

Research Article

Chicken Husbandry Practices and Marketing System in Assosa Town and Around, Benishangul Gumuz Regional State, North Western Ethiopia

Tenaw Temesgen^{1,*} , Berenabas Ayeneshet² 

¹Department of Animal Science, College of Agriculture and Natural Resources, Assosa University, Assosa, Ethiopia

²Department of Animal Science, College of Agriculture and Natural Resources, Woldia University, Woldia, Ethiopia

Abstract

Chicken production is important for income generation, food, and nutritional aspects globally. The study aimed to explore husbandry practices and the marketing system of chicken production in Assosa town (district 1) and around. The study district was selected through a purposive sampling method. However, the kebeles of the study area were selected randomly. A multi-stage random sampling technique was applied to choose 156 Households. Data were generated by semi-structured questionnaires and field observations. The data was analysed using SPSS version 20 software. Descriptive statistics were used to analyse the data. The results indicate the aim of keeping chickens was income generation and home consumption in urban and peri-urban areas and rural areas, respectively. Chickens were reared intensively in urban areas, whereas they were reared extensively in rural areas. Industrial by-products were a major (65.4%) feed source in urban areas, whereas scavenging (65.4%) was practiced in rural areas. The most common disease outbreak in urban areas was reported to be coccidiosis (57.80%), whereas Newcastle disease (63.40%) was the dominant outbreak disease in rural areas. All respondents (100%) in urban areas had information about the marketing system of chicken and egg. Feed problems were the first chicken production problem in the study area. The attention given to chicken, particularly in husbandry practices like supplementary feeding, health care and housing practices, was very low in rural areas. Therefore, extension development should be implemented to increase the productivity of chickens. As most of the chicken and egg marketing activity of the study area was not information-based, training on chicken husbandry and marketing practices to households would be essential for chicken production and marketing.

Keywords

Chicken Husbandry, Feeding, Marketing System, Assosa Town

1. Introduction

In terms of livestock populations, Ethiopia is endowed first in Africa and tenth in the world. From the estimated total (57 million) number of chickens in Ethiopia, the contribution of the local, hybrid and exotic chicken breeds was about 78.85%,

12.02% and 9.11%, respectively. [1]. Still, these large populations of indigenous chickens are found in traditional production systems. Nevertheless, they are well adapted to the tropics, resistant to poor management, feed shortages, toler-

*Corresponding author: tenawtemesgen84@gmail.com (Tenaw Temesgen)

Received: 16 May 2025; Accepted: 9 June 2025; Published: 14 July 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

ance of diseases, and give better meat and egg quality than exotic chickens. Poultry production is an important sector in Ethiopia where chickens and their products are important sources of income generation [2]. According to [3], the role of chicken in Ethiopia has become more important over time. Socio-economically, chicken production is a key source of eggs and meat in both rural and urban areas of Ethiopia, as well as a source of income, particularly for women.

The poultry sector in Ethiopia can be characterized into three major production systems based on some selected parameters such as breed, flock size, housing, feeding, health, and technology. These are large-scale commercial poultry production systems, small-scale commercial poultry production systems, and village or backyard poultry production systems [4]. Under village management systems, the low productivity of native scavenger chickens is attributed not only to their limited egg production and slow growth but also to the system's high chick mortality before they reach around 8 weeks of age [5]. Local chicken breeds can produce 30-60 eggs per year per hen with an average of 38g egg weight [6]. In the smallholder sector, chicken and egg marketing is informal and usually occurs between farming households and non-farming households such as clinics, schools, and business centers [7].

There are various studies showed that factors like diseases, predators, lack of proper health care, feed sources and poor marketing information hinder the productivity of chickens in most areas of the country [8]. The disease is one of the critical constraints for chicken production in Ethiopia followed by feed resources, predators, and poor marketing information [9]. Knowledge and understanding of the chicken production systems, opportunities and constraints are important in the design and implementation of the chicken-based-development program, which can benefit the societies [10]. Therefore, evaluating the production performance of chicken husbandry practices and marketing as well as sustainability of the poultry industry were the key points to deliver combined information to the beneficiaries. Therefore, deep knowledge of production practices, marketing and constraints is key to the sustainable production of chicken in the study area.

1.1. Statement of the Problem

Benishangul Gumuz region in general and Assosa Town, in particular, was known for livestock resources. Local chicken production plays a significant role in the supply of human food (eggs and meat) in rural and urban areas as a source of income, especially to smallholder farmers majorly in Ethiopia and Benishangul Gumuz regional state in particular. Chicken production plays significant socio-economic impacts on food security, generating income, and other purposes. According to Assosa Town Agriculture Office, people in Assosa Town and around drive some of their livelihood through chicken production and marketing businesses. However, this chicken production system can be characterized by poor husbandry

practices. Despite these facts, there is a limitation of proper information on husbandry practices, egg production performance and marketing conditions of chicken kept under traditional and small-scale intensive production systems in Assosa town. This leads to lower production and productivity of chicken products in the region. Furthermore, most households that practice chicken production have been subjected to income deficits and challenges in their family life.

1.2. Study Objective

This study was targeted to fulfill the knowledge gap by assessing the socio-economic status of local chicken production in town and rural areas, around Assosa town and around in Benishangul Gumuz region, Northwestern, Ethiopia. The study assessed the demographic characteristics of farmers in the study area. This study further assessed many factors to local chicken production in the study area. The study hypothesized that the age of the household head, education level, breed, marital status, religion, chicken breed, and type had a positive significant effect in all chicken production areas. The research findings would have information about policy decisions that promote sustainable chicken production in the study area and also for chicken enterprises. Therefore the study objectives have deep knowledge of the production practices, marketing and constraints is a key to the sustainable production of chicken in the study area.

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted in Assosa town, Benishangul Gumuz Regional State, at a distance of 687 Km from Addis Ababa. Currently, the town has changed its administrative structure into two woredas (woreda-1 and woreda-2). Each woredas have five "kebeles"; hence, the town has a total of 10 kebeles. The town is located at 10°04'N34°31'E and 9°45'N34°44'E, respectively, with an elevation of 1570 meters (BGRS Meteorology Service Center, 2020). According to the projection made from the 2020 population and housing census, the total population of Assosa town was 62,632, of which 32,100 are male and 30,532 are female. The majority of the inhabitants professed Ethiopian Orthodox Christianity, with 54.92% of the population having reported they practiced that belief, while 29.75% of the population said they were Muslim, and 14.89% were Protestant.

The mean annual temperature of Assosa town is a minimum of 14 °C and a maximum of 33 °C. However, there is a slight variation in temperature by month. The total amount of rainfall recorded at Assosa during the last nine months of 2020 was 1,119mm (BGRS, Meteorology Service Center, 2020). The population size of different livestock species in Assosa town is cattle 569; goat 1545, sheep 739, poultry 17676, donkey 122 and pig 8, a total of 20659 livestock pop-

ulations are found in the town (Assosa Town Agriculture Office).

2.2. Sampling Procedures and Sample Size

The study was focused on households and farmers that are practicing chicken production in intensive, semi-intensive and extensive chicken production systems in the study area. Chicken production potential and marketing system were the main criteria in the selection of the study area. Based on the availability and potential of local chicken production the study district was selected through a purposive sampling method. However, the kebeles of the study area were selected randomly. Depending on the information obtained from agriculture development offices, two kebeles (administrative divisions) from each stratum (Urban, per-urban and Rural) were selected. Therefore, a total of 6 representative kebeles

were selected randomly for this study. Multi-stage random sampling technique was applied to choose 156 Households (26 households from each kebele) that participate in chicken production.

