

Pastoral and Agropastoral Indigenous Chicken Eco-Type Husbandry and Performance Evaluation Practices in Yabello, Ethiopia

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ABSTRACT

The study was conducted at Yabello district Borana zone, to assess husbandry practices and performance evaluation of indigenous chicken populations. A total of 120 local chicken owners with three chickens were selected for data collection. Descriptive statistics, a general linear model, and univariate and multivariate analyses were used for data analysis. As a result, the main objectives of poultry farming in the study areas were income generation and egg production. Meat production and breeding stock were ranked lower. The traits preferred for breeding purposes were body size, growth rate, feed requirement, leg length, comp shape, chick production rate, egg size/weight, temperament scavenging ability, brooding/hatching ability, egg productivity, and rearing/mothering ability. The common husbandry system practiced in study areas was the free-ranging management system with small seasonal feed supplementation. The majority of the households responded that they keep their chicken in the perches and the kitchen. Disease prevalence and predators were the major constraints. The overall results indicated that poultry husbandry practices play a crucial role in Rural smallholder livelihood Change despite different constraints. As a result, there is a need to improve poultry productivity through breeding and husbandry practices to sustain its role in livelihood change.

Keywords: Poultry, Breed Selection, Husbandry, Performance Evaluation

Mathematics Subject Classification: 92D99

Journal of Economic Literature (JEL) Classification: Q19

1. INTRODUCTION

Ethiopia has the highest number of livestock in Africa and the tenth-largest in the world (FAO, 2010). This livestock has been contributing considerable parts to the economy of the country contributing 20% to the total national GDP and 40% to the agricultural GDP, supporting the livelihoods of 70 % of the population and generating about 11% of annual export earnings. The total chicken population at the

country level is 57 million regarding the blood level of chickens, 95.86 %, 2.7 %, and 1.35% of the total poultry were reported to be indigenous, hybrid, and exotic, respectively (CSA, 2015).

Village chicken production is an essential contributor of animal-source protein and income to the resource-poor and marginal groups of society (Hänke and Barkmann, 2017; Akinola, and Essien, 2011). Rural and urban households consume chicken products produced by this subsector, and these products are of great cultural and religious significance. The farming technique that produces high-quality proteins from low-quality feeds and household waste also includes the production of village chickens. Additionally, small-scale domestic poultry is essential for enhancing the livelihoods of farmers who lack access to resources. It is well known because it offers a balanced diet and helps to reduce poverty in rural regions. Generally, village women kept household poultry and made a significant change in the family's life. The poultry production sub-sector contributes to rural household food security, income, and overall growth and development of society remain unrealized. However, the contribution of village chickens to farm households and rural economies was not proportional to their high numbers. This is mainly due to low productivity levels, poor management systems, poultry disease prevalence, poor growth rates, predation, and lack of organized markets.

Interventions to improve these low levels of production may be warranted because they can assist women and their families in generating social capital and entering a positive cycle of events that can help them escape poverty (Jensen and Dolberg, 2003). A change in production technology can result in an increase in output quantity or quality while maintaining the level of inputs (Jin et al., 2010). It may be possible to achieve this through the introduction of appropriate technologies such as improved breeds, high-quality feeds, vaccines, or other management options. However, indigenous chickens of small body size, productivity, different colors of plumage, and dual-purpose type, with variable body conformation and physical characteristics need genetic improvement. The level of production and productivity of smallholder farmers are significantly increased by improved production practices. The productivity of chicken in smallholder chicken production depends on breed performances, including sexual maturity age, the number of eggs/clutches, the number of chicks produced per single hatch, adaptability, and growth performance were the major parameters that improved significantly. It is crucial for all developing countries to maximize chicken productivity by cross-breeding and selection. Studies conducted in different parts of Ethiopia revealed that village chicken breeding is completely uncontrolled and replacement stock is produced through natural incubation using broody hens (Negussie, 2007; 2011 and farmers do a selection of chickens for breeding to improve village chicken production to enhance rural livelihood. However, genetic improvements in the tropics on native indigenous chicken genetic resources are either rare or non-existent (Tadelle et al., 2011). Therefore, this study was designed to assess poultry husbandry practices and performance evaluation for Rural smallholder livelihood Change in Ethiopia.

2. MATERIALS AND METHODS

2.1. Description of the Study Areas

The research was conducted in **the Yabello** district of the Borana zone which is bordering with Kenya to the south, the Somali region to the East, the Guji zone to the North, and the Southern people, nation, and nationalities region to the west and is located between 3°36'-6°38' North latitude and 3°43'-39°30' East longitude. The altitude of the zone ranges between 1000 m to 2400 m above sea level (Zewdie *et al.*, 2015)

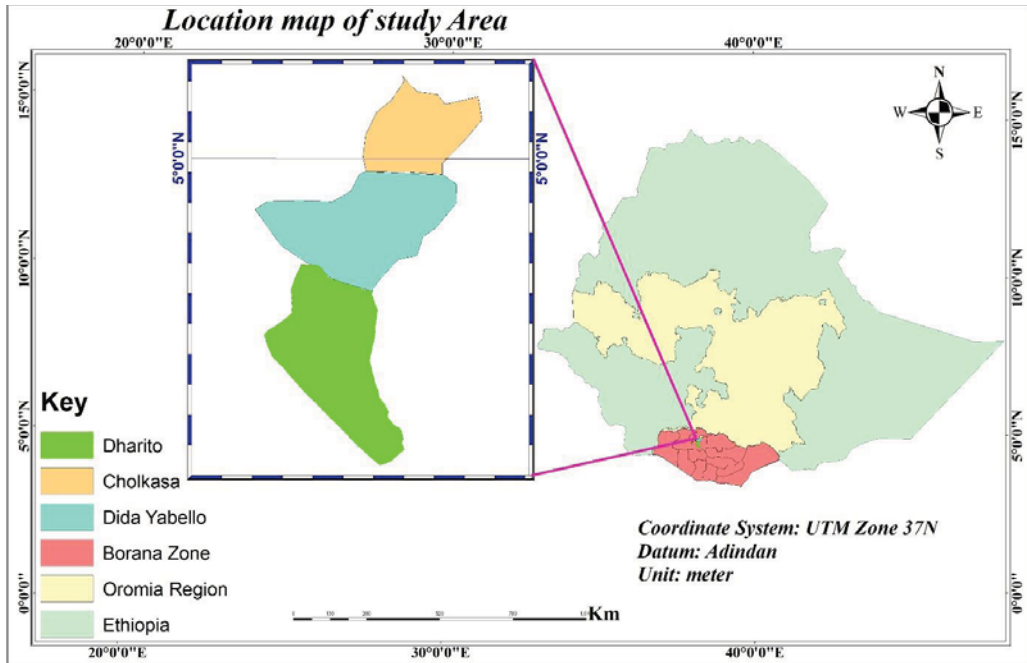


Figure 1 Map of the study areas
Source: Borana Zone woreda administration

2.2. Sampling Techniques and Data Collection

The research was carried out in the Yabello district of the Borana zone. Before the major survey, a rapid field survey or mapping experiment area was conducted to confirm the geographical distribution, and populations of chicken ecotypes and the sample of kebeles from the district. Three (3) rural kebeles were purposively selected among 15 kebeles in the district based on the population and distribution of the poultry. A total of 120 households were selected with forty (40) households from Dida Yabello, thirty-nine (39) from Dharito, and forty-one (41) from Cholkasa kebeles based on the number of chickens they raised, chicken production potential, road accessibility, and agroecological diversity. Yamanes' (1967) formula was used to calculate the sample size of the study households. The formulas for sample size determination were;

$$\text{The formula was given as, } n_i = \frac{N}{1 + N(e)^2}$$

Where n= is the sample size

N= total population size

e= sampling error

The total population number of sampled kebele was 4416 households using the formula above the sample size was 120 households. Where the marginal error is 9%.

