.1 Map of Nigeria showing ekiti state where the experiment was conducted

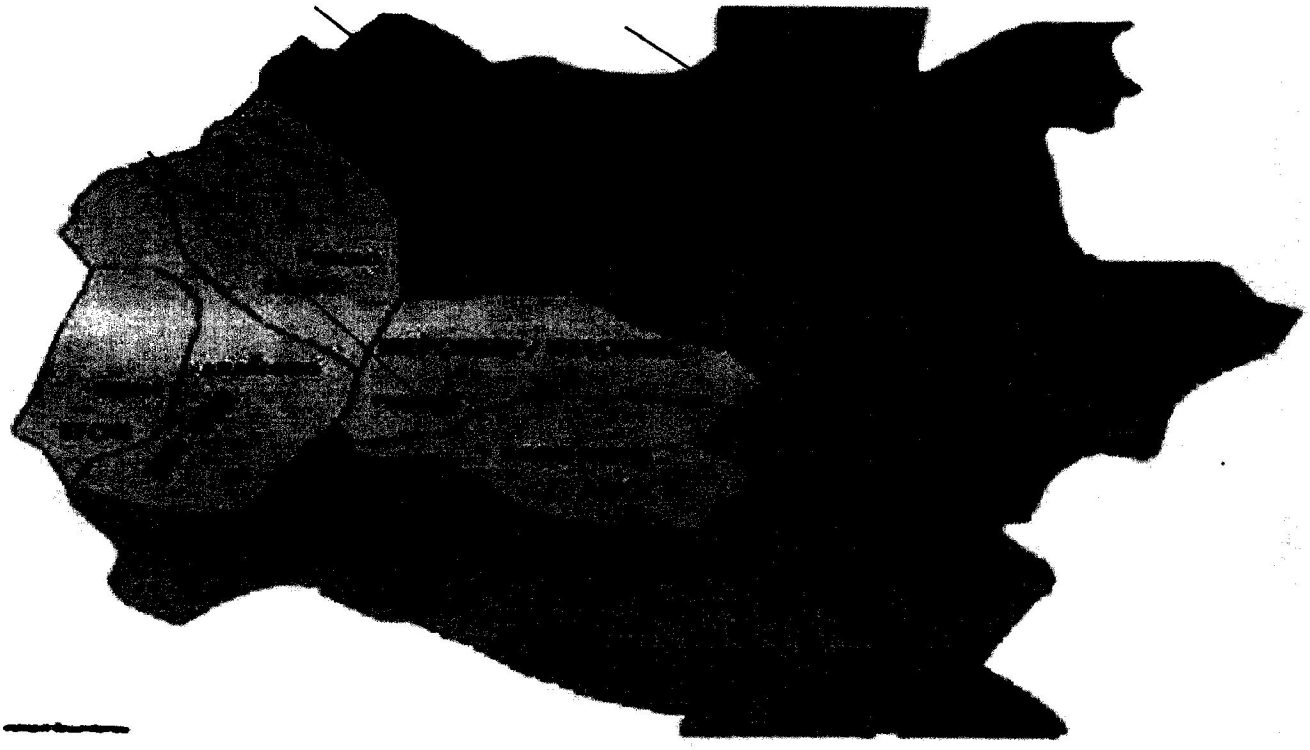

Figure 3.2 Map of Ekiti showing the three local government area the experiment was conducted (Ado,Ikole and Oye LGA).

3.2 Care and handling of goat at the the research locations

Since the system of production for West African dwarf goat in Ekiti state is mostly the free-range system, there is little to which management is taken to consideration except for the little ones raised intensively. Goat pens are mainly stalls with floors either concrete or sandy soil. Care in handling goat at the market.

3.3 Research animal

One hundred and thirty-two (132) West African Dwarf (WAD) goats was randomly selected and allotted into three treatment groups. Animals were randomly selected from around the study area. Only healthy and non-pregnant animals were included in this study. All the animals are selected using phenotypic parameters.

3.4 Data collection

Data was collected on phenotypic characteristics. Also, the live weight, body length and heart girth was measured on 132 adult goats comprising equal number of males and females using measuring tape. Data was collected from the individual animals. Ten (10) body traits were taken, including the ***body weights (kg) and linear body measurements (cm), from the animals.*** The morphometric criteria generally used to classify West African dwarf goats are: Body weight, height at wither, body length, rump height, heart girth, horn length, ear length, tail length, sex and the colours of each animal examined. (Dossa *et al.*, 2007; Sam *et al.*, 2016). Live body weights was gotten with the use of the heart girth while other body measurements was taken with the use of simple tape rule. Data's were taken in the morning before animals were fed so as to avoid feed and water interference in the record. All measurements were taken according to the method described and adopted by Rotimi *et al.* (2015).

