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Research Article

Identification of Farmers' Breeding Objective and Traits Preferences of Local Chicken in Doba and Mesala Districts, West Hararghe Zone, Ethiopia

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Abstract

The study was carried out to describe the husbandry and breeding practices, and identification of farmers' preferences for breeding objective traits of local chicken ecotypes, in the Doba and Mesala districts of the West Hararghe Zone, Oromia Regional State, Ethiopia. Samples were selected purposively based on the extent of chicken production potential and the agroecology of the districts. From each district, three kebeles were selected and 200 respondents (102 from the Doba and 98 from Mesala) were randomly selected from households included in the study for the questionnaire survey. With key informants, three focus group discussions per district were also conducted, and identified parameters were analyzed and summarized by the index method. The ranking index results revealed that in both districts, the primary objective of breeding hens was egg production, followed by income from the sale of adult chickens, while the main objective of keeping a cock was to generate cash income in the Doba districts and meat production in the Mesala districts. Regarding trait preferences, farmers in Doba districts prefer brown and white-coloured hens and cocks respectively, whereas red-plumed hens and cocks were most preferred in the Mesala district. The overall number of eggs laid per clutch per hen was 14.29 ± 0.12 and the number of clutches per hen per year was 3.43 ± 0.05. As a result, the local hen's performance in terms of yearly egg production was 49.04± 0.81 per year. More desirable traits and community-based genetic improvement programs should be developed and implemented with the inclusion of breeding objectives, trait preferences, and a production system that is focused on the market. These steps would complement the current study by conserving as well as using diverse indigenous chicken genetic resources sustainably.

Introduction

The estimated poultry population in Ethiopia is 57 million, of which 78.85% are local chicken, 12.02% cross-breed, and 9.11% exotic breed types. About 14.90 million local chickens come from the Oromia regional state, and 1.35 million of them are from the West Hararghe zone [1]. A large number of local chickens indicates the significance of the local chicken as the principal potential farm animal genetic resource of the country.

The production performance of local breeds is poor in egg production, late growth rate, and longer reproductive cycles due to selection. The traits to be improved, the cost of production, and the income from the product sales related to a genetic change in each trait are referred to as breeding objectives. It is critical to build a baseline of knowledge on husbandry practices, production performance, and farmers' breeding objective characteristics of local chickens in the Doba and Mesala districts of the West Hararghe zone. The districts were selected purposively based on the extent of chicken production potential and agroecology. So identification of farmers' preference for breeding objective traits of local chicken ecotypes is essential for sustainable utilization, planning, improvement, and conservation strategies of a breed at the local and national levels [2]. Describing the breeding and farmers' preference for breeding objective traits of local chickens is also essential to tackle the problems related to local chicken production, particularly in management aspects, productive performance, breeding objective traits, and breeds or populations that are at risk of extinction or which are highly desired by farmers are a major issue that needs critical attention and hence an important input into nation's chicken population development planning of local chickens [3].

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Chicken genetic resource characterization was launched to measure their performances and tried to improve the production system in different parts of the country, as expressed in many livestock-related sectors. However, the lack of information on farmers' breeding practices based on agroecologies and identification of trait preference for the breeding objective is creating difficulty in implementing and designing the chicken breeding program. Therefore, identifying adapted local chicken genotypes for market requirements, genetic improvement, and production circumstances through investigation should be inhaled; breeding practices and selection criteria by Fitsum [4], breeding objectives, and trait preferences by Birhan, et al. [5] were undertaken in different parts of the country. However, no previous studies have been carried out for the identification of farmers' breeding objectives traits in the Doba and Mesala districts. Thus, the present study sought first to characterize and identify farmers' breeding objective traits of local chicken ecotypes in the study area. Therefore, this research was developed to address the following objectives.

- To describe the breeding and husbandry practices of chicken in the study area;
- To identify farmers' preference for breeding objective traits

Materials and methods

Sample size and sampling techniques

Before the actual survey work, a rapid field survey was made to locate the distribution of local chickens and their production system. The distribution and numbers of local chickens were then obtained from the Office of Agriculture and Natural Resources (OANR) of each district before starting the actual fieldwork. A multi-stage sampling procedure (purposive and random) was applied for the study; then two districts were purposively selected because of chicken production potential and agroecology. A stratified sampling technique was employed to stratify Keeble's of the two districts and three rural Keeble's per district were selected based on agroecology and chicken production potential. A total of 200 respondents (102 from Doba and 98 from Mesala districts) were randomly selected from households based on chicken production potential. The total households included in the study were determined according to the formula given by Arsham [6]. N=0.25/SE2 Where, N= Sample size, SE= Standard error. Thus, using the standard error of 0.035 with a 95% confidence level, 200 households (102 from Doba and 98 from Mesala districts) were randomly selected from households. The numbers of respondents (farmers) per single agroecology or Keeble were determined by proportionate sampling technique based on their household population size as follows:

W= [A/B] x No

Where: W= Number of respondents required per single agroecology

A=Total number of households (farmers) living per a single selected Keeble

B= Total sum of households living in all selected samples Keeble's and

No = The total required calculated sample size (http://www.raosoft.com/samplesize.html

Data collection procedure

The study was carried out from December 2022 up to November 2023. The data input for this study was obtained from both primary and secondary sources. The primary data was generated through observation, structured questionnaires, employing linear body measurements, and organizing group discussions. Data on socioeconomic characteristics, flock structure, productive and reproductive traits, and breeding practices, were collected from selected households. The information collected included age at the first egg for hens and age at first mating for cocks, clutch length, eggs incubated per bird, eggs hatched per clutch, the survival rate of chicks, number of eggs laying per hen per clutch, the total number of eggs per hen per year, selection criteria and farmer trait preference. Focus group discussion and personnel observation were also carried out to strengthen the information collected from the questionnaire-based household survey. Data on production system descriptions like, chicken production constraints, feeding, housing, and marketing systems were also collected by using a questionnaire from focal group discussion and owner of chickens. Secondary data of both districts, total livestock population by species, main crop, topography, and climate data, and chicken population potential Keeble of each sample district were collected from the District Agricultural Officer [7].

