

Phenotypic Characterization of Indigenous Chicken Ecotypes in Awi Zone, Ethiopia

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Abstract: The study was conducted in three districts of Awi zone in Amhara region, with the aim to characterize and identify the phenotypic variation of indigenous chicken ecotypes. A total of 720 indigenous chicken ecotypes were (504 females and (216) males from the whole districts) to describe qualitative and quantitative traits. Local chicken were mostly normally feathered and large phenotypic variability among ecotypes was observed for plumage color. A many plumage colors were identified in all districts in which Red in high-land and mid-land and Gebsuma (grayish) colours in low-land were the predominant color of the study area beside a large diversity. The average body weight of local chickens in high-land, mid-land and low-land agro-ecologies were 1.476, 1.75 and 1.71kg respectively, while the respective values for mature cocks and hens were 1.78 and 1.51kg. Variations were also observed in shank length, chest circumference, body length, neck length, wingspan, wing length, comb width, comb length and shank circumference. In conclusion, there is diversity of indigenous chicken population and farmers' preference of different traits that may invite to design community based genetic improvement. These were recommended in poultry breeding policy which focused on managerial system, selection, and trait preference should be designed.

Keywords: Characterization, Morphology, Production Environment

1. Introduction

Poultry is the largest livestock group in the world estimated to be about 23.39 billion, consisting mainly; chickens, ducks and turkeys [1]. Ethiopia is believed to have the largest livestock population. According to [2], there are about 56.53 million chickens in Ethiopia, comprising of 94.31, 3.21 and 2.49% of indigenous, hybrid and exotic types, respectively. Phenotypic characterization of Animal Genetic Resources (AnGR) generally refers to the process of identifying distinct breed populations and describing their external and production characteristics within a given production environment [3]. The term "breed" is used in phenotypic characterization to identify distinct Animal Genetic Resources (AnGR) populations as units of phenotypic reference and measurement.

Characterization is the initial step for long-term genetic

improvement as it provides the basis for any other livestock development interventions and provides information for designing appropriate breeding programs [4]. Phenotypic characterization of breed includes all activities related with the description of the source, development, structure, and populations of quantitative and qualitative characteristics in the defined climatic condition [3]. Furthermore, characterization can identify breeds and/or populations which are at risk of extinction or which are highly desired by farmers, and hence is an important input into nation's chicken development planning [5].

No such characterization studies have been carried out to characterize and classify the existing local chicken Ecotypes in these area, in general the study districts in particular (Faggeta lekoma, Dangila and Zigom) districts. Given the highest potential for poultry production and presence of diverse ecotypes, it is imperative to conduct comprehensive studies to characterize morphological, functional, and

adaptive traits of local chickens. Therefore, the objective of this study was to identify and characterize the new local chicken ecotypes in Awi zone, Ethiopia.

2. Material and Methodology

The study was conducted in Faggeta lekoma, Dangila and Zigom districts of Awi Zone based on their altitude classification into three agro-ecologies of Awi zone, Amhara

regional state, Ethiopia. The administrative centre of Awi zone is Injibara; other towns include Chagni, Adis kidame, jawi, gimjabet, ----Dangila. Topographically, Awi zone is relatively flat: the altitude of the zone ranges from as low as 550 to 3100 m.a.s.l and the Minimum and maximum annual temperature ranges between 5°C and 27°C. Daily temperature becomes very high during the months of March to May. Average mean annual rainfall for the area is about 1700 mm. The study site is presented in figure 1.