Among all (N=256) households that participate in chicken production and marketing in Assosa town and around, a sample size was determined by using [11] simplified formula.

$$n = N / (1 + N(e)^2)$$

$$n = 256 / (1 + 256(0.05)^2)$$

$$n = 156$$

Where: n= sample size,
N= target population size,
e= level of precision of 5% confidence level.

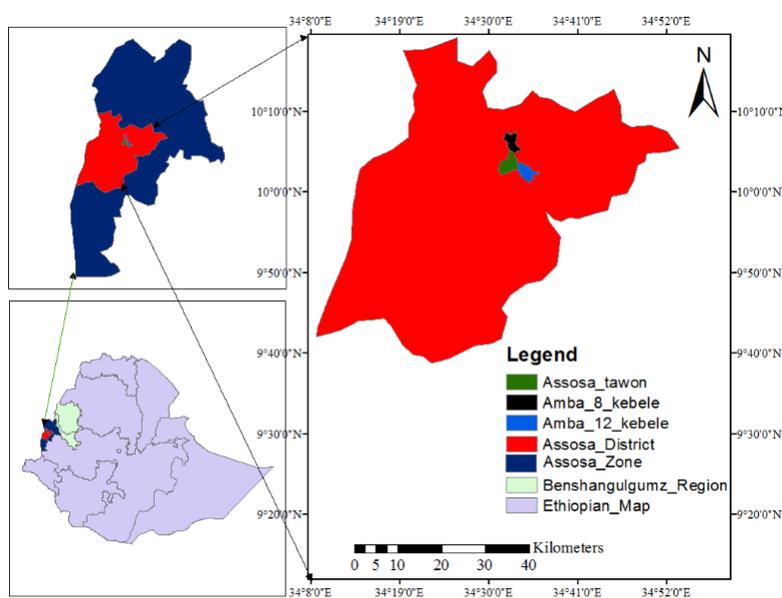


Figure 1. The study area.

2.3. Data Collection

Relevant secondary data were collected from various reports and sources, including the Office of Agriculture & Rural Development. Primary data were collected intensively through personal and house-to-house interviews using a well-organized and pre-tested semi-structured questionnaire. Farmer's perceptions, opinions and experiences on chicken production, marketing of chicken and constraints of chicken production were interviewed. All interviewed households were a part of the sampling frame for selecting attendants for the focus group discussion. The sampling frame for selecting attendants of the key informant interview was individuals and professionals who have enough knowledge and information needed by the research. The checklist was prepared for the

collection of data through focus group discussion, key informant interviews and personnel observation. The questionnaire was designed to cover a wide range of topics and variables.

2.4. Data Analysis

The obtained primary data was reviewed for completeness and consistency before being coded and collected data from the household survey through semi-structured questionnaires was stored into Microsoft Excel Spreadsheets to create a database and processed. The data were processed and analyzed by using the statistical package for social science (SPSS) version 20.0 software. The household data of the study participants and the livestock holding characteristics were compiled using descriptive statistics. Eventually, the analyzed data

was interpreted, summarized and presented by using graphs and tables. An index also was calculated to provide a ranking of the major chicken production constraints using a rank index formula.

$$\text{Rank index} = (R_n * C_1 + R_{n-1} * C_2 \dots + R_1 * C_n)$$

$$\sum (R_n * C_1 + R_{n-1} * C_2 \dots + R_1 * C_n)$$

Where: R_n = Value of the least rank of constraint; C_n = Counted value of the least ranked level, $(R_n * C_1 + R_{n-1} * C_2 \dots + R_1 * C_n) = \sum$ = weighted summation of each constraint
The following model was used for data analysis.

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where: Y_{ij} = represents the observation in the kebeles

μ = the overall mean

T_i = husbandry practices and marketing systems

e_{ij} = random error.

3. Results and Discussion

3.1. Socio-economic Characteristics of the Respondents

The average sex, age, marital status and religion of the households were presented in Table 1. A greater percentage of male respondents were involved in chicken production in all

urban, peri-urban and rural areas. This was due to chicken production in all areas used as a start-up business for the male producer. This result was disagreed with the finding of [12], who noted that from the total interviewed village chicken owners, 72.4 and 65% were female in Kucha and Arba minch zuria districts; respectively. The highest (69.2%) youth classes of respondents participated in chicken husbandry practices was urban areas at kebele 2 and rural at Amba 8 (69.2%). High production of chicken and chicken products might be produced in this area because the highest percentage of youths participated, and there might be better production management in the 18-35 age of respondents. According to the result of the study conducted by [13] in urban and peri-urban areas of Addis Ababa town, the small-scale commercial poultry production was run by 31-55 age groups.

The highest (69.2%) percent of married respondents participated in urban at kebele 2 compared to all other study areas. This might be the reason why high consumption of chicken and chicken products was practiced in town, and thus respondents used chicken production for income generation. The present result agreed with the result of [14], who reported (84.9% of the respondents were married in the production of Indigenous poultry among smallholder farmers in Tigania West Meru County, Kenya. The highest percentage (69.2%) of Muslim respondents has participated in chicken production at Amba 12 from the rural area. The present study was not comparable with the finding of [15], who reported that 96.7% of the respondents belonged to the Orthodox religion in the East Gojam Zone, Amhara Regional State, Ethiopia.

Table 1. Average sex, age, marital status and religion of the households.

Household characteristics	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Sex of respondents						
Male	17 (65.4)	15(57.6)	16(61.5)	19(73)	12(46.2)	9(34.6)
Female	9(34.6)	11(42.4)	10(38.5)	7(27)	14(53.8)	17(65.4)
Age of respondents						
18-35	13(50)	18(69.2)	16(61.6)	12(46.2)	18(69.2)	17(65.4)
35-60	9(34.6)	8(30.8)	9(34.6)	9(34.6)	6(23.1)	9(34.6)
>60	4(15.4)	-	1(3.8)	5(19.2)	2(7.7)	-
Marital status						
Single	4(15.4)	2(7.7)	4(15.4)	5(19.2)	7(26.9)	8(30.8)
Married	14(53.8)	18(69.2)	16(61.5)	17(65.4)	13(50)	12(46.1)
Widowed	2(7.7)	3(11.5)	2(7.7)	3(11.5)	1(3.9)	2(7.7)
Divorce	6(23.1)	3(11.5)	4(15.4)	1(3.9)	5(19.2)	4(15.4)
Religion						

Household characteristics	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Muslim	9(34.6)	7(26.9)	5(19.2)	14(53.8)	11(42.4)	18(69.2)
Orthodox	8(30.8)	10(38.5)	13(50)	9(34.6)	9(34.6)	8(30.8)
Protestant	9(34.6)	9(34.6)	8(30.8)	3(11.6)	6(23)	-

n= number of respondents in the study area

The educational status of the respondents in the current study is presented in Figure 2 below. The highest (46.20%) of respondents with a degree certificate participated in chicken husbandry practices was observed in urban areas at kebele 1. Similarly, [16] noted that nearly 77.5% of the farm owners were those who completed higher education in poultry farms in layer production in Ibadan, Oyo state. On the other hand, a high illiterate (34.6%) and fewer diploma (3.8%) of respondents were observed in the rural area of Amba 12

kebele. The result revealed by [12], educational backgrounds of the respondents 49.1% of interviewed participants did not have any formal education (illiterate). The present result might be due to most of the educated persons migrating into the town whereas illiterate and read-and-write respondents were left in rural areas. The present result was comparable with [17], who reported about 18.3% of respondents as illiterate in the Central Rift Valley.

