Journal of Innovative Agriculture

Research Article
DOI: https://doi.org/10.37446/jinagri/rsa/10.4.2023.41-53

Study on the status, adoption, and economic role of disseminated improved chickens and their production constraints

Elias Gonta[1*], **Tegegn Tesfaye**[2]

[1]Poultry researcher, Jinka Agricultural Research Center, P.O. Box 96, Jinka, Ethiopia.
[2]Animal Health Researcher, Jinka Agricultural Research Center, P.O. Box 96, Jinka, Ethiopia.

Received: 21 August 2023
Accepted: 18 November 2023
Published: 31 December 2023

***Correspondence**
Elias Gonta
eliasgonta@gmail.com

Volume: 10
Issue: 4
Pages: 41- 53

A study targeted the study of the status, economic contribution, adoption, and production constraint of disseminated exotic chickens was conducted in the Malle district and Jinka town. A purposive sampling method was used to select kebeles and households. A total of 120 households were used (2*2*30) to collect information focusing on improved chicken distribution, aim, improved breed sources, performances of the breeds, production practices, health and medication, extension services, and constraints. In addition to questionnaire data, house-to-house observation and inspection were undertaken. Chicken production provided additional income sources to household women to prepare cultural food (*Cheka*) and drink (*Shoforro*) in addition to providing animal protein. The extension sector of livestock played a significant role in the dissemination of improved chicken breeds, but there were no chicken keepers that used the full poultry package. The distribution of the improved breed was in a fast-increasing manner without the poultry full package. The breeds such as Rhode Island Red, SASSO, Koekoek, and Bovan Brown were disseminated breeds and the SASSO breed was highly distributed breed in the areas, but currently, there was no distribution of RIR. Compared to the fast chicken distribution and demand for chicken meat and egg, the productivity of the improved chicken breed was not satisfactory due to the weak management, absence of a full poultry package, feed shortage, absence of vaccine, chicken disease, absence of options for improved breeds and predators. Therefore, changing the management interventions that are used for local ecotypes and securing the locally available feed and medication options should be recommended to get satisfactory products from the improved chicken production.

Key words: *Breed, Chicken, Dissemination, Improved and Production*

INTRODUCTION

Chickens cover the highest population compared to other livestock genetic resources in Ethiopia and play the highest role in the area of chicken keeper's nutrition and income source (Bibi et al., 2021). The total poultry number at the national level is estimated to be about 57 million and in the Ethiopian context, it includes cocks, cockerels, pullets, laying hens, non-laying hens, and chicks of chicken (CSA, 2020). Of the total chicken population in Ethiopia, about 78.85% was local ecotype and that of the improved, and hybrids of the exotic chicken breeds contribute only 21.14% (CSA, 2021), but the local chickens are characterized by low productive performance and late age of sexual maturity, due to their poor genetic potential (Yizengaw et al., 2021). In Ethiopia the genetic improvement programs for chicken were focused on the use of improved temperate breeds to increase productivity and different breeds of improved breeds such as egg and dual purpose were introduced in 1952 (Nigussie, 2011). As the same author stated, in addition to introducing the temperate breed crossing the local breeds with that of the improved breed was also one of the approaches to improve the productivity of the local breed. In this regard, the evaluation of the productive performance of 62.5% blood level crosses (local * white leg horn) at Debre Zeit Agricultural Research Center revealed the highest egg production performance of cross than the local and pure white leghorn breeds (DZARC, 1991). Domestic poultry production is the main base of economy for poor households of developing countries particularly and the world generally (Fikadu, 2021). The low-input and low-output poultry production practices are vital sources of income for peri-urban and urban chicken keepers in developing countries (Nigussie, 2011). The economic contribution of the poultry sector is not proportional to the large chicken population in our country, due to varying production and reproduction systems and infrastructural problems in the country (Halima, 2007).

The adoption of chicken production under the smallholder chicken producers was affected by different production factors such as disease, feed, chicken house, veterinary drug and vaccine, extension, conflict with neighbors, predators, and thieves (Elias et al., 2023). High-producing improved breeds need more production input and adopting them is possible when the chicken keepers confirm the improved breed's contribution by commercializing the breeds (Nigussie, 2011). In addition to other production factors the adoption of chicken production was also affected by the uncontrolled distribution of breeds; the dissemination of the improved breed was not based on the scientific research output about the complementarity of the breed with respective agro-ecology (Elias et al., 2023).

Similar to the other parts of Ethiopia, numbers and types of improved chicken breeds were distributed to the different agro-ecologies of South Omo Zone, Ethiopia. Knowing improved breed distribution, the economic contribution of chicken rearing, productive performances of improved breeds, production practices of the area, extension access, and problems of improved chicken breed production are the most important things to confirm the productivity and constraints of disseminated chicken breeds. However, there is a research or information gap regarding the breed status, adaptation, and economic role of disseminated improved chickens and their production constraints. Therefore, this study was targeted to evaluate the status, production practice, economic contribution, and production problems of disseminated improved chickens in the south Omo zone.