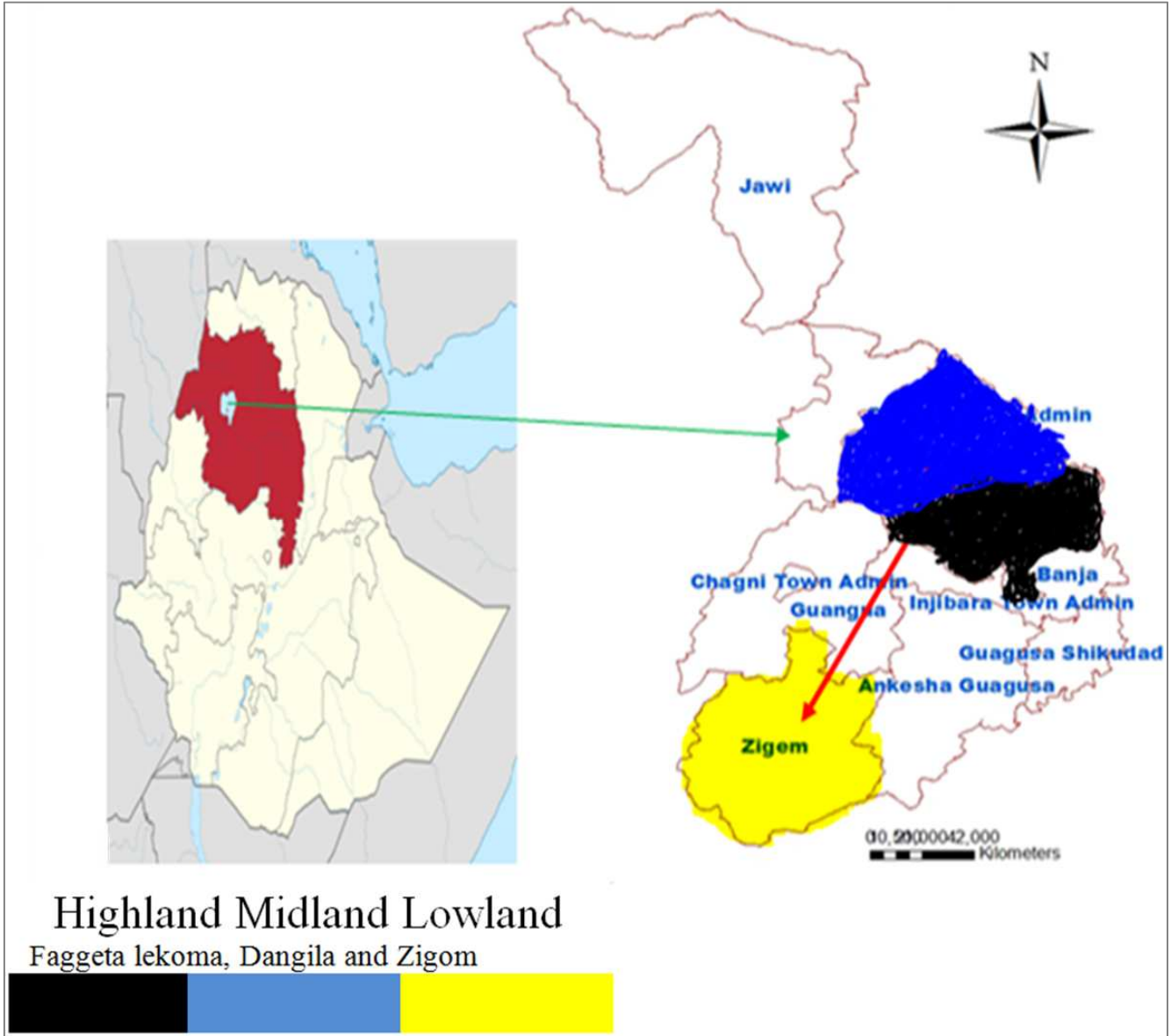


Figure 1. Location of the study site.

The Zone is crossed by about nine permanent rivers which drain into the Blue Nile; Awi Zone has Two crater lakes namely, Zengena and Tirba. Awi zone has 1,231,447 cattle, 676,509 sheep, 162,576 goats, 206,035 equine (Horse 96,136, Donkey 93,052, mule 16,667), 1,151,708 poultry and 128,906 bee colonies [2]. The Samples were conducted from three districts, Faggeta lekoma, Dangila and Zigom.

2.1. Sample Size Determination and Sampling Technique

The study was conducted in Faggeta lekoma, Dangila and Zigom districts of Awi zone.

Purposive sampling was employed to select districts based on distribution of chicken population and Agro-ecological variations. Thus, three sample districts and six rural *Kebeles* (2 from each district) were selected for the study. The

numbers of sampled households and total populations in the study area were determined by the formula described by [6]

$$No = \frac{Z^2 * (p)(q)}{e^2}$$

Where no= required sample size

Z^2 = is the abscissa of the normal curve

e^2 = is the margin of error (eg. $\pm 0.05\%$, margin of error for confidence level of 95%)

p = is the degree of variability in the attributes being measured refers to the distribution of attributes in the population $q = 1-p$.

