DOI: https://doi.org/10.20372/star.v12i2.01
ISSN: 2226-7522 (Print) and 2305-3372 (Online)
Science, Technology and Arts Research Journal
Sci. Technol. Arts Res. J., April - June 2023, 12(2), 1-12
Journal Homepage: https://journals.wgu.edu.et

Original Research

Characterization of Scavenged Feeds and Crop Content Composition of Scavenging Indigenous Chicken

Solomon Dugassa[1], Diriba Diba[2]*, Demissu Hundie[2] & Fantahun Dereje[2]

[1]Horro Guduru Livestock Improvement and Genetic Conservation Center, Wollega University, Ethiopia
[2]Department of Animal Sciences, Faculty of Agriculture, Wollega University, Ethiopia

Abstract

The objective of the study was to characterize resources for scavenged feed and the crop content composition of native chickens. Roughly 48 grower chickens were purchased from farmers in rural areas and slaughtered during both the dry and rainy seasons so that we could analyze the chemical and physical composition of the crop contents. The crop contents mainly consisted of insect parts, wheat grains, leaves from plants, and domestic garbage. Both the pullets (26.41g) and the cockerels (26.74g) have the same crop content. There was no significant change in the crop content of slaughtered chickens from lowland and highland habitats throughout different seasons regarding DM, Ash, CF, EE, NFE, and ME, according to the laboratory examination, with the exception of CP. The amounts of calcium and phosphorus in pullet crops did not differ significantly between lowland and highland areas throughout the dry and wet seasons, with concentrations of 0.45 and 0.57% and 0.49 and 0.54%, respectively. To sum up, the bird couldn't reach its maximum potential because the nutrients in its foraged food weren't enough. Therefore, chicken keepers need to make sure they provide their birds adequate vitamins so they can grow to full potential year-round, regardless of the agro-ecologies.

Article Information

Article History:
Received: 08-04-2023
Revised: 26-05-2023
Accepted: 29-06-2023

Keywords:
Composition, Crop Content, Indigenous Chicken, Scavenged Feed

*Corresponding Author:
Diriba Diba

E-mail:
dnazerawi2010@gmail.com

INTRODUCTION

The traditional approach to chicken farming in Ethiopia is to keep the birds in a separate poultry house and let them forage for their own food, with minimal or no supplements. Muchadeyi et al. (2004) asserts that scavenging village poultry contribute significantly to the socioeconomic well-being of Ethiopians by providing both nutrition and revenue. Because of this, it seems like the poultry subsector could be a good source of affordable animal protein for low-income communities. Among Ethiopia's estimated 59.5 million chickens, 90.85% are native, 4.76 percent are hybrids, and 4.39 percent are exotics (CSA, 2017). According to Hassen (2007), native Ethiopian chickens can vary greatly in terms of body shape, feather color, comb type, and overall productivity. In 2017, the CSA reported that of the total chicken population in the country, approximately 37-93% were chicks, 16.04% were growers, and 46.03% were adult birds older than 20 weeks. Of all the chickens in the country, hens account for about 36.21 percent, with 2.74 percent of them not being layers.

Based on land area and human population, the four major regional states—Oromia, Amhara, SNNP, and Tigray—account for over 96.32% of the entire national poultry population. The Oromia area accounts for around 34.4 percent of the country's hens and produces 36.6 percent of the country's eggs and poultry meat each year. Solomon (2008) estimates that 97.1% of the chickens in the region live in rural regions, while only 2.9% call urban areas home. According to the EWZLO report from 2021, the East Wollega Zone is home to about two million native fowl. The poultry subsector in Ethiopia does not contribute significantly to the country's massive chicken population due to various production, reproduction, and infrastructure constraints (Aberra, 2000; Hassen, 2007). The primary challenges to the production of chickens are the accessibility, affordability, and quality of feed ingredients (Soniya, 2004). Scavenging is nearly the sole means of subsistence in traditional Ethiopian village production, as organized chicken feeding is absent. The majority of the feed that free-range poultry consumes in rural areas comes from scavengeable feed resources. However, SFRB amounts and availability change periodically throughout the year (Cummings, 1992). The season, farming methods, life cycles of bugs and other invertebrates, and other factors might cause these feed sources to shift often (Roberts, 1995; Tadele, 1996; Sonaiya, 2004).

