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Morphological Characterization of IndigenousArsi-Bale Sheep in the Oromia Regional State, Ethiopia

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Key words: Arsi-Bale sheep, phenotypic characterization, qualitative character, linear body measurement, breeds

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Abstract: Description of the physical characteristics of livestock breeds is very important for developing a breeding strategy in a particular production system. Arsi-Bale sheep are among the potential breeds of Ethiopia reared in the mixed crop and livestock production system of Oromia Ethiopia. This research was conducted to characterize the morphological features of Arsi-Bale sheep in an attempt to develop a breeding strategy that suits the production system of the area. A total of 777 sheep were characterized for different morphological features. Most 503 of the sheep in the flock were females and 274 were male sheep of four and above dentition classes. Browncoat colour was abundant (34%) and 60.7% of the colour pattern was plain. Arsi-Bale sheep were long fat-tailed (87.9%) and hairy (73.7%). The overall least square mean body weight was 25.9±0.2 kg and was affected by sex and age of sheep. The mean chest depth (26.85±0.3),heart girth (68.8 ± 0.4 cm), body length (41.6±0.4cm), horn length (7.4±0.2 cm) and tail circumference(18.4±0.1cm) were also affected by sex and dentition. Positive and significant correlations were obtained between body weight and other linear body measurements. The highest correlation coefficient was between body weight and chest depth. The positive and significant correlation of weight with linear body measurements indicates that linear body measurements can be used as a marker to estimate weight for different purposes. For breeding and selection purposes, since, there is a need to be more precise use of models involving more number of variables is important.

INTRODUCTION

Ethiopia is home for at least 9 breeds and 14 traditional sheep populations[1]. Sheep have multipurpose function and contribute to the livelihood of a large number of small and marginal farmers[2]. Morphological characterization entails the description and documentation of the physical traits of a breed[3]. The World Watch List for Domestic Animal Diversity (WWL-DAD) prepared by FAO[4] defined a breed as either a homogenous, sub-

specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species.

Characterization of Animal Genetic Resources for food and agriculture (AnGR) involves three types of information: phenotypic, genetic and historical. The weight given to each depends on the country (e.g., whether it is developed or developing) and the objective (e.g. improvement, conservation or breed differentiation[5].

Phenotypic characterization of AnGR is the process of identifying distinct breed populations and describing their external and production characteristics in a given environment and under given management, taking into account the social and economic factors that affect them. The information provided by characterization studies is essential for planning the management of AnGR at local, national, regional and global levels[5]. The term "phenotypic characterization of AnGR" generally refers to the process of identifying distinct breed populations and describing their external and production characteristics within a given production environment.

Indirect estimation of body weight to an acceptable degree of accuracy using a prediction equation based on linear body measurements is of considerable practical use. Body measurements, especially body length; heart girth and height at withers are used to describe the population of the sheep breed and are prerequisites for further genetic gain improvements.

Alemayehu and Tikab[6] the three linear body measurements mentioned above are the most important criteria for selection of individual animals. Live body weight is also used as criteria for performance evaluation of the individual animals[7]. The present study was thus initiated to bridge the gap left behind from the previous studies and thus describes the physical and morphological characteristics of Arsi-Bale sheep types found in the three administrative zones of Oromia region, Ethiopia.

MATERIALS AND METHODS

Description of the study areas and sampling procedure: Divergent to previous studies undertaken by various scholars in the current study we did nottarget sheep types traditionally recognized by ethnic and/or geographic nomenclatures, rather we included all sheep types from randomly selected districts of densely populated major administrative zones of the Region. The study was conducted from November 2018 to August 2019 in three administrative zones of Oromia Region, Ethiopia. The study was conducted in three Zone Arsi (LimuBilbilo and ZiwayDugda), West Arsi (Arsi Negele) and Bale (Dinsho) were selected.

Stepwise purposive selection procedure was carried out in the study area where the districts and the Kebeles (villages) were purposively selected based on the available sheep population in each study zone. This was followed by identi cation of the households which owned at least four sheep and had prior experience in sheep husbandry. Among the identi ed households, 160 of them were then randomly selected from each district and zone to obtain the qualitative and quantitative sample data. All the sheep in the sampled households were included in the current study. The total sample size will be selected 777 sheep in the three zones of which 274 were male and 503 were female by the proportion sample size techniques:

$$n = \frac{N}{1+N*(e)^2}$$

Where:
n = The sample size
N = The population size
e = The acceptable sampling error Yamane

Data collection procedures

Morphological characterization: Data on the assessment of qualitative characters and quantitative morph-metrical traits were obtained from a total of 777 sheep that were drawn from 160 households. For the assessment of quantitative morph-metrical traits, only those aged one year and above were considered for the purpose of uniformed comparison. The FAO[5] qualitative and quantitative sheep breed descriptor list was followed to characterize the sheep types phenotypically and morphologically.