$$\text{Dida Yaballo, } n_i = \frac{1,471}{1 + 4416(0.09)^2} = \frac{1,471}{36} = 40$$

$$\text{Dharito, } n_i = \frac{1,434}{1 + 4416(0.09)^2} = \frac{1,434}{36} = 39$$

$$\text{Cholkasa, } n_i = \frac{1,511}{1 + 4416(0.09)^2} = \frac{1,511}{36} = 41$$

Then, based on the total population of each per kebeles,

$$n_i = (40 + 39 + 41) = 120 \text{ total households of each kebeles.}$$

The data collected for performance evaluation were conducted per two weeks for three (3) months. To reduce bias due to watering and feeding, data collecting measurements were done early in the morning. Structured and pre-tested questionnaires were utilized to collect socioeconomic, purpose of chicken rearing, chicken selection methods-based breeding objectives, and husbandry practices data for each household survey.

2.3. Data Collection Procedure

A total of 120 HHs were chosen and interviewed for qualitative data collection based on the number of chickens they raised. Three chickens per HH with a total of 360 chickens were selected and quantitative data on selected linear body measurements (morphometric) were generated. Information on flock structure, sources of first foundation flock size, husbandry practice, and management were collected through questionnaires.

2.4. Questionnaire Administration and Focal Group Discussion

Focal group discussions were held in each of the selected Kebele which was composed of youngsters, women, village leaders, and socially respected individuals who are known to have better knowledge of the present and past social and economic status of the area with the recommended group size of 9 members. The discussions were focused on the history of the stock, current status and major constraints of the stock, the purpose of keeping chicken flocks, husbandry practices, and distribution of the local chicken and performance.

2.5. Data Analysis and Management

After the data were collected, it was loaded into a computer in the form of a Microsoft Excel spreadsheet and prepared for analysis. All the collected data were double-checked for any types of errors that occurred during data collection. Simple descriptive statistics such as average, standard deviation, and standard error of the mean were applied for quantitative data or frequencies and tabulations for qualitative attributes by the Statistical analysis system (SPSS version 20). Chi-square tests were employed to test the assumption of equal proportion between the categorical variables. Mean comparisons were made using Tukey's studentized range test method at $p < 0.05$ for variables showing significant differences between sample populations.

3. RESULTS AND DISCUSSION

3.1. Socio-Economic Characteristics of Respondents

To assess the influence of family poultry farming on livelihood improvement is essential to understand the socio-economic features of the poultry keeper. The socio-economic qualities of farmers have an impact on their daily lives. The socio-economic characteristics of the respondents in the study area, female-headed respondents were 62.5 % in Dida Yabello, 74.4 % in Dharito, and 80.5 % in Cholkasa. Male-headed households made up 37.5 %, 25.6 %, and 19.5 % of the remaining interviewed households in Dida Yabello, Dharito, and Cholkasa Kebeles, respectively. Men might be working in towns and transporting domestic animals to grazing areas may account for the low number of male responders in the research areas. This showed that village poultry rearing was mainly managed by the female. Studies by Emebet et al. (2013) and Melaku, (2016) revealed that a high proportion of female respondents participated in southern Ethiopia and the south Wollo zone with the percentage of 79.1 and 71.11%, respectively agreeing with the current research finding.

3.2. Poultry owner and Division of Household Labor

Wong, et al (2017) stated that poultry is the major type of livestock owned and managed by women in developing countries. This demonstrates the need to take gender into account when analyzing the sector's productivity and output. Accordingly, the research results showed that women possessed the majority (47.5%) of the chicken in the household followed by (27.5%) daughters, (15%) Sons, and (7.5%) men from Dida Yabello, (53.8%) women, (38.5%) daughters, (5.1%) Son and (2.5%) men from Dharito and (58.5%) Women, (14.6%) daughters, (12.2%) Son and (14.6%) men from Cholkasa kebeles. The result indicated that women and children were the main role players in keeping the chickens in the study areas. The choice of input and choice of farm size are influenced by the production objectives of smallholders. Producers who view poultry farming as a substantial source of income might devote time and resources to maximizing both monetary and non-monetary rewards. Some households in the study area responded that keeping the chicken by the adult male was not practiced. The current finding was in line with the result of Abubakar *et al.* (2007) reported that chickens in Nigeria and Cameron were mainly owned and managed by women and children. Similarly, Emebet et al. (2013) and Melaku, (2016) revealed that a high proportion of female respondents participated in southern Ethiopia and the south Wollo zone with the percentage of 79.1 and 71.11%, respectively. This showed that in some parts of the country females more participating in poultry husbandry. Diversifying income sources can enhance producers' ability to access liquid capital, which is a significant challenge in developing countries. In addition to Berkhouta et al. (2010), Awoyinka et al. (2009), Ahmed and Melesse (2018), other researchers have also explored how production objectives and income diversification affected smallholders' technical efficiency (Berkhouta et al., 2010; Awoyinka et al., 2009; Ahmed and Melesse, 2018).

3.3. Poultry Flock composition per household

The Average chicken flock size and chicken composition per household are shown in (Table 5). Holding a larger flock size could be an incentive to use different inputs such as feed, vaccines, and housing,

and improve overall production and productivity. The majority of respondents in the study areas kept chickens, due to different reasons. The average mean of all flock sizes per household in the study area were 3.23 ± 2.99 Hens, 2.40 ± 1.91 Pullets, 2.08 ± 2.01 Cockerels, 1.40 ± 1.05 Cocks and 0.83 ± 0.78 Chicken from Dida Yabello, 2.95 ± 1.19 Hens, 2.15 ± 2.14 Pullets 1.90 ± 2.05 Cockerels, 1.61 ± 1.11 Cocks and 1.17 ± 1.11 Chicks from Dharito and 3.30 ± 1.28 Hens, 2.18 ± 1.72 Pullets, 2.23 ± 2.12 Cockerels, 1.28 ± 1.17 Cocks and 1.15 ± 1.14 Chicks from Cholkasa Kebeles. The Highest mean was observed for the number of chickens per household, followed by 3.12 ± 1.43 hens, 2.24 ± 1.92 pullet, 2.00 ± 2.05 cockerels, 1.43 ± 1.11 cocks, and 1.05 ± 1.01 chicken. In the study areas, there were more breeding female hens. This could be due to pastoralists usually selling male chickens for greater income and keeping female chickens for egg production and replacement stock. The farm size indicator makes a compelling case for the importance of growing flock sizes in boosting the sector's production. Smallholder production may have a higher death rate and delayed replenishment of productive stocks due to a smaller flock size. Due to inadequate immunization, poor management, and attacks by predators, the mortality rate is highest during the chick stage.