Breeding objectives and selection criteria

Information on breeding objectives, trait preferences, and selection criteria for the production of local chicken ecotypes in each selected Kebele of the respective agroecology of the study area was collected using questionnaires. Farmers were interviewed to identify, rank, and list priorities of breeding objectives, trait preferences, selection criteria, chicken production constraints, and ways of breed improvement. Then identified parameters by farmers were analyzed and summarized by the index method.

$$\text{Index} = \frac{\Sigma\left(n * R_1 + n-1 * R_2 \ldots + 1 * R_n\right) \text{for particular trait}}{\Sigma\left(n * R_1 + n-1 * R_2 \ldots + 1 * R_n\right) \text{ for all traits}}$$

Where n = number of traits under consideration.

R_1 is the number of Respondents ranked 1st

R_2 is the number of Respondents ranked 2nd

R_n is the number of Respondents ranked last [8]

Data management and statistical analysis

After data was collected, it was coded and recorded in a Microsoft Excel sheet and made ready for analysis. Preliminary data analysis was

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employed before conducting the main data analysis for clearance and checked for any type of error that occurred during data collection which then was exported to SAS (version 9.4) and SPSS version 20. Statistical analyses were made separately for male and female chickens on variables that varied in sex; otherwise, the data were merged and analyzed together.

The qualitative and quantitative data were analyzed by using SAS (version 9.4). ANOVA was also used to locate means that are significantly different. Discrete measurements of the qualitative traits of the investigated chicken were analyzed using the frequency procedure of the Chi-square (⊠2) test. Mean comparisons were made using Tukey's student zed range test method at $p < 0.05$. The t - test was also used to see the mean difference in respondent age, family size, land size, productive performance, and marketing value of indigenous chicken.

Results and discussions

Socioeconomic characteristics of respondents

The relationship between socioeconomic characteristics and local chicken production in rural areas is multifaceted and has significant implications for rural livelihoods, food security, and economic development. However, this study suggested no significant difference ($p > 0.05$) between the two districts. The lack of significant differences may indicate the local chicken production practices are relatively uniform across different socio-economic groups. This could suggest that traditional methods are widely adopted regardless of income, education, or land ownership. The respondent's age, sex, family size, educational background, occupation, and cultivated land of households in the study area are presented in Table 1. Of the total of interviewed rural local chicken producers, 58.8% and 68.4% were female in the Doba and Mesala districts, respectively. This is due to the workload that females experience in homework and socio-cultural background while men are primarily responsible for the farm. Moreover, small animals are culturally left to women's responsibility. Corresponding results have been reported from the West Harerghe zone of Ethiopia [9] in which the proportions of males (33.3%) were lower than females (66.7%). Mekete (2019) also reported that two-thirds of the respondents were female in the total respondents in Gamo Gofa zone. Differently, the study by Yonatan [10] in the Haramaya and Darolabu districts revealed that the majority of the respondents (86.4%) who participated in the study were male. This may indicate that chickens were managed by males and it could be important to participate in the study group when any intervention on poultry improvement was planned.

The mean age of respondents was 35.39 years in Doba and 38.97 years in Mesala districts. Regarding the farmers' educational background, about 52.94% and 37.75% of the respondents were found to be illiterate in Doba and Mesala, respectively. However, among the literates, 8.82% and 6.12% have basic education (reading and writing) in Doba and Masala districts, respectively. In Doba districts, the proportions of illiterate respondents were high because they got married at a young age before getting to education. The number of illiterates observed in this result corresponded to the finding of Yonatan [10] who reported that 53.3% of respondents were illiterate in the Darolabu and Haramaya districts. However, this result is much higher than the result of Tsegaye [11] who reported the proportion of illiterate respondents was 23.7% in the Wolaita zone. These differences might be due to the socio-economic status of respondents as well as the agroecological variation of the study.

Table 1: Socioeconomic status of village chicken owners in the study areas.

Parameters	District		
	Doba (102)	Mesala (98)	Overall (200)
Age of respondents (Mean ± SE)	35.39^{b} ± 0.82	38.97^{a} ± 0.69	37.18 ± 0.75
Average family size/HH (Mean ± SE)	7.02^{a} ± 0.21	6.87^{a} ± 0.20	6.94 ± 0.20
Cultivated land (hectare) (Mean ± SE)	1.03^{a} ± 0.06	0.53^{b} ± 0.03	0.78 ± 0.04
Sex of the respondents (frequency, (%))			χ2=1.96 (0.161^{ns})
Male	42 (41.2)	31 (31.6)	73 (36.5)
Female	60 (58.8)	67 (68.4)	127 (63.5)
Educational level (frequency, (%))			χ2=8.69 ($.069^{ns}$)
Illiterate	54 (52.94)	37 (37.75)	91 (45.5)
1-4	18 (17.65)	33 (33.67)	51 (25.5)
5-8	10 (9.80)	8 (8.16)	18 (9%)
9-12	11 (10.78)	14 (14.28)	25 (12.5)
Read and write	9 (8.82)	6 (6.12)	15 (7.5)
Household occupation (frequency, (%))			χ2=2.63($.268^{ns}$)
Agriculture	74 (72.55)	75 (76.53)	149 (74.5)
Government employer	13 (12.75)	6 (6.12)	19 (9.5)
Merchant	15 (14.71)	17 (17.35)	32 (16)

χ2 = Pearson chi-square (value in parenthesis are p - value); ns none significant difference ($p > 0.05$) between the two districts.