Qualitative characters: Data on coat colour pattern, coat colour type, hair coat type, tail type, head pro le, ear form, presence and absence of wattle, horn and ruff were observed and recorded.

Quantitative morph metrical characters: They were obtained by a measuring tape calibrated in centimeters (cm) after restraining and holding the animals in an unforced position. All measurements were taken by the experienced expert while sheep were in an up-right plane during measurement. The following linear body measurements were taken: chest girth, heart girth, height at withers, rump width, rump length, body length, ear length, horn length, tail circumference and scrotum circumference. The morph metrical measurements were taken using self-devised equipment's and according to the methods suggested by Macjowski and Zieba[9]. Body weight was measured using suspended spring balance with 50 kg capacity with ±200 g error margin. The age of animals was estimated using dentition method as suggested by Charring *et al*.[10].

Data analysis: Preliminary data analysis such as homogeneity test, normality test and screening of outliers

was employed before conducting the main data analysis. Discrete measurements on the form and appearance of the investigated animals were analysed using the frequency procedure of chi-square test.

Body weight and quantitative linear body measurements were analysed using the generalized linear model procedures. Means were separated using Duncan's multiple range test procedure and values were considered signi cant at $p<0.05$. The major quantitative morphometrical variables included in the hierarchical cluster analysis were body weight, chest girth, body length, height at withers, rump (pelvic) width, ear length, horn length, tail circumference of the sheep in which the data for individual traits were pooled for both sexes within each of the studied area.

Live body weight and linear body measurements were subjected to List-square analysis of variance using the General Linear Model (GLM) procedure of SPSS Version 22.0 with sex and age as fixed effects:

$$Y_{ijk} = \mu + S_i + T_j + (S_T)i_j + e_{ijk}, \text{....., analysis of variance}$$

Where:

Y_{ijk} = The observation on body weight and other linear body measurements
W = The observation on live body weight of the animal
μ = Overall mean
S_i = Fixed effect of sex (i = Female, Male)
T_j = Fixed effect of age (j = 0 PPI, 1PPI, 2PPI, ≥3 PPI)
$(S_T)i_j$ = The interaction effect of sex with age
e_{ijk} = Effect of random error

RESULTS AND DISCUSSION

Physical body characteristic of the Arsi-Bale sheep: The morphological descriptions of the Arsi-Bale sheep are presented in Table 1. The study was observed for qualitative parameter in the Arsi-Bale sheep population. Majority of the Arsi-Bale male sheep had plain coat (62.4%), patchy (24.8%) and spotted (12.8%) while the frequently observed coat pattern in the female sheep was plain (59.8%) followed by Patchy (24.3%) and spotted (15.9%). Asefa *et al*.[11] reported that the sheep found in Selalearea is characterized as coat pattern were plain, patchy and spotted which was similar with the present report. Majority of the male (35%) and female (33.4%) sheep characterized was brown pursued red white and black color. Beside, brown dominant (7.9%), white dominant (3.6%) and red dominant (1.5%) coat were also observed in plain pattern and mixed in patchy or spotted patterns. Gizaw *et al*.[12] reported that coat colors are brown, brown with white patches, black, white and combinations of above colors were observed in thisstudy. Male (77%) and female (72%) were hairy typed of body cover. Males were usually horned (81.4%) and females were 53.5% but some female (46.5%) were polled. Majority of sheep population (93.2%) didn't have wattle and majority (97%) lack ruff. Greater parts of sheep population (87.9%) have long fat tail with twisted end in some animal. Long fat tail with twisted end in some animals; medium size; hairy fiber, especially in adult ewes, males have minor wool growth in some parts of body; Males and most females (52%) are horned; large size as reported[12]. According to the ESGPIP (2009), body shape is the relative contribution of body length; heart girth and height at wither. Coat color and presence of horn are among the qualitative body traits used as a criterion to select individual sheep for breeding purpose[11]. Another author reported similar findings that coat color is among the qualitative body characteristics, the local community selects breeding rams and ewes based on the coat color[13]. The course hair type of the highland sheep is among the indictor for evaluating the adaptability of the sheep population. This report of the current finding is in line to the previous finding by Gizaw *et al*.[12] reported that the sheep population found in the same study district is classified as long fat tailed sheep type.