3.4. Poultry Husbandry practices

The output and productivity of smallholders are increased by improved flock management techniques such as better housing, feeding, and watering procedures. The purpose of poultry housing is to keep poultry safe from adverse weather conditions, diseases, predator attacks, accidents, and thefts caused by predators. Further, poultry housing improves smallholder chicken production and productivity. The presence of feeders and drinkers improves bird health by increasing access to feed and water, facilitating the administration of medications and vitamins, and reducing feed and clean water pollution. Additionally, it reduces disease transmission by preventing mice, rats, and other birds from consuming their diet. Nin-Pratt, (2016) explored the positive role of improved husbandry practices and input use to enhance the productivity of the poultry sectors in developing countries.

3.5. Poultry Housing in the study area

Time spent on management has a favorable and significant impact. Farrelly, (1996) reported that in villages farmers raise a small number of domestic fowl mainly for home consumption with small. Investments in village poultry farming can improve productivity and generate additional income which contributes to poverty reduction and increased food security (Mack & Otte 2005; Pica-Ciamarra & Otte, 2010). Village poultry is often associated with good quality/size eggs and meat flavor, hard egg shells, high dressing percentages, and low production costs (Gueye, 1998). The main function of village chickens according to the farmers is the provision of meat and eggs for home consumption besides it contributes to the national economies of developing countries (Andrews, 1990; Cairns & Lea 1990). Poultry housing practices by the respondents in the study area are shown in (Table 1). Housing is a prerequisite for any sustainable poultry farming. A higher value represents better housing quality. Better index was recorded by households who use separate poultry houses during dry and wet seasons than households who do not use any type of housing. It is essential for chickens because it protects them against predators, theft, and weather (rain, sun, chilly wind, decreasing night temperatures) and

provides shelter for egg-laying and a broody hen. Housing is a low priority in rural areas for managing poultry. However, the data in the study areas showed that (30%) of Dida Yabello, (20.5) from Dharito, and (36.6%) from Cholkasa kebeles respondents were housing separately for poultry from another livestock house. The majority of the respondents keep their chicken at various night sheltering places in the main house including perches inside the house and the kitchen (60%) and (10%) from Dida Yabello, (66.7%) and (12.8%) from Dharito and (48.8%) and (14.6%) from Cholkasa kebeles, respectively.

The major housing materials used in the study area were wood (52%), wood and mud (35%) at Dida Yabello, wood (61.9%), wood and mud (20.5%) at Dharito and wood (46.3%), wood and mud (26.8%) at Cholkasa kebeles.

Table 1. The poultry housing system in the study areas

Type of house %	Study Kebele			
	Dida Yabello (N=40)	Dharito (N= 39)	Cholkasa (N= 41)	Overall Mean
Tree perch inside the house	60.0%	66.7%	48.8%	58.3%
In the kitchens	10.0%	12.8%	14.6%	12.5%
Separate chicken house	30.0%	20.5%	36.6%	29.2%
Type of housing materials (%)				
Wood	52.5%	61.5%	46.3%	53.3%
Wood + mud	35.0%	20.5%	26.8%	27.5%
Wood + iron sheet roof	3.6%	5.1%	7.3%	5.0%
Wood + grass roof	10.0%	12.8%	19.5%	14.2%
Reason for not to have poultry house (%)				
Lack of knowledge	67.1%	61.2%	70.9%	47.5%
Lack of awareness	14.3%	25.8%	19.3%	15.0%
Risk of predators	28.6%	12.9%	9.7%	12.5%

Source: Data collected for research in 2021

3.6. Poultry Feed sources and feeding practice

The respondents' poultry feeding practices in the research area are shown in (Table 2). Under village management conditions, feed is the other production and productivity-limiting element.

Supplemental feeding of hens during the incubation period was observed to be an effective management tool in achieving a transition from subsistence to economically viable semicommercial production. Utilizing indigenous birds sustainably is doing so in a way that effectively achieves current economic and social goals without jeopardizing the ecosystem and available resources (Besbes, 2009). In developing countries, poultry consumption grew by 5.8 percent per year, faster than human population growth (Sonaiya et al., 2004). Increasing poultry production might be a timely solution to meet the needs of the growing population (Ondwasay et al., 2006). The profitability, however, depends

very much on feed costs, market prices, stock sizes, and number of birds sold and consumed (Masku, 2013). Changes in traditional management practices can improve the performance of native chickens and thus contribute to household incomes per year as reported in native chickens in Bangladesh (Sarkar and M. Golam, 2009). According to Okeno et al. (2012) reported a free-range and semi-intensive system, native chickens are more profitable, but not economically viable in an intensive system. Scavenging feed resources with some type of conditional supplementary feeding was the main nutritional management strategy in the study areas. The poultry forages for food under trees, in leftover feed, and in the barns of cattle and other animals. All of these were full of risks to the poultry. Poultry scavenging under trees and open fields were at risk of predators in general the hawks and cats in particular (Samson and Endalew, 2010). Similar to other village poultry systems in developing countries, all kebeles studied were generally characterized by extensive scavenging management (82.5%) from Dida Yabello, (89.7%) from Dharito, and (70.7%) from Cholkasa kebeles, respectively; reported to provided supplementary feeding with practice scavenging system feeding while the remaining (17.5%) from Dida Yabello, (10.4%) from Dharito and (29.2%) from Cholkasa kebeles, respectively did not provide supplementary feed. They offered supplemental feed, small quantities of grain (maize, cereals), kitchen and household leftovers, and insects (maggots, termites, silkworms) were occasionally offered to the chickens. In this study, the results matched those of Meseret (2010), and Mekonnen (2007) found that 95-98% of small-scale poultry producers in Awassa Zuria, Dale, and Gomma districts provide supplementary feeding to their chickens, and 99.28% of farmers in Northwest Ethiopia provided supplementary feeding to their chickens Halima (2007). There was no significant difference ($P < 0.05$) in supplementary feed provided by the households in the study areas.