3.5 The descriptions are:

- **Body Weight (BWT):** Body weight of the animal was obtained using the heart girth to estimate the weight in kilogram (KG).
- **Heart Girth (HG):** The height girth was measured as the circumference of the body, slightly behind the shoulders and perpendicular to the body axis in centimetres (CM).
- **Withers height (WH):** This was measured at the highest point on the dorsum of the animal to the platform at the level of the forelegs while the animal was standing in centimetres (CM).
- **Rump height (RH):** This was measured as the distance from the ground level to the base of the tail in centimetres (CM)
- **Body Length (BL):** Measured from the tip of the scapula close to the neck region to the pin bone of the tail region in centimetres (CM).
- **Ear Length (EL):** This was measured from the point where the ear is attached to its tip in centimetres (CM).
- **Horn Length (HnL):** The point of attachment of the horns to the head up to its tips. in centimetres (CM).
- **Tail Length (TL):** This was measured as the distance between the beginnings of the caudal vertebrae to its tip in centimeters (CM).
- **Coat colour (CC):** The coat was observed based on visual appraisal and was recorded as white, black, brown, white/black, white/brown.
- **Sex:** the sex of the goats in the three locations was observed and noted, the males possesses testes and presence of udder in females.

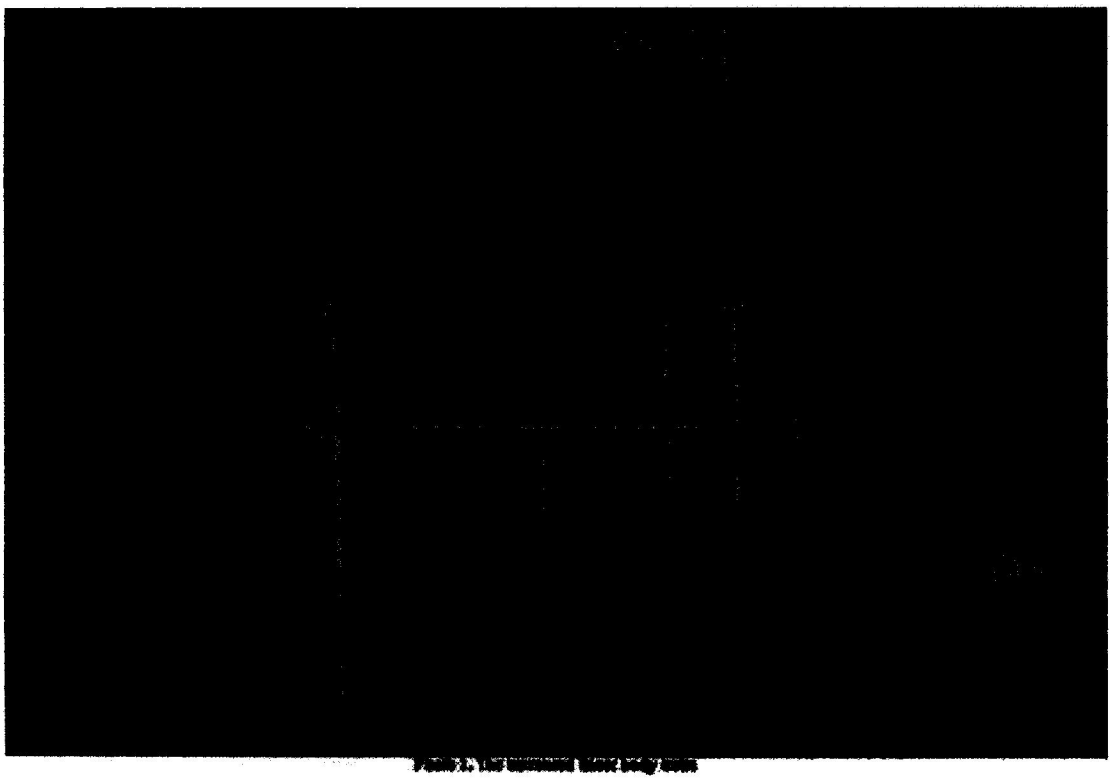

Plate3.1: A diagram showing the measured linear body traits

3.6 EXPERIMENTAL DESIGN

- The experimental design used is Randomized completely block Design (RCBD). Of which the (3) treatment groups represent the three locations the experiment was conducted. The treatment has forty-four (44) replicates each. Individual data collected from the experimental animal was analyzed using descriptive statistics and are subjected to Analysis Of Variance (ANOVA) test using the General Linear Model (GLM). Tukey's Honesty Significant Difference Test at 5% probability level was used to separate the differences between treatment means

3.7 Statistical model

- The data collected on each animal were analyzed using the General Linear Model Procedure to evaluate the significance of sources of variation affecting measurements of each animal. The fixed effects considered was sex and location.