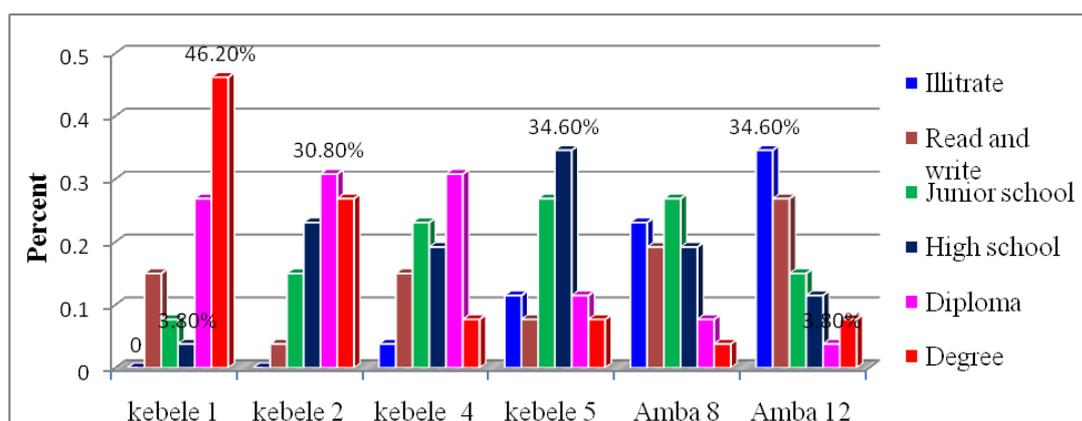


Figure 2. The educational level of the respondents.

3.2. Number of Different Breeds and Utility Types of Chicken

All chicken breeds and types based on utility are shown in Table 2 below. A few numbers of local chickens were kept by respondents in the urban area compared to a rural area. The major reason why local breeds in rural areas were adopted was their robustness to management. The current study was sup-

ported by [18] the size of local chicken possessed by households in the Bure and Fogera districts was 13.10% and 12.38%, respectively, compared to exotic chicken kept in rural areas. Meat-type chicken was kept dominantly in the rural area compared to the urban area whereas; egg-type chicken was kept in a greater proportion in urban compared to rural areas. This was due to farmers in rural areas producing chickens for live marketing purposes for income generation.

Table 2. Number of different breeds of chicken possessed by respondents.

Chicken breeds	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Local breed	54.6±1.4	15.7±0.9	76.5±1.4	65.6±3.7	87.2±1.6	75.6±1.3
Cross breed	76.6±0.4	81.6±2.4	24.6±0.4	54.3±0.5	26.9±0.2	23.2±0.7
Sasso T44 breed	33.7±1.5	14.3±0.6	47.3±0.6	25.9±0.4	21.4±0.9	28.3±2.6
Bovans Brown breed	25±1.2	45.8±0.7	65.3±1.9	32.2±3.5	22.4±2.7	27.3±1.4
White leg horn breed	41±0.03	65.2±0.3	34.5±2.5	23±0.7	13.1±2.1	16.2±0.7
Chicken type (utility)						
Meat type	43.3±0.3	25.7±0.5	54.7±0.4	62.6±3.7	23.2±1.6	68.9±0.4
Egg type	67.7±2.1	37.2±0.8	64.6±1.4	71.2±1.5	56.6±1.4	81.6±1.9
Dual type	45.9±0.8	34.3±1.3	42.3±1.6	22.4±2.1	11.4±1.9	26.9±1.6

n= number of respondents in the study area

As the results indicated in Table 3, the majority of respondents (61.5%) in urban areas use day-old chickens for starting chicken production, and most respondents (65.4%) in rural areas reared pullet chickens mainly due to a lack of awareness of how to manage day old chicken. The present

study was supported by [12] noted that farmers in rural areas do not keep records because they pay little attention to day-old chickens. Farmers should be acknowledged to use day-old chicken for better economic gain.

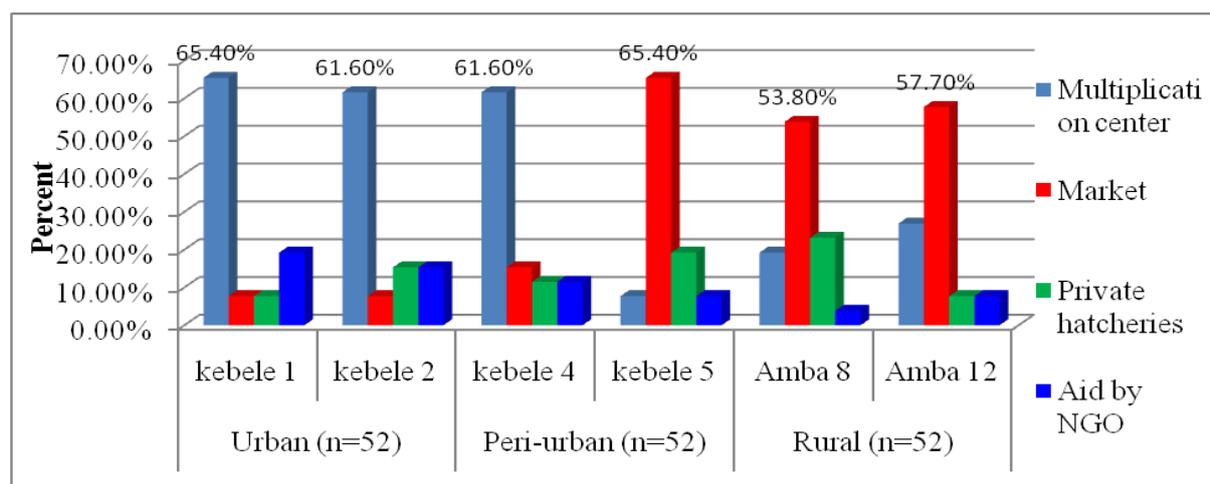
Table 3. Groups of chickens used to start production.

Startup Chicken	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Pullet	12(46.2%)	10(38.5%)	11(42.3%)	14(53.8%)	15(57.7%)	17(65.4%)
Day-Old Chicken	14(53.8%)	16(61.5%)	15(57.7%)	12(46.2%)	11(42.3%)	9(34.6%)

n= number of respondents in the study area

According to Figure 3, a high (65.4%) of respondents in the urban area purchased chicken from the multiplication center. About 65.4% and 57.7% of respondents in peri-urban areas at kebele 5 and in rural areas at Amba 12 purchased chickens from market sources, respectively. The same result was obtained by [19], where commercial farms obtained chickens from multiplication centers in Ethiopia whereas [20] noted that the majority (46.7%) of the replacement stock originates from the local market.

**Figure 4.** Peri-urban chicken production.



n= number of respondents in the study area

Figure 3. Chicken sources of the respondents.

Table 4. Chicken production systems.

Chicken production system	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Extensive	3 (11.5%)	2 (7.7%)	9 (34.6%)	9 (34.6%)	15 (57.7%)	17 (65.4%)
Semi-intensive	12 (46.2%)	11 (42.3%)	10 (38.5%)	14 (53.9%)	9 (34.6%)	8 (30.8%)
Intensive	11 (42.3%)	13 (50%)	7 (26.9%)	3 (11.5%)	2 (7.7%)	1(3.8%)

n= number of respondents in the study area

The majority of respondents in the urban area were rearing their chickens intensively in both kebeles, as shown in Table 4 below. Unlike to the current study [12], who described that the indigenous chicken production system is characterized with backyard scavenging (100%) in Arba minch zuria and Kucha districts. Chickens in urban area were confined in their house and provided feed and water whereas the majority of respondents in a rural area of both Amba 8 and Amba 12 kept their chickens extensively. This finding was agreed with the findings of [21], who reported that the majority (74.4%) of the chicken production system in the Gorogutu district was extensive. This result was also the same as [22], who revealed scavenging (extensive) as the major chicken production system practiced in Lemo District, Hadiya Zone, Ethiopia.