Table 2. Poultry Feed sources and feeding practice

Main Source of Feed %	Study Kebeles			Overall mean
	Dida Yabello (N =40)	Dharito (N =39)	Cholkasa (N = 41)	
Extensive	100%	100%	100%	100%
Provision feeds (%)				
Yes	82.5%	89.7%	70.7%	80.8%
No	17.5%	10.4%	29.2%	19.1%
Frequency of feeding (%)				
Morning	87.9%	76.9%	72.4%	82.4%
Morning and afternoon	9.1%	2.6%	12.2%	9.2%
Afternoon	2.5%	5.1%	10.3%	6.1%
Type of supplementary feed%				
Maize	84.8%	42.8%	75.8%	67.0%
maize and leftover	9.1%	20.0%	6.9%	12.3%
Leftover	6.1%	37.1%	17.2%	20.6%
Poultry supplementary feed (%)				
All poultry	12.1%	8.6%	27.6%	15.4%
Chicks	69.7%	80.0%	58.6%	70.1%
Layer	15.2%	5.7%	13.8%	11.3%
Cockerels and pullets	3.0%	5.7%	0	3.0%
How to feed? (%)				

Put in container	9.0%	16.7%	20.7%	14.4%
Throw it on the ground	90.9%	85.7%	79.3%	85.5%
Reason for not giving supplementary feeds (%)				
Lack of awareness	85.7%	75.0%	91.7%	19.5%
Unavailable	14.3%	25.0%	8.3%	3.3%

Source: Data collected for research in 2021

3.7. Poultry watering practice in the study areas

Table 3 shows the respondents' poultry watering methods in the research area. Water aids in the digestion and metabolism of the bird, as well as serves as a vehicle for the administration of some critical immunizations. During the rainy and dry seasons, the water source was different. The majority of the respondents were (90%) from Dida Yabello, (71.8%) from Dharito and (82.9%) from Cholkasa kebeles, respectively were provided water to poultry, while the remaining (10%) were from Dida Yabello, (28.6%) from Dharito and (17%), they were not providing water for their poultry.

All household respondents' frequency of watering their poultry was Morning (87.9%), Morning and afternoon (9.09%) and afternoon (2.5%) from Dida Yabello, Morning (82.1%), Morning and afternoon (14.3%) and afternoon (3.6%) from Dharito and Morning (85.3%), Morning and afternoon (8.8%) and afternoon (5.9%) from Cholkasa Kebeles respectively.

Table 3. Poultry watering practices in the study area

Study Kebeles				
Water provision (%)	Dida Yabello (N =40)	Dharito (N =39)	Cholkasa (N = 41)	Overall Mean
Yes	90.0%	71.8%	82.9%	81.6%
No	10.0%	28.6%	17.0%	18.3%
Frequency of watering (%)				
Morning	87.9%	82.1%	85.3%	81.6%
Morning and afternoon	9.1%	14.3%	8.8%	13.2%
Afternoon	2.5%	3.6%	5.9%	3.0%

3.8. Poultry Disease outbreak and controlling mechanism

In terms of disease outbreaks in the research areas, the survey results were presented (Table 4). The vaccination of village chickens is one of the most important technical ways to increase their production (Tomo, 2009). The majority of respondents (90 % in Dida Yabello, 97.4 % in Dharito, and 80.5 % in Cholkasa kebeles, respectively) experienced chicken disease outbreaks. As in Tadesse, (2016), all respondents in the study area in east Hararghe of Kersa districts reported the presence of diseases in their flocks. The result showed that 40.7% of respondents were locally treating the birds against diseases. A majority of interviewed farmers (86.1%, 94.7%, and 84.8%) in Dida Yabello, Dharito and Cholkasa kebeles, respectively were reported treating birds with green pepper, antibiotics such as tetracycline, a local alcoholic drink (local name, areke), and Aloe Vera plant juice, and only 11.1%, 5.2% and 15.2% in Dida Yabello, Dharito and Cholkasa kebeles, respectively of respondents were calling a veterinarian to treat their chickens. Taddele *et al.* (2013) also reported that traditional treatments against

NCD and other diseases and parasites were local alcoholic drinks (*areke*), garlic, and supper dip (Flavoured Instant Powder Drink), in central Ethiopia, though the treatments are not always effective. A significant effort in disease control and advisory services was necessary to reduce losses and boost poultry production and productivity. Respondents carried out white salt mixing with oil (fat) and kerosene (lamp oil) ectoparasites and endo-parasites control when the need arose.

Table 4. Disease outbreak and controlling mechanisms in the study areas

Occurrence of disease (%)	Study Kebeles			Overall Mean
	Dida Yabello (N =40)	Dharito (N =39)	Cholkasa (N = 41)	
Yes	90.0%	97.4%	80.5%	89.1%
No	10.0%	2.6%	19.5%	10.8%
Control measures taken (%)				
Traditional treatments	86.1%	94.7%	84.8%	79.1%
Call in veterinarians	11.1%	5.2%	15.2%	9.1%
No control measures	2.8%	0	0	

Source: Data collected for research in 2021

The average chicken mortality rate by age group in the study areas was indicated in (Table 5). The result revealed that all age groups were 0.38 ± 0.49 , 0.23 ± 0.423 , 0.13 ± 0.335 and 0.28 ± 0.452 in Dida Yabello, 0.34 ± 0.48 , 0.28 ± 0.445 , 0.10 ± 0.354 and 0.31 ± 0.468 in Dharito and 0.40 ± 0.496 , 0.20 ± 0.405 , 0.15 ± 0.362 and 0.25 ± 0.439 in Cholkasa kebeles. The chicks less than two weeks of age ranked first followed by the group aged greater than five months. The scavenging system is characterized by high chick mortality in the first for less than two weeks of life which is mainly caused by predators and Newcastle disease (Aberra and Tegene, 2011). There was a significant difference ($P < 0.05$) between the study areas for chicks and adult chickens >5 months in mortality rate. This might be due to a lack of chick management and disease prevalence, which mostly affects chicks and adults mainly layers and brooding hens as reported by interviewed households. Regarding the reason for poultry mortality, an index of diseases (0.37), predators (0.29), and accident (0.19) in Dida Yabello, diseases (0.384), predators (0.315) and accident (0.295) in Dharito and diseases (0.287), predators (0.362) and accident (0.225) in Cholkasa Kebeles were predators hold the first rank followed by diseases, accident and other factors, in order of their importance. Newcastle disease was the most important disease-causing high mortality of young and adult birds in the study areas. The findings agreed with other studies conducted in other developing countries (Harrison and Alders, 2010; Moges et al., 2010; Okeno et al., 2012) where Newcastle disease was reported to be the major cause of chickens' deaths. In addition, hawks, wild cats, eagles, honey badgers, dogs, domestic cats, and hyenas were the major poultry predators. Wild birds (hawks and eagles) were the most dangerous type of predators affecting the village's chicken production.