The model used is as follows:

$Y_{ij} = \mu + \alpha_i + \beta_j + e_{ij}$

- Where **Yij** = record of body weight and body linear measurements of each animal (General observation);
- μ =overall mean;
- α_i = the fixed effect of phenotypic characteristics of the animal (male and female) on growth
- βj = the fixed effect of sex of the animal;
- **eij** = random error associated with record of each animal

CHAPTER 4

RESULTS

4.1 Analysis of variance summary for all the quantitative traits measured (CM) and the body weight (kg)

The analysis of variance(ANOVA) for the eight quantitative traits considered in this study showed different levels of significance ranging from P= 0.05 to P= 0.01. Two traits (BL, TL) showed significant (P<0.05) difference among the goats. There is highly significant (P<0.01) difference between the male and female goat for trait heart girth.

Location showed no significant difference for heart girth, bodyweight, wither height, rump-height, ear length and horn length and body length, there is significant (P<0.05) difference in the tail length of goats measured in the three locations.

Sex showed highly significant (P<0.001) difference in the male and female goat for the following traits heart girth, bodyweight, wither height, rump height, body length, tail length and ear length but horn length shows no insignificant difference.

Location and sex showed insignificants in all the quantitative traits measured. Coefficient of variation (CV %) for all the traits ranges from low (10%) to high (41%). The CV% was low for rump height (9.81%), wither height (10.20%). Body length (12.61%), height girth (13.84%), ear length (14.83%), and tail length (16.58%). The CV% was high for the body weight (37.40%) and horn length (41.39%). On the ANOVA table, the highest mean was recorded for heart girth (55.56cm), followed by body length (45.61cm), rump height (43.30cm), and wither height (41.12cm). The lowest mean was recorded for horn length (5.36cm), tail length (8.24cm), ear length (8.99cm), and body weight (18.65kg)

Table 4.1 Analysis of variance summary for all the quantitative traits measured (CM) and the body weight (kg)

SOV	DF	HG	BWT	WH	RH	BL	TL	EL	HL
Location	2	48.73^{ns}	55.42^{ns}	31.87^{ns}	30.21^{ns}	109.01^{ns}	7.84^{*}	3.05^{ns}	14.21^{ns}
Sex	1	3712.12^{***}	3020.20^{***}	938.67^{***}	954.73^{***}	1939.67^{***}	39.27^{***}	74.25^{***}	47.28^{ns}
Loc x sex	2	69.14^{ns}	52.09^{ns}	36.46^{ns}	40.85^{ns}	39.69^{ns}	0.36^{ns}	2.52^{ns}	2.94^{ns}
Error	105	59.13	48.67	17.58	17.90	39.80	1.87	1.78	4.91
Cv%	-	13.84	37.40	10.20	9.81	12.61	16.58	14.82	41.39
Mean	-	55.56	18.65	41.12	43.10	45.61	8.24	8.99	5.36

*, and *** = significance at 0.05and 0.001 Levels of probability

SOV= source of variation, DF= degree of freedom, CV= coefficient of variation, HG= heart girth, BWT= bodyweight, WH= wither height, RH= rump height, BL= body length, TL= tail length, EL= ear length, HL= horn length, ns= not significant.

4.2 Result on mean separation for body measurements and the body weight (KG) according to location

From table (4.2) below, Ado has the highest heart girth (56.34cm) with standard error of mean (±1.64), followed by Ikole (55.97cm) with standard error of mean (±1.72), while Oye had the least (54.36cm) with standard error of mean (±1.40), and there is no significant difference between the three locations. For body weight Ikole had the highest (19.46kg) with standard error of mean (±1.56), however the lowest is from oye (17.37kg) with standard error of mean (±1.27), and Ado had (19.12kg) with standard error of mean (±1.53), and there is no significant difference in the body weight measured across the three locations. For wither height there is no significant difference across the three locations, Ado had the highest (41.84cm) with standard error of mean (±1.0.89), followed by Ikole (41.34cm) with standard error of mean (±1.0.87), and Oye had the lowest (40.18cm) with standard error of mean (±1.0.91). Ado had the highest rump height (43.84cm) with standard error of mean (±1.0.89), and Ikole had (43.25cm) with standard error of mean (±1.0.88), while oye had the least (42.20cm) with standard error of mean (±1.28). There is no significant difference across three location.