3.3. Chicken Husbandry Practices

3.3.1. Chicken Feeds and Feeding Practices in the Study Area

Feed resources for chicken in the present study are shown in Table 5 below. The majority (65.4%) of respondents in urban areas were feeding their chickens with industrial by-products, whereas a few respondents (3.8%) in urban areas practiced scavenging. In the current study, respondents in rural areas did not feed their chickens with industrial by-products. Scavenging feeding practices were dominantly practiced in rural areas compared to urban areas. This practice leads to a decrease in the productivity of chickens. The current result agreed with the finding of Samson and [23] who reported that 94% of the respondents in the mid-rift valley of the Oromia region practiced scavenging feeding practices.

Table 5. Feed resources for chicken production.

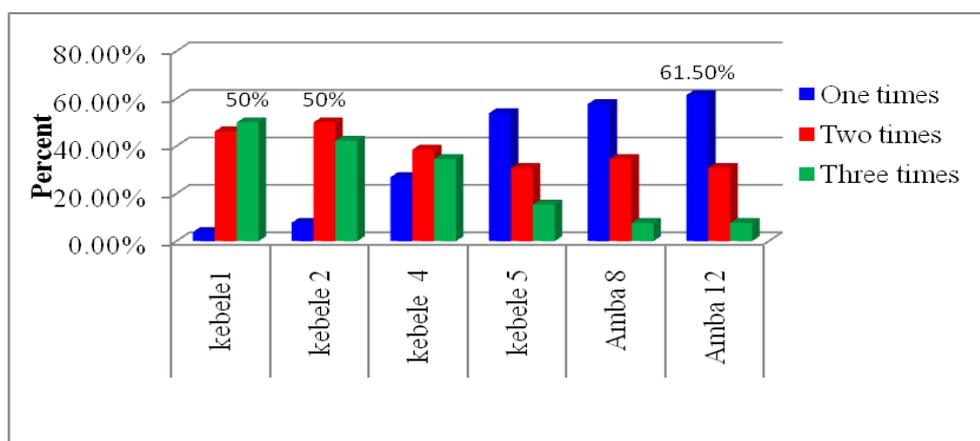
Feed sources	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Scavenging	3 (11.5%)	1 (3.8%)	6 (23.1%)	6 (23.1%)	19 (57.7%)	17 (65.4%)
Scavenging & Grain feed	6 (23.1%)	10 (38.5%)	11 (42.3%)	12 (46.2%)	7 (26.9%)	1 (3.8%)
Scavenging & Supplement	-	-	1 (3.8%)	2 (7.7%)	-	8 (30.8%)
Industrial by-products	17 (65.4%)	15 (57.7%)	8 (30.8%)	6 (23.1%)	-	-

n = number of respondents in the study area

3.3.2. Feeding Frequency

The frequency of feeding and the supplementary feed type of chickens kept in urban, peri-urban, and rural areas are presented in Figure 5. The majority of respondents in urban areas were fed their chickens three (50%) and two times (50%) in kebele 1 and kebele 2, respectively. The result obtained was in line with [24] who reported that farmers supplied feed

three times a day to their chickens depending upon the number of chickens on the farm. The percentage of feeding frequency in the present study was lower than [25] who reported that the majority (40.8%) of respondents were fed their chicken twice a day and (3.8%) of respondents were given feed to their chicken three times a day in Gantahafeshum district of Eastern Tigray.

**Figure 5.** Frequency of feeding.

3.3.3. Chicken Feeding Practice

The way of providing extra feeds to the chicken is presented in Figure 6. Respondents in all study areas were provided supplementary feeds to their chickens in different ways. In the rural area, a majority (91.50%) of respondents were fed their chickens together, whereas fewer respondents in rural areas were fed their chickens with breed, sex, and age categories. This was due to the chickens reared in the rural area being characterized by scavenging. The current result was similar to the finding of [26] reported that 97.2% of the households provided grain supplementary feeds for different

chicken age groups together, while 2.8% of them provided feeds for different chicken age categories separately in Goma Woreda Jimma Zone. Chickens in urban areas were offered supplemented feed with chicken breed (42.20%) categories. This indicates that most chicken keepers in urban areas usually offer supplementary feeds to their chickens according to chicken age, breed categories, and production levels. This study was similar to [27], who stated that about 32.6% of households in the Andracha district, Sheka Zone, provided supplementary feed separately for different age categories of chicken.

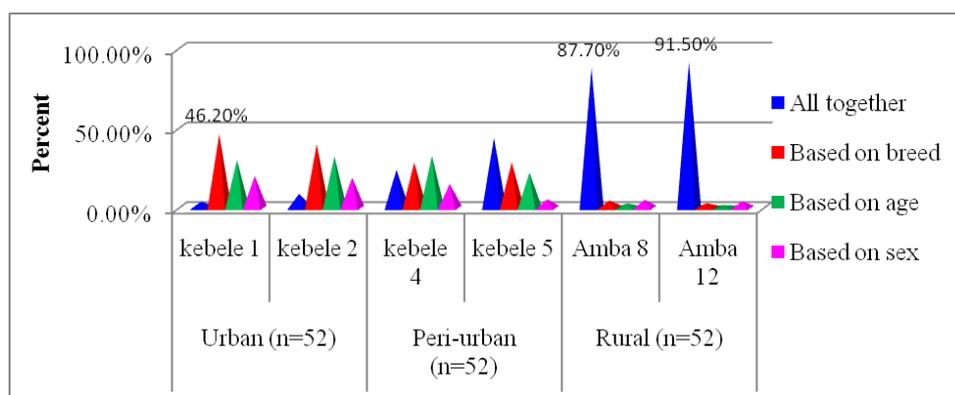


Figure 6. Ways of feeding.

3.3.4. Types of Supplementary Feeds

Feed sources and the feeding management of the chicken in the study area are presented in Table 6. The majority (46.2%) of respondents in urban and (69.2%) respondents in rural areas offered prepared ration and grains, respectively, for chicken due to its contribution to egg and meat production. The current result was agreed with [28] who indicated that (36%) of respondents in traditional production system were

supplement grains (maize, sorghum and wheat), industrial by-products (18%) and prepared ration (11%) for their chickens. Other studies revealed by [20], who noted that home produced grains were the major (65.1%) kinds of feeds stuffs supplemented by farmers. Generally, the main feed supplement of chickens in the rural area was found to be grains (maize and sorghum) and household waste, whereas prepared ration was the main feed supplement in the urban area.

Table 6. Type of supplementary feeds.

Supplementary feeds	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Grains	2 (7.7%)	2 (7.7%)	9 (34.6%)	12 (46.2%)	17 (65.4%)	18(69.2%)
Industrial by products	11 (42.3%)	10 (38.5%)	8 (30.8%)	3 (11.5%)	2 (7.7%)	2 (7.7%)
Prepared ration	12 (46.2%)	14 (53.9%)	6 (23.2%)	2 (7.7%)	1(3.8%)	1(3.8%)
Left over feed	1(3.8%)	-	3 (11.5%)	9 (34.6%)	6 (23.2%)	5 (19.3%)

n= number of respondents in the study area

3.3.5. Water Source

All respondents in the current result were provided water for their chicken, as shown in Table 7 below. the same reports were identified from the scholars [20], the noted that about 84.4% of the respondent in the study area provided water for their chickens. About 53.9% of respondents in urban and 69.2% of respondents in rural areas were using Tap/Pipe water and pond water, respectively. According to [29], the

offering of pipe water was preferred, but if bore or surface water from a dam or river was used, then the quality of water must be tested and allowed for use in New South Wales. Regarding the frequency of water, 50% of respondents in urban areas provided water three times a day, whereas in rural areas, 46.2% of respondents provided water two times a day. The current result was comparable with [30], who reported chicken owners in Ada'a and the Lume district of east Shewa chicken have free access to water.