The mean family size per household is 7.02 in Doba and 6.87 in Mesala district. This is due to socio-economic status and awareness of respondent's use of the family plan with their educational status they have. This result is higher than the average family size of 4.43 in the highland and 4.26 in the lowland, as reported by Derbie [12] in Ankober Woreda of the North Shewa zone and 3.98 in the North Gondar zone of Amhara region [13]. However, this is in line with the findings of Mearg [14] who reported 6.29 persons per household in the central zone of Tigray and 6.04 persons per household in the lowland district of Southern Ethiopia [15]. The overall mean cultivated land size per household in the study area was 0.78 hectares. The majority of the respondents in the study area have very small and fragmented farmland occupied by chat, coffee, and crops.

The present study revealed that 74.5% of the total interviewed households were farmers whereas the remaining 16% and 9.5% of the respondents were merchants and government workers,

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respectively. In both agroecologies, the highest proportions of the respondents were engaged in farming activities as a means of their livelihood. In line with this results have been reported from the Western zone of Tigray by Shishay [16] and Worku[17] who have observed that about 90% of the respondent farmers in the Tegede district. Shuma and Gurmessa [18] reported that labor employment was the dominant structure for agricultural production in the Kellem Wollega zone. These differences might be due to limiting farming land in rural areas and work opportunities that exist in different agroecological studies.

Chicken husbandry practices

Feeding and watering: The majority of respondents in the study area provided supplementary feeding on top of free scavenging and water for their chicken (Tables 2). The most widely used ingredient as a supplementary feed was maize with an index value (of 0.39) followed by sorghum (0.27) in Doba districts whereas, the most supplementary feed in Mesala districts was wheat (0.40) followed by barely (0.38). This variation is due to feed resource availability cultivated in agroecology. There was significant variation ($p < 0.05$) among the districts in providing supplementation of feed for chickens by respondents. Comparable results have also been reported by Tarekegn [19] who suggested that the majority of the respondents were using maize (70%) as a supplementary feed followed by sorghum (13.3%) in the Chiro district of the West Hararghe zone. In the same way, Abiyu, et al. [20] reported that major supplementary feed in the Kafa zone was maize, wheat, and sorghum. However, contradicted results have been reported by Hana [13] in Northern Gondar of the Amhara region which almost all of the respondents (88.8%) practice scavenging systems while the remaining (11.2%) use a supplementary feed. The results for feeding practices [21] revealed that overall 70% of the respondents practice a scavenging system with supplementary in selected rural areas of Bishoftu. The observed variation could be due to diversifying feed resource availability and major cereal crops cultivated in the study area.

Regarding the provision of water for chickens, all respondents provided water for chickens in the Doba district while 90.82% of producers in Mesala gave water to their chickens. This implies that variations in the perception of farmers towards proper watering of chickens improve chicken productivity and accessibility of water resources found in the study area. This result corresponds to the findings of Chala [22], Fitsum (2016), and Hunde [21] that all of the respondents offered water to their chickens. Meskerem, et al. [23] revealed that about 56% of the respondents reported offering water to their chickens throughout the year in the Dedo district, Jimma zone.

Generally, the feeding and watering practices of chickens in both districts were almost all traditional production with extensive management activities. However, as respondents stated, during the rainy season or at the beginning of cultivating crops, major farmers especially those whose houses are on farmland confined or restricted to certain areas of their chicken to prevent scavenging of newly planted seeds. Therefore, during this time all farmers practiced supplementary feeding with locally produced feeds Table 3.

Housing system: About 86.5% of the respondents reported having no separate poultry house (Table 4). About 65% of the respondents in the study area confined their chickens within the family house (perches in the house) during nighttime and released them for scavenging early in the morning whereas only 18% and 3.5% of chickens were perches in the kitchen and perches on the veranda respectively, during the night while the rest 13.45% of respondents housing their birds in the separate poultry houses. These are due to lack of awareness, fear of predators, and lack of construction materials. Differences significant ($p < 0.05$) among alternative houses for chickens in the study area because of poor attention to village chicken production may be some of the reasons for not constructing a separate chicken house. A similar finding was reported by Asmelash, et al. [24] in the East Hararghe zone, about 93.3% of the respondents have no separate poultry house, and Amanuel,

Table 2: Housing condition of village chickens in the study districts.

Housing conditions (frequency (%))	District		
	Doba(102)	Mesala (98)	Overall (200)
Alternative house for chicken	$\chi2 = 14.32(.0025*)$		
Separate house	19(18.63)	8 (8.16)	27 (13.45)
Perches in the house	70(68.63)	60 (61.22)	130(65)
Perches in the kitchen	9(8.82)	27(27.55)	36(18)
Perches on the veranda	4(3.92)	3 (3.06)	7(3.5)
Reason for a not separate house (frequency (%))	$\chi2 = 5.39(.1455^{ns})$		
Lack of awareness	42(50.60)	50(55.56)	92(53.18)
Risk of predators	18(21.69)	19(21.11)	37(21.39)
Lack of construction materials	13(15.66)	5(5.56)	18(10.4)
Small flock size	10(12.05)	6(17.78)	26(15)

$\chi2$ = Pearson chi-square (value in parenthesis are p - value); * significant difference at ($p < 0.05$) between the two districts; ^{ns} none significant ($p > 0.05$)

Table 3: Feeding and watering of chickens.