Quantitative physical body measurements: The overall least squares mean body weight obtained in the current study was 25.9±0.2 kg (Table 2). This value is

Table 1: Qualitative physical body characteristics of Arsi-Bale sheep

Physical body character/variables	Male		Female		Total	
	N	Percentage	N	Percentage	N	Percentage
Coat pattern						
Plain	171	62.2	301	60.0	472	60.7
Patchy	69	25.1	121	24.1	190	24.5
Spotted	35	12.7	80	15.9	115	14.8
Total	275	100	502	100	777	100
Color type						
Brown	96	34.9	168	33.5	264	34.0
Black	44	16.0	75	14.9	119	15.3
White	41	14.9	78	15.5	119	15.3
Red	50	18.2	96	19.1	146	18.8
Brown dominant	16	5.8	45	9.0	61	7.9
White dominant	12	4.4	16	3.2	28	3.6

Table 1: Continue

Physical body character/variables	Male		Female		Total	
	N	Percentage	N	Percentage	N	Percentage
Black dominant	3	1.1	8	1.6	11	1.4
Red dominant	7	2.5	5	1.0	12	1.5
Others	6	2.2	11	2.2	17	2.2
Total	275	100	502	100	777	100
Hair type						
Hairy	212	77.1	361	71.9	573	73.7
Short and smooth	63	22.9	141	28.1	204	26.3
Total	275	100	502	100	777	100
Head profile						
Straight	265	96.4	492	98.0	757	97.4
Convex	10	3.6	10	2.0	20	2.6
Total	275	100	502	100	777	100
Wattle						
Present	17	6.2	36	7.2	53	6.8
Absent	258	93.8	466	92.8	724	93.2
Total	275	100	502	100	777	100
Horn						
Present	223	81.1	269	53.6	492	63.3
Absent	52	18.9	233	46.4	285	36.7
Total	275	100	502	100	777	100
Ruff						
Present	6	2.2	17	3.4	23	3.0
Absent	269	97.8	485	96.6	754	97.0
Total	275	100	502	100	777	100
Tail type						
Long fat	249	90.5	434	86.5	683	87.9
Short fat	26	9.5	68	13.5	94	12.1
Total	275	100	502	100	777	100

Table 2: Least square means (±SE) of body weight (kg) and linear body measurements (cm) for the effect of sex, age and sex by age interaction on