During the ripening and harvesting seasons, it is possible to intentionally enhance grain feeding. According to Mehari (2016), the standard manufacturing method uses a Scavenging Feed Resource Base (SFRB) that consists of nearby edible resources, household trash, and a small amount of grain supplements. Bekele (2016) claims that scavenging birds in the region could only lay 40-60 eggs per hen per year due to a scarcity of food. According to Hayat et al. (2016), local hens who scavenge for food do not have access to enough of the right nutrients, and the amount and variety of nutrients available as scavenging feed is inadequate.

At now, there is a dearth of adequate data in the field about the seasonal and agroecological variability in the quantity of scavengeable feed resources compared to the carrying capacity of land areas and flock size. Before taking any action, it is necessary to assess the chemical composition, limitations, potential alternatives, and resource scavenging of chicken feed. Feed is a problem in any animal production system. Determining the base of available scavenging feed resources is necessary for making the most sensible use of feed resources that are easily available locally. As a result, this research set out to characterize the chemical composition of crop contents and the feed supplies for poultry in the Guto Gidda district across different agroecologies during the dry and rainy seasons.

MATERIALS AND METHODS

The western part of Ethiopia's East Wollega Zone is home to the Oromia National Regional State. The precise location of the zone is at a height of 80˚31′ 52′ North and a longitude of 36˚07’ 51’ East. Three main agro-ecologies—lowland (30%), midland (57%), and highland (13%),—are found in the East Wollega zone's steep, rolling, and undulating terrain. The average annual rainfall ranges from 1400 to 2200 millimeters, while the height above sea level is from 1000 to 2798 meters. Agrarian subsistence is the main economic activity in the zone.

Data collection

Prior to data collection, a specific district was selected from the East Wallagga Zone based on the local chicken population. The Addis-Assosa route passes through this neighborhood, which is called Guto Gidda. From the district, six kebeles were selected, three from the lowlands and three from the highlands. In order to further investigate the agricultural composition, ten houses were randomly selected from each kebele based on whether they had scavenging chicken and were willing to sell it.

Crop Content Determination

Nearly half of the district's households—24 in the highlands and 24 in the lowlands—were selected for the crop content trials because they had scavenging hens and were willing to sell them. A contract was established with 48 households, or 8 farmers from each kebele, in order to purchase experimental chicks. Fifty percent cockerels and forty-eight pullets were purchased throughout the dry and wet seasons, respectively, based on physical traits and data from the homes that participated. The hens that were bought were plucked from the flock first thing in the morning, specifically between five and six o'clock (local time), when foraging is said to be at its peak. The hens were transported directly to the site of their killing in the afternoon, specifically between 6:00 and 7:00. After weighing each bird individually, they were slaughtered and then left to bleed. Evisceration, plucking of feathers, and socking in hot water were the final procedures. Afterwards, the crop was painstakingly removed from each deceased bird and then measured with a precise electronic scale. In the end, the crop contents are separated and measured in grams using a precise balance.

Laboratory Chemical Analysis

After being ground until it passed through a 1 mm screen, the crop material was oven dried at 650 °C until it reached a constant weight. Until they were required for chemical examination in a lab, the ground materials were stored in airtight plastic bags. The next step was to determine the dry matter (DM) content according to the standards set by the Association of Official Analytical Chemists (AOAC, 2000). To determine the N content, the Kjeldahl method was employed. To determine the crude protein content of the crop material, the nitrogen (N) obtained in this way was multiplied by a conversion factor of 6.25. In compliance with AOAC (2000), the Ceramic Fibre Filter method was employed to ascertain the crude fiber (CF). Using the Sohxlet equipment, the ether extract was computed using the usual AOAC (2000) protocol.

Additionally, the quantity of ash was determined by subjecting the sample to a six-hour burning at 5500 °C, following the AOAC's (2000) official direct technique. The amounts of calcium and phosphorus were measured in line with AOAC (2000) using vanadomolybdo phosphoric acid and EDTA titration. Nitrogen Free Extract (NFE) was denoted by the formula DM% - (CP+CF+EE+Ash). An evaluation of the materials' metabolic energy content was conducted using Wiseman's (1987) formula. For the proximate studies, Jimma University's (JU) Animal Nutrition Laboratory was responsible, whereas the analyses for calcium and phosphorus were performed by Hawassa University.