Variables	District							
	Doba (102)				Mesala (98)			
Supplementation feed (frequency (%))	$\chi2 = 9.05(.0026*)$							
Yes	93 (91.18)				98 (100%)			
No	9 (8.82)				-			
Feed type or supplementary feeds	Rank 1	Rank 2	Rank 3	Index	Rank 1	Rank 2	Rank 3	Index
Wheat	5	26	43	0.19	49	37	4	0.40
Barley	-	-	-	-	40	44	6	0.36
Maize	56	20	14	0.39	-	2	11	0.03
Household scraps	8	13	26	0.14	3	6	53	0.13
Sorghum	25	34	11	0.27	1	4	18	0.05
Provide water for chickens (frequency (%))	$\chi2 = 9.81$ (.0017*)							
Yes	102 (100)				89 (90.82)			
No	-				9 (9.18%)			

$\chi2$ = Pearson chi-square (value in parenthesis are p value) * significant difference at ($p < 0.05$)

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et al. [25] showed that about 55.56% of the respondents have no separate poultry house and only 42.8% of respondents purposefully construct a separate house for their chickens in Buno Bedele zone. However, this result contradicted with finding reported by Alemayehu and Negasi [26] which suggested that 61.1% of respondents have separate poultry houses in the Lume district, East Showa zone. This variation is due to a lack of awareness, the prevalence of predators, and the small flock size in the study area.

The majority of the respondents in the study area kept their chickens at various night sheltering places in the main house and farmers described different reasons for not constructing separate chicken houses; in which lack of awareness and risk of predators were the major reasons not to have a separate poultry house.

Constraints of the chicken production system: The impact of predators and disease was the major constraint on chicken production in the study area (Table 5). The results from both respondents' interviews and focus group discussions revealed that disease and predators were the first main constraints that devastated chicken productivity in Doba and Mesala districts respectively. The disease and predators affect chickens in the area due to the absence of extension support and creating awareness of farmers in the study are for prevention of disease and poor housing conditions which need to intervene improvements in housing conditions and vaccination of chickens.

Eagle (locally called "*Risa*") and black kite (locally called "*culule*") were the most dangerous type of predators affecting young chicks while the prevalence of foxes (locally called "*Jeedalo*") was severe in all classes of chickens in Mesala district while predators like mongoose (locally called "*Amaa*") and wild cats were the most important predator affecting poultry production in the Doba mainly during the rainy season when vegetation was higher around the homestead. Keeping the chickens inside a house, especially when no family member looks after them could reduce mortality due to predators.

Table 4: Major constraints of chicken production in the study districts.

Constraints	District							
	Doba				Mesala			
	Rank 1	Rank 2	Rank 3	Index	Rank 1	Rank 2	Rank 3	Index
Predators	32	50	12	0.35	65	22	10	0.36
Disease	55	30	11	0.40	31	57	5	0.31
Marketing	6	6	21	0.08	-	51	21	0.18
Feed shortage	4	13	45	0.14	-	8	20	0.05
Lack of housing	-	1	7	0.01	1	9	19	0.06
Weak extension	1	1	3	0.01	1	6	16	0.04

Index = sum of (3 *rank 1 + 2*rank 2 + 1 *rank 3) for particular constraints divided by the sum of (3*rank 1 + 2*rank 2 + 1*rank 3) for all.

Table 5: Chicken flock size per household in the study area.

Parameters	District		
	Doba (Mean ±SE)	Mesala (Mean ±SE)	Overall (Mean ±SE)
Cocks	0.99^{a} ±0.11	0.96^{a} ±0.08	0.98±0.09
Chicks	2.36^{a} ±0.18	2.45^{a} ±0.19	2.41±0.18
Pullet	1.13^{a} ±0.11	0.90^{a} ±0.10	1.02±0.10
Hens	3.94^{a} ±0.16	2.31^{b} ±0.12	3.12 ±0.14
Cockerels	0.50^{a} ±0.07	0.32^{a} ±0.05	0.41 ±0.06
Total chickens/ HH	8.93^{a} ±0.29	6.94^{b} ±0.16	7.94 ±0.57

^{a,b} Values with different letters are indicated in the same row which means that the difference is significant pP < 0.05) between Doba and Mesala.

The most important diseases that occurred in the study area were New Castle Disease (NCD) and external parasites (locally called "*Kinkin*" which affects mostly chicks). The mortality of village birds due to disease outbreaks (NCD) was usually higher during the start of the rainy season, especially in April and May in the Doba district as respondents mentioned. However, the respondents in the study areas did not identify the specific name of the disease but they reported clinical signs of the disease such as raffled feathers, twisting of the head and neck, sneezing, and diarrhea. In the same manner, respondents mentioned similar clinical signs of NCD in the Mesala district. This result is in agreement with the report of Habtie [27] that the major constraints of poultry production in the Gondar Zuria and Kalu districts of the Amhara region were the presence of disease (NCD), lack of breed or low egg production, the presence of predators and lack of feed are the major challenges in the study districts. Hunde, et al. [21] also reported that disease and predators were the most important problems affecting poultry productivity with an overall average of 38.1% and 23.1% respectively. The same study conducted by Chala [22] reported that disease (NCD), predators, feed shortage, and external parasites (*kinkin*) were the most prevalent and economically important diseases that destroyed the poultry population around the Gudar area Oromia region. Getiso, et al. [28] reported that the major common diseases observed in the Kambata Tambaro and Wolaita zones were respiratory disease (55.7%) followed by Newcastle disease (86.7%), Coccidiosis (39.2%), and Fowl cholera (20.2%).

Overall, the challenge of chicken production and reproduction constraints observed in the study area including marketing, feed shortage, lack of housing, predators, disease, and weak extension support were mentioned by the respondents as important constraints of the village chicken production system. This shows there is a need to intervene to reduce chicken mortality and improve productivity. So, this problem can be overcome by slight advances in poultry houses, crossbreeding, improved feed, and vaccination of chickens. Therefore, information should be disseminated to farmers about chicken husbandry and the government provide vaccines and improved breeds of chicken for farmers.