$$No = \frac{Z^2 * (p)(q)}{e^2}$$

$$\begin{aligned} &= 1.96^2 \times (0.136) (0.864) \div (0.05)^2 \\ &= 3.8416 \times (0.136) (0.864) \div 0.0025 \\ &= 180.56 - 180 \end{aligned}$$

The numbers of total population of chicken per single district was determined as below formula:

$$no = \frac{Z^2 * (p)(q)}{e^2}$$

$$N = (1.96)^2 \times (0.194) (0.806) \div (0.05)^2$$

$$N = 3.8416 \times 0.194 \times 0.806 \div 0.0025$$

$$N = 240.275 - 240$$

This is for one district, for the three districts $3 \times 240 = 720$. Therefore totally 720 indigenous chickens used for collecting data of quantitative and qualitative traits.

Table 1. Sampled house hold and chicken sample in the study area.

District	Agro-ecology	Kebele	Household Inter-viewed	Number selected chicken		
				Male	Female	Total selected chicken
Faggeta Lekoma	Highland	Tafoch Danbull	30	36	84	120
		Wazi	30	36	84	120
Sub-total			60	72	168	240
Dangila	Midland	Afesa	30	36	84	120
		Ligaba	30	36	84	120
Sub-total			60	72	168	240
Zigom	Lowland	Gisayta	30	36	84	120
		Kilaji	30	36	84	120
Sub-total			60	72	168	240
Overall Total			180	216	504	720

2.2. Data Collection Procedure

For this study, primary data sources were used. In order to collect primary data, the Participatory Rural Appraisal (PRA) involves local communities as active analysts of their own situations where they estimate, quantify, compare and list priorities of resources and constraints of poultry based on their circumstances.

Data generated by the actual recording of linear body measurements (such as; body weight, shank length, earlobe length, body length, wing span, chest circumference, comb length, comb width, beak length, wing length, neck length, wattle length, shank Circumference, wattle width) and Qualitative data such as plumage color, comb type, feather distribution, shank colour, earlobe color, eye colour, beak colour, comb colour, shank feather and head shape was gathered based on standard format breed descriptor list [3].

2.3. Data Management and Analysis

Both the qualitative and quantitative data were entered into Microsoft EXCEL. Simple descriptive statistics such as average and standard error of the mean were applied for quantitative data, or frequencies and tabulations for qualitative attributes. And chi-square was used to compare variables for significantly or not across the three agro-

ecologies. Multivariate analyses variance technique was applied to determine the most interesting traits from a set of traits, in order to differentiate chicken population based on their nature of similarity. The results of the analysis of the data were presented as tables.

2.4. Quantitative Data

A general linear model procedure (PROC GLM) of the SAS was employed for quantitative variables to detect statistical differences among sampled indigenous chicken populations. For mature animals, agro-ecology and sex of the experimental indigenous chickens are fitted as fixed variables. The effects of class variables and their interaction is expressed as Least Square Means (LSM) \pm SE. Mean comparisons of significant differences were carried out using Tukey test (studentized range test) method at $p < 0.05$. The following Model was used for the least - squares analysis of local chicken.

$$Y_{ijk} = \mu + A_i + S_j + AS_{ij} + E_{ijk}$$

Where:

Y_{ijk} = k^{th} observation under j^{th} sex and i^{th}

Agro-ecology (Observed body weight or linear measurements)

μ = Overall mean

A_i = Fixed effect of i^{th} agro-ecology (I = High-Land, Mid-

Land and Law-Land)

S_j = Fixed effect of j^{th} sex (j = Male and Female)

AS_{ij} = agro-ecology & sex interaction effect

E_{ijk} = Residual error corresponding to E_{ijk}

3. Result and Discussion

3.1. Phenotypic Characteristics of Local Chicken

The results on phenotypic (morphological) characterization of local chicken in the study areas were presented in Table 2 and figure 2. The phenotypic characterization was studied in terms of feather distribution, plumage colour, beak colour, eye colour, comb shape, comb colour, head shape, earlobe colour, shank colour and shank feather. The results are discussed as under:

(a) Feather Distribution and Plumage Colour

The results showed that local chicken were either normal feathered or necked neck. Out of these two-feather distributions, normal feathering was more numerous as indicated by proportion of birds (70, 59.2, 53.8% for female birds and 30, 28.3, 25% for male birds in Highland, Midland and Lowland agro-ecologies, respectively). The naked-neck genotype is characterized by featherless skin on the neck and on the breast part of the body [7]. Similarly, the naked-neck traits found in indigenous chicken population of the tropics considered to have desirable effect on heat tolerances [8]. The results showed that the plumage colours were red, white, black, *gebsima*, *Tetrima* and multi-colour. Out of these colours, red plumage colour was more numerous in both male and female birds in Highland (28.8, 20.2) female and male, in Midland (29.6, 19.2) female and male and in Lowland (19.2, 17.9%) in female and male birds, respectively). In Lowland red plumage colour was more numerous in only male (17.9%) birds whereas in female birds *gebsima* was more numerous (24.6%).

This result was comparable with [9] who reported that chicken having red (26.9%) white (15.60%), *gebsima* (greyish) (14.2%) and black (11.5%) plumage colour were predominately found in North Gonder. However, this result is not in line with [10] who reported that white (19.5%), black (11.33%), and black with white stripes (10.17%) and *dira* (red wheaten) were the most predominant colour type was reported.

(b) Eye Colour and Beak Colour

The various eye colours exhibited by the local chicks were red, orange, brown and blue. The overall percentages of orange, red, brown and blue eye color of chicken in all agro-ecologies were 39.3, 36.00, 22.50 and 1.90% in the present study. The results showed that orange eye colour was more numerous in females in the three agro-ecologies (28.3, 32.5, 29.2% in Highland, Midland and Lowland agro-ecologies, respectively); whereas in males red eye colour was more numerous in Highland (13.8%) and Lowland (16.3%) agro-ecologies. However, orange eye colour was more numerous in Midland (13.3%).

The study showed that local chicks showed white, yellow

and brown beak colour. The white beak colour was more numerous in Highland (33.3, 17.1% in female and male birds, respectively); in Midland yellow was more numerous in females (27.5%) whereas white was more numerous in males (13.8%); in Lowland females had white beak colour in more birds (26.7%) and male had more yellow beak colour (11.7%). The results also showed that white, yellow and brown proportions were generally number one, two and three in descending order of proportions.

(c) Comb Shape and Comb Colour

Regarding comb types rose, pea and single comb types was observed in all agro-ecologies. The rose comb type was predominant in all agro-ecologies followed by pea and single. The overall average proportion of rose, pea and single combs were 52.78%, 30.97% and 16.25% in present study. The comb colours observed in the studied population were red, brown and black. The dominant comb color was red 95.69% (Overall proportions) whereas the remaining 2.77% and 1.54% proportion (Overall) of studied birds had brown and black comb colors, respectively. The red comb colour was more numerous in all agro-ecologies. This result was similar with [10] who reports that commonest comb color observed was red (hens 95%, cocks 97%), whereas the remaining 5% of hens and 3% of cocks showed brown and black colors in Central Tigray.

(d) Head Shape and Earlobe Colour

The study of head shapes showed that local chicken had either plain or crest head shape. Out of these two shapes, the plain head shapes was more common in both sexes in all agro-ecologies (40.00, 20.40% in female and male in Highland; 36.30, 20.80% in females and males in Midland; 50.00, 23.8% in female and males in Lowland agro-ecologies). The overall mean values of head shapes were 63.75% plain head and 36.25% crest. This result agreed with [11] who reported 72.8% and 27.2% were plain and crest headed shape in Southwest Oromia and Gurage zone.

The earlobe colours found in the studied populations were either white or red or mixture of red + white colours. The overall proportion of earlobe colour showed that 36.30, 32.20 and 31.50% of birds had mixture of red+white, red and white colours. This result was more or less comparable to those of [12] who reported that red and white earlobes showed 41.4% and 49.5% in Horro and Jarso ecotypes, respectively and also close to the reports of [13] for Fogera chicken.

(e) Shank Colour and Shank Feather

Most of the indigenous chickens evaluated in scavenging management systems in the study area showed white (45.97%), yellow (33.6%), brown (17.08%), red (2.36%) and black (0.97%) shank colour (Overall proportions) were exhibited by these birds. This result was comparable with the findings of [10] who reported that yellow shank colour (41.17%) was dominant over white (19.83%) and black (15.5%) shank colours in Central Tigray. Similarly, a study conducted in districts of North West Ethiopia also revealed that most indigenous chickens had yellow, white, red, black and grey shank colours by [5]. The results on presence / absence of shank feathers showed that all studied chickens in

mid-land and low-land agro-ecology were not having shank feather in Highland agro-ecologies in the present study. feather whereas only 2.5% hen and 1.67% cock had shank

Table 2. Phenotypic (Morphological) Characterization of Local Chicken in the Study Areas.