MATERIALS AND METHODS

Description of the study areas

The study was conducted in the Malle district and Jinka town administration of the South Omo Zone, Southwestern Ethiopia. The Malle district is located between 4085'-5067' North Latitude and 35075'-36023' East Longitude. The district has 1,432 km^2 total land area with a relative altitude of 600-1500 mean above sea level. The annual rainfall of the district lies between 800-

1200 millimeters with a relative annual temperature of 18-35ºc. The agro-ecology of the district comprised 15% midland and 85% lowland. The dominant crops that are cultivated in the district are Maize, sorghum, finger millet, "*teff"*, coffee, and sunflower and the dominant livestock species of the district are Cattles, Goats, sheep, Chickens, bee hives, and Donkeys. The total human population of the district is 32,115 with a density of 67.9 people per sq. km according to the South Omo Zone Finance and Economy Development Department report of 2020.

Jinka town is located 755 Km away from Addis Ababa (The national capital) and 525 Km from Hawassa (The regional capital). It is located between 5°47′N latitude and 36°34′E longitude. The estimated human population of the town was 32,115. The altitude of the administrative area lies between 1490 mean above sea level. The annual rainfall of the district ranges from 162.9 millimeters with an average annual temperature of 21.1^{0}c. The dominant crops that are grown in the area are Maize, sorghum, wheat, "teff", horticultural crops, and sunflower and the dominant livestock species of the district are Cattles, Goats, sheep, Chickens, Bee hives, horses, and Donkeys. The total human population of the district is 37072 with a density of 67.9 people per sq. km according to the South Omo Zone Finance and Economy Development Department report of 2020. The town has an estimated population size of 31,226 living in 6 kebeles.

Sample size selection

A purposive sampling method was used to select both kebele and households. Based on this the Baneta and Koibe kebeles were selected from the Malle district whereas the Bazzet and Gerteph from Jinka town administration. Similarly, 30 households were selected from each for kebele purposively. Based on this a total of 120 (2*2*30) households were selected based on their chicken-keeping practices and the presence of improved chicken breeds.

Data collection

The questionnaire survey was pre-tested by using some households and development agents before the actual data collection. Face to face household survey was carried out in the chicken keeper's residence to collect information focusing on improved chicken breed distribution, aims of chicken keeping, sources of improved chicken breeds in the area, productive performances of the chicken breeds in the area, production practices of chicken keepers, health and medication practices, extension access in the areas and constraints of improved breed production were collected from members of the households which are directly responsible for management and care of chickens. Additionally, the matured body weights at sexual maturity, age at the first egg laying, and number of eggs/hen/year were collected based on the farmers 'estimation or recall response. In addition to questionnaire data, the management practices were assessed through observation and inspection of the breed's management situation such as the provision of supplemental feed, water, housing, extension system, vaccination, and the use of modern medicaments.

Data analysis

Descriptive statistics such as mean, frequency, and percentage of the collected data were analyzed using the Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, Illinois, USA 2007). The chi-square test was determined for each data expressed in the forms of percentage and frequency.

RESULTS AND DISCUSSION

Improved breed distribution status

The distribution of improved chicken breeds is presented in the (Table 1). The distribution of improved breeds was higher in Jinka town (67%) than in the Malle district (50%), due to the access to the different infrastructures and extension facilities such as new breed, information, and veterinary services. As the result of the overall total indicated, the current distribution of

exotic breeds in the area was 58.3%, indicating that the exotic breeds are dominating over the existing ecotypes at a faster rate and causing the extinction of local ecotypes. The fast distribution of improved breeds was due to the higher productivity of the breeds over the local ones, and the fast age of sexual maturity of improved breeds. This productivity difference between breeds attributed wide distribution of improved breeds and antagonistically decreased the population of local breeds and diluted the genes of local breeds. Similarly, more consideration and awareness for producers were needed for Ethiopian chicken production, reproduction, husbandry practices, and breeds (Bayesa, 2021) and the breed composition of the indigenous, exotic, and hybrid chicken population in 2021 was 78.85, 9.11, and 12.03% and showed the presence of genetic erosion and dilution of local breeds by exotic ones (Fikadu, 2021). However, the high compatibility and docile behavior of the temperate breeds have opened high awareness for the breeds (Yizengaw et al., 2021). The author also reported that the genetic makeup of local chicken types in Northwest Ethiopia is fast erosion due to the uncontrolled distribution and dissemination of improved chicken breeds by government and non-government organizations.

Table 1. Improved breed distribution status

Variables	District			X^2-test	P-value	LS
Breeds	**Malle (N=60)**	**Jinka (N=60)**	**Overall (N=120)**	**50**	**0.000**	***
Local	20(33)	10(17)	30(25.0)			
Exotic	30(50)	40(67)	70(58.3)			
Hybrid	10(17)	10(16)	20(16.7)			

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

Aims and economic contribution of chicken-keeping

The economic contribution (main aim) of chicken rearing is presented in (Table 2). The sale of eggs (46.7%) and live chicken (21.7%) (Sources of income) was the 1st and main aim production of chicken, secondly, the consumption of eggs (30.5%) and chicken meat (40.7%) (Nutritional purpose) was the 2nd aim of chicken rearing in the study districts. As stated by chicken keepers the most vulnerable groups of society such as household females own chickens to buy raw materials for cultural drinks and food such as "S*hoporoo*", and "C*heka*" and for social payments such as "E*dir*". Similarly, the chicken keepers of the districts explained that keeping improved chicken breeds with appropriate management gives additional income source opportunities for chicken keepers, especially for the dependent family members such as women, and children to escape from the dependency.