Statistical Data Analysis

The data obtained from laboratory chemical analysis and analysis of crop content samples from experimental hens were analyzed using the General Linear Models (GLM) technique in SAS (2011) Version 9.3. The means were divided according to differences, taking into account the 5% significant level. The following model was employed for the investigation:

$$Yijk = \mu + Si + Aj + Sek + (SASe)ijk + Eijk$$

Yijk is an observation for a given variable.
μ = overall mean
S_i = effect of the ith sex of the bird
A_j = the effect of the jth altitude of the study area (j = 1 low altitude, 2 high altitudes).
Sek = effect k^{th} Season (k = 1 dry, 2 wet)
(SASe) ijk = effect of interaction between sex, altitude, and season
eijk = residual random error

RESULTS AND DISCUSSION

Weights of live bird and crop content

Bird abundance and crop content results are shown in Table 1. Results showed that cocks had an average live weight of 1.22 kg/bird and pullets 1.14 kg/bird when harvested for crop content assessment. The results showed that the mean live weight of the experimentally sampled pullets and cockerels was not significantly different (P>0.05). Native pullets and cockerels in Seka Chokorsa had mean live weights of 1.12 and 1.4 kg/head, respectively, according to Hayat et al. (2016) and the present study. There was no statistically significant difference (P>0.05) between the highland and lowland agro-ecological systems in terms of the mean bodyweight at slaughter of the cockerels and pullets analyzed in this study. The obtained data showed that the mean total crop content obtained from pullets was 26.41g and that from cockerels it was 26.74g, although there was no statistically significant difference (p>0.05).

In contrast to the present study, McBride et al. (1999) argued that pullets are better at scavenging, can more easily satisfy the nutritional needs of egg production, and that males would normally be alert and on guard while females scavenged, leading to higher crop contents. Still, throughout the development stage, the sexes compete to see who can produce the most fruit; no one is particularly good at scavenging, and now is not the moment to be vigilant.

Physical characteristics of the crop content

Based on an objective evaluation of the chicken's crop content, the scavenging feed resources in the research area consisted of grass, leaves, grains (maize, sorghum, millet, teff, and barley), worms, small snails, grass hoppers, termites, and household refusal as sources of animal protein. Based on the visual inspection, the agricultural components mostly consisted of plant leaves, insects, household refuse, and cereal grains.

There was no significant difference (p>0.05) between the crop contents of cockerels in both agroecologies and the fresh crop contents of pullets in both lowland and highland altitudes, as shown in Table 1. When it came to house rejection, insects, and plant material, agro ecology played a major role in determining the crop mix. Pullets and cocks in mountain regions have more plant leaves and household rejects in their crop contents than those in lowland areas.

Similarly, the present study found no statistically significant difference (p>0.05) in the crop content of cockels reared in different agro-ecologies (highland vs. low land). Furthermore, the results showed that cereal grains make up the bulk of the scavengeable feed resources in both of the studied agro-ecologies. The crop content of the deceased chickens showed that the scavenging feed resources of the lowland and highland ecosystems in the research region included worms, insects, green materials, cereal grains, and rejected household objects, with some variation among the birds. There were significant differences (P<0.05) in the amount of plant leaves and bugs found in the chickens' crop between the pullets and cockerels. A closer look revealed insects and bigger leaves among the cockels' harvest. While cockers are known to venture out, pulselets tend to stay put. Due to their smaller size and lighter weight, pullets are more easily caught by wild birds, thus they like to stay near or within their houses.

There was no statistically significant difference (p>0.05) between the 26.41g and 26.74g total crop content of the deceased pullets and cockerels in the highlands, with cereal contributing around 14.35g and 15.13g, respectively. In lowland areas, there was no statistically significant difference (p>0.05) between the total crop content of deceased pullets and cockerels, with cereal grains making up about 15.01g and 14.58g, respectively. Hayat et al. (2016) found that experimental chickens in the Seka Chokorsa district of South Western Ethiopia were mostly fed cereal grains, which was in line with the results of this analysis.

In addition, this finding was in agreement with the findings of Tadelle and Ogle (2000), who revealed that, according to a study carried out in the central highlands of Ethiopia, the feed components comprising the crop were, in order of composition, seeds, plant matter, worms, insects, and unknown substances. Table 2 shows that the carcass weight of pulleys and cockerels grown in different agro-ecologies and seasons does not vary significantly (p > 0.05). Possible explanation: during development, pulleys and cockrels compute feed equally, which results in a constant body weight regardless of agro-ecologies or season.