Variables	Agro-ecologies						Over-all Mean
	Highland		Midland		Lowland		
	Female	Male	Female	Male	Female	Male	
	%	%	%	%	%	%	
(I) Feather distribution							
Normal	70	30	59.2	28.3	53.8	25	88.8
Necked-Neck	-	-	10.8	1.7	16.3	5	11.2
X ² value/ P value							5.4 / 0.00
(II) Plumage colour							
Red	28.8	20.2	29.6	19.2	16.2	17.9	43.2
White	3.3	1.7	5	1.3	2.9	0.4	4.9
Black	3.8	0.4	3.3	0.4	4.2	-	4
Gebshima	16.3	6.3	17.3	2.5	24.6	7.5	26.5
Tetrima	9.2	4.6	7.1	2.9	14.6	3.3	13.9
Multi-colour	8.8	0.4	7.9	-	4.6	0.8	7.5
X ² value/ P value							4.46/ 0.00
(III) Eye colour							
Red	24.6	13.8	20	10.4	23.3	16.3	36.00
Orange	28.3	7.1	32.5	13.3	29.2	7.9	39.30
Brown	15.4	8.8	14.6	5.4	17.5	5.8	22.50
Blue	1.7	0.4	2.9	0.8	-	-	1.90
X ² value/ P value							6.89 / 0.000
(IV) Beak colour							
White	33.3	17.1	26.7	13.8	26.7	10.8	42.8
Yellow	27.9	8.3	27.5	11.7	25.8	11.7	37.6
Brown	8.8	4.6	15.8	4.6	17.5	7.5	19.6
X ² value/ P value							3.5/ 0.000
(V) Comb shape							
Rose	34.2	18.3	40.4	20.8	27.5	17.08	52.8
Pea	24.2	10	20.8	7.1	22.1	8.8	30.9
Single	11.7	1.7	8.8	2.1	20.4	4.2	16.3
X ² value/ P value							8.61 / 0.000
(VI) Comb colour							
Red	67	29.2	67.1	28.3	65	28.8	95.7
Brown	1.3	-	1.3	1.67	3.3	0.8	2.8
Black	1.7	0.8	-	-	1.7	0.4	1.6
X ² value/ P value							8.61/ 0.07
(VII) Head shape							
Plain	40	20.4	36.3	20.8	50	23.8	63.75
Crest	30	9.6	33.8	9.2	20	6.3	36.25
X ² value/ P value							16.43 / 0.000
(VIII) Earlobe colour							
White	15.42	14.6	20	15	15.8	13.8	31.5
Red	25.83	3.3	24.6	5.8	30.8	6.3	32.2
White & Red	28.8	12.1	25.4	9.2	23.3	10	36.3
X ² value/ P value							15.2 / 0.000
(IX) Shank colour							
Yellow	27.5	6.3	23.3	6.7	24.6	12.5	33.6
White	25.8	17.1	30.8	20	31.7	12.5	45.9
Brown	13.8	4.6	12.1	2.1	13.8	5	17.1
Red	2.9	1.3	2.5	0.4	-	-	2.4
Black	-	0.8	1.3	0.8	-	-	0.9
X ² value/ P value							4.11 / 0.000
(X) Shank feather							
Absence	67.5	28.3	70	30	70	30	96.6
Presence	2.5	1.7	-	-	-	-	1.4
X ² value/ P value							2.8 / 0.000



Figure 2. Phenotypic Variation of Indigenous Chicken.

3.2. Quantitative Traits

The quantitative traits studied were Bwt (Body weight), Bl (Body length), Cl (Comb length), Cw (Comb width), Ww (Wattle width), Ws (Wingspan), Bel (beak length), Wl (Wattle length), Cc (Chest circumference), El (Ear lobe length), Sl (Shank length), Sc (Shank circumference), Nl (Neck length), and Wil (wing length) in the present study. The least square ANOVA for agro-ecologies, sex and interaction between sex X agro-ecologies was presented in the least square means of these traits was presented in Tables 3, 4 and 5.