Effect and level	BW LSM±SE	CD LSM±SE	HG LSM±SE	BL LSM±SE	HW LSM±SE	RW LSM±SE	EL LSM±SE	HL LSM±SE	TW LSM±SE
Overall	25.9±0.2	26.85±0.3	68.8±0.4	41.6±0.4	60±0.3	17.5±0.4	9.5±0.1	7.4±0.2	18.4±0.1
Sex	***	***	***	*	NS	NS	NS	***	***
Female	24.7±0.3^{b}	25.4±0.3^{b}	67.4±0.4^{b}	39.9±0.6^{b}	59.8±0.3^{a}	17.1±0.4^{a}	9.4±0.1^{a}	4.3±0.2^{b}	17.2±0.4^{b}
Male	27.2±0.4^{a}	28.3±0.5^{a}	70.2±0.6^{a}	43.5±0.9^{a}	60.4±0.5^{a}	18.1±0.6^{a}	9.6±0.1^{a}	10.4±0.4^{a}	19.6±0.4^{a}
Age	***	***	***	***	***	***	***	***	***
0PPI	22.07±0.3^{d}	25.2±0.4^{b}	65.1±0.5^{c}	36.8±0.7^{d}	57.9±0.4^{c}	15.8±0.5^{c}	9.0±0.1^{c}	6.3±0.3^{b}	17.4±0.4^{b}
1PPI	25.2±0.5^{c}	26.6±0.6^{ab}	68.4±0.7^{b}	40.8±0.7^{c}	59.6±0.6^{b}	16.8±0.7^{b}	9.4±0.2^{b}	6.6±0.4^{ab}	17.8±0.6^{ab}
2PPI	27.5±0.5^{b}	28.07±0.6^{a}	70.08±0.7^{ab}	43.4±0.7^{b}	60.2±0.6^{b}	18.6±0.7^{ab}	9.5±0.2^{b}	8.3±0.4^{ab}	19.4±0.6^{ab}
≥3PPI	29.1±0.7^{a}	27.5±0.8^{a}	71.7±0.9^{a}	45.2±0.9^{a}	62.5±0.8^{a}	19.2±1^{a}	10.2±0.2^{a}	8.2±0.6^{a}	19.2±0.8^{a}
Sex*Age	***	**	**	*	*	NS	NS	*	NS
Female*0PPI	20.4±0.4^{c}	23.7±0.5^{b}	63.8±0.5^{c}	33.8±0.8^{c}	57.3±0.5^{b}	14.3±0.6^{b}	8.0±0.1^{b}	3.1±0.3^{c}	16.4±0.4^{b}
Female*1PPI	23.8±0.6^{b}	24.6±0.8^{ab}	67.0±0.9^{b}	38.2±1.3^{b}	58.7±0.8^{ab}	16.7±0.9^{ab}	9.3±0.2^{a}	4.2±0.5^{b}	17.4±0.6^{b}
Female*2PPI	26.6±0.5^{ab}	25.9±0.7^{ab}	69.0±0.7^{a}	41.3±1.1^{ab}	60.7±0.7^{ab}	17.9±0.8^{ab}	9.6±0.2^{a}	4.7±0.5^{b}	17±0.6^{b}
Female*≥3PPI	28.0±0.6^{a}	26.9±0.7^{a}	69.8±0.8^{a}	46..0±1.2^{a}	62.4±0.7^{ab}	20.5±0.9^{a}	9.8±0.2^{a}	5.2±0.5^{a}	18.4±0.6^{a}
Male*0PPI	23.7±0.5^{b}	26.3±0.6^{b}	66.4±0.7^{b}	38.8±1^{b}	58.5±0.6^{b}	16.3±0.8^{b}	9.0±0.1^{b}	9.6±0.4^{b}	18.6±0.6^{b}
Male*1PPI	26.5±0.7^{ab}	28.6±0.9^{ab}	69.7±1^{ab}	43.8±1.5^{ab}	59.7±1^{ab}	17.8±1.1^{ab}	9.4±0.2^{b}	9.0±0.6^{b}	18.4±0.8^{b}
Male*2PPI	28.4±0.8^{a}	28.0±1.4^{ab}	71.1±1.1^{ab}	44.5±2.4^{ab}	60.6±0.9^{ab}	17.9±1.8^{ab}	9.5±0.3^{b}	11.4±0.7^{a}	21.6±0.8^{a}
Male*≥3PPI	30.2±1.2^{a}	30.1±1^{a}	73.6±1.6^{a}	46.7±1.6^{a}	62.7±1.5^{a}	19.4±1.2^{a}	10.6±0.4^{a}	11.6±1^{a}	20.2±0.1.2^{a}

LS Means with different letters (a, b, c, d) within a trait in a column are different at indicated p-value; SE= Standard Error, NS = Non-Significant p>0.05); *p<0.05; **p<0.01; ***p<0.001

comparable with Kembata, Tembaro-Hadiya and Fartasheep[14, 15, 16] but smaller than the value reported for other breeds listed in Table 3[11, 17]. Body weight was significantly affected by the sex of sheep that females had a lower weight than males. Dentition also affected body weight of sheep. Yearlings had a lower weight than other higher dentition groups and this might be because of the fact that yearlings has not yet achieve mature body weight. The interaction effect of sex and dentition was also significant (p<0.001). A significant effect of sex and age of sheep on body weight of sheep is reported by many scholars for different breeds of sheep[16, 18, 19] as indicted Table 3.

The least squares mean of chest depth, heart girth, and body length of Arsi-Bale sheep obtained in the current study were 26.85±0.3, 68.8±0.4 and 41.6±0.4 cm respectively. Sex and age of sheep had a significant effect (p<0.001) and (p<0.05) on chest depth, heart girth and

Table 3: Linear body measurements of some of Ethiopian sheep breeds characterized by different researcher