While previous research by Goromela et al. (2008) indicated that slaughter chickens in Central Tanzania had lower mean live weights during the rainy season, the current study revealed the opposite to be true. Furthermore, there was no significant difference (p > 0.05) in the crop contents of the pulleys and cockels across different agro-ecologies and seasons.

Table 1

Effect of sex of birds and altitude on crop content of chicken [Mean±SEM]

Altitude *sex of birds	BW (kg)	Unopened CW(g)	TCC (g)	Composition (Fresh bases, g)			
				Cereals	HH refusal	Insects	Plant leaves
Altitude							
HL(24)	1.17±0.01	39.66±0.69	26.65±0.22	14.61±0.29	6.97±0.15a	2.66±0.13b	2.38±0.18a
LL(24)	1.20±0.01	39.72±0.42	26.46±0.50	14.23±0.39	6.02±0.31b	3.35±0.28a	2.85±0.26b
PV	0.07	0.98	0.09	0.14	0.008	0.01	0.0005
Sex of birds							
Cockerel(24)	1.22±0.01	41.58±0.14	26.74±0.15	14.07±0.33	6.18±0.21	3.66±0.32a	2.81±0.18a
Pullet(24)	1.14±0.007	37.81±0.28	26.41±0.50	14.48±0.36	6.81±0.16	2.35±0.22b	2.76±0.28b
PV	0.84	0.16	0.06	0.88	0.04	0.04	0.007
*Altitude*Sex*							
HL*Coc	1.19±0.02	42.00±0.87	26.95±0.26	13.61±0.36	6.83±0.02^{a}	3.58±0.45^{a}	2.91±0.22^{a}
HL*Pul	1.14±0.01	37.33±0.16	26.43±0.37	15.03±0.40	7.12±0.19^{a}	1.75±0.22^{b}	2.52±0.37^{a}
LL*Coc	1.25±0.01	41.16±0.42	26.54±0.14	14.54±0.55	5.54±0.25^{b}	3.75±0.47^{a}	2.70±0.29^{b}
LL*Pul	1.15±0.008	38.29±0.57	26.39±0.03	13.93±0.57	6.50±0.63^{b}	2.95±0.30^{b}	3.00±0.44^{b}
PV	0.74	0.15	0.08	0.78	0.03	0.04	0.006

*^{a,b}least square means with different supper script with in the same column are significantly different(p<0.05)Altitude*sex of birds= interaction of altitude with sex of birds ; HL*Coc=Highland with Cockerels; HL*Pul=Highland with Pullets; LL*Coc= Lowland with Cockerels; LL*Pul=Lowland with Pullets; BW= Body weight, CW= Crop weight, g=gram , kg= kilogram, HH= household, TCC= Total crop content, PV=Probability Value; SEM=Standard Error Mean*

In both agro-ecologies, cereals constitute the bulk of crop content for both cockerels and pullets during the dry season of the year, as shown in the present study (p<0.05). It is possible that the peak percentage is caused by the harvesting season. However, in both types of agricultural ecosystems, the amount of pullets and cockels harvested during the rainy season was significantly higher (p<0.05) compared to the dry season for both insects and plant leaves. Insects and plant leaves were abundant during the rainy season because of the ideal conditions for plant growth and an increase in bug populations.

Chemical Composition of Crop Contents

Table 3 shows the chemical makeup of the crop contents of killed chicken. There is no statistically significant difference (p > 0.05) in the crop contents of chickens slaughtered in lowland and highland regions throughout different seasons with respect to DM, Ash, CF, EE, NFE, and ME. In both agro-ecologies, the CP (crude protein) content of the pullet and cockerel crops was greater during the wet season compared to the dry season (p<0.05). The present study found that during the rainy season, the CP of slaughtered chicken was significantly higher (P<0.05) compared to the dry season in both agro-ecological years.

Both lowland and highland chickens had a relatively higher percentage of CP in their crop contents during the rainy season due to the abundance of insects and green foliage. The higher the protein content, the more well-known that green leaves and insects are. In the Central Highlands of Ethiopia, scavenging hens consumed more worms and green plants during the wet season (10.2% of DM) than during the dry season (7.6% of DM), which was supported by Tadelle (1996). This led to higher concentrations of CP in their crops.