(a) Agro-ecology Effect

The least square mean showed that AEGs significantly ($P < 0.05$) influenced all quantitative traits studied except Bl, Cl, Ww, Bel, Wl and El. The least square mean values of body weight, wing length, shank length, shank circumference, and chest circumference, were significantly ($p < 0.05$) maximum in mid-land chicken but wing span and neck length were higher in low-land.

(b) Sex Effect

The least square mean showed that sex significantly ($P < 0.05$) influenced all quantitative traits studied except Ww, Sc and Bel. The results showed that there was wide variation in these quantitative traits between two sexes. The average measurement parameters of female and male indigenous

chickens were 1.51kg & 1.78kg for body weight, 35.26 cm & 36.23 cm for body length, 2.08cm & 2.82cm for comb length, 9.007 & 9.86 for shank length, 3.44 & 3.49 for shank circumference, 11.65 & 12.34 for neck length, 11.99 & 12.84 for wing length, 36.96 & 38.16 for wing span, 2.05 & 2.44 for wattle length and 26.59 & 27.53 for chest circumference in female and male local chickens, respectively.

The sex differences in live weight and most of the LBMs, observed in this study, showed that these parameters are sex dependent. The cocks had consistently higher measurement value than hens across all the significantly affected variables except some variables, that was not significant ($p < 0.05$).

The possible reason for higher values of studied quantitative traits in males (Cocks) might be ascribed to the effect of sex hormones, stress on hens during egg formation/ laying and brooding time (which reduce period spent on feeding/ scavenging). The present results were in good

agreement with the report of [5, 4, 14] who stated that male chickens had better performance than females. These differences was also agreement with [12] in Jarso and Horro; [13] in Fogera; [5] in Northwest Ethiopia; and [14]; from North Gonder who reported that differences between sexes may be due to the differential effects of androgens and estrogens hormones on growth.

(c) Interaction Effect

There was no significant ($P < 0.05$) interaction observed between agro-ecologies and sexes with respect to quantitative traits studied except for comb length and wattle length. In these traits higher measurements were mostly observed in mid-land and low-land as compare to high-land. The significant interaction between agro-ecology and sexes with respect to these morphometric traits might be due to the differences between the three agro-ecologies with respect to the degree of expression of sex dimorphism for the traits.

Table 3. Least Square Means for Body Weight (kg) and Body length, comp length, comp width wattle width Measurements are in (cm) of Local Chickens.

Effect Trait	Traits				
	Bwt (kg)	Bl (cm)	Cl (cm)	Cw (cm)	Ww (cm)
Overall	1.59±0.02	35.55±0.06	2.29±0.02	2.26±0.02	2.24±0.02
R ²	0.18	0.08	0.67	0.64	0.52
Cv%	2.45	4.38	9.79	9.53	12.49
Agro-ecology	*	Ns	ns	*	ns
Highland	1.48±0.01b	35.77 ± 0.14	2.46±0.04	2.42±0.01a	2.38±0.02a
Midland	1.75±0.02a	35.84 ± 0.13	2.44 ± 0.049	2.39±0.01a	2.06 ± 0.2b
Lowland	1.71 ± 0.02a	35.62 ± 0.12	2.39±0.04	2.28±0.01b	2±0.02b
SEX	*	*	*	*	ns
Female	1.51±0.02 ^b	35.26±0.07 ^b	2.08±0.02 ^b	2.06±0.01 ^b	2.06±0.09
Male	1.78±0.02 ^a	36.24±0.12 ^a	2.78±0.02 ^a	2.45±0.02 ^a	2.73±0.02
Sex*AEs interaction	Ns	Ns	**	ns	ns
HL x Female	1.36±0.02	35.24±0.12	2.06±0.01	2.06±0.02	2.23±0.02
HL x male	1.68±0.03	36.23±0.17	2.87±0.03	2.49±0.03	2.42±0.002
ML x Female	1.59±0.03	35.27±0.12	2.17±0.02	2.08±0.02	2.15±0.023
ML x male	1.85±0.04	36.27±0.17	2.71±0.03	2.46±0.03	2.58±0.03
LL x Female	1.61±0.03	35.26±0.13	2.05±0.02	2.05±0.02	1.9±0.01
LL x male	1.82±0.04	36.25±0.17	2.75±0.03	2.41±0.03	2.4±0.02

Table 4. Least Square Means for Wing span, Beak length, wattle length, Comb length and Ear length Chickens.