From the table below, the highest body length measurement is from Ado while the least is found in Oye, the body length showed significant difference between Ado (46.86cm) with standard error of mean (±1.29) and Oye (43.84cm) with standard error of mean (±1.27), but there is no significant difference between the goat in Ado and Ikole, and also no significant difference between Ikole (46.11cm) with standard error of mean (±1.1.22) and Oye (43.84cm) with standard error of mean (±1.27).

The tail length showed significance difference between Ikole (8.68cm) with standard error of mean (±0.28) and oye (7.86cm) with standard error of mean (±0.28), while there is no

Significance difference between Ikole and Ado, and also for Oye and Ado. For ear length, Ikole has the highest (9.27cm) with standard error of mean (±0.28), followed by Oye (8.95cm) with standard error of mean (±0.28), while the least ear length is from Ado (8.75cm) with standard error of mean (±0.26), however there is no significance difference across the three location. For horn length, Ikole has the highest measurement (5.75cm) with standard error of mean (±0.48). While Oye had the least measurement (4.70cm) with standard error of mean (±0.47) and Ado had measured horn length as (5.61cm) with standard error of mean (±0.45). Therefore there is no significance difference between the three locations.

Table 4.2: Table on mean separation for the body measurements and the body weight (KG) according to location

Location	HG	SEM	BWT	SEM	WH	SEM	RH	SEM	BL	SEM	TL	SEM	EL	SEM	HL	SEI
ADO	56.34[a]	±1.64	19.12[a]	±1.53	41.84[a]	±0.89	43.84[a]	±0.89	46.86[a]	±1.29	8.18[ab]	±0.27	8.75[a]	±0.26	5.61[a]	±0.
IKOLE	55.97[a]	±1.72	19.46[a]	±1.56	41.34[a]	±0.87	43.25[a]	±0.88	46.11[ab]	±1.22	8.68[a]	±0.28	9.27[a]	±0.28	5.75[a]	±0.
OYE	54.36[a]	±1.40	17.37[a]	±1.27	40.18[a]	±0.91	42.20[a]	±1.28	43.84[b]	±1.27	7.86[b]	±0.28	8.95[a]	±0.29	4.70[a]	±0.

Means of treatment was separated using HSD TUKEYS Means with the same letter are not significantly different and mean comparison is along each column.

HG= heart girth, BWT= bodyweight, WH= wither height, RH= rump height, BL= body length, TL= tail length, EL= ear length, HL= horn length, SEM= standard error of mean.

4.3 Result on the mean separation for body measurements and the body weight (KG) according to Sex

From table 4.3, across the three locations (Ado, Ikole, Oye LGA) where the study was conducted, the female goat had significantly higher means square than the male goats in all the traits measured which includes heart girth, body weight, wither height, rump height, body length ,tail length ,ear length and horn length.

Table 4.3: mean separation for the body measurements and the body weight (KG) according to Sex

Location	HG	SEM	BWT	SEM	WH	SEM	RH	SEM	BL	SEM	TL	SEM	EL	SEM	HL	SEM
MALE	50.26^{B}	±1.45	13.87^{B}	±1.47	38.45^{B}	±0.88	40.41^{B}	±0.88	41.77^{B}	±1.27	7.07^{B}	±0.24	8.24^{b}	±0.29	4.76^{b}	±0.49
FEMALE	60.84^{A}	±8.10	23.44^{A}	±6.75	43.79^{A}	±4.28	45.79^{A}	±4.33	49.44^{A}	±5.90	8.79^{A}	±1.52	9.74^{a}	±1.26	5.95^{a}	±2.09

Means of treatment was separated using HSD TUKEYS. Means with the same letter are not significantly different and mean comparison is along each column.

HG= heart girth, BWT= bodyweight, WH= wither height, RH= rump height, BL= body length, TL= tail length, EL= ear length, HL= horn length, SEM= Standard error of mean

4.4 Result on location and sex interaction

The female goat in Ikole had the highest mean of (62.73cm) for heart-girth with the standard error of (1.61), compared to the other females in the study area of which mean shows (60.95cm) for Ado and (58.91cm) for Oye and a standard error of (1.44) and (1.30) respectively. The male goats in Ado had the highest mean for heart-girth which is (51.73cm) with the standard error of (1.67), and Oye which had the mean to be (49.82cm) with the standard error of (1.49), followed by Ikole which had the lowest mean for heart-girth which is (49.23cm) with the standard error of (2.01).