Table 2. Aims and economic contribution of chicken-keeping

Variables	Districts			X^2-test	P-value	LS
Aims of chicken-keeping	**Malle (N=60)**	**Jinka (N=60)**	**Overall (N=120)**	**14.95**	**0.000**	***
Egg consumption	9(15)	18(30.5)	27(22.5)			
Egg sale	28(46.7)	11(16.9)	39(32.5)			
Meat consumption	10(16.7)	24(40.7)	34(28.3)			
Live chicken sale	13(21.7)	7(11.9)	20(16.7)			

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

In the rural community, the chicken-keeping practice believed as the baseline ladder to reach the ownership of large animals such as goats, sheep, and cattle and also gives the hope to own greater things. Similarly, chicken rearing plays a significant economic, social, cultural, and nutritional role for the countries with the line of development (Urgesa, 2023) and the primary aim of chicken rearing was to generate income (54.67%) (Elias et al., 2021). Haile-Michael *et al.* (2016) also reported that in Africa, almost every household keeps limited numbers of chicken for consumption of chicken eggs and meat in addition to income sources.

Sources of improved breeds

The sources of the improved chicken breed are presented in (Table 3). The extension (68.3%), purchase (23.3%), and hatching on their farm (8.4%) were the main sources of improved chicken breeds in both districts, but the significance of extension was highest over the other sources. Although there were rare scientific and research trials formerly regarding the complementarity of breeds and their effect on existing breeds, the extension sector of livestock played a significant role in improved breed dissemination and distribution. In addition to the extension, purchasing from markets and small cooperatives was also another source of improved chicken breeds in the study districts. In this way, the chicken keepers purchase directly from the market, adjacent chicken keepers, or cooperatives which were organized to rear chickens from day old up to 45 days pullet. Limited numbers of chicken keepers were hatched on their farm (8.4%), in which the chicken keepers get fertile eggs from the relatives or adjacent farmers and hatch on their farm by using local broody hen with better mothering ability. Similarly, some of the chicken keepers get the improved breeds from governmental extension (Fisseha et al., 2010), the same author also reported that the main source of improved chicken breed source in the Bure district was purchase (93.9%). Purchasing from private hatcheries was the main source of initial rearing stock of improved chicken breeds in Ada'a (84.4%) and Lume (80%) districts Desalew (2012).

Table 3. Sources of improved breeds

Variables	Districts			X^2-test	P-value	LS
Sources of initial stock	Malle (N=60)	Jinka (N=60)	Overall (N=120)	35.52	0.000	***
Hatching	6(10)	4(6.7)	10(8.4)			
Purchase	12(20)	16(26.7)	28(23.3)			
Extension	42(70)	40(66.6)	82(68.3)			

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

Distribution of improved breeds and productive performance

The distributed improved chicken breeds and their productive performance are presented in (Table 4). As observed during monitoring and data collection the SASSO breed was the more widely disseminated breed in the area than the others. The Rhode Island Red breed was the 1st disseminated breed in the area, but, currently, there is no distribution of the Red Island Red. The Koekoek and Bovans brown chicken breeds are newly disseminating breeds. Although all of the breeds were adapted and performed well, the SASSO and koekoek breeds are preferable due to their availability, scavenging ability, production with little supplementation, disease resistance, and provision of enough animal meat after the end of egg production. Still, there is no distribution of Broiler (meat type) chicken breeds in the Malle and Jinka districts of the South Omo Zone. Likewise, the improved chicken breeds such as the Bovan Brown, Rhode Island Red, and Koekoek were the most common poultry breeds that disseminated in Northwestern zones of Tigray (Teklemariam, 2017). The same author also reported that currently, pure exotic breeds such as Rhode Island Red and White Leg Horns are not available in commercial markets of Ethiopia. The most preferred and accepted breed of improved chicken breed in the Tselemit districts of the Tigray region was Bovans Brown due to its high egg production and adaptability than other disseminated breeds (Teklemariam, 2017).

Both the male (3Kg) and female (2.5Kg) breeds of SASSO showed the highest body weight than the other breeds such as Red Island Red male (2.5Kg) and female (2.2Kg) and Koekoek male (2.16Kg) and female (2.08Kg). Similarly, both the male (2Kg) and female (1.82Kg) Bovan Brown breeds showed the lowest body weight than other breeds, due to the breed difference; the SASSO and Koekoek are dual-purpose breeds, whereas, the Bovan Brown is a commercial egg layer and their genes are modified for the highest egg production purpose. Similarly, the male SASSO breed weighed 2.98 Kg at the age of first mating (Aman et al., 2017).