Effect	Traits				
	Ws (cm)	Bel (cm)	Wl (cm)	Cc (cm)	El (cm)
Overall	37.32±0.07	2.25±0.03	2.17±0.09	26.87 ± 0.06	1.76±0.04
R ²	0.19	0.02	0.52	0.12	0.12
CV (%)	4.25	3.95	5.23	5.36	2.29
Agro ecology	*	Ns	ns	*	ns
Highland	36.85±0.1 ^b	2.24±0.02	2.29±0.02	26.75±0.09b	1.84±0.02
Midland	37.89±0.02 ^a	2.25±0.02	2.25±0.01	27.27±0.07a	1.82 ± 0.02
Lowland	37.94±0.01a	2.24±0.04	2.19±0.01	27.15±0.06ab	1.85±0.02
Sex	*	Ns	*	*	*
Female	36.96±0.1b	2.24±0.01	2.05±0.08b	26.59±0.06b	1.68±0.06b
Male	38.26 ± 0.01a	2.25±0.02	2.44±0.01a	27.53±0.09a	1.96±0.02a
Sex*AEs interaction	Ns	Ns	*	ns	ns
HL x Female	36.13±0.12	2.24±0.02	2.1±0.01	26.12±0.10	1.70±0.03
HL x male	37.59±0.18	2.24±0.01	2.5±0.02	27.38±0.16	1.98±0.04
ML x Female	37.31±0.17	2.25±0.02	2.03±0.01	26.81±0.11	1.66±0.03
ML x male	38.47±0.19	2.25±0.02	2.5±0.02	27.74±0.17	1.89±0.04
LL x Female	37.64±0.18	2.24±0.01	2.02±0.01	26.83±0.11	1.68±0.03
LL x male	38.43±0.19	2.25±0.02	2.4±0.02	27.47±0.16	2.10±0.04

Table 5. Least Square Means for Shank length, Shank circumference, Nick length and Wing length of Local Chickens.

Effect	Trait			
	Sl (cm)	Sc (cm)	Nl (cm)	Wil (cm)
Trait				
Overall	9.26±0.05	3.46±0.02	11.85±0.04	12.25±0.06
R ²	0.16	0.14	0.28	0.15
CV (%)	12.66	7.39	6.73	11.27
Agro-ecology	*	*	*	*
Highland	9.02±0.02b	3.47±0.05ab	11.71±0.02b	11.96±0.02b
Midland	9.61±0.03a	3.62±0.05a	12.07 ± 0.03ab	12.94±0.03a
Lowland	9.59±0.03a	3.29±0.05b	12.12±0.03a	12.36±0.04ab
Sex	*	Ns	*	*
Female	9.10±0.05b	3.44±0.01	11.65±0.04 7b	11.99±0.06b
Male	9.95±0.08a	3.65±0.016	12.34±0.07a	12.64±0.09a
Sex*AEs interaction	Ns	Ns	ns	ns
HL x female	8.88±0.08	3.45±0.014	11.26±0.08	11.86±0.11
HL x male	9.89±0.11	3.63±0.02	12.16±0.13	12.44±0.14
ML x female	9.17±0.09	3.62±0.032	11.71±0.09	12.20±0.12
ML x male	10.1±80.14	3.74±0.03	12.42±0.015	13.14±0.16
LL x female	9.33±0.09	3.29±0.014	11.96±0.09	12.03±0.12
LL x male	9.98±0.11	3.68±0.02	12.46±0.014	12.68±0.15

When, (*) shows significant and (ns) shows no significant. HL: Highland, ML: Midland and LL: Lowland and Traits of Ws: Wing span, Bel: Beak length, WI: wattle length, Cc: Chest circumference, Sl: Shank length, Wbt: Body weight, El: Ear length, Bl: Body length, Cl: Comb length, Cw: Comb width, Nl: Nick length, Wil: Wing length, Ww: Wattle width and Sc: Shank circumference.