Flock composition and size: The mean value of local hens, cocks, cockerel, pullets, and total flock size per household are summarized in Table 6. The overall mean value of indigenous cock, chicks, pullet, hens, cockerel, and total indigenous flock size per household were 0.98, 2.41, 1.02, 3.12, 0.41, and 7.94, respectively in the study area. There were significant differences ($p < 0.05$) in the total flock size per household being 8.93 and 6.94 in Dobba and Mesala districts, respectively. The

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Table 6: Ranking qualitative traits of hen for trait preferences in the study area.

Trait	Districts							
	Doba				Mesala			
	Rank 1	Rank 2	Rank 3	Index	Rank 1	Rank 2	Rank 3	Index
Plumage colour								
Brown	29	17	5	0.36	8	10	5	0.16
White	14	27	8	0.30	8	20	13	0.25
Black	-	-	12	0.03	- 1		-	0.01
Greyish	6	3	10	0.10	13	5	18	0.22
Red	7	9	17	0.16	21	14	14	0.34
Multi- colour	-	-	4	0.01	-	-	-	-
Any color	5	-	-	0.04	2	-	-	0.02
Comb type								
Single	32	16	6	0.39	33	17	-	0.43
Double	7	17	28	0.24	1	5	42	0.18
Pea	15	21	14	0.30	17	26	6	0.35
Rose	-	-	5	0.01	-	1	3	0.02
Any comb	6	-	-	0.05	2	-	-	0.02
Shank colour								
Yellow	26	22	8	0.44	31	18	3	0.47
White	20	24	3	0.38	20	28	4	0.42
Black	3	2	22	0.12	1	4	20	0.11
Any color	6	-	-	0.06	-	-	-	

Index = sum of (3 *rank 1 + 2*rank 2 + 1 *rank 3) for particular traits divided by the sum of (3*rank 1 + 2*rank 2 + 1*rank 3) for all.

result of the study suggested that the average flock size per household varied mainly due to the occurrence of disease and predators, availability of feed resources, economic status of chicken owners, and awareness of what producers have of chicken production. This result was higher than the mean chicken flock size/household of 3.01 reported by Mengistu [29] in the Alefa district, the central zone of Gondar, and lower than 11.14 revealed by Derbie [12] in Ankober Woreda of North Shewa zone, respectively. However, Demissu [30] has reported similar results in the highland agroecology of Horro district, Wollega zone Western Ethiopia.

Generally, in this current study, the respondents stated that the flock size varies between seasons mainly due to the prevalence of diseases, availability of feed, and the presence of predators as well as the economic status of the farmers.

Because the farmer primarily kept layers of hens for egg production and use of eggs for income generation in the study area, the highest proportion was hens (3.12±0.14) among the flock composition. Similarly, Alemayehu and Misba [31] reported that the mean value of local hen was higher among flock composition in the Lume district of the East Showa zone. Haile and Biratu [32] also revealed that out of the total flock size hens accounts for (3.32%) in the Jimma and Ilu Aba Bora zone. In contrast, the dominant flock composition of chickens observed in Southwestern Ethiopia were chicks (36.23%) which were followed by hens (28.01%) [33]. This variation is mainly due to the major constraint of indigenous chicken production and feed accessibility in the different agroecologies.

Breeding objective of chicken and purpose of egg production

The purpose of keeping chicken and egg production in the study area is presented in Table 7. A female chicken is primarily reared for egg production followed by cash from the sale of adult chickens in both districts. Cocks primarily keep for meat production ranked first followed by income generation in Mesala districts while the main breeding objectives of cocks chicken in the Doba districts were for cash income with an index value of 0.47 followed by meat production (0.24) which is comparable with the result of Petros [34] who revealed that cash income for the households is the primary purpose of keeping chicken followed by meat production for male chicken and egg production for the household is the primary purpose of keeping female chicken followed by breeding in East Hararghe zone. Bogale [35] also reported that the main function of keeping chickens is a source of cash income in the West Hararghe zone. Hailemichael [36], Shishay, et al. (2016) [37], and Addisu, et al. [38] reported that the first most important function of rearing chicken was the sale for cash income, for the ceremony, and home consumption respectively in the different study areas. The variation of breeding objectives reported by different authors indicated that farmers keeping chickens for different purposes and objectives are based on socio-economic status, trait preference and selection criteria, and the culture of communities raising birds in various environments.

Regarding the purpose of egg production, egg sales for income ranked first followed by hatching and home consumption in the Doba district. This implies that as respondents mentioned income generation by selling eggs mainly to improve family food security and purchase home materials such as salt, educational equipment, and clothes for their children. This result was comparable with the reports of Mengistu [29] in which egg production had the highest utilization for generating additional income sources (57.6%)

Table 7: The ranking breeding objective of chickens in the study area.

Objectives	District							
	Doba				Mesala			
	Rank 1	Rank 2	Rank 3	Index	Rank 1	Rank 2	Rank 3	Index
Hen								
Egg	50	37	17	0.39	72	26	1	0.40
Income	35	42	9	0.32	28	70	4	0.34
Breeding	17	4	41	0.16	1	2	59	0.09
Meat	2	11	38	0.11	-	23	35	0.12
Cultural	-	1	2	0.01	-	-	-	-
Ceremonies	-	3	7	0.02	-	-	14	0.02
Religious	-	-	1	0.00	-	2	5	0.01
Egg								
Income	85	9	8	0.48	67	18	13	0.41
Hatching	28	11	63	0.29	24	37	35	0.27
Consumption	7	16	79	0.23	36	13	61	0.32
Male								
Income	71	15	13	0.47	57	37	3	0.42
Meat production	16	12	58	0.24	39	67	8	0.44
Breeding	17	19	32	0.22	5	2	42	0.10
Ceremonies	-	10	14	0.06	-	5	-	0.02
Cultural	-	-	4	0.01	-	-	3	0.01
Religious	-	1	2	0.00	-	1	-	0.00

Index = sum of (3 *rank 1 + 2*rank 2 + 1 *rank 3) for particular objectives divided by the sum of (3*rank 1 + 2*rank 2 + 1*rank 3) for all.