The average number of eggs/year/breed was higher for the Bovan Brown (200 eggs) than other breeds, attributed to the breed differences. As the chicken keepers explained there was a problem of delaying or showing any sign of egg lay for long months in the layer breed (more than 150 days), due to the provision of low protein source feeds especially limiting amino acids, and the absence of egg stimulators. Similarly, there was an excess body size (weight) increment in the dual-purpose breeds such as the SASSO and Koekoek breeds; attributed to the nutritional imbalance, especially the provision of energy source feeds that exposed them to excess body weight. The mean age at the first egg laying was 126 days (Nebiyu, 2016) and the average age at the first egg laying was 127 days for the SASSO breed (Aman et al., 2017).

Table 4. Distribution of improved breeds and productive performance

Variables	Breeds				
Traits	**SASSO**	**RIR**	**Koekoek**	**Bovan brown**	**Mean**
Body weight of cock	3 Kg	2.5 Kg	2.16 Kg	2 Kg	2.4 Kg
Body weight of hens	2.5 Kg	2.2 Kg	2.08 Kg	1.82 Kg	2.2 Kg
Age of sexual maturity of cock	140 days	145 days	150 days	145 days	145 days
Age of sexual maturity of hen	160 days	155 days	167 days	150 days	158 days
Average numbers of eggs/year	150 eggs	155 eggs	140 eggs	200 eggs	163 eggs

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

Chicken production practice

The chicken production practices of the districts are presented in the (Table 5). The most dominating form of the chicken production practice was scavenging + conditional supplementation (57.5%) followed by scavenging + regular supplementation (29.2%). Additionally, there was also production practice with any supplemental feed or only scavenging (13.3%), due to the awareness level of chicken keepers to provide supplemental feed. The chicken keepers that practice any supplemental feed provision believe that the chickens are animals that lay eggs through scavenging and supplying kitchen waste; buying supplemental feed for the chickens was not their common habit. Similarly, 4.9% of chicken keepers let their chickens scavenge without any supplemental feed provision (Teklemariam, 2017). The village poultry production practice in Ethiopia is characterized by scavenging and occasional feeding with grains and kitchen refusals (Fikadu, 2021).

The majority of chicken keepers use locally available grain feeds (83.3%) such as maize, sorghum, and sunflower simply by throwing them on bare ground. The chicken keepers use it as a common feed for regular and conditional/seasonal supplementation followed by farm or kitchen leftovers (14.2%). Due to the absence of chicken feed processing plants, the use of commercial feed as supplemental feed (2.5%) of chicken was rare in the area and might be the one cause for the low egg production of chickens under the smallholder chicken producer. Coherently, the majority of chicken keepers in Northwestern Tigray zones used grain feeds and kitchen leftovers as supplemental feed of chicken (Teklemariam, 2017) and grains such as maize, sorghum, and sunflower are the common and sustainable feeding resources of chicken in Debub-Ari South omo zone, Ethiopia (Elias et al., 2022).

Based on the awareness level of chicken keepers the supplemental feed provision frequency was categorized into once per day (48.1%), twice per (43.3%), and three times per day (8.6%). Providing once per day was the most dominating feeding frequency in the Malle district, whereas twice per day for Jinka town attributed to the awareness difference of chicken keepers between the rural and urban areas. There was no ad-libitum (always) supplementation practice due to the absence of intensive poultry production. In agreement with Teklemariam (2017), the chicken keepers provided supplementary feed to all groups of age together three times per day (59.1%), twice per day (17%) and once per day (18.6%) and as the report of Nigatu and Bezabih (2014) stated, the chicken keepers in the area supplemented their chicken once, twice and more than twice per day 56.7%, 34.4% and 8.9 %, respectively. Grain feed provision (77.9%) was the most dominating feeding form and the habit of feed processing for supplementation was not commonly used practice in the study districts unless there were

chicks that couldn't feed row grains. The habit of feed processing was higher in the Jinka town (28.8%) than in the Malle district (15.4%) and the chicken owners in the Malle district use more row grains (84.6) than in Jinka town (71.2); might be due to the access for local feed grinding millers in urban areas. Similarly, 92.5% and 77.4% of chicken keepers provided supplementary feed without any processing (Habte, 2019) and (Elias et al., 2021), respectively. The most dominating form of chicken feeding method was throwing on bare ground for collective feeding (71.2%). The habit of using feed and water troughs was better in Jinka town (34.6%) than the Malle district (23.1%), due to the awareness difference between the agro-pastoralist and peri-urban chicken keepers. In addition, the feeding and water troughs used in the study sites were made up of locally available materials like bamboo, water-fetching materials, and a container of paint after the use of it. Similarly, 53.3% of chicken keepers provided supplemental feed on bare ground (Ermias, 2015) and 74.73% of chicken keepers in the Debub-Ari and Bena-steamy districts spread supplemental feed on bare ground (Elias, 2020).