Table 2

Effect of sex of birds , altitude and Season on crop content of chicken [Mean± SEM]

Sex *altitude *season	BW (kg)	Un opened CW(g)	TCC(g)	Composition (Fresh basis, g)			
				Cereals	HH refusal	Insects	Plant leaves
Coc * HL*DS	1.17±0.03	38.50±1.56	27.08±0.45	14.75±0.17[a]	7.33±0.37	2.34±0.35[b]	2.67±0.33[b]
Pull*HL*DS	1.15±0.01	37.00±0.73	25.75±0.44	15.95±0.26[a]	6.83±0.30	1.25±0.17[b]	1.71±0.23[b]
Coc*LL*DS	1.23±0.02	38.33±0.80	26.58±0.20	16.33±0.21[a]	5.83±0.25	2.33±0.33[b]	2.08±0.32[b]
Pull*LL*DS	1.15±0.08	38.66±0.33	26.11±0.51	15.7±0.35[a]	6.33±0.33	2.08±0.27[b]	2.00±0.51[b]
Coc*HL*WS	1.21±0.03	38.00±0.68	26.81±0.30	12.48±0.22[b]	6.73±0.21	4.83±0.40[a]	3.16±0.30[a]
Pull*HL*WS	1.13±0.02	36.66±0.55	27.11±0.46	14.11±0.57[b]	6.41±0.20	3.25±0.30[a]	3.33±0.55[a]
Coc*LL*WS	1.28±0.01	38.66±0.49	26.50±0.22	12.75±0.17[b]	5.25±0.32	5.16±0.30[a]	3.33±0.33[a]
Pull*LL*WS	1.14±0.01	37.91±0.37	26.67±0.33	12.17±0.30[b]	6.67±0.33	3.83±0.16[a]	4.00±0.44[a]
PV	0.07	0.42	0.07	0.04	0.09	0.002	0.02

*[a,b]least square means with different supper script with in the same column are significantly different(p<0.05) Sex *altitude*season = interaction of sex of birds , altitude and season ; Coc *HL* DS = Cockerels with Highland with dry season; Pull *HL* DS= Pullets with Highland with dry season ; Coc* LL*DS= Cockerels with Lowland with dry season; Pull* LL*DS= Pullets with Lowland with ; dry season ; Coc*HL* WS= Cockerels with highland with wet season; Pull *HL*WS= Pullets with highland with wet season; Coc* LL= Cockerels with lowland with wet season ; Pull*LL*WS= Pullets with lowland with wet season; BW = Body Weight, CW= Crop weight, TCC= Total crop weight, HH=household , kg=kilogram, g= gram, PV=Probability Value; SEM= Standard Error Mean*

While Amassu et al. (2019) found no significant difference (P>0.05) in crop content between males and females in terms of CP, they did find a significant difference (P<0.05) in the level of CP in the crop content of the experimental birds in relation to altitude. The present results, on the other hand, contradict this finding. The varying types of feed supplies available at these various elevation sites may explain why different agro-ecologies have such diverse crop content compositions. All crops require different conditions to thrive, including different ideal heights, therefore this is essential to their development and maintenance. Comparatively, Pousga et al. (2005) discovered that scavenging pullet crop contents had higher CP contents during the dry season (11.5% of DM) in Burkina Faso compared to the rainy season (10.5% of DM). These findings are at odds with present findings. The gap was explained by the fact that worms and insects were more readily available as the dry season came to a close, thanks to the infrequency of rainstorms.

In the research region, the CP content of the pullet crop was 13.15% during the rainy season and 12.78% during the dry season in the lowland, whereas in the highland it was 10.46% and in the lowland it was 11.61%. Both the highland and lowland cockerels crops had CP contents of 11.44% and 10.53% during the dry season, respectively. During the rainy season, the corresponding CP contents were 13.65% and 13.47%. Following the recommendation of Kinghori et al. (2003), the current study found that the crop content of the killed birds had a CP that was lower than the 16% required for local laying hens in both agro-ecologies and seasons. Incorporating 15% to 20% CP into the diet of egg producers is recommended by the NRC (1994). Regardless of the experimental birds' sex or altitude, Table 3 shows that the percentage composition of crude fiber (CF) in their crop contents was not significantly different (P > 0.05). Also, regardless of the birds' sex, altitude, or season, the proportion of CF in the crop contents of killed chicken did not differ significantly (P > 0.05). The crop contents of plucked lambs from lowland areas were 10.89% and 11.14 % during the dry season, and 11.48 % and 11.86% during the wet season, respectively. During the dry season, the average CF content of the highland cockerel crop was 10.48%, whereas during the rainy season, it was 11.35%. In the early dry season, Momoh et al. (2010) discovered a CF concentration of 9.95 percent in the crop contents of native Nigerian chickens; in the late dry season, the same researchers reported a slightly higher CF level of 8.91%.