Table 7. Frequency and water source in the study area.

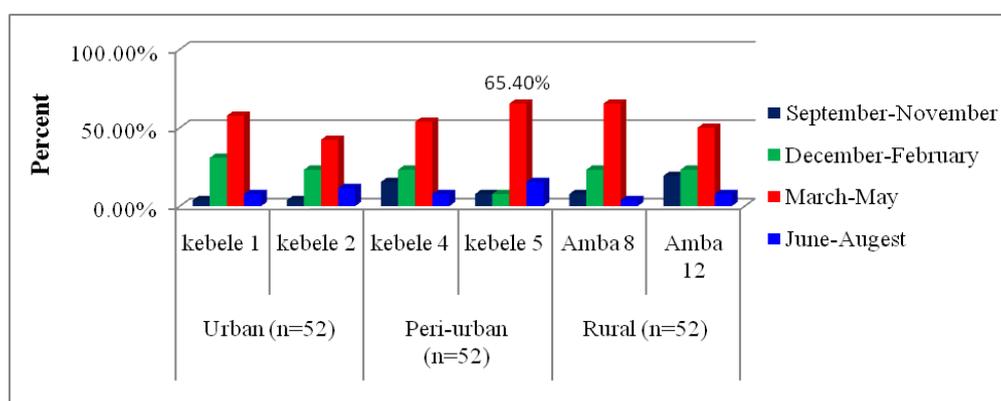
Source of water	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
River	2 (7.7%)	1(3.8%)	9 (34.6%)	12 (46.2%)	2 (7.7%)	2 (7.7%)
Pond water	1(3.8%)	10 (38.5%)	6 (23.2%)	3 (11.5%)	17 (65.4%)	18 (69.2%)
Tap/Pipe water	11 (42.3%)	14 (53.9%)	8 (30.8%)	2 (7.7%)	1(3.8%)	1(3.8%)
Borehole	12 (46.2%)	1(3.8%)	3 (11.5%)	9 (34.6%)	6 (23.2%)	5 (19.3%)
Watering Frequency						
Two times	1 (3.8%)	2 (7.7%)	8 (30.8%)	11 (42.3%)	12 (46.2%)	12 (46.2%)
Three times	13 (50%)	13 (50%)	6 (23.2%)	13 (50%)	2 (7.7%)	6 (23.2%)
Adlibitum	12 (46.2%)	11 (42.3%)	12 (46.2%)	2 (7.7%)	12 (46.2%)	8 (30.8%)

n= number of respondents in the study area

3.3.6. Water Shortage

Water shortage in the study area is presented in Figure 7 below. In all the study areas, chickens were faced with water shortage from March to May. The majority of the respondents of chickens were faced with water shortage during March-May, December-February, September-November, and June-August, respectively. In general, water shortage was

experienced from March to May in all production systems, however, the lowest shortage of water was observed from September to November in the study area. The current finding was in line with [10] who noted that there were seasonal variations in the source and practice of offering water for village chickens in Dedo District, Jimma Zone.



n= number of respondents in the study area

Figure 7. Shortage of water occurrence.

3.4. Housing of Chicken Production in the Study Area

3.4.1. Housing System

The housing of chicken production in the study area was presented in Table 8 below. Most 96.2% of the respondents in

all study areas (urban, peri-urban, and rural) provide separate houses for their chickens. In urban and peri-urban areas, about 3.8% of the respondents provided a separate house for chickens. All 100% of respondents in the urban area provided entirely chicken houses only, whereas 88.5% of respondents in the rural area kept their chickens in a night shelter only. The results of the discussions made with key informants indicated that some of the chicken producers in the study area were not

aware of the importance of separate chicken house construction from the point of productivity and biosecurity. This indicates that chicken producers needed awareness of the importance of housing and needed to educate farmers to build proper houses for their chickens. This result was similar to [30], who reported that 91.11% of Ada'a and 95.6% of Lume

districts' backyard chicken owners provided separate houses for their chickens. Similarly, this result was also in agreement with [31], who reported that the majority of village chicken producers use separate shelters for chicken production in Benshangul-Gumuz Region.

Table 8. Use of separate house and type of chicken house.

Parameters	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Use separate house						
Yes	25 (96.2%)	24 (92.3%)	22 (84.6%)	25 (96.2%)	24 (92.3%)	21 (80.7%)
No	1 (3.8%)	2 (7.7%)	4 (15.4%)	1 (3.8%)	2 (7.7%)	5 (19.3%)
Type of house						
Night shelter	-	2 (7.7%)	3 (11.5%)	6 (23.2%)	24 (92.3%)	23 (88.5%)
Chicken house	26 (100%)	24 (92.3%)	23 (88.5%)	20 (76.8%)	2 (7.7%)	3 (11.5%)

n= number of respondents in the study area

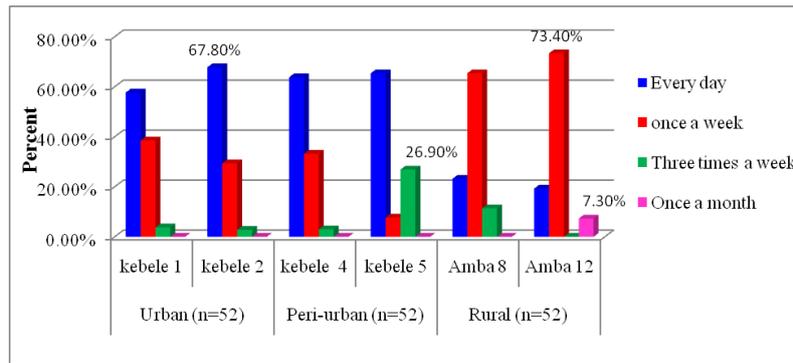


Figure 8. Rural area chicken housing (a) and urban area chicken housing (b).

3.4.2. House Cleaning Frequency

Almost all interviewed respondents in the study area cleaned their chicken house in the study area as shown in Figure 8 below. In urban areas, most of the respondents clean their chicken house every day, and in rural areas, the respondents clean their chicken house once a week. More than 67.80% of the respondents cleaned their chicken house every day in kebele 2 compared to kebele 1. The results of this study agreed with the study of [32], who reported that the household cleaned their chicken house twice a week, once a

week, three times per week, four times per week and once a day, respectively in North Wollo zone of Amhara regional state. In a rural area at Amba, 12 7.30% of the respondents cleaned the chicken house once a month. This result was supported by the scholar [33], who noted that 0.3% of respondents' chicken houses are cleaned once per month in the Western Zone of Tigray. This large gap in cleaning practices or lack of frequent cleaning of the chicken house can cause disease, parasite infestation and increase mortality rates of chickens in rural areas.



n= number of respondents in the study area

Figure 9. Frequency of cleaning the chicken house.

3.5. Common Diseases of Chicken

The common diseases of chicken in urban, peri-urban, and rural areas were presented in Figure 10 below. Chicken disease problem was the major problem of village chicken production. The most common disease outbreak in the urban area was reported to be coccidiosis (57.80%), whereas Newcastle disease (63.40%) was the dominant outbreak disease in a rural area of the study area at Amba 12. Chicken disease was widely distributed in Ethiopia, and Newcastle disease (ND) was the most important cause of economic loss in chicken production in the country. This was further confirmed by the

veterinary experts, all of whom indicated that Newcastle disease was one of the major limitations to chicken production. The same reports were presented by [23, 34] noted that Newcastle disease occurs seasonally and is the major chicken-killing disease in Ethiopia. External parasites were the ones that occurred and affected the chicken when the chicken was not clean, as indicated in Figure 11. The fewest respondents in urban chicken production reported that no chickens were infested with external parasites. Whereas the highest respondents reported lice and fleas were the most common parasites observed in the rural area compared to the peri-urban area.