Table 5. Chicken production system

Variables	Districts			X^2-test	P-value	LS
Production practice	**Malle (N=60)**	**Jinka (N=60)**	**Overall (N=120)**	**20.83**	**0.000**	***
Traditional	8(13.3)	8(13.3)	16(13.3)			
Scavenging + conditional supplementation	33(55.0)	36(60.0)	69(57.5)			
Scavenging + regular supplementation	19(31.7)	16(26.7)	35(29.2)			
Supplementary feed provision				64.53	0.000	***
Yes	52(86.7)	52(86.7)	104(86.7)			
No	8(13.3)	8(13.3)	16(13.3)			
Feed types				223.13	0.000	***
Grains	44(73.3)	56(93.2)	100(83.3)			
Kitchen refusal + Miller grounded waste	15(25.0)	2(3.40)	17(14.2)			
Commercial feed	1(1.70)	2(3.40)	3(2.50)			
Feeding time				91.75	0.000	***
Morning/afternoon	33(63.5)	17(32.7)	50(48.1)			
Morning and afternoon	15(28.8)	30(57.7)	45(43.3)			
Morning, afternoon, and evening	4(7.70)	5(9.60)	9(8.60)			
Feed processing				108.6	0.000	***
Yes	8(15.4)	15(28.8)	23(22.1)			
No	44(84.6)	37(71.2)	81(77.9)			
Method of feeding				22.23	0.000	***
On container	12(23.1)	18(34.6)	30(28.8)			
On bare ground	40(76.9)	34(65.4)	74(71.2)			
Feed source				39.35	0.000	***
Own farm	30(57.7)	24(46.2)	54(51.9)			
Purchase	2(3.80)	10(19.2)	12(11.5)			
Both	20(38.5)	18(34.6)	38(36.6)			

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

The chicken keepers in the study districts used different feed sources such as own farm (51.9%), purchase (11.5%), and both own farm and purchase (36.6%). The number of respondents that used from own farm was highest in the malle district (57.7%), whereas the number of respondents that used through purchase was highest in Jinka town, due to the presence and absence of wide agricultural farms in rural and urban areas, respectively. Providing Supplemental feed from own farm was the primary source of feed in both the study districts (51.9%) followed by combined use of own farm and purchase (36.6%). Similarly, the majority of supplemental feed is composed of a mixture of various crops produced on their farm (Ermias, 2015) and home-grown primarily and purchasing followed were the main source of supplemental feed for chicken in Debub-Ari and Bena-Tsemay districts of the South Omo Zone (Elias et al., 2021).

Health and medication

The access to veterinary drugs is presented in (Table 6). Due to the remoteness of the area, the chicken keepers in the Malle district (65.5%) have less access to veterinary drugs than the Jinka town (78.3%). As the chicken keepers explained, there was no probability of getting a live vaccine due to the absence of a vaccine-storing refrigerator and icebox in the area. Due to this, the vaccination of chickens was limited to chicken breeding, hatching, multiplication centers, and small enterprises. The improved chicken breeds under the smallholder chicken producers take vaccination in the first 45 days at the farm level of hatching centers before the actual distribution. As a result of the overall total indicated, 70.8% of chicken keepers in the study districts have access to veterinary drugs, but there was mortality in several chickens due to the implementation gap of drugs and free movement of chickens. Similarly, the majority of chicken keepers in Ethiopia did not vaccinate their chickens properly (Assefa and Melesse, 2018) and a lack of veterinary service and an organized village-level delivery system are the main constraints to implementing vaccination for chicken producers in rural areas (Tadiose et al., 2017).

Table 6. Table of chicken health and medication

Variables	Districts			X^2-test	P-value	LS
Access to vet. drug	**Malle (N=60)**	**Jinka (N=60)**	**Overall (N=120)**	**25.13**	**0.000**	***
No	22(34.5)	13(21.7)	35(29.2)			
Yes	38(65.5)	47(78.3)	85(70.8)			
Economically important disease?				35.98	0.000	***
Newcastle	24(63.1)	20(42.6)	44(51.8)			
Gumboro	2(5.30)	5(10.6)	7(8.2)			
Coccidiosis	3(7.90)	12(25.5)	15(17.6)			
Fowl cholera	9(23.7)	10(21.3)	19(22.4)			
Who provided?				139.04	0.000	***
Myself	3(7.90)	7(14.9)	10(11.8)			
Extension	30(78.9)	33(70.2)	63(74.1)			
Private expert	2(5.30)	6(12.8)	8(9.4)			
Local healer	3(7.90)	1(2.10)	4(4.7)			

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

As the results of the study indicated, 74.1% of chicken keepers get veterinary drugs from extension and the treatment of chickens was also performed by extension workers. On the other hand, certain chicken keepers bought the veterinary drug and treated themselves (11.8%), private animal health workers (9.4%), and local healers (4.7%). Due to the absence of good management, an effective vaccination schedule, an intensive production system, and all-in all-out delivery of similar batches the veterinary drugs used for the treatment were not effective and sometimes caused the loss of the whole flock during the disease outbreak. Similarly, about 52.94% of chicken keepers have vaccinated their chickens by trained animal health experts (Yohannes et al., 2021). Alebachew et al., 2022 also stated that the veterinary treatments provided for chickens were not supported by laboratory results. Based on the visual observation and signs told by respondents Newcastle, Fowl cholera, Coccidiosis, and Gumboro diseases were economically important diseases that cause mortality of chickens, but the Newcastle disease is the most frequently occurring, serious, and main problem of chicken production. As the chicken keepers explained the probability of an outbreak of diseases was highest during seed sowing season due to the sale of numbers of chickens to get money for sowing and crop damage. Similarly, the Newcastle, Gumboroo, Coccidiosis and Parasitic diseases were economically important diseases that caused mortality of chickens in Debub Ari and Bena-Tsemay districts (Elias et al., 2023) and due to the absence of balanced medication and veterinary services, the chickens under the free range production system were exposed to high mortality (FAO, 2019).