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in the Alefa district. However, this result is different from the report of Ayana (2020) [39] who reported that the main purpose of egg production was for hatching in the Awi zone in the Amhara Region. Differences between the previous and current findings illustrated that the breeding objectives of local chickens are diverse in different agroecologies and based on farmers' preferences as well as market demand.

As information obtained during data collection from focus group discussions and individual interviews, they stated that egg and chicken cover expenses at the home such as chill, and student exercise book. Therefore, the priority they keeping chickens was for egg production or income from egg sales flowed by cash income selling adult live chickens.

Generally, to improve the livelihood of rural farmers in terms of egg and chicken production selected breed, management practice, and breed improvement were necessary for the study area, dual-purpose chickens would be suitable to maximize both egg production and meat.

Identification of breeding objectives and trait preference of farmers

Trait preference for hen: Qualitative trait preferences by chicken producers for breeding hens are indicated in Table 8. Red plumage colours in Mesala and brown and white in Doba were the most preferred traits while black and mixture-colored chickens are the least favored for the breeding hens. As respondents stated red and brown plumage colors chickens have high market demand while black and mixed chickens are undesired on the market across both agroecologies. This result was comparable with the findings of Sena [40] who revealed that red, white, and brown body colour hen more desired by farmers in the North Showa zone. However, contrary to the reports of Sisay [41] who reported that wheaten-colored hens are most preferred while white-colored hens are less preferred by farmers in the Bale zone. This implies that the trait preference by the farmers reflects that chicken was taken into consideration the factors or traits that affected the market value and cultural values of communities.

Regarding comb type, the single comb type with an index of 0.39 in Doba and 0.43 in Mesala districts were the most preferred traits by chicken owners. Yellow shank color followed by white colour with an index of 0.44 and 0.38 in Doba districts and 0.47 and 0.42 in Mesala districts were the most preferred trait respectively. This result is in line with the report by Nigussie [42] in which farmers in different parts of Ethiopia prefer different morphological traits. Getachew, et al. [43], Zelalem, et al. [44], and [45] reported that producers gave the greatest attention to the economic trait (egg production) rather than morphological traits because of the obvious benefits of selling eggs, at home consumption and hatching. Diversity in trait preferences indicated that genetic improvement of indigenous chickens should incorporate trait preferences of chicken owners in future market circumstances.

Trait preference for cock: Red, white, and red brownish plumage-colored cock was more liked traits in the Mesala district while white followed by red and greyish was more desired by farmers in the Doba district (Table 9). During the group discussion with chicken producers in the study area, they also perceive that the plumage color of chicks is inherited from the plumage colour of the breeding cock and hence farmers gave more attention to the plumage colour of cocks during selection for breeding purposes. The current result corresponds to the finding of Feyera [46] who reported that breeding cock's importance for market and cultural values like plumage colour was more desirable traits in the Western Oromia region. Concerning comb-type cock with single comb types are highly preferred in both districts for breeding and

Table 8: Selection for breeding hen and cock based on trait preference in the study area.

	District							
	Doba				Mesala			
Selection criteria	Rank 1	Rank 2	Rank 3	Index	Rank 1	Rank 2	Rank 3	Index
Hen								
Egg number	68	25	5	0.45	85	15	-	0.50
Hatchability	18	15	49	0.23	11	71	10	0.32
Mothering ability	-	-	3	0.01	-	1	10	0.02
Plumage color	-	-	3	0.01	-	-	-	0
Body size	14	59	20	0.31	4	13	54	0.16
Cock								
Comb type	7	2	55	0.13	-	-	3	0.00
Body size/large	55	28	15	0.39	72	27	1	0.47
Growth rate	9	9	25	0.12	12	51	31	0.29
Plumage color	35	51	3	0.35	16	18	54	0.24
Breed improvement								
Crossbreeding	13	28	61	0.25	47	42	16	0.41
Line breeding	19	57	26	0.32	33	37	26	0.34
Pure breeding	73	17	12	0.43	16	20	62	0.25

Index = sum of (3 *rank 1 + 2*rank 2 + 1 *rank 3) for particular selection criteria divided by the sum of (3*rank 1 + 2*rank 2 + 1*rank 3) for all.

Table 9: Culling practice, mating system, and way of breed improvement method of chicken in the study area.

Parameter	Districts	
	Doba	Mesala
Culling practice (frequency (%))		χ2 =21.449(.0001*)
Yes	43(42.16)	73 (74.5)
No	59(57.84)	25 (25.5)
Reason for culling		χ2 = 29.333(.0001*)
Sickness	14(32.56)	23(31.51)
Un reproductive	7(16.28)	31(42.47)
Getting old	19(44.19)	4(5.48)
Unwanted plumage	3(6.98)	15(20.55)
Mating system (frequency (%))		χ2=1.858(0.1729^{ns})
Control mating	3(2.94)	7(7.14)
Uncontrolled mating	99(97.06)	91(92.86)

χ2 = Pearson chi-square (value in parenthesis are *p* value); * significant difference at ($p < 0.0001$) between the two districts; ^{ns} none significant

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have higher market demand. This result was not in line with the findings of Fitsum [4] in which that double comb type was the most preferred trait by farmers in Northern Ethiopia and also contrasts with the finding of Sisay [41] who reported that almost all respondents in the Bale zone not preferred single comb type. Differences in the desired traits might be due to the cultural value of the community and market demand in the different study areas Table 10.