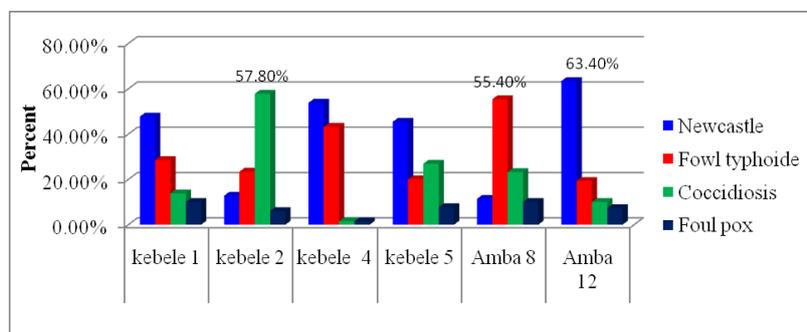
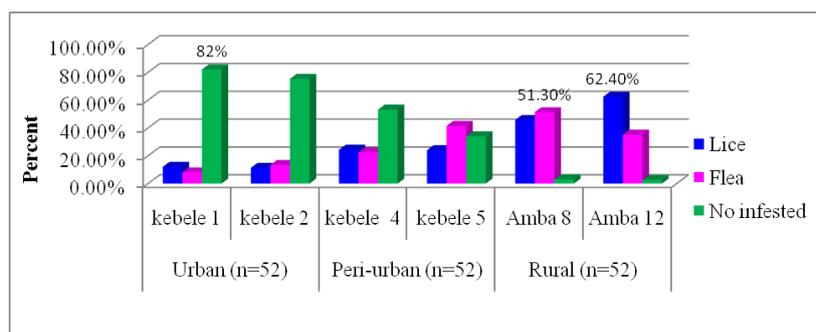


Figure 10. Common disease of chicken in the study area.



n= number of respondents in the study area

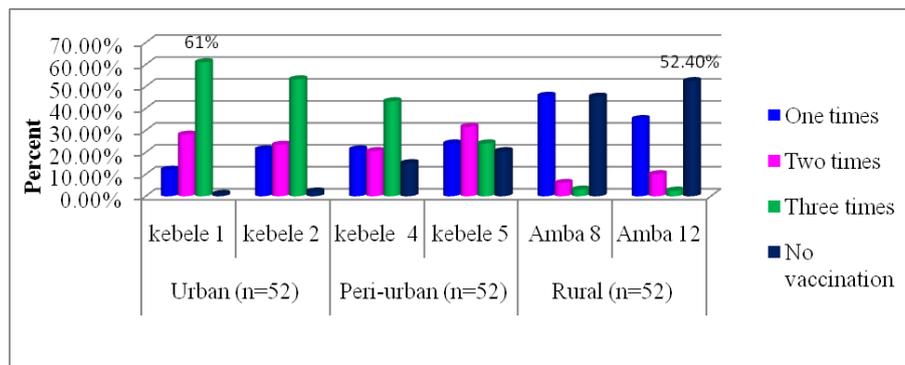
Figure 11. External parasites of chicken in the study area.

3.5.1. Vaccination Time for the Chicken

The respondents vaccinated their chickens in the urban compared to the rural areas as shown in Figure 12 below. This was due to the reason farmers in the rural areas did not have awareness of the vaccination and no access to clinical services. According to the information obtained from the Key informant interview, vaccine delivery time and routes used to provide vaccines for the diseases called Gumboro, Newcastle, fowl pox, and Fowl typhoid were 14 days with water, 21 days with water, 28 days into a wing, 42 days into the neck respectively in all urban, peri-urban, and rural area. In the current study, 61% of respondents in urban chicken production vaccinate their chicken three times. The same results were reported by the previous scholars who researched vaccination schedules to prevent chicken from disease. Based on the current profound results, [35] reported that among all respondents, 24% vaccinated their birds, whereas 76% did not vaccinate chicken for common diseases in Bahir Dar Zuria District, Ethiopia. According to [36], the majority of the producers 46.9% vaccinate their chicks more than four times on small-scale commercial poultry farms in and around Debre Markos, Amhara Region.

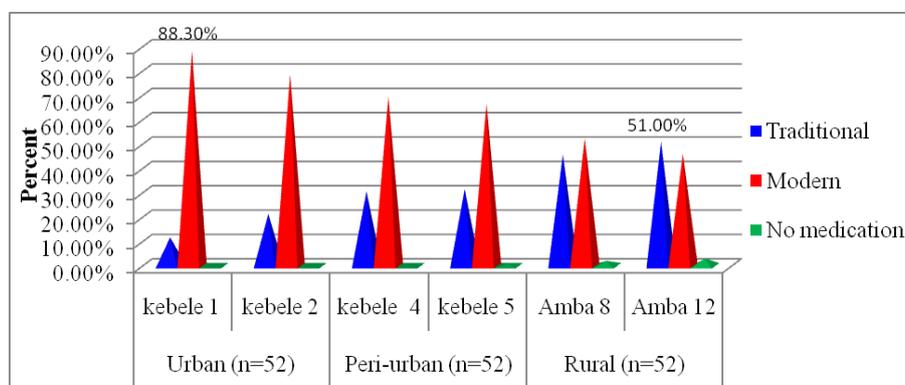
3.5.2. Disease Treatment and Control Methods

The majority of respondents in urban and peri-urban areas were medicating their chickens with modern medication systems, whereas in rural areas, the majority of the respondents were medicating their chickens with traditional methods. However, in the rural area, most of the respondents medicated their chicken with traditional treatment, as shown in Figure 13 below. The same result was reported by [23, 34] stated that when chickens become sick, farmers usually treat sick chickens using traditional methods. According to information generated from FGD, traditional medicines were provided to the chickens by adding them to the feed and water (Table 9). The same reports were presented by 27.2%, 30.6% and 42.2% of the respondents used traditional, pharmaceutical and both traditional and pharmaceutical medicaments, respectively. This provision of traditional medicine was not supported by veterinarians due to farmers not having information about the amount, doss and treatment methods. The result stated by [37] noted that traditional medicaments are not effective in treating Newcastle disease; vaccination was the only means to control Newcastle disease.



n= number of respondents in the study area

Figure 12. Vaccination times of chicken per year.



n= number of respondents in the study area

Figure 13. Chicken medication methods in the study area.

Table 9. Traditional medicines used by farmers in the study area.

Traditional drugs	Scientific name	Prevented disease	Preparation method
Lomi	<i>Citrus aurantifolia</i>	Coccidiosis diseases	Squeezing, collecting juice, and rearing with water
Nech shinkurt +tena-adam	<i>Allium sativum</i> + <i>Ruta chalepensis</i>	Fowl typhoid diseases	Crushing and giving by mixing with <i>injera</i> ”
Shiferaw leaf	<i>Moringa oleifera</i>	Newcastle diseases	Cut and give by throwing them to the ground
“Girawa +“tena-adam”+”lomi”	<i>Verinonia amygdalin del</i> + <i>Allium sativum</i> + <i>Citrus ourantifolia</i>	Prevention diseases	Crushing together and mixing with water

Source, own survey (2024)

3.6. Chicken And Egg Marketing System

3.6.1. Demand and Supply of Chicken and Eggs

All respondents witnessed in fluctuation of demand and supply of chicken and eggs in the study area (Table 10). The demand and supply of chicken and egg in the religious festival time was higher in all the study areas due to the reason people celebrated their ceremony by consuming meat and egg. These results reflected the fact that respondents were preferred to sell and buy at higher prices, as the price of eggs and chicken is highly related to holidays, similar to the reports of previous

scholars [38, 39]. The price of chicken and egg in the current study was highly related to religious festivals (Table 11). The price of chicken and eggs increases during the high sale periods like Easter (‘Fasika’) and Christmas (‘Gena’), Ed-Al-Adha, and the like. The current results of the chicken and egg show the highest prices in the urban area compared to rural areas during the festival periods. The current study was supported by [9, 40] reported that the price of cock, hen, growers and eggs at fasting time was reduced and their price becomes increase during festival times in Debsan Tikara Kebele at Gonder Zuria district.