Breed	Sex	Body weight	Heart girth	Body length	Height at Withers	Rump width	Ear length	Horn length	Tail circumf	References
Bale	Male	25.6±0.38	68.47 ± 0.7	48.28 ± 0.5	60.76 ± 0.5	16.9 ± 0.4	10.8 ± 0.15	-	-	Asefa *et al*.[11]
	Female	26.36±0.2	71.73 ± 0.2	48.8 ± 0.16	62.2 ± 0.17	16.25 ± 0.13	11.1 ± 0.05	-	-	
Selale sheep	Male	27.23±0.4	77.13± 0.5	60.3± 0.3	65.0 ± 0.3	-	9.48 ± 0.1	-	-	Abera *et al*.[17]
	Female	27.96±0.2	76.23 ± 0.2	63.51± 0.2	65.6 ± 0.2	-	9.5 ± 0.1	-	-	
Kembata, Tembaro-Hadiya	Male	27.5±6	71.5±5.7	65.8±5.5	65.8±6.3	15.6±1.9	10.8±1.3	20.1±8.5	25.4±5.0	Melesse *et al*.[14, 15]
	Female	25.8±4.2	69.5±3.8	64.3±5.1	63.3±3.3	15.9±1.1	11.2±1.0	6.79±3.7	13.5±3.3	
Menz	Male	22.0±0.27	65.7±0.39	53.9±0.29	59.6±0.28	18.2±0.13	7.4±0.18	20.15±0.46	18.1±0.27	Getachew *et al*.[18]
	Female	19.3±0.13	64.5±0.20	53.7±0.15	57.1±0.14	17.9±0.06	8.0±0.13	-	12.8±0.14	
Halaba sheep	Male	19.9 ± 4.1	63.2 ± 5.7	82.3 ± 6.8	60.6 ± 4.6	-		-	-	Kocho[21]
	Female	23.0 ± 4.4	67.9 ± 4.9	86.3 ± 6.1	63.6 ± 4.3	-		-	-	
Farta	Male	28.0± 0.51	71.4 ±0.71	56.5 ±0.56	65.2 ±0.58	12.5±0.2	8.9 ± 0.21	-	-	Bimerow *et al*.[16]
	Female	23.6 ± 0.21	69.4 ±0.28	54.3 ±0.22	62.1 ± 0.23	12.8 ±0.08	9.8 ± 0.08	-	-	
Highland Sheep of Tigray	Male	23.3 ± 0.5	71.6 ± 0.6	57.6 ± 0.8	62.2 ± 0.7	-	10.0±0.2	6.4 ± 0.4	-	Weldeyesus and Yayneshet[20]
	Female	20.9 ± 0.3	68.4 ± 0.4	54.9 ±0.5	58.5 ± 0.5	-	9.8 ± 0.2	3.12±0.2	-	
Doyogena sheep	Male	34.37±0.97	75.28±0.91	60.62±0.71	70.11±0.71	14.28±0.24	9.72±0.17	22.76±0.72	21.40±0.79	Taye *et al*.[19]
	Female	27.05±0.45	71.37±0.35	57.03±0.28	65.33±0.28	14.87±0.09	10.09±0.07	7.91±0.44	16.06±0.32	
Arsi-Bale	Male	27.2±0.4	70.2±0.6	43.5±0.9	60.4±0.5	18.1±0.6	9.6±0.1	10.4±0.4	19.6±0.4	Present study
	Female	24.7±0.3	67.4±0.4	39.9±0.6	59.8±0.3	17.1±0.4	9.4±0.1	4.3±0.2	17.2±0.4	

Table 4: Pearson's correlation of linear body measurements

1	BW	CD	HG	BL	HW	RW	EL	HL	TL	TW	RL	SC
BW		0.579**	0.522**	0.571**	0.436**	0.305**	0.267**	0.320**	0.369**	0.263**	0.171**	0.192**
CD	0.579**	1	0.421**	0.415**	0.237**	0.201**	0.279**	0.301**	0.281**	0.085*	0.231**	0.224**
HG	0.522**	0.421**	1	0.347**	0.513**	0.202**	0.334**	0.257**	0.226**	0.230**	0.286**	0.188**
BL	0.571**	0.415**	0.347**	1	0.341**	0.369**	0.227**	0.345**	0.293**	0.206**	-0.246**	0.163**
HW	0.436**	0.237**	0.513**	0.341**	1	.0 205**	0.268**	0.098**	0.373**	0.180**	0.162**	0.076*
RW	0.305**	0.201**	0.202**	0.369**	0.205**	1	0.037ns	0.227**	0.032ns	0.277**	0.082*	0.048ns
EL	0.267**	0.279**	0.334**	0.227**	0.268**	0.037ns	1	0.153**	0.191**	0.118**	0.196**	0.065ns
HL	0.320**	0.301**	0.257**	0.345**	0.098**	0.227**	0.153**	1	0.092*	0.326**	0.105**	0.486**
TL	0.369**	0.281**	0.226**	0.293**	0.373**	0.032ns	0.191**	0.092*	1	0.197**	0.112**	0.130**
TW	0.263**	0.085*	0.230**	0.206**	0.180**	0.277**	0.118**	0.326**	0.197**	1	0.223**	0.171**
RL	0.171**	0.231**	0.286**	-0.246**	0.162**	0.082*	0.196**	0.105**	0.112**	0.223**	1	0.127**
SC	0.192**	0.224**	0.188**	0.163**	0.076*	0.048ns	0.065ns	0.486**	0.130**	0.171**	0.127**	1