For body weight, female goats from Ikole had the highest mean for body weight (25.50kg), with the standard error of (1.49), whereas female goats from Oye had the lowest mean for body weight which is (21.48kg), with the standard error of (1.33), and females from Ado had body weight of (23.32kg), with standard error of (1.59). Male goats from Oye had the lowest mean for body weight which is (13.26kg), with the standard error of (1.22), and the highest mean for body weight for the male goats is from Ado which is (14.92kg), with the standard error of (1.46), while Ikole had mean of (13.42kg) for body weight and standard error of (1.64).

Female goats from Ikole had the highest wither height with a mean of (44.82cm), and a standard error of (0.89), the lowest mean for wither height is from Oye having (38.50cm), with a standard error of (0.85). Ado had mean of (44.68cm) with a standard error of (0.89). The male goat from Oye had the lowest mean for wither height which is (38.50cm), with standard error of (0.98), while the male goats from Ado has the highest mean of (39.00cm), with standard error of (0.90) and Ikole male goats had the mean of (37.86cm) with standard error of (0.86).

From the table, Ikole female goats had the highest mean of (46.82cm) for rump height with standard error of (0.89), and the lowest Rump height mean for female goats is from Oye which is (43.86cm), with standard error of (0.84), and Ado had the mean of (46.68cm) with standard error of (0.89). The male goats in Ikole had the lowest mean for rump height which is (39.68cm) with standard error of (0.88), and Oye male goats had the highest mean for rump height which is (40.55cm), with standard error of (0.99), whereas Ado male had the mean for rump height to be (41.00cm), with standard error of (0.90).

The female goats from Ado had the highest mean for body length which is (50.91cm),with the standard error of (1.29), whereas female goats from Oye had the lowest mean body length of (46.64cm), with standard error of (1.23), while female goats from Ikole had the mean body length of (50.77cm), with standard error of (1.29). The male goats from Ado had the highest mean for body length which is (42.82cm), with standard error of (1.29), whereas male goats from Oye had the lowest mean for body length of (41.05cm) with standard error of (1.32), and male goat from Ikole had the mean body length of (41.45cm) with standard error of (1.16).

The highest mean tail length for female is from Ikole which is (9.23cm) with standard error of (0.22), followed by female goats from Ado which had the mean tail length of (8.64cm) with standard error of (0.26) and the lowest mean tail length is from Oye which is (8.50cm) with standard error of (0.23). For the male, the lowest mean tail length is from Oye which is (7.23cm), with standard error of (0.33) and the highest mean is from Ikole which is (8.14cm), with standard error of (0.36) and Ado had a mean tail length for male as (7.73cm), and standard error of (0.29).

Female goats in Ikole had the highest mean for ear length which is (10.00cm) with standard **error of** (0.29) and Ado had the least ear length of (9.27cm), with standard error of (0.26while **Oye had** mean ear length of (9.95cm) with standard error of (0.32). The male goat from Ikole **had** the highest mean ear length of (8.55cm) with standard error of (0.28) and Ado had the mean ear length of (8.23cm) with standard error of (0.27) while Oye had the mean ear length of (7.95cm) with standard error of (0.26).

The female from Ado had the highest mean horn length of (6.50cm) and standard error of (0.51), while the female goats from Oye had the least horn length of (5.23cm) and standard error of (0.41), Ikole had mean horn length of (6.14cm) with standard error of (0.55). The male goat from Ikole had the highest mean horn length of (5.36cm) with standard error of (0.41) and the male goat from Oye had the least horn length of (4.18cm) with the standard error of (0.52) and Ado had the mean horn length of (4.73cm) with standard error of (0.44).