Comparing the crop's CF content from this study to that of Hayat et al. (2016), we find that both the pullet and cockerel crops had CF levels of 11.92% and 11.07%, respectively, at Seka Chokorsa. With CF values of 3.65% for egg-type adults and 3.3% for grower hens, the crop content in Ada'adistrict, Oromia Region, South Africa, was 3. Table 3 shows that there were no significant effects of sex, season, or altitude on the crop content of the ash level of the deceased chickens (P > 0.05). Mean ash content of crop in pullets in lowland areas was 12.66% during the rainy season and 14.07% during the dry season, whereas in highland areas it was 12.45 and 12.66%, respectively. Tadelle and Ogle (2000) also came to a similar conclusion, reporting that native chickens reared in the Central Highlands of Ethiopia during the dry season had an ash percentage of 1.67–15.7 percent in their crop content.

The current study found a decreased ash percentage in the crop content of pullets and cockerels in SekaChokorsa (22.86% and 22.15%, respectively), compared to Hayat et al. (2016). The ash level of the crop content of the experimental hens was unaffected by either the sex of the birds or their altitude (P > 0.05), according to Admasu et al. (2019). Calculated nitrogen-free extract (NFE) levels in the crop content of the slaughtered chickens were unaffected by season, sex, or altitude (P > 0.05), according to the present study. While Admasu et al. (2016) estimated a crop content NFE value of 62.61% from experimental hens in Genji woreda, our results were lower. In the dry season, the average NFE content of the crop content of pullets from highland and lowland was 51.64% and 50.03%, respectively. In the rainy season, the corresponding figures were 48.82% and 48.49%. Additionally, Momoh et al. (2010) found 53.62 and 56.26% of NFE in the crop content of the experimental birds in the early and late dry seasons of North Central Nigeria, respectively; the present study's finding was slightly lower than that. In contrast to Hayat et al. (2016), who found an NFE value of 46.2% in the crop contents of the experimental chickens in Seka Chokorsa Woreda, the current investigation yielded somewhat better results.

Table 3

Effect of sex of birds , altitude and Season on Chemical composition of chicken Crop content [Mean± SEM]

Se* alt *Seas	Chemical Composition								
	DM	CP	EE	CF	ASH	NFE	ME (kcal)	Ca	P
Coc *HL*DS	90.33±0.22	11.44±0.42[b]	3.03±0.11	10.48±0.33	14.14±0.3	51.22±0.56	2609.37±21.90	0.44±0.05	0.6±0.03
Pull*HL*DS	90.25±0.29	10.46±0.45[b]	2.91±0.08	11.14±0.38	14.07±0.27	51.64±0.96	2546.70±43.19	0.45±0.005	0.57±0.01
Coc*LL*DS	90.48±0.38	10.53±0.49[b]	2.94±0.07	11.11±0.38	13.50±0.38	52.39±1.1	2574.86±37.55	0.57±0.03	0.59±0.02
Pull*LL*DS	89.56±0.36	11.61±0.24[b]	2.91±0.04	10.89±0.28	14.10±0.31	50.03±0.69	2568.09±34.98	0.36±0.03	0.57±0.01
Coc*HL*WS	89.07±0.26	13.65±0.44[a]	3.13±0.10	11.35±0.32	11.59±0.36	49.34±0.43	2641.95±14.56	0.33±0.08	0.56±0.03
Pull*HL*WS	88.97±0.21	13.15±0.29[a]	3.05±0.10	11.48±0.40	12.45±0.41	48.82±0.56	2589±35.20	0.45±0.06	0.57±0.01
Coc*LL*WS	89.25±0.38	13.47±0.18[a]	3.23±0.08	11.31±0.26	12.31±0.45	48.90±0.67	2620.59±17.86	0.35±0.005	0.55±0.02
Pull*LL*WS	89.20±0.28	12.78±0.23[a]	3.39±0.08	11.86±0.36	12.66±0.35	48.49±0.96	2566.13±46.06	0.49±0.02	0.54±0.008
PV	0.90	0.04	0.16	0.91	0.35	0.65	0.66	0.47	0.37