Table 5. Case and Average numbers of poultry mortality by age group in one year
Rn (rank1, rank2 Rank n)

Study Kebeles								
Age of birds	Dida Yabello (N=40)		Dharito (N=39)		Cholkasa (N=40)		Overall Mean	
< 2 weeks	0.38±0.49		0.34±0.48		0.40±0.50		0.37±0.48	
2 weeks-2 months	0.23±0.42		0.28±0.45		0.20±0.41		0.23±0.42	
2 -5 months	0.13±0.34		0.10±0.35		0.15±0.36		0.12±0.35	
> 5 months	0.28±0.45		0.31±0.47		0.25±0.44		0.28±0.45	
Cause of mortality	index	Rank	index	Rank	index	Rank	index	Rank
Accident	0.24	3	0.30	3	0.23	3	0.25	3
Diseases	0.38	2	0.38	1	0.29	2	0.35	2
Predators	0.39	1	0.32	2	0.36	1	0.36	1

Source: Data collected for research in 2021

3.9. Poultry breeding objectives

The main objectives of poultry breeding in the study areas are presented in (Table 6). Selective breeding is largely responsible for such increases in livestock productivity over recent decades (Leakey et al., 2009). In addition, the production and productivity of the sector are significantly increased by the knowledge and capabilities of village chicken producers in marketing and production choices. The skill-related components of the inefficiency determinant model include experience in poultry production and involvement in training in poultry production and management. Within-breed selection has not been widely used in the developing countries. Widely, in part because of a lack of adequate infrastructure, this practice has to be encouraged since the commercial lines sometimes work poorly in subpar conditions in developing nations. As an alternative, genetic improvement of native chicken breeds can be carried out in the areas where they have evolved and adapted, but breeding objectives should take into account regional variation in the production environment as well as uncertainty and risk related to the future (Smith, 1984). As a result, the main objectives of poultry farming in the study areas were income generation (0.32, 0.31 and 0.32 at Dida Yabello, Dharito, and Cholkasa kebeles, respectively) and egg production (0.26, 0.24 and 0.29 at Dida Yabello, Dharota and Cholkasa kebeles, respectively). Other uses, such as meat production and production of breeding stock, were ranked lower. The study reveals that village poultry was kept for cash income sale of chicken and egg selling. Among the most important functions of rearing chicken is the sale for cash, followed by hatching for breeding stock, according to Hailemichael (2013). In Kenya and Ethiopia, Halima (2007), Moges et al. (2010), and Okeno et al. (2012) reported that indigenous chickens were raised for food, cash income, breeding stock, and cultural and religious ceremonies. Breed-specific selection rather than crossbreeding with

commercial chicken breeds should be the emphasis of breeding programs aimed at improving indigenous chickens. The genetic potential of village chickens is often not the main factor limiting their production, according to research on village poultry in many nations. Village poultry breeding was lower than livestock seems in the study areas as indicated by the low average poultry holding per household. As a result, this finding indicated that chicken farming was the most important activity for generating household income in the study areas.

During the period of egg incubation, all respondents reported using broody hens to incubate eggs naturally. All respondents (100%) in the study areas use the traditional incubation method and 96.8% of respondents provided nesting/bedding material during incubation periods with straw and old clothes being the most used. When it came to the mating mechanism, all respondents reported that the birds mated freely (uncontrollably) while scavenging. There is a substantial risk of increased inbreeding rates due to the tiny flock size. Hence, poultry producers should utilize breeding cocks to manage chicken mating by exchanging them with households from different villages.

Table 6. Ranking for breeding poultry in the study areas

Variables	Study Kebeles					
	Dida Yabello N=40		Dharito N=39		Cholkasa N=41	
Factors	Index	Rank	Index	Rank	Index	Rank
Chick Sale	0.24	3	0.17	3	0.19	3
Income	0.31	1	0.33	1	0.29	2
Egg Sale	0.26	2	0.24	2	0.32	1
Meat	0.14	4	0.16	4	0.16	4

Respondents selected based on more than one trait category Index=the sum of (4times first order +3times second-order + 1times four order) for individual variables divided by the sum of (4times first order +3times second-order +1times four order) for all variables.

3.10. Poultry Trait Preference and Selection Criteria

In order to increase productivity, breed selection builds flocks with the desired characteristics. Despite the long duration it takes, in rural household settings, breed improvement through selection is more sustainable than other breed improvement techniques (Padhi, 2016). It is important to understand the adaptive characteristics and genetic merits of indigenous chickens by considering them as breeding stock selection criteria and to identify the factors that determine the choice of chicken breeds and the underlying factors that determine the choice of genetic stock used by farmers (Nigussie et al., 2010). According to the sampled respondents, producers use body size/weight, egg size/weight, egg productivity, feed requirement, and others are all traits that poultry breeders look for when selecting breeding males and females. Despite the difficulty of managing chicken mating in the scavenger production system, households select breeding females and breeding males for the features they favor and want to enhance for their production objectives. The purpose of maintaining chickens in the research areas was to produce eggs for hatching, sell, and replace the flock.

3.11. Households' trait preference of hen for production

The respondents' trait preferences for local chickens were recorded in (Table 7). For chicken selection, chicken owners in the research area examined both physical features and egg production criteria. As shown in the results, egg production, body size/weight, egg size, egg counts, and disease resistance were all examined in order of priority when selecting breeding chickens. Trait preferences of hen for breeding according to the respondents ranked with an index value of Body size (0.19), egg size (0.18), Egg number (0.15), disease resistance (0.12), hatchability (0.11), mothering ability (0.71), broodiness (0.08), growth rate (0.04) and good scavenging (0.02) in Dida Yabello. In Dharito kebele, Body size (0.19), egg size (0.19), Egg number (0.19), disease resistance (0.18), mothering ability (0.15), hatchability (0.13), broodiness (0.08), growth rate (0.05) and good scavenging (0.03). In Cholkasa kebele, Body size (0.20), egg size (0.18), Egg number (0.19), disease resistance (0.13), hatchability (0.11), broodiness (0.08), mothering ability (0.07), growth (0.05) rate and good scavenging (0.03) were traits highly preferred for poultry selection for breeding purposes in the study areas. The present findings were inconsistent with the report of Duguma et al. (2010) reported that conformation traits are important criteria of selection under traditional breeding practices. This was because size/conformation heavily determines live chickens' prices in traditional poultry markets. Similarly, the high rating of sale cash income in the present study was in line with the report of Nigussie et al. (2010) comb type, body size, and egg size were used as selection criteria. Similarly, the present findings were in agreement with reports of Okeno et al. (2011) that chickens' traits of economic significance such as egg number; body size, and egg size highly rated. In developing breeding goals for indigenous poultry improvement, stakeholders should focus on traits considered important to them (Okeno et al., 2011). As a result, all chicken producers gave the greatest attention to egg production, mothering ability, and disease resistance) rather than reproduction trait and comb type and shape.

Table 7. Traits used to select hens for egg production in the study areas

Traits used to select Breeding Hen	Study Kebeles					
	Dida Yabello N=40		Dharito N=39		Cholkasa N=41	
	Index	Rank	Index	Rank	Index	Rank
Egg number	0.15	3	0.19	3	0.19	2
Body size	0.18	2	2.38	1	0.20	1
Egg size	0.20	1	0.19	2	0.18	3
Disease resistance	0.13	4	0.18	4	0.13	5
Hatchability	0.11	5	0.15	6	0.14	4
Mothering ability	0.07	7	0.13	5	0.07	7
Broodiness	0.08	6	0.08	7	0.08	6
Growth rate	0.04	8	0.05	8	0.05	8
Good scavenging	0.03	9	0.03	9	0.03	9

The sum of (9 times first order + 8 times second order + ... + 1st to 9th order) for individual variables divided by the sum of (9 times first order + 8 times second order + ... + times ninth order) for all variables.