Table 4.4 Result on Location and Sex Interaction for all the body trait measured (CM) and the body weight (KG)

Level of		HG		BWT		WH		RH		BL		TL		EL		HL	
Location	Sex	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Ado	F	60.95	1.61	23.32	1.59	44.68	0.89	46.68	0.89	50.91	1.29	8.64	0.26	9.27	0.26	6.50	0.51
Ado	M	51.73	1.67	14.92	1.46	39.00	0.90	41.00	0.90	42.82	1.29	7.73	0.29	8.23	0.27	4.73	0.44
Ikole	F	62.73	1.44	25.50	1.49	44.82	0.89	46.82	0.89	50.77	1.29	9.23	0.22	10.00	0.29	6.14	0.55
Ikole	M	49.23	2.01	13.42	1.64	37.86	0.86	39.68	0.88	41.45	1.16	8.14	0.36	8.55	0.28	5.36	0.41
Oye	F	58.91	1.30	21.48	1.33	41.86	0.85	43.86	0.84	46.64	1.23	8.50	0.23	9.95	0.32	5.23	0.41
Oye	M	49.82	1.49	13.26	1.22	38.50	0.98	40.55	0.99	41.05	1.32	7.23	0.33	7.95	0.26	4.18	0.52

HG= heart girth, BWT= bodyweight, WH= wither height, RH= rump height, BL= body length, TL= tail length, EL= ear length, HL= horn length. SE= Standard error

4.5 Correlation

4.5 Pearson correlation of the traits measured in goats in Ikole LGA

The correlation among the eight traits measured in Ikole local government is presented in Table (4.5). BWT had positive and highly significance ($P \leq 0.001$) correlation with HG (r=0.99). However in the same table WH showed positive significant ($P \leq 0.001$) correlation with HG (r=0.82) and BWT (r=0.83). Moreover RH recorded positive and significant ($P \leq 0.001$) correlation with the following traits: HG (r=0.82), BWT (r=0.83), WH (r=0.99). However BL showed positive and significant ($P \leq 0.001$) correlation with the following traits: HG (r=0.81), BWT (r=0.83), WH (r=0.78), RH (r=0.76). Furthermore, TL had positive and significant ($P \leq 0.05$) correlation with WH (r=0.26) and RH (r=0.27). EL showed positive and non-significant (ns) correlation with TL (r=0.40). HL exhibited positive and significant ($P \leq 0.001$) correlation with TL (r=0.34).

Table 4.5 Pearson correlation of the traits measured in goats in Ikole LGA

	HG	BWT	WH	RH	BL	TL	EL	HL
HG	1.00000							
BWT	0.98573***							
WH	0.82366***	0.83037***						
RH	0.82092***	0.82863***	0.98712***					
BL	0.81219***	0.83116***	0.77512***	0.76453***				
TL	0.34073**	0.38983***	0.26158*	0.26781*	0.38703^{ns}			
EL	0.62492***	0.61632***	0.53964***	0.53808***	0.63363***	0.39913^{ns}		
HL	0.50747***	0.55755***	0.57639***	0.56372***	0.54171***	0.33701**	0.28867*	1.00000

*, ** and ***= significance at 0.05, 0.01and 0.001 Levels of probability

HG= heart girth, BWT= bodyweight, WH= wither height, RH= rump height, BL= body length, TL= tail length, EL= ear length, HL= horn length.

4.6 Pearson correlation of the traits measured in goats in Oye LGA

The correlation among the eight traits measured in Oye local government is shown in Table (4.5). BWT had positive and highly significance ($P \leq 0.001$) correlation with HG (r=0.99). Whereas WH showed positive significant ($P \leq 0.001$) correlation with HG (r=0.79) and BWT (r=0.75). Also from the table, RH recorded positive and significant ($P \leq 0.001$) correlation with the following traits: HG (r=0.79), BWT (r=0.75), WH (r=0.10). However BL showed positive and significant ($P \leq 0.001$) correlation with the following traits: HG (r=0.79), BWT (r=0.76), WH (r=0.80), RH (r=0.80). Moreover, TL had positive and non-significant (ns) correlation with HG (r=0.45) and BWT (r=0.45), and BL (r=0.22). EL also showed positive and non-significant (ns) correlation with BWT (r=0.46), WH (r=0.38), RH (r=0.37). HL exhibited positive and significant ($P \leq 0.001$) correlation with HG (r=0.64), BWT (r=0.63), WH (r=0.53), RH (r=0.53), BL (r=0.51). TL also showed positive significant ($P \leq 0.05$) correlation WH (r=0.30), RH (r= 0.29).