[A,b]least square means with different supper script with in the same column are significantly different(p<0.05)
*Se =sex of birds, alt= altitude, seas= season, se *alt*seas = interaction of sex of birds , altitude and season ; coc *hl* ds = cockerels with highland with dry season; pull *hl* ds= pullets with highland with dry season ; coc* ll*ds= cockerels with lowland with dry season; pull* ll*ds= pullets with lowland with ; dry season ; coc*hl* ws= cockerels with highland with wet season; pull *hl*ws= pullets with highland with wet season; coc* ll*ws= cockerels with lowland with wet season ; pull*ll*ws= pullets with lowland with wet season; dm = dry matter, cp=crude protein, ee= ether extract, cf= crude fiber, nfe= nitrogen free extract, me= metabolizable energy, kcal = kilocalorie, ca= calcium, p=phosphorus, pv=probability value, sem= standard error mean*

There was no significant difference (P > 0.05) in the mean computed metabolic energy (ME) of the crop contents of killed chickens in both agro-ecologies across different seasons. Pullet crop contents had a dry-season ME of 2546 kcal and a wet-season ME of 2589 kcal in mountain regions. In lowland regions, the dry season brings about 2568 kcal and the rainy season about 2566 kcal. This study's crop contents showed a little higher mean computed metabolizable energy level of 2552 kcal than previous findings (Admassu et al., 2019) for the hens that were killed. In addition, Momoh et al. (2010) found that the metabolizable energy values of 2598 and 2352 Kcal were determined using the crop content of layers and growers, respectively, during the early dry season in Nigeria. While the crop's energy content was lower than the suggested amount for growers, it was comparable to the level reported by Payne (1990) at 2595 kcal.

There was no statistically significant difference (P > 0.05) in the crop's calcium and phosphorus content in the chicken carcasses from either agro-ecology during separate seasons. During the dry season in highland areas, the crop contents of pullets had calcium levels of 0.45 and phosphorus levels of 0.57%; in lowland areas, these values were 0.49 and 0.54%, respectively, during the wet season. This number is lower than what Tadelle and Ogle (2000) discovered; they discovered that native hens in the Central Highlands of Ethiopia had a crop content of 0.9 percent calcium and 0.66 percent phosphorus. Consistent with the current results, Rashid et al. (2005) determined that scavenging layers had 0.34% phosphorus in their crop content and that growers in Bangladesh contained 0.46 % phosphorus.

CONCLUSIONS

This study found that the quantity and chemical composition of the different scavenged feeds utilized in the hen crop in the Guto Gidda district varied according to agro-ecology and season. Over the course of the research period, the crop contents of neighboring chickens contained more grains of cereal and household debris than insects and green plants. Native scavenger chickens, according to the study's findings, had less access to nutrients than producers required for optimal growth, with the exception of dietary fiber (CF). Cereal grains are the sole supplementary energy source in the study region. However, the present study found that scavengeable feed supplies are inadequate to sustain the local chickens' optimal growth and egg production. Therefore, it is crucial to intervene by educating farmers on how to supplement their feed according to the composition of the feed resources base. This is necessary to achieve optimal growth and productivity of the local scavenging hens, regardless of the agro-ecology or season in the study area.

ACKNOWLEDGEMENTS

We are grateful to Wollega University for providing the necessary facilities to complete this research work.

DECLARATION

There is no conflict of interest in this work.

DATA AVAILABILITY STATEMENT

All data included in the article are available from the corresponding author upon request.

REFERENCES

Aberra, M. (2000). *Comparative studies on performance and physiological responses of Ethiopian indigenous naked neck (Angete-Melata) chickens and their F1 crosses to long-term heat exposure*. Logos Verlag. (PhD Thesis). Martin Luther University, Halle Witten berg, Berlin, Germany.

Admasu, S., Demeke, S., & Meseret, M. (2019). Poultry feed resources and chemical composition of crop content of scavenging indigenous chicken. *Journal of Animal and Feed Research*, *9*(6), 247-255.