Yellow and white shank colours were the most preferred trait ranked first and second in both districts respectively. In general, the trait preference by the farmers is used for breeding purposes following the factors that affect the market value. For this reason, selection criteria by farmers are mainly based on consumer and market preference.

Selection of breeding hen and cock based on trait preference: Farmers' decisions on the choice of breeding stock are shown in Table 11. The most preferred traits by farmers were more egg-produced breeding hens with an index value of 0.45 in Doba and 0.50 in Mesala districts for selection purposes while mothering ability and plumage color were desired less in both districts. Egg production appeared to be the most important selection criterion because of the obvious benefits of selling eggs, consumption, and hatching for replacement stock. This result is consistent with Petros [34] and Yonatan [10] reports indicating farmers favored more egg-producing hens in the Eastern Hararghe zone and Haramaya districts, respectively. Gutu and Yosef [47] and Hailemichael, et al. [48] also reported that the majority of farmers selected breeding hens based on egg production in the different study areas. However, this finding does not correspond to the report of Asmelash, et al. [24] and Nigussie, et al. [42] in which the majority of farmers selected breeding hens based on egg size, growth rate, and disease tolerance. This difference could be attributed to the trait preference of farmers for breeding objectives and market reasons.

Table 10: Ranking qualitative traits of cock for trait preferences in the study area.

Trait	Districts							
	Doba				Mesala			
	Rank 1	Rank 2	Rank 3	Index	Rank 1	Rank 2	Rank 3	Index
Plumage color								
Red	6	18	9	0.26	32	10	2	0.42
White	19	5	5	0.30	8	24	11	0.29
Black	-	-	3	0.01	1	-	-	0.01
Red brownish	5	11	5	0.17	2	9	20	0.16
Greyish/*gebsima*	7	4	15	0.18	4	4	12	0.11
Multi-colour	2	1	3	0.05	-	-	-	-
Any color	1	-	-	0.01	-	-	-	-
Comb type								
Single	25	15	-	0.42	42	2	1	0.50
Double	17	17	3	0.36	-	28	13	0.26
Pea	1	4	19	0.12	3	10	17	0.17
Rose	-	2	17	0.10	-	4	12	0.08
Any comb	1	-	-	0.01	-	-	-	
Shank color								
Yellow	20	12	4	0.43	30	13	-	0.50
White	12	19	6	0.39	12	26	3	0.39
Black	3	2	13	0.13	-	1	12	0.06
Any shank	3	-	-	0.04	5	-	-	0.06

Index = sum of (3 *rank 1 + 2*rank 2 + 1 *rank 3) for particular traits divided by the sum of (3*rank 1 + 2*rank 2 + 1*rank 3) for all.

Table 11: Reproductive and Productive performance of local chicken ecotypes in the study area.

	Districts		
Traits (Mean ± SE)	Doba	Mesala	Overall mean
Age at 1s[t] egg-laying pullets (months)	5.54 [b]± 0.07	6.15[a] ± 0.06	5.85 ± 0.06
The average age of cockerels at 1[st] mating (month)	6.22 [b] ± 0.06	6.47[a] ± 0.04	6.35 ± 0.05
The average number of eggs per clutch	13.54 [b] ± 0.14	15.04 [a] ± 0.11	14.29 ± 0.12
Total egg production per hen/year	47.25[b] ± 0.85	50.83 [a] ± 0.77	49.04 ± 0.81
Number of clutches /hen per year	3.48 [a] ± 0.06	3.38 [a] ± 0.05	3.43 ± 0.05
Number of eggs set to a broody hen	8.60 [b] ± 0.22	9.58 [a] ± 0.23	9.09± 0.22
Hatched number of chicks	7.41 [b] ± 0.21	8.05[a] ± 0.22	7.73± 0.21
The survival rate of chicks to 8 weeks	4.26 [b] ± 0.17	5.00 [a] ± 0.16	4.63± 0.33
Hatchability (%)	85.5 [a] ± 1.24	83.94 [a] ± 1.03	84.72± 1.13

[a,b] Values of different letters are indicated in the same row which means that the difference is significant at $P < 0.05$.

The highest selection criteria used for the selection of breeding cock were body size with an index value of 0.39 in Doba and 0.47 in Mesala districts. This implies that as respondents mentioned large body size cock is highly desired by consumers on the market and fetch a good price. Since egg and body size were ranked first and second in the preference of the farmers, dual purpose with good fertility chicken will be considered an improvement strategy in the study area. This finding is lined with the report of Berhanu, et al. (2020) who revealed male chickens that have convincing body weight were the most preferred traits in different agroecologies of Ethiopia. However, contradicting results have been reported by Petros [34] in which most farmers' selection criteria were mainly based on body plumage color in the Fedis, Kersa, and Gorogutu districts of the Eastern Hararghe zone. This is due to the selection criteria of farmers in different agroecology for specific traits considering factors that influence the production system (i.e. market demand, visibility for predators, and culture of the community). In general, for the selection of breeding hens and breeding cocks, chicken producers prefer similar trait categories with different emphases such as body size, growth rate, plumage color, hatchability, and egg production number for the hen. Because controlling mating is difficult in the extensive production system, farmers practice selection for their breeding females and breeding males for the traits they prefer and want to improve for their breeding objective.