Table: 4.6 Pearson correlation of the traits measured in goats in Oye LGA

	HG	BWT	WH	RH	BL	TL	EL	HL
HG	1.00000							
BWT	0.98792***							
WH	0.79187***	0.75247***						
RH	0.78868***	0.74885***	0.99917***					
BL	0.78758***	0.75529***	0.79914***	0.80261***				
TL	0.44901^{ns}	0.44649^{ns}	0.30214*	0.28979*	0.21625^{ns}			
EL	0.47493***	0.46435^{ns}	0.37958^{ns}	0.36589^{ns}	0.42714***	0.37872^{ns}		
HL	0.63857***	0.63246***	0.52642***	0.53410***	0.51001***	0.30916*	0.14960^{ns}	1.00000

*, and ***= significance at 0.05, and 0.001 Levels of probability HG= heart girth, BWT= bodyweight, WH= wither height, RH= rump height, BL= body length, TL= tail length, EL= ear length, HL= horn length.

4.7 Pearson correlation of the traits measured in goats in Ado LGA

The correlation among the eight traits measured in Ado local government is presented in Table (4.6). BWT had positive and highly significance ($P \leq 0.001$) correlation with HG (r=0.99). However the table showed WH to be positive significant ($P \leq 0.001$) correlation with HG (r=0.73) and BWT (r=0.71). Whereas RH recorded positive and significant ($P \leq 0.001$) correlation with the following traits: HG (r=0.74), BWT (r=0.71), WH (r=1.00). BL exhibit positive and significant ($P \leq 0.001$) correlation with the following traits: HG (r=0.81), BWT (r=0.79), WH (r=0.86), RH (r=0.86). Furthermore, TL had positive and non-significant (ns) correlation with BL (r=0.37). EL showed positive and significant ($P \leq 0.001$) correlation with HG (r=0.50), BWT (r=0.40), WH (r=0.53), RH (r=0.53), BL (r=0.55), TL (r=0.41). HL exhibited positive and significant ($P \leq 0.05$) correlation with TL (r=0.28).

Table: 4.7 Pearson correlation of the traits measured in goats in Ado LGA

	HG	BWT	WH	RH	BL	TL	EL	HL
HG	1.00000							
BWT	0.99411***							
WH	0.73528***	0.70984***						
RH	0.73528***	0.70984***	1.00000***					
BL	0.80813***	0.79106***	0.85649***	0.85649***				
TL	0.43621***	0.40529***	0.48413***	0.48413***	0.36524^{ns}			
EL	0.50269***	0.49947***	0.53451***	0.53451***	0.54510***	0.40868***		
HL	0.75037***	0.75059***	0.69011***	0.69011***	0.73460***	0.28363*	0.42549***	1.00000

*, and ***= significance at 0.05, and 0.001 Levels of probability

HG= heart girth, BWT= bodyweight, WH= wither height, RH= rump height, BL= body length, TL= tail length, EL= ear length, HL= horn length.

4.8 Chi square Analysis for the coat Colour of all the West African Dwarf (WAD) goats observed in the study areas

The Chi square analysis showed that most of the WAD goat observed in the study areas have predominantly black colour compare to the other colours, of which black colour goat are found to be a total number of seventy one (71) with percentage of (53.79), followed by the brown colour WAD goat which total up to thirty (30) from all the WAD goat measured and a percentage of (22.73). The total number of white and black goat measured is eighteen (18) with a percentage of (13.64), and the brown and black goat total number is six (6) with a percentage of (4.55), the white and brown WAD goat measured are five (5) with percentage of (3.79), while the white goat measured in the three locations the research was conducted are two (2) with a percentage number of (1.52).

Chi square probability which is (0.49), this shows that there is no association in the coat colours of all the WAD goats measured in the three locations.

Table 4.8 Chi square analysis for coat colours of the WAD goats in the three Local government areas

Parameters	LOCAL GOVERNMENT					
	IKOLE		OYE		ADO	
Coat clours	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Black	21	15.91	22	16.67	28	21.21
Brown	11	8.33	10	7.58	9	6.82
White and Black	8	0.00	8	6.06	2	1.52
Brown and Black	3	0.00	1	0.76	2	1.52
White and Brown	1	0.76	2	1.52	2	1.52
White	0	0.00	1	0.76	1	0.76

TOTAL

colour	Black	Brown	White/Black	Brown/Black	White/Brown	White
Frequency	71	30	18	6	5	2
Percentage	53.39	22.73	13.64	4.55	3.79	1.52

Chi square probability= 0.49

CHAPTER 5

DISCUSSIONS

The presence of significant difference ($P<0.05$ and $P<0.001$) among the traits for the West African dwarf (WAD) goat measured and examined which include (heart girth, wither height, body length, rump height, ear length, tail length, horn length, body weight, sex and colour of each animal. From the ANOVA table, sex has the highest variation for individual trait measured but the location does not really affect the performance of the animal except for low performance in the goats measured in Oye local government, this may be as a result of the small land area compare to Ado and Ikole local government.