Table 10. Demand and supply of both chicken and egg in the study area.

Demand and supply of chicken	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
During a religious festival	88.30%	67.70%	50.00%	46.50%	35.70%	30.50%
During fastening time	2.00%	11.00%	5%	10.70%	11.50%	19.50%
During winter	5.70%	5%	12.40%	11.50%	10.50%	20.50%
During summer	6%	16.30%	32.60%	31.30%	42.30%	29.50%
Demand and supply of eggs						
During a religious festival	78.30%	16.30%	53.00%	56.80%	45.70%	40.50%
During fastening time	5.70%	9.00%	4%	10.70%	5.50%	16.50%
During winter	2%	7%	12.40%	11.20%	16.50%	17.50%
During summer	16%	67.70%	30.60%	21.30%	32.30%	25.50%

n= number of respondents in the study area

Table 11. Average price of different categories of chicken in the study area.

Average price of chicken and egg in fasting days in birr (Mean±SD)

	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Cocks	330±8.6	360±7.6	420 ±3.9	320±2.6	310.20 ±4.9	296.40 ±8.9
Hens	290.12±7.6	265.12±5.6	320.67±1.3	235.2±4.6	230.7±9.3	240.3±7.3
Cockerels	260±4.8	160±2.8	310.14±6.16	170±2.9	250.4±3.6	235.6±3.8
Pullets	185.5±2.3	162.5±2.6	270.12±7.6	142.5±3.6	230.2±7.6	170.2±5.6
Egg	10.01±1.5	11.01±1.7	12.00±2.4	9.01±1.8	7.00±1.4	6.00±2.4

Average price of chicken and egg on festival days in birr (Mean±SD)

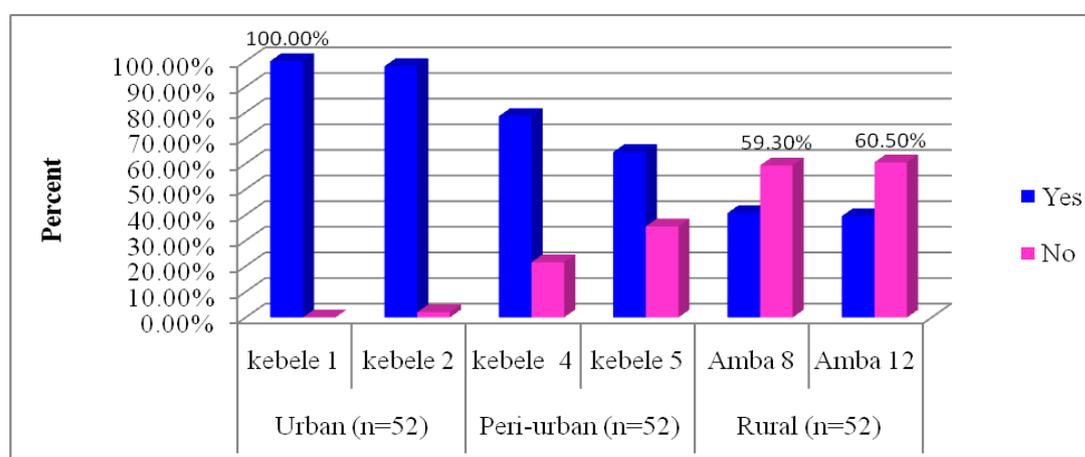
	Urban (n=52)		Peri-urban (n=52)		Rural (n=52)	
	kebele 1	kebele 2	kebele 4	kebele 5	Amba 8	Amba 12
Cocks	390.12±7.6	420.6±4.6	350.3 ±4.9	320.67±1.3	330.7±9.3	310.4±7.6
Hens	330±8.7	365.2±2.6	340.7±3.3	170±2.9	230.7±9.3	235.2±4.6
Cockerels	285.5±2.6	220.3±3.8	311.1±2.6	290.4±3.6	230.4±2.8	215.6±3.8
Pullets	250±4.8	282.5±5.6	230.2±3.6	260.2±7.6	170.7±2.9	210.2±7.6
Egg	12.12±2.6	13.01±1.8	11.2±1.4	11.01±1.7	6.3±1.4	7±1.4

n= number of respondents in the study area, SD: Standard Deviation

3.6.2. Marketing Information

Efficient marketing information is one of the major components to increase village chicken production to the rural household economy. The current results were supported by [41], who showed that an efficient marketing system is one of the most important components to increase village chicken production in the rural household economy. In the current study 100% respondents in urban areas had information about

the marketing system of chicken and egg, and a majority 60.5% of respondents in the rural area had no information about the price of chicken and egg (Figure 14). This was due to some respondents going to urban areas to sell and buy chicken, and at that time, they had some information about the marketing system. The same results were reported by [12], who noted that majority of respondents revealed that they had market problems related to the chickens and chickens product marketing in rural area.



n= number of respondents in the study area

Figure 14. Information about the marketing of chicken and egg in the study area.

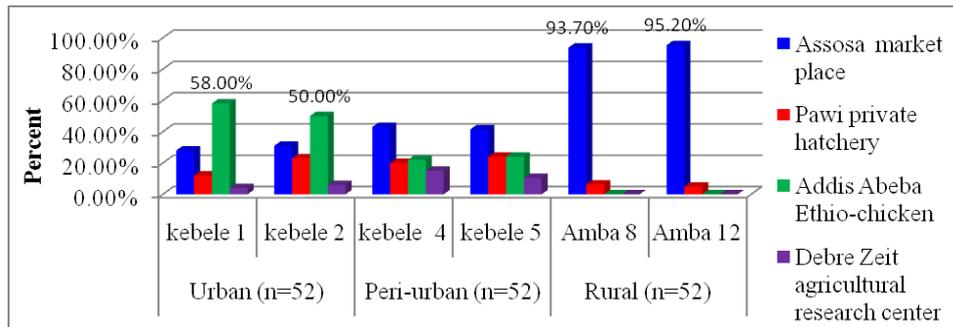
3.6.3. Chicken Marketing Place

Places for buying chicken production in the study area are presented in Figure 15. The 58% of respondents in urban chicken producers bought from Ethio-chicken, whereas 95.2% and 93.7% of the respondents bought their chicken from the local market (Assosa market place) in rural area at Amba 12 and Amba 8, respectively. The current results were similar to the findings of [18], who indicated that 99.6% of interviewed village chicken owners were involved in live chicken marketing of birds taking place in various places, including urban

markets, local markets and around the villages.

3.6.4. Marketing Channels

FGDs respond about the live chicken and egg marketing channels, which were directly sold to the marketing actors (producer, consumer, middlemen, trader, and processor). Details of the most important routes (channels) involved in the transfer of different age and sex categories of live chicken and their eggs in the study area were indicated in Figure 16.



n= number of respondents in the study area

Figure 15. Places of buying and selling chicken in the study area.