Extension services

The extension access of chicken in the Malle and Jinka districts is presented in (Table 7). The chicken keepers around Jinka town (91.7%) have a little higher access to extension service than the Malle district (80%) due to the presence of different aspects in peri-urban areas than rural. However, the extension service was not strong regarding the poultry (39.8%) sector compared to other livestock sectors. It was not full-package, and limited by simple advice (62.1%), improved breed provision (20.45), and drug services (17.5%) rather than scheduled vaccination and poultry feed. Due to the absence of a full package (vaccination, house access, and balanced chicken feed), the productivity of the chickens under the smallholder producer was not satisfying and the owners lost numbers of chickens throughout the year due to disease and predatory animals. Consistently, about 73.5% of chicken keepers have linkage with extension experts (Teklemariam, 2017). In addition, the linkage between the extension agents and chicken keepers affects the adoption of chicken significantly and positively (Ermias, 2015). However, Mwobobia et al. 2016 stated that rural households have better extension access, veterinary service, training, and market information than peri-urban households.

Table 7. Table of the extension access

Variables	**Districts**			**X^2-test**	**P-value**	**LS**
Extension service access	**Malle (N=60)**	**Jinka (N=60)**	**Overall (N=120)**	**61.63**	**0.000**	*******
Yes	48(80)	55(91.7)	103(85.3)			
No	12(20)	5(8.30)	17(14.7)			
Regarding which animal species				19.16	0.000	***
Poultry	22(45.8)	19(34.5)	41(39.8)			
Large ruminant	9(18.8)	9(16.4)	18(17.5)			
Small ruminant	17(35.4)	27(49.1)	44(42.7)			
In what form				41.31	0.000	***
Advise	34(70.8)	30(54.5)	64(62.1)			
Veterinary service/drug	7(14.6)	11(20.0)	18(17.5)			
Exotic breed provision	7(14.6)	14(25.5)	21(20.4)			

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

Constraints of improved chicken breed adoption

The constraints of adoption of improved chicken production are presented in (Table 8). Primarily, the adoption of the improved chicken production was affected by the feed shortage (39.2%), and the absence of commercial feed access on another hand, and the extent of the problem was highest in the Malle district, especially during the dry season. Although the chicken producers have a high preference for improved breeds, their preference was limited due to food-feed competition of chickens for grain feeds. Due to this and other related problems, the disseminated improved breeds were not performing at their full genetic potential. Consistently, feed quality and price of feed ingredients were the main constraints of chicken production in Ethiopia (Yizengawu et al., 2022) and the feed shortage was the second challenge of chicken production in Northwest Ethiopia (Habtamu et al., 2022). Secondly, the adoption of improved chicken breeds was also affected by the absence of vaccines (18.4%) and storing equipment on the other side. Even though vaccination is the primary protection method to safeguard the disease outbreaks, the practice of scheduled vaccination was limited at the farm level in the first 45 days. Of all the chicken's lifetime vaccinations, only the first 45 days of vaccinations that were implemented at the chicken multiplication and breeding centers were provided. Due to this and other related problems the probability of chickens getting sick and dying was highest and this in turn affected the chicken keeper's preference and caused economic loss. Likewise, the most hindering factor of chicken production in the Debub Ari and Bena-Tsemay districts was the absence of veterinary drugs and vaccines (Elias et al., 2023). Thirdly, the adoption of improved chicken breeds was also affected by mortality due to disease (15.8%) and weak management practices. Due to the free movement of chickens and the absence of the practice of all-in all-out chicken marketing, the numbers of chickens getting

diseased and dying were highest under smallholder chicken producers. The unexpected chicken loss due to the disease and weak management practices was also affecting the farmer's preference and causing the economic loss of smallholder chicken producers. Similarly, the main problem of village chicken production was poor management (lack of proper health care, disease, and predation) of chickens (Melkam, 2022). Feed shortage, disease, veterinary services, health management, and extension services were the main poultry production constraints in Ethiopia (Abera, 2022). Fourthly, the adoption of improved chicken production in the study districts was also affected by the absence of the best-producing improved breeds (14.95%) and the far-ness of improved breed sources. Due to the far-ness, the chicken producers were forced to keep only limited breeds in the area rather than their preferences and interests. Due to this, the chicken keepers were exposed to additional cost and time lost to bring more preferable and interested breeds from distances of kilometers. Likewise, the absence of improved breeds was the main constraint of chicken production (Melkam, 2022).

Table 8. Table of constraints of improved Chicken Breed Production

Variables	Districts			X^2-test	P-value	LS
Which one is the most important constraint	Malle (N=60)	Jinka (N=60)	Overall (N=120)	36.00	0.000	***
Feed shortage	25(41.7)	22(36.7)	47(39.20)			
Disease and mortality	9(15.0)	10(16.7)	19(15.80)			
Lack of vaccine	10(16.7)	12(20.0)	22(18.40)			
Predator	8(13.3)	6(10.0)	14(11.65)			
Absence of improved breed	8(13.3)	10(16.6)	18(14.95)			

**=significant at P<0.01; N=number of households. Figures in the table represent frequency and percentage, LS = level of significance.