Body weight of each animal was estimated using the hearth girth (HG), this was in tandem with Birteeb and Ozoje (2012) reported that estimation of live weight can be more accurate when heart girth is combined with one or two other measurements. (Yakubu, 2010) also said the importance of heart girth in weight estimation could be as a result of the muscle and a little of fat along with bone structure which contribute to its formation. Heart girth is the most suitable trait for estimation of live weight for animals under field condition where weighing bridges or scales are unavailable Badi *et al.* (2002) and Leng *et al.* (2010). Heart girth was found to be a single most important traits for predicting body weight of farm animals (Birteeb and Ozoje, 2012; Okpeku *et al.*, 2011; Olatunji-Akioye and Adeyemo, 2009).

From the result seen in the three locations where the research was conducted, sex was highly significant *($P<0.05$)*.for most of the traits observed, female West African Dwarf (WAD) goats

has higher mean square compared to the male West African Dwarf (WAD) goats observed in all the three locations the experiment was carried out.

There was no significant difference in the body weight of goats measured across the three locations. Ikole had the highest (19.46kg), however the lowest is from oye (17.37kg), and Ado had (19.12kg), Although the difference between the body weight of goat measured in Ado and oye is (1.75kg), this (1.75kg) weight is still due to chance and it is not significantly different enough because the result shows that mean with the same letters are not significantly different.

Based on the Result gotten from this research work, the relationship between linear body traits sex and body weights of goats observed in the three local government area (LGA)

Showed high and significant values, which shows that they are highly correlated and that increase in the body traits performance have potential possibility of also influencing an improvement in body weight. This was similar to the research conducted by Okpeku, (2010) for similar studies in Nigerian goats.

Body linear measurement is useful for breeding, nutrition and health management in WAD goat production. Various studies have been conducted to investigate the relationship between body weight and various linear measurements in goats (Mayaka *et al.*, 1996; Slippers *et al.*, 2000; Badi *et al.*, 2002; Khan *et al.*, 2006). Live weight may be estimated through several measurements but it is best achieved through the use of the heart girth.

5.1 The frequency of qualitative traits of WAD goats according to locations and coat colour based on Chi square analysis.

The black coloured goats were found to be predominant compared with all other West African goat measured across the three locations, while white coated goats were fewer in number.

Several authors however agreed that goats could have an array of different coat colours which could range from black, brown, white and brown, black and white, brown black and white etc., (Haenlein, 1992; Vanghan *et al.,* 2000; Mileski and Myers, 2004).

Other authors have also recorded basic coat colours of brown, light brown, dark red and white with its other pattern mixtures were observed, (Peacock, 1996; Akpa *et al.,* 1998a and Asuku, 2010). Frequency of occurrence of coat colour variations could differ from place to place, however, this majorly depends on cross breeding and the various system of managements.

5.2 Effect of sex in the body conformation and weight of the WAD goats used in the study

The effect of sex on body morphometric trait was significant. Female goats were superior to males. The result obtained in this study is also similar to that reported by Asuku (2010). Fajemilehin and Salako (2008) revealed that sex is an important source of variation for body weight and body linear measurements of goats. This effect is linked to the presence or absence of androgenic hormones in both sexes. According to Ojedapo, *et al.* (2007) sex had a significant effect on body weight and some linear body measurements. Akpa *et al.* (1998a) also reported a significant effect of sex on body measurements of Red Sokoto goats; bucks weighed heavier and had wider heart girth than does while the does had longer body length and higher height at withers. The females weighing heavier than males in this study could be as a result of management and the population of the females compared to males, more so,farmers do sell their male goats at their early stage and most are not allowed to reach full maturity stage.

CHAPTER 6

CONCLUSION

Results obtained in this study revealed that sex had significant effect ($p<0.001$) on all the body parameters examined with females having higher values than the male goats for all the traits. Whereas, location had no significant effect (P>0.05). Therefore, the information obtained in this research would be useful for phenotypic characterization of West African Dwarf (WAD) goats in the study area and could assist farmers and breeders when conducting management, selection and preservation programs. The study strongly indicates that the heart girth was successfully used for predicting body weight of the WAD goat measured in the three LGA (Ad0, Ikole and Oye).

RECOMMENDATON

It is very necessary to study the phenotypic characteristics of West African Dwarf (WAD) goat so as to improve it production and also to enhance knowledge on its production. I hereby recommend that weight belt should be made available to enhance this study and to easily estimate the weight of the Animal.

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