3.12. Households' trait preference of cock for breeding

Trait preferences for breeding cocks by the respondents were shown in (Table 8). The current result showed that the trait preferences for cock selection for breeding purposes of index value were Comb type (0.27), Body size (0.28), disease resistance (0.19), Fighting ability (0.13), growth rate (0.10) and good scavenging (0.06) from Dida Yabello, Comb type (0.30), Body size (0.29), disease resistance (0.28), Fighting ability (0.13), growth rate (0.10) and good scavenging (0.06) from Dharito and Comb type (0.25), Body size (0.25), disease resistance (0.23), Fighting ability (0.13), growth rate (0.10) and good scavenging (0.07) of selection criteria of local poultry for breeding cock in Cholkasa kebeles. The highest trait preference cock breeding selection criteria were disease resistance (0.28), comb-type (0.30), and Body size (0.30) in Dharota kebele. This was due to breeding goals that were set without taking into account the needs of all stakeholders, as well as a significant risk of rejection by end-users. The pastoralists' conversations revealed that morphological features, particularly comb type for cocks and body size for hens, were very essential in determining the market appropriateness of chickens in the research area. The current result agreed with the finding of Getachew et al. (2014) reported traits considered for males were weight (0.19), comb-type (0.20), and physical appearance (0.17) in South Wollo Ethiopia. Similarly, Adisu et al. (2013) reported that body conformation (0.17), live weight (0.17), and adaption (disease resistance) (0.12) were traits preferred for selection of the breeding cock in the north Wello, Amhara region. Therefore, economic traits such as the growth rate and body size of the male chicken and egg production of the female chicken were important for the development of breeding objectives for the improvement of indigenous chickens in the study area.

Table 8. Traits used to select cock for breeding in the study areas

Traits used to select	Study Kebeles					
	Dida Yabello N=40		Dharito N=39		Cholkasa N=41	
Breeding Kock	Index	Rank	Index	Rank	Index	Rank
Disease resistance	0.20	3	0.28	3	0.23	2
Comb type	0.27	2	0.30	1	0.25	1
Body size	0.28	1	0.29	2	0.21	3
Fighting ability	0.13	4	0.13	4	0.13	4
Growth rate	0.10	5	0.10	5	0.10	5
Good scavenging	0.06	6	0.06	6	0.07	6

Index=the sum of (6 times first order + 5 times second order + ... + 1-time eighth order) for individual variables divided by the sum of (6 times first order + 5 times second order + ... + times ninth order) for all variables.

3.13. Production of poultry in the study areas

Higher eggs and live bird productivity help improve household members' food and nutritional security and increase household income and social capital. The mean age at first lay, number of clutches/ hen/ years, and number of eggs/clutch/hens were given in Table (9). The average number of eggs per clutch, number of clutches per year and average number of eggs produced per year from local chickens were 0.14 ± 0.35 , 0.19 ± 0.39 and 0.24 ± 0.42 from Dida Yabello, 0.12 ± 0.33 , 0.16 ± 0.37 and 0.18 ± 0.39 in

Dharito and 0.14 ± 0.33 , 0.18 ± 0.37 and 0.20 ± 0.39 in Cholkasa Kebeles, respectively. The result showed significantly no difference at ($P > 0.05$) between the study areas. The average age of the pullet at first egg-laying was 6.54 ± 0.06 months. Age at the first egg-laying of pullets was significantly lower ($P < 0.05$) at midland agroecology and the average mean number of clutches per year (0.21 ± 0.244) recorded was lower than by Mammo, (2006), Fisseha *et al.* (2010) and Eskindir (2013) reported 5.2, 3.83, and 3.9 in Jamma woreda, and Jarso and Horro districts per year, respectively. The lower attention and management of chickens in pastoralist areas lower the number of clutches per year. Moreover, it was lower than Agide (2015), who reported 2.98 clutches per year. This indicated the variation of broodiness behavior among the Ethiopian ecotypes. Clutch sizes or the number of eggs per clutch also depend on the availability of scavenging feed resources in the area during breeding seasons (Kwakua, 2009). Because of the positive reinforcing changes in perceptions and livelihood outcomes, increasing efficiency has a short-term influence on higher production or productivity, but it also has a long-term impact on the level of the sector's overall performance.

Table 9. Production traits of poultry in the study areas

Variables	Study Kebeles			
	Dida Yabello (N =40)	Dharito (N = 39)	Cholkasa (N = 41)	Overall mean
Mean $\pm$ SD				
AFEP (month)	0.14 ± 0.35	0.12 ± 0.33	0.14 ± 0.33	0.13 ± 0.34
AEPPcl	0.19 ± 0.39	0.16 ± 0.37	0.18 ± 0.37	0.17 ± 0.27
NCIYr	0.04 ± 0.19	0.08 ± 0.27	0.09 ± 0.27	0.07 ± 0.24
EPPYr	0.24 ± 0.42	0.18 ± 0.39	0.20 ± 0.39	0.20 ± 0.40

AFEP = age at the first egg of pullet; AEPPcl = average egg production per clutch; NCIYr = number of clutches per year; EPPYr = Average egg production per year.

3.14. Poultry Reproductive performance

Table (10) shows the average reproductive performances and egg production of chickens. This study revealed that local broody hens were the only means of egg incubation and brooding young chicks. Low hatchability, prolonged brooding times, and small numbers of eggs laid in a single hatch led to a slower rate of stock replacement. Multiple factors that can be used to reduce flock size point to the need for creative interventions that can simultaneously address the most important limitations. The average ages at first mating of males, sexual maturity and first laying of females at Dida Yabello were 0.11 ± 0.32 , 0.13 ± 0.33 , and 0.09 ± 0.29 , respectively. Similarly, the average ages at first mating of males, sexual maturity and first laying of females at Dharito kebele were 0.10 ± 0.31 , 0.17 ± 0.36 and 0.12 ± 0.32 , respectively. Moreover, the average ages at first mating of males, sexual maturity and first laying of females at Cholkasa kebele were 0.12 ± 0.309 , 0.15 ± 0.358 , and 0.13 ± 0.325 , respectively. The highest values were 0.12 ± 0.31 and 0.15 ± 0.36 months for the average mean age at sexual maturity of males and females at Cholkasa kebele. The reproductive performance was generally low in the study areas where household management affects egg production and chick survival.