Breeding and culling practices: As shown in Table 9 below, about 74.5% of the farmers were practicing culling in Mesala and 42.16% in Doba districts. Based on their indigenous knowledge farmers cull their chickens for getting old, sick, unwanted plumage colour, and unproductive or low production of eggs. Selling and home consumption were the main culling means of chicken from the flock in both districts. There were significant differences ($p < 0.001$) among the districts in culling and the reason for culling chickens. The variation that appeared in the culling practice of chickens in study areas was based on the awareness of farmers had to improve their flock

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and factors that led farmers to cull their chickens, which is the main identified type of culling chicken from the flock. This result agreed with the finding of Bogale [35] who reported that 97.22% of respondents culled their chickens in the Odabultum, Habro, and Darolabu districts. Awoke, et al. [15] also reported that most farmers cull underproductive chickens in the Tarcha, Loma, and Konta special districts. The village chicken owners who culled their chickens through different means of culling were different from the agroecological study because of various factors that led farmers to cull their chickens.

The greatest proportion of respondents had practiced an uncontrolled mating system 97.06% in Doba and 92.86% in Mesala districts while low proportions of chicken owners had practiced a control mating system in both districts. This implies that the scavenging habit of village chickens does not allow farmers to directly influence the exact mates of the breeding stock. Whereas, farmers confining the best local cock with hens during the conception period was the major way of mate controlling. Similarly, this result was comparable with the findings of Fitsum [4] in the central zone of Tigray which revealed that 78.90% of chicken producers had an uncontrolled mating system, and Addisu, et al. [3] in the North Wollo zone of Amhara regional state which revealed that 88.9% of village chicken owners had an uncontrolled natural mating system.

Regarding the breed improvement methods, the majority of respondents improved the productivity of their chickens using pure breeding (0.43) in Doba, whereas crossbreeding and line-breeding (0.41) and 0.34, respectively, ranked first and second in the Mesala districts. This result was in agreement with that of Berhan, et al. [12], who noted that in Western Amhara, the majority of respondents practiced breeding to improve their native chicken by cross-breeding (20.75%), line breeding (25.78%), or cross-and line-breeding (53.45%). However, Nigussie [42] reported that the village chicken breeding system was completely uncontrolled breeding practices in different parts of Ethiopia. The results of studies conducted by Alemayehu [26] revealed that respondents use ways of improving indigenous chickens through crossbreeding (8.9%) line breeding (40%) and non-trying to improve their indigenous chickens (51.1%) in the Lume district.

Productive and reproductive performance of local chickens

The average age at first lay, the average age of cockerels at first mating (month), the number of eggs per clutch per hen, the number of clutches per hen per year, and the total egg output per hen/year are presented in Table 11. The current study's findings indicate that the average number of clutches per hen per year and the age at first mating of cockerel chickens were 3.43 and 6.35 months, respectively. Regarding the average number of clutches per hen per year and hatchability, there was no significant difference ($p > 0.05$) between the two agroecologies.

The overall mean of annual egg production per hen per year in the study area was 49.04 eggs. This result was slightly agreed with those reported 44.71 eggs per year from Southern Ethiopia [49] and higher than the total egg production (39.8) per hen per year of local hens from Horro district of Kelem Wollega zone [50] and significantly lower than the average number of eggs laid per hen per year of 63.2 eggs for local chickens in Southern zone of Tigray [51]. This variation is attributed to highly pronouncing the mothering ability of chickens and the management practice of farmers for their birds.

The overall mean of the hatchability (%), number of clutches per hen per year, number of eggs set to a broody hen, hatched several chicks, and survival rate of chicks to 8 weeks of the local chicken in the study area were 84.72, 3.43, 9.09, 7.73 and 4.63 respectively. Significant differences between agroecologies were observed for an average number of eggs per clutch. Doba had the lower egg number per clutch (13.54), while Masala district had the higher egg number per clutch (15.04). This result was comparable with the findings of Chala [22] who revealed that the average eggs per hen per clutch was 15.9 in the Guder, Oromia region. However, this finding is not in line with the report of Mekete (2019) who found that average egg production per clutch/hen was 11.87 in the Gamo Gofaa zone. This variation is associated with the availability of feeding, management, feed resources, and agroecology diversity.

Generally, the differences in production and reproduction performance of local chickens can be influenced by a variety of factors, including management practices (housing conditions, feeding practices, and health management), environmental practices (climate and geography), socioeconomic factors(income level, education, and knowledge), cultural practices (traditional and beliefs and gender role), market access(proximity to market and market demand), health and disease(disease prevalence and veterinary services), breeding practices (selection criteria and cross-breeding. Understanding these factors is essential for improving local chicken production and reproduction. Targeted interventions that address these influences can help enhance productivity, ensuring better livelihoods for farmers and contributing to food security.

Summary and conclusion

The study aimed to describe the husbandry and breeding practices of local chickens in the Doba and Mesala districts of the West Hararghe Zone, Oromia Regional State, Ethiopia. A total of 200 respondents were surveyed, with findings indicating that the primary breeding objective for hens was egg production, while for cocks, it varied between generating cash income in Doba and meat production in Mesala. Farmers showed distinct preferences for chicken traits based on color, with brown and white hens favored in Doba and red-plumed chickens preferred in Mesala. The average annual egg production per hen was found to be 49.04 eggs. The study emphasizes the need for community-based genetic improvement programs that incorporate farmers' preferences and market-focused production systems to sustainably utilize indigenous chicken genetic resources.

The research highlights the critical role of local chicken production in the Doba and Mesala districts, revealing significant insights into farmers' breeding objectives and trait

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preferences. Despite the challenges faced by local breeds in terms of production performance, the findings suggest that targeted breeding programs that align with farmers' needs and market demands can enhance productivity. Implementing these programs will not only improve local chicken production but also contribute to the conservation of diverse indigenous chicken genetic resources, thus supporting sustainable agricultural development in the region.

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