AOAC, (2000). Official Methods of Analysis. (17^{th} edition). The Association of Official Analytical Chemists. Alington, V.A., USA

Baset, M. A., Bhuiyan, M. M., & Islam, M. M. (2000). Performance of Fayoumi chicken under different rearing systems in

Sylhet District. *Bangladesh Journal of Animal Science*, *29*(1-2), 105-110.

Bekele, B. (2016). Assessment of locally available poultry feeds, feeding practices and health in Sidama zone and Halaba special Woreda in SNNPR. *Journal of Biology, Agriculture and Healthcare*, *6*(7), 2224-3208.

Cummings, RB.(1992). The Advantages of Free Choice Feeding for village chickens. Proceedings of the XIX World's Poultry Congress. 3 (20-24 September 1992): 627-630 Amsterdam, The Netherlands.

EWZLO, (2021). East Wollega Livrstock office un published document

Goromela, E. H., Kwakkel, R. P., Verstegen, M. W. A., & Katule, A. M. (2006). Strategies to optimize the use of scavengeable feed resource base by smallholders in traditional poultry production systems in Africa: A review. *African Journal of Agricultural Research*, *1*(4), 91-100.

Hassen, H. (2007). Phenotypic and genetic characterization of indigenous chicken populations in northwest Ethiopia. (PhD Thesis), University of the Free State, Bloemfontein, South Africa.

Hayat, N., Solomon, D., & Meseret, M. (2016). Chemical composition of scavenging feed resource of indigenous chickens. *Asian Journal of Animal Sciences*, *10*: 182-188.

Livestock, C. S. A. (2017). Livestock characteristics, agricultural sample survey. Addis Ababa, Ethiopia. *Statistical Bulletin*, *2*(583), 9-13.

McBride, G., Parer, I. P., & Foenander, F. (1969). The social organization and behaviour of the feral domestic fowl. *Animal Behaviour Monographs*, *2*, 125-181.

Mehari, K. (2016). Poultry production systems and its feed resources in Ethiopia: A research review. *Scientific Journal of Animal Science*, *5*(2), 220-227.

Momoh, O. M., Egahi, J. O., Ogwuche, P. O., & Etim, V. E. (2010). Variation in nutrient composition of crop contents of scavenging local chickens in North Central Nigeria. *Agriculture and Biology Journal of North America*, *1*(5), 912-915.

Muchadeyi, F. C., Sibanda, S., Kusina, N. T., Kusina, J., & Makuza, S. (2004). The village chicken production system in Rushinga District of Zimbabwe. *Livestock Research for Rural Development*, *16*(6), 2004.

Pousga, S., Boly, H., Lindberg, J. E., & Ogle, B. (2005). Scavenging pullets in Burkina Faso: Effect of season, location and breed on feed and nutrient intake. *Tropical Animal Health and Production*, *37*, 623-634.

Robert, J. A., & Gunaratne, S. P. (1992). The scavenging feed resource base for the village chicken in a developing country. In *Proceedings of XIX Worlds Poultry Congress* (pp. 822-825).

SAS. (2011). Statistical Analytical Systems / STAT user's guide).Version 9.3, Institute Inc., Cary, North Carolina.

Solomon, D.(2008). Poultry sector country review: from the report; HPAI prevention and control strategies in Eastern Africa. *The structure, marketing and importance of the commercial and village poultry industry: An analysis of the poultry sector in Ethiopia.*

Sonaiya, E.B. , Swan, S.E.J. (2004). Small-scale poultry production, technical guide manual.FAO Animal Production and Health, 1.

Tadelle, D. (1996). Studies on village poultry production systems in the central highlands of Ethiopia.

Tadelle, D., & Ogle, B. (2000). Nutritional status of village poultry in the central highlands of Ethiopia as assessed by analyses of crop contents. *Ethiopian Journal of Agricultural Sciences*, *17*(1-2), 47-56.

Tadelle, D., Alemu, Y., & Peters, K. J. (2000). Indigenous chickens in Ethiopia: genetic potential and attempts at improvement. *World's Poultry Science Journal*, *56*(1), 45-54.

Wisemam, J. (1987). Feeding of Non-ruminant livestock. *Butterworths*. London, United Kingdom 913.