Table 10. Reproduction traits of poultry in the study areas

Variables	Study Kebeles			Overall mean
	Dida Yabello (N =40)	Dharito (N= 39)	Cholkasa (N = 41)	
Mean $\pm$ SD				
ASMM (month)	0.11 $\pm$ 0.32	0.10 $\pm$ 0.31	0.12 $\pm$ 0.31	0.11 $\pm$ 0.31
ASMF (month)	0.13 $\pm$ 0.33	0.17 $\pm$ 0.36	0.15 $\pm$ 0.36	0.15 $\pm$ 0.35
NCHPI (month)	0.09 $\pm$ 0.29	0.12 $\pm$ 0.32	0.13 $\pm$ 0.33	0.11 $\pm$ 0.31
NCSA	0.09 $\pm$ 0.26	0.09 $\pm$ 0.29	0.09 $\pm$ 0.29	0.09 $\pm$ 0.28

ASMM = age at sexual maturity of male; ASMF = age at sexual maturity of female; NCHPI = number of chicks hatched per one natural incubation; NCSA = number of chicks survive to adulthood

3.15. Quantitative traits

Bodyweight and other body measurements are useful parameters that are used to describe a breed or type jointly with the breed's morphological characteristics and the environment it inhabited. The least-square means for body weights (Bwt), Wingspan (WS), Body length (BL), thigh circumference (TC), Chest circumference (Cc), shank length (SL), Neck length (NL), Back length (BL), Wattle length (WL), Comb length (CL) and Comb height (CH) measurements of local chicken populations in the study areas (Table 11).

The result indicated female Comb length (cm) 7.13 $\pm$ 0.2 and male Comb length (cm) 6.30 $\pm$ 0.5, female Comb height (cm) 5.68 $\pm$ 0.1 and male comb height (cm) 5.20 $\pm$ 0.3, female shank circumferences(cm) 38.70 $\pm$ 1.54, male shank circumferences (cm) 35.78 $\pm$ 2.3, female chest circumferences (cm)101.33 $\pm$ 2.1 and male chest circumferences (cm) 104.92 $\pm$ 3.3 and female Body weight (kg) 10.06 $\pm$ 1.3 and male Body weight (kg) 8.53 $\pm$ 0.6 at Dida Yabello. Moreover, the female Comb length (cm) was 5.15 $\pm$ 0.2, and male Comb length (cm) 4.51 $\pm$ 0.6, female height (cm) 6.73 $\pm$ 0.32 and male comb height (cm) 6.25 $\pm$ 0.5, female shank circumferences (cm) 39.48 $\pm$ 1.4 and male shank circumferences (cm)31.60 $\pm$ 2.8, female chest circumferences (cm) 92.35 $\pm$ 1.9 and chest circumferences (cm) 87.35 $\pm$ 7.1 and female weight (kg) 13.38 $\pm$ 1.4 and male Body weight (kg) 8.01 $\pm$ 0.8 at Dharito. Similarly, female Comb length was 9.87 $\pm$ 0.3 and male Comb length (cm)7.63 $\pm$ 0.3, female comb height (cm) 7.30 $\pm$ 0.2 and male comb height (cm) 4.92 $\pm$ 0.6, female shank circumferences (cm) 39.48 $\pm$ 1.4 and male shank circumferences(cm) 31.60 $\pm$ 2.8, female chest circumferences (cm) 120.51 $\pm$ 1.9 and male chest circumferences (cm) 92.94 $\pm$ 6.00 and female body weight (kg) 9.14 $\pm$ 0.9 and male body weight (kg)11.06 $\pm$ 1.5 at Cholkasa kebele were recorded. The morphometric features of the female and male chickens population at Cholkasa Kebele were 5.15 $\pm$ 0.2 female Comb length (cm) and 4.51 $\pm$ 0.6 male Comb length (cm), 6.73 $\pm$ 0.3 female comb height (cm) and 6.25 $\pm$ 0.5 male comb height (cm), 39.48 $\pm$ 1.4 female shank circumferences (cm) and 31.60 $\pm$ 2.8 male shank circumferences (cm), 92.35 $\pm$ 1.9 female chest circumferences (cm) and 87.35 $\pm$ 7.1 male chest circumferences (cm), 13.38 $\pm$ 1.4 female Body weight (kg) and 8.01 $\pm$ 0.8 male Body weight (kg), 96.35 $\pm$ 1.2 female body length (cm) and 93.17 $\pm$ 2.9 male body length (cm) and 50.49 $\pm$ 1.5 female Neck length (cm) and 45.63 $\pm$ 3.5 male Neck length (cm) as compared to chicken populations from Dida Yabello and Dharito Kebeles. The Cholkasa Kebele chickens were higher in most traits than both study kebeles. The result of the current study was in line with the report of mean body weight (1.7 to 2.1 kg) of central Namibian semi-arid region local chickens by Ndahambelela (2016) and the range of 1.6 to 2.18 kg as reported by Alabi *et al.* (2012).

The average mean shank length of males found in the current study areas was greater than the reported average value of 11.3 cm in Horro and 10 cm in Jarso poultry ecotypes in mid-altitude (Eskinder, 2013) and 8.2 for Farta, 8.4 for Mandura (Nigussie *et al.*, 2010b). The current study was in line with the report of Hailemichael (2015) the average comb height, comb length, and wattle length (2.05 and 0.76), (5.52 and 2.18), and (3.19 and 0.73) for males and females in Raya-Azebo. The average comb length and comb height found in this study were higher than the reported values of 1.56 and 1.25, average comb height and 2.95 and 2.45 average comb lengths of male and female chickens by Agide, (2015) in the north Showa zone of Amhara Region. Being able to dissipate heat more effectively in a tropical climate is made possible by morphological features like long legs, large combs, and wattles, which account for 40% of heat losses from body surfaces that occur at temperatures higher than 26.7 °C.

The presence of sexual dimorphism in chickens can be shown in differences in body weight and other linear body measurements between cocks and hens. Hormonal variations between males and females could be to blame for the chickens' superiority in this study. The findings of this study on both poultry sex variation were in line with those of Yakubu (2009) in Nigeria and Nigussie *et al.* (2010) in Ethiopia. Hens use more energy on maintenance and producing eggs than for growth, while cocks use most energy for growth, (Merga, 2016). This variation might be attributed to the stronger foraging behavior and over-computation nature of males than females and females gone through egg-laying and brooding behavior (Tadelle, 2003).

Means in a row with different superscript letters denote significant differences between populations or sampling districts ($P < 0.05$). Overall, the current study found that local poultry populations varied greatly in terms of their morphological measurements and performance. These variations could be ascribed to a number of factors, including variations in household management practices, the impact of ecotype, and the availability of feed supplements and scavenging feed resources.