Lastly, the adoption of improved chicken breeds in the area was also affected by predatory animals and birds (11.65%). Due to the absence of an intensive production system under the smallholder chicken producers, chickens scavenge around the family dwellings in addition to conditional supplementation. The free movement of chickens exposes the chickens to predatory animals and birds; causing economic loss and this in turn affects the adoption of improved chicken breeds. Similarly, the major cause of premature death of chickens was predators (Melkam, 2022) and predators were the main causes of the death of rural poultry in the Basin of Oromia Region, Ethiopia (Yizengaw, et al., 2022).

CONCLUSION

Chicken production provided income ownership responsibility to the most vulnerable groups of families such as women and children in addition to nutrition (animal protein source). For the rural community, it is a baseline ladder to reach the ownership of large animals and also gives the hope to own greater things. The extension sector of livestock played a significant role in the dissemination of improved breeds, but the distribution of breeds was not based on scientific research for the complementarity of breeds to different agro-ecologies. The distribution of exotic breeds was in a fast-increasing manner, indicating the dilution and population dominancy of exotic over the existing ecotypes. The driving force behind the fast distribution of improved breeds was the productivity and age of sexual maturity difference over the existing ones. The SASSO was a largely distributed breed, and currently, the Koekoek and Bovans Brown are in the initial stage of distribution. The RIR was the first distributed breed in the area, but currently, there is no distribution of RIR. The extension sector of livestock focused only on the distribution of improved chicken breeds rather than their full package such as feed, drug and vaccine, shelter service, and productivity of the breeds. The feed shortage, absence of veterinary drugs and vaccines, chicken mortality due to disease, absence of improved chicken breed sources, and presence of predatory animals and birds were the main improved chicken production constraints in the study districts. Due to the available constraints, poor management, and absence of a full poultry package, the disseminated improved chicken breeds did not expressed their full genomic potential and the chicken keepers were facing economic loss due to the death of chickens. Therefore, awareness creation/training should be given to solve the poor management issues and enhance the use of full poultry packages, and locally

available feed sources and medication options should be available to improve chicken productivity.

ACKNOWLEDGMENTS

The authors would like to thank the South Agricultural Research Institute for logistics support. The authors also express their great appreciation to the Livestock extension experts of both districts, & chicken keeping households who were involved interview.

AUTHOR CONTRIBUTIONS

Mr. Elias Gonta wrote the entire manuscript in addition to proposal development and data collection. Dr. Tegegn Tesfaye was involved in data collection and paper edition.

COMPETING INTERESTS

The authors declare that there is no conflict of interest & the manuscript has not been submitted for publication in other journals.

ETHICS APPROVAL

Not applicable

REFERENCES

Abadi, T. (2017). Factors affecting adoption of exotic poultry breeds in smallholder producers in North Western zone of Tigray, Ethiopia (Doctoral dissertation, Haramaya University).

Alebachew, G. W., Ejigu, A. K., Adnie, L. Y., et al. (2022). Poultry Production and Marketing Systems in Ethiopia: A Review. *Ann Agric Crop Sci, 7*(2), 1112. www.austinpublishinggroup.com

Aleme, M. (2022). Review on production and reproduction performance of indigenous chicken in Ethiopia. *East African Journal of Agriculture and Biotechnology, 5*(1), 90-107. https://doi.org/10.37284/eajab.5.1.638

Arega Kidie, H. (2019). Characterization of chicken production system and on-farm evaluation of introduced exotic chicken breeds in Gondar Zuria and Kalu districts of Amhara region, Ethiopia (Doctoral dissertation, Haramaya University). http://localhost:8080/xmlui/handle/123456789/390

Assefa, H., & Melesse, A. (2018). Morphological and morphometric characterization of indigenous chicken populations in Sheka Zone, South Western Ethiopia. *Poultry, Fisheries & Wildlife Sciences, 6*(2), 200. https://DOI: 10.4172/2375-446X.1000200

Asfaw, Y. T., Ameni, G., Medhin, G. et al. (2021). Poultry health services in Ethiopia: Availability of diagnostic, clinical, and vaccination services. *Poultry science, 100*(6), 101023. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8080080

Ayalew, H., Yinnesu, A., Misganaw, G., et al. (2023). Performance evaluation and sustainability challenges of tropically adapted exotic chicken breeds in Northwest Ethiopia. *Cogent Food & Agriculture, 9*(1), 2202221. https://doi.org/10.1080/23311932.2023.2202221

Bibi, S., Noreen, S., Rehman, A., et al. (2021). Morphological characteristics of native chicken of village Chhajjian, Haripur Pakistan. *Poultry science, 100*(3), 100843. https://doi.org/10.1016/j.psj.2020.11.022

CSA (Central Statistical Authority) 2019. Report on livestock and livestock characteristics (private peasant holdings). Agricultural Sample Survey; Federal Democratic Republic of Ethiopia, Addis Ababa Ethiopia.