4. Conclusion and Recommendation

In Ethiopia, the agricultural sector is a corner stone of the economic and social life of the people since they are used for generation of extra cash incomes, provision of animal protein and religious/cultural considerations. Understanding the situation of poultry rearing was crucial for improvement of poultry products and to design poultry breeding strategy. Generally chicken rearing system in the study area was mixed with crop- livestock production system using traditional management of indigenous chickens. The presences of various predators and diseases prevalence were two major economic important of chicken rearing constraints. There is diversity of indigenous chicken population and farmers' preference for specific traits that may invite to design community based genetic improvement. The study also showed that wide variations of traits considered among the indigenous chickens in the study area. The study reveals phenotypic variability which is affected by both genetic and environmental factors.

- i. Poultry breeding policy which focused on selection and trait preference should be designed.
- ii. Government, research and developmental organizations should give attention to village poultry sector and its development.
- iii. Government should train community chicken vaccinators to provide wide spread vaccination against major poultry diseases.
- iv. The finding of this study showed that there are varied indigenous chicken ecotypes in phenotypic characterization but there is not enough phenotypic characterization for indigenous chicken, Therefore

studies on phenotypic characterization including egg quantity/quality together with molecular characterization need to be planned that will further clarify the genetic similarity and diversity among the ecotypes.

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References

- [1] FAOSTAT Database, 2012. Retrieved October 10, 2014, from <http://faostat.fao.org/faostat/>, FAO, Rome.
- [2] CSA (central statistical agency). 2016/17 [2009 E. C.] livestock and livestock characteristics (private peasant holdings); agricultural sample survey volume 2, federal democratic republic of Ethiopia, Addis Ababa, Ethiopia.
- [3] FAO, (Food and Agriculture Organization of the United Nations). 2012. Phenotypic characterization of animal genetic resources. FAO Animal Production and Health Guidelines No. 11. Rome. [Accessed on 25. 05. 2014]. Available at <http://www.fao.org/docrep/015/i2686e/i2686e00.pdf>. FAO, Rome.
- [4] Aberra, M. and Tegene, N., 2011. Phenotypic and morphological characterization of indigenous chicken populations in southern region of Ethiopia. *Animal Genetic Resources / Resources génétiques animales / Recursos genéticos animales*, 49, 19-31.
- [5] Halima, H., Neser, F. W. C., van Marle-Koster, E. and De Kock, A., 2007. Phenotypic variation of native chicken populations in northwest Ethiopia. *Tropical animal health and production*, 39 (7), pp. 507-513.
- [6] Cochran, W. G. 1963. *Sampling Techniques*, 2nd Ed., New York: John Wiley and Sons, Inc.
- [7] Khobondo, J. O., Okeno, T. O., Lihare, G. O., Wasike, C. B. and Kahi, A. K., 2015. The past, present and future genetic improvement of indigenous chicken of Kenya. *Animal Genetic Resources/Recursos génétiques animales/Recursos genéticos animales*, 55, pp. 125-135.
- [8] Horst, P., 1989. Native fowl as reservoir for genomes and major genes with direct and indirect effects on the adaptability and their potential for tropically orientated breeding plans. *Archive Gefluegelkunde (Germany, FR)*. household type and household composition on women's reproductive health outcomes in urban Uttar Pradesh, India. *Decision-making*, 6, 8.
- [9] Addisu, G. and Aschalew, T., 2014. A Phenotypic and Genetic Characterized Indigenous Chicken Ecotypes in Ethiopia. *International Journal of Genetics*, 4 (1), 04-10.
- [10] Mearg, F. E. A. R. G., 2016. Phenotypic characterization of local chicken ecotypes in the Central Zone of Tigray in northern Ethiopia (M.Sc Thesis, Jimma University).
- [11] Emebet, M., Singh, H., Sisaye, T. and Johansson, A. M., 2013. Phenotypic characterization of indigenous chicken population in South West and South part of Ethiopia. *Br. J. Poult. Sci.*, 3 (1), pp. 15-19.
- [12] Eskindir, K., Tadelle D., and Banerjee, A. K. 2013. Phenotypic Characterization of Indigenous Chicken Population in Ethiopia. *International Journal. Ethiopia. African Journal of Agricultural Research*, 8 (11): 1014–1021.
- [13] Bogale K., 2008. In Situ Characterization of Local Chicken Eco-Type for Functional Traits and Production System in Fogera District, Amhara Regional State. MSc Thesis Haramaya University, Haramaya, Ethiopia.
- [14] Addisu H., 2013. Phenotypic Characterization of Indigenous Chicken Ecotypes in North Wollo Amhara Regional State. MSc Thesis, Wollo University, Wollo, Ethiopia.