Table 11. Morphometric variation (LSM $\pm$ SE) of local poultry in the study areas

Variables	Study Kebeles			Overall mean
	Dida Yabello	Dharota	Cholkasa	
Parameter	(LSM $\pm$ SE)	(LSM $\pm$ SE)	(LSM $\pm$ SE)	
Wingspan				
F	91.60 $\pm$ 1.60	89.30 $\pm$ 1.60	99.20 $\pm$ 1.50	93.30 $\pm$ 1.50
M	68.80 $\pm$ 2.40	95.30 $\pm$ 3.50	88.30 $\pm$ 5.30	84.10 $\pm$ 3.70
Body weight(kg)				
F	10.10 $\pm$ 1.30	13.40 $\pm$ 1.40	9.10 $\pm$ 0.90	10.90 $\pm$ 1.20
M	8.60 $\pm$ 0.60	8.00 $\pm$ 0.80	11.10 $\pm$ 1.50	9.2 $\pm$ 0.9
Body length				
F	91.30 $\pm$ 1.30	86.70 $\pm$ 1.20	96.40 $\pm$ 1.20	91.40 $\pm$ 1.20
M	89.20 $\pm$ 1.70	82.90 $\pm$ 4.70	93.17 $\pm$ 2.90	88.40 $\pm$ 3.10
chest circumference				
F	101.30 $\pm$ 2.10	92.40 $\pm$ 1.90	120.50 $\pm$ 1.90	104.60 $\pm$ 1.90
M	104.90 $\pm$ 3.30	87.40 $\pm$ 7.10	92.90 $\pm$ 5.90	95.10 $\pm$ 5.50
Shank length				

F	49.60±2.1	41.10±1.90	51.40±3.10	47.40±2.40
M	46.80±2.9	41.80±3.80	44.60±3.50	44.40±3.40
thigh circumference				
F	38.70±1.5	39.50±1.40	42.50±1.40	40.20±1.40
M	35.80±2.3	31.60±2.80	34.10±2.30	33.80±2.60
Neck length				
F	44.80±2.1	50.50±1.50	47.40±1.90	47.60±1.80
M	45.60±3.5	41.50±2.40	43.40±2.90	43.50±2.90
Back length				
F	78.00±2.12	71.10±2.30	91.90±1.90	80.40±2.10
M	82.05±3.11	67.40±5.50	74.20±4.90	74.50±4.50
Wattle length				
F	5.11±0.35	4.00±0.40	7.20±0.30	5.40±0.30
M	4.65±0.54	3.30±0.70	4.70±0.70	4.20±0.70
Comb length				
F	7.1±0.20	5.20±0.20	9.90±0.30	7.40±0.30
M	6.30±0.50	4.50±0.60	7.60±0.20	76.10±0.30
Comb height				
F	5.70±0.00	6.70±0.30	7.30±0.20	6.60±0.20
M	5.20±0.30	6.30±0.50	4.90±0.60	5.40±0.40

Table 13. On-farm body weight, Body length(cm), Chest circumference(cm) Shank length(cm) and Shank circumference(cm) (Least squares mean ±SE)

Parameter	Study Kebeles				
	Age/ weeks	Dida Yabello (N=20)	Dharito (N=20)	Cholkasa (N= 20)	Overall mean
Body weight(kg)	2 nd	0.30±0.017	0.37±0.027	0.41±0.025	1.36±0.023
Body length(cm)	2	7.37±0.237	8.63±0.239	7.52±0.241	7.84±0.239
Chest circumference(cm)	2	5.25±0.19	8.02±0.224	5.60±0.208	6.29±0.207
Shank length(cm)	2	5.69±0.130	5.89±0.213	5.83±0.151	8.80±0.164
Shank Circumference(cm)	2	7.91±0.225	5.94±0.156	7.94±0.227	7.26±0.202
Body weight(kg))	4 th	1.52±0.041	1.66±0.053	1.87±0.052	1.68±0.048
Body length(cm)	4	10.03±0.159	9.84±0.187	9.91±0.183	9.92±0.176
Chest circumference(cm)	4	9.42±0.160	11.24±0.216	11.45±0.211	10.70±0.195
Shank length(cm)	4	7.26±0.186	7.32±0.198	9.39±0.176	7.99±0.186
Shank Circumference (cm)	4	11.79±0.199	9.4 ±0.182	7.31±0.194	9.5±0.191
Body weight(kg))	8 th	1.60±0.035	1.59±0.047	1.45±0.057	1.54±0.046
Body length(cm)	8	14.67±0.187	15.11±0.225	14.37±0.241	14.17±0.217
Chest circumference(cm)	8	15.69±0.238	15.43±0.269	12.49±0.214	14.53±0.240
Shank length(cm)	8	11.34±0.113	10.39±0.147	15.29±0.315	12.34±0.191
Shank Circumference(cm)	8	12.65±0.195	12.61±0.198	10.20±0.157	11.82±0.183
Body weight(kg))	10 th	2.48±0.053	2.39±0.066	2.22±0.066	2.36±0.061
Body length(cm)	10	18.50±0.154	18.29±0.174	16.45±0.366	17.74±0.231

Chest circumference(cm)	10	20.63±0.149	14.77±0.190	17.90±0.230	17.76±0.189
Shank length(cm)	10	13.17±0.213	20.26±0.176	17.91±0.462	17.11±0.283
Shank Circumference	10	14.92±0.159	13.07±0.226	11.41±0.312	39.4±0.6978
Body weight(kg))	12 th	2.65±0.075	2.80±0.075	2.55±0.073	2.56±0.075
Body length(cm)	12	20.75±0.193	21.57±0.198	20.68±0.189	21±0.193
Chest circumference(cm)	12	22.33±0.236	21.99±0.245	20.95±2.479	21.75±0.98
Shank length(cm)	12	14.72±0.183	15.64±0.180	22.14±0.239	19.16±0.200
Shank Circumference(cm)	12	15.88±0.183	13.52±0.192	13.63±0.187	14.34±0.187

Source: Data collected for research in 2021

3.16. Constraints of Poultry Production

The biggest problems in chicken production in the research areas were disease outbreaks, a lack of investment capital, and predators. In addition, interviewed households cited feed shortages, theft, market price fluctuations, a lack of information on poultry rearing, and a lack of chicken homes. The biggest problems in chicken production in the research areas were disease outbreaks, a lack of investment capital, and predators. In addition, households interviewed cited feed shortages, theft, market price fluctuations, a lack of information on poultry rearing, and a lack of chicken homes. The result obtained in this study is in agreement with studies carried out by (Nigusse et al., 2010; Harrison and Alders, 2010; Mekonnen et al., 2010; Moges et al., 2010; Okeno et al., 2012; Magothe et al., 2012a), which reported that Newcastle disease and predators were serious constraints to poultry flocks, causing severe losses. The limited flock size per household and lack of cooperation among families to designate particular days of the year as immunization days and pool all chickens together, for this reason, are significant hurdles.

4. CONCLUSION

In Africa, many smallholder farmers rely on the sale of chickens for their livelihoods, but this industry is infamous for its low output and productivity. This might be attributed to a production system that lacks adequate technological advancement and technical efficiency. The study was conducted in the Yabello district of the Borana zone, to assess poultry husbandry practices and performance evaluation of indigenous chicken populations for Rural smallholder livelihood Change. This study revealed that Indigenous Chickens' production plays an essential role in household livelihood in terms of food provision and revenue generation. Due to the linked constraints of disease outbreaks, predators, a lack of investment capital, price instability, and a lack of breeding stock, Indigenous Chickens have a poor production potential. The findings revealed that management intervention measures to reduce losses caused by diseases and parasites, predators, and poor nutrition, as well as the development of informal and formal marketing channels for indigenous chicken products, are urgently needed. As a result, there is a need to improve poultry productivity through breeding and husbandry practices in the study area to sustain its role in rural livelihood change.

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