CSA (Central Statistical Authority) 2021. Report on livestock and livestock characteristics (private peasant holdings). Agricultural Sample Survey; Federal Democratic Republic of Ethiopia, Addis Ababa Ethiopia.

Dana, N. (2011). Breeding programs for indigenous chicken in Ethiopia: analysis of diversity in production systems and chicken populations. Wageningen University and Research. https://cgspace.cgiar.org/handle/10568/32821

DZARC (Debre Zeit Agricultural Research Centre), 1991. Annual Research Report. Debre Zeit, Ethiopia. https://cgspace.cgiar.org/bitstream/handle/10568/2713/ILCAr91.pdf

Ermias, T., Berhan, T., & Zemelak, S. (2015). Determinants of village poultry technology package Adoption; Limitations, Constraints, and Opportunities in the central Oromia Region, Ethiopia. *International Journal of Development Research, 5*(5), 4436. https://www.researchgate.net/publication/312471639

FAO (Food and Agricultural Organization), 2019. Poultry sector Ethiopia. FAO animal production and health livestock country reviews. No. 11. Rome, Italy; 2019. https://www.scirp.org/reference/referencespapers?referenceid=2913565

Getiso, A., Jimma, A., Asrat, M., et al. (2017). Management practices and productive performances of Sasso chickens breed under village production system in SNNPR, Ethiopia. *Journal of Biology, Agriculture and Healthcare, 7*(7), 120-135. https://www.iiste.org/Journals/index.php/JBAH/article/view/36482

Gonta, E., Urge, M., & Girma, M. (2022). Assessment of smallholder chicken feeding practices, available feeds, and evaluation of locally used mixtures in two districts of South Omo Zone, Ethiopia. *Veterinary Research Notes, 2*(3), 27-27. http://dx.doi.org/10.5455/vrn.2022.b10

Gonta, E., Urge, M., & Girma, M. (2022). Assessment of Smallholder Chicken Production Practices, Marketing, and Constraints in Two Districts of South-Omo Zone, Ethiopia. *Ann Agric Crop Sci. 8*(2): 1-9. https://austinpublishinggroup.com/agriculture-crop-sciences/fulltext/aacs-v8-id1133.php

Gonta Gobena, E., & Urge, P. (2021). Assessment of Smallholder Chicken Production Practices and Evaluation of Local Feed Resources in Two Districts of South Omo Zone, Ethiopia (Doctoral dissertation, Haramaya University). http://ir.haramaya.edu.et/hru

Habte, T., Amare, A., Bettridge, J. M., et al. (2017). Guide to chicken health and management in Ethiopia: For farmers and development agents. ILRI Manual. https://www.ilri.org/

Mogesse, H. H. (2007). Phenotypic and genetic characterization of indigenous chicken populations in Northwest Ethiopia (Doctoral dissertation, University of the Free State). https://scholar.ufs.ac.za/bitstream/handle/11660/2207/MogesseHH.pdf

Melese, G., & Melkamu, B. (2014). Assessment of chicken production under farmer's management condition in East Gojam Zone, Amhara Regional State, Ethiopia. *Greener Journal of Animal Breeding and Genetics, 1*(1), 001-010. http://dx.doi.org/10.5455/ijlr.20160313125928

Mengesha, Y., Kebede, E., & Getachew, A. (2022). Review of chicken productive and reproductive performance and its challenges in Ethiopia. *All Life, 15*(1), 118-125. https://doi.org/10.1080/26895293.2021.2024894

Murangiri, M. R., Amwata, D. A., & Kanui, T. I. Extension Support Services Among Poultry Farmers, a Case of Katulani District, Kitui County, Kenya. http://repository.mut.ac.ke:8080/xmlui/handle/123456789/2972

Nebiyu, Y. A. (2016). Assessment of urban poultry production practices in Addis Ababa with emphasis on egg production, product marketing, feed quality, and waste management. Ph.D. Diss., Department of Animal Production Studies, College of Veterinary Medicine and Agriculture, Addis Ababa University. http://etd.aau.edu.et/handle/123456789/5046

Sime, A. G. (2022). Review on poultry production, processing, and Utilization in Ethiopia. *International Journal of Agricultural Science and Food Technology, 8*(2), 147-152. https://doi.org/10.17352/2455-815X.000156

Teklemariam, A. (2017). Perception of farmers on exotic chicken breeds and its management condition in Northwestern zone Tigray, Ethiopia. *World Scientific News, 86*(3), 168-179. https://bibliotekanauki.pl/articles/1178284.pdf

Tirfie, F. W. (2021). Review on Poultry Production Status and Economic Contribution of the Sector in Ethiopia. https://www.iiste.org/

Tolasa, B. (2021). Current status of indigenous and highly productive chicken breeds in Ethiopia. Advances in Agriculture, 2021. https://www.semanticscholar.org/

Urgesa, L. (2023). Review on Poultry Production System, Trends and Development Strategies in Ethiopia. Journal of Aquaculture & Livestock Production. SRC/JALP-138. DOI: doi.org/10.47363/JALP/2023 (4), 125, 2-5.