**p<0.01; *p<0.05; ns = Non-significant; BW = Body Weight; CD = Chest Depth; HG = Heart Girth; BL = Body Length; HW = Height at Withers; RW = Rump Width; EL = Ear Length; HL = Horn Length; TL = Tail Length; TW = Tail Width, RL = Rump Length; SC = Scrotal Circumference

respectively. Sex and age of sheep had a significant effect (p<0.001) and (p<0.05) on chest depth, heart girth and body length that females and yearlings had lower values in all the traits. The interaction effect of sex and age (dentition) was significant (p<0.05) for chest depth, heart girth, body length and height at wither however, it did not affect the rump width.

Arsi-Bale sheep had similar heart girth with Highland Sheep of Tigray, Kembata, Tembaro-Hadiyaand Farta sheep[14, 15, 20] but higher than Menz and Halaba sheep[16, 21]. Arsi-Bale sheep has shorter body length than sheep breed present Table 3. The height at wither obtained was almost similar with Baleand Halaba sheep[11, 18], however, Arsi-Bale sheep is taller than Menz[18]. In most of the traits considered, Arsi-Bale sheep is almost similar to highland breeds of the country. The overall mean pelvic (rump) width obtained (17.5±0.4) is similar to the value reported for Bale and Menze sheep[11, 18]. However, it is higher than Farta, Doyogena and Kembata, Tembaro-Hadiya sheep[14-16, 19]. Rump width was affected (p<0.001) by age of sheep. Yearling male and female and young sheep had a narrower (p<0.001) pelvis. Rump width is an important trait affecting the productivity of the ewe through its effect on ease of lambing, perinatal ewe and lamb mortality rates and lifetime rearing performances[22].

The overall mean horn length (7.4±0.2 cm), analysed among those with horn was significantly affected (p<0.001) by sex and age of sheep. Male sheep hadlonger horn than female. Horn length increasedas the age of sheep increased. A tail circumference is important traits used as selectioncriteria especially for male sheep in the study area. Themean tail circumference (18.4±0.1) obtained was larger than Menz sheep[18] and narrower than Kembata, Tembaro-Hadiya[14, 15] and Doyogena sheep[19]. Tail circumference of Arsi-Balesheep were affected (p<0.001) by sex of sheep.Femaleshad short and narrow tail circumference than male. This might be because of the selectionpractice towards longer and wider tail length andcircumference of male sheep.

Correlation: The Pearson's correlation of linear body measurements with weight and with each other is presented in Table 4. There was a positive and significant (r>0.17; p<0.05) correlation between weight and other body measurements except with ear length. The highest correlation coefficient obtained was between body weight and chest depth (r = 0.58) which was followed by weight with body length (c = 0.57). The higher correlation of linear body measurements with body weight indicates that these linear body measurements can be used as indirect

selection criteria in the absence of weighing scale. The observed positive ($p<0.05$) correlations between weight and other body measurements is in agreement with literature[14, 15, 23].

CONCLUSION

The present study was initiated to describe the qualitative characters and quantitative morphometrical traits of indigenous sheep types reared in Oromia, Arsi, west Arsi and Bale zone of Ethiopia. This study revealed the presence of high variability in the observed qualitative and quantitative morphometrical characteristics among the sheep studied in all administrative zones. It is thus concluded that the indigenous sheep in these zones may possess unique adaptive features that are useful in designing sustainable sheep improvement programmes in the region. The live body weight and major linear body measurements of the males are higher than those of females are and the difference in these measurements between males and females increased with age. At the adult age (≥3 PPI), the Arsi-Bale ram and ewe sheep had an average live body weight of 30.2±1.2 kg and 28.0±0.6 kg, respectively. The range of values in different traits considered in the population indicates its potential response to selection. The positive and significant correlation of weight with linear body measurements indicate that linear body measurements can be used as a marker to estimate weight using regression equations.

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