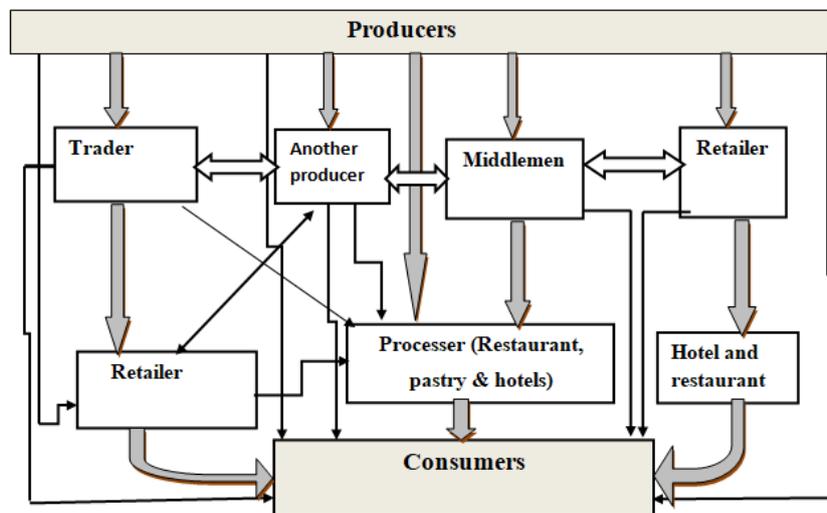


Figure 16. Marketing chain of chicken and eggs.

3.7. Challenges of Chicken Production

Challenges of chicken production in the study area were ranked to indicate chicken production problems in the order of their severity in Table 12 below. The first constraint respondents mentioned in urban chicken producers was high feed cost, whereas the second rank was the problems of quality of chicken feed. Therefore, chicken producers in urban area were acknowledged to use local available feeds like that of chicken producers in rural area. [42], stated findings simi-



Figure 17. Focus group discussion with selected chicken producers.

lar to those of the present study, who noted that disease, predation, market problems, and lack of water and extension services were the main challenges of chicken production in the North Gondar zone of the Amhara region. In contrast to the present study, the author [12] showed that disease and

predators were the major and economically important constraints for the existing chicken production system in the Gamo zone, Southern Nation Nationality and Peoples of Ethiopia.

Table 12. The main constraints of exotic chicken production system.

Constraints	Urban area (n=52)		Peri-urban area (n=52)		Rural area (n=52)	
	Index	Rank	Index	Rank	Index	Rank
High feed cost	0.31	1	0.21	2	0.02	8
Feed quality	0.23	2	0.07	5	0.09	4
Diseases	0.02	8	0.33	1	0.24	3
Predator	0.01	9	0.2	3	0.25	1
Land	0.03	7	0.08	4	0.05	6
Capital	0.06	5	0.04	6	0.06	5
Housing	0.09	4	0.041	7	0.01	9
Water	0.05	6	0.01	9	0.03	7
Veterinary service	0.2	3	0.02	8	0.25	2

n= number of respondents in the study area

4. Conclusion and Recommendations

Chickens are the first important animals kept in all study areas. The main purposes of keeping chickens in urban and peri-urban areas were for income generation whereas; home consumption in rural areas. Respondents in urban area reared their chickens intensively, whereas; extensively in rural area. The most important feed resources of chicken kept in the study area were feed obtained from scavenging, household wastes, market leftovers, and industrial by-products. Industrial by-products were a major 65.4% feed source practiced in urban area, whereas scavenging 65.4% in rural area. The chicken housing system in urban areas was characterized into an intensive (totally confined) system whereas; in rural area an extensive (kept outdoors and confined) housing system was practiced. All 100% respondents in urban area provided an entirely chicken house whereas; 88.5% of respondents in rural area kept their chickens in a night shelter. Newcastle disease, fowl typhoid, fowl pox and coccidiosis were identified as major diseases in the study area. The most common disease outbreak in urban area was reported to be coccidiosis (57.80%) whereas; Newcastle disease (63.40%) was the dominant outbreak disease in the rural area. All respondents (100%) in urban areas had information about marketing system of chicken and egg whereas; a majority (60.5%) of re-

spondents in rural area had no marketing information. From the identified chicken production constraints, feed problems were the first challenge of chicken production in the study area. Particularly in husbandry practices like supplementary feeding, health care and housing practices, was very low in a rural area. Therefore, area-based development should be implemented to increase the productivity of local chicken. Most of the chicken and egg marketing activity was not information-based, training on chicken husbandry and marketing practices to households would be essential for chicken production and marketing.

Abbreviations

BGRS	Benishangul Gumuz Regional State
CSA	Central Statistical Agency
FGD	Focus Group Discussion
ND	Newcastle Disease
SPSS	Statistical Package for Social Science

Author Contributions

Tenaw Temesgen: Conceptualization, Formal Analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing

Bernabas Ayeneshet: Conceptualization, Methodology,

Writing – review & editing

Acknowledgments

The authors would like to thank the respondents and Animal science experts who worked with us at the study sites for their cooperation during data collection.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Central statistical agency (CSA), “Federal Democratic Republic of Ethiopia Central Statistical Agency Agricultural Sample Survey 2020 / 21 [2013 E. C.] report on livestock and livestock characteristics,” vol. II, no. February, 2021.
- [2] M. Matawork, “Productive and reproductive performance of indigenous chickens in Ethiopia,” *Int. J. Livest. Prod.*, vol. 9, no. October, pp. 253-259, 2018, <https://doi.org/10.5897/IJLP2018.0451>
- [3] D. Alemu, T. Degefe, S. Ferede, S. Nzietcheung, and D. Roy, *Overview and background paper on Ethiopia’s poultry sector: Relevance for HPAI research in Ethiopia*. International Food Policy Research Institute (IFPRI), 2009.
- [4] B. Tolasa, “Current status of indigenous and highly productive chicken breeds in Ethiopia,” *Adv. Agric.*, vol. 2021, 2021.
- [5] N. Dana, A. Yami, T. Dessie, and S. W. Hana, “On-Station and On-Farm Evaluation of the ‘Hay-Box Chick Brooder’ Using Different Insulation Materials at the Debre Zeit Agricultural Research Center and Denbi Village, Adaa Wereda,” *Challenges Oppor. Livest. Mark. Ethiop.*, vol. 211, 2003.
- [6] A. Tola, M. Belissa, and G. Kebede, “Survey on traditional livestock production systems in Manasibu District of West Wallaga, Ethiopia,” in *Proceedings of the 11 th annual conference of the Ethiopian Society of Animal Production (ESAP)*. Addis Ababa, Ethiopia, 2003, pp. 141-150.
- [7] F. C. Muchadeyi, H. Eding, H. Simianer, C. B. A. Wollny, E. Groeneveld, and S. Weigend, “Mitochondrial DNA D - loop sequences suggest a Southeast Asian and Indian origin of Zimbabwean village chickens,” *Anim. Genet.*, vol. 39, no. 6, pp. 615-622, 2008.
- [8] A. Mohammed, “Major constraints and health management of village poultry production in Ethiopia: review school of veterinary medicine, Jimma University, Jimma, Ethiopia,” *J. Res. Stud. Microbiol. Biotechnol.*, vol. 4, no. 1, pp. 1-10, 2018.
- [9] K. Yosefe *et al.*, “Poultry Production, Management and Marketing System at Selected Districts of Kafa and Benchmaji Zone, South West Ethiopia,” *J. Biol. Agric. Healthc.*, vol. 6, no. 11, pp. 2224-3208, 2016.
- [10] M. Assefa, B. Amanuel, and T. Tekalign, “Characterization of Village Chicken Production and Husbandry Practices in Dedo District, Jimma Zone, South West Ethiopia,” *Int. J. Vet. Sci. Agric. Res.*, vol. 1, no. 1, pp. 13-24, 2019.
- [11] T. Yemane, “Tara Yamane (1967), Taro Yamane Method For Sample Size Calculation. The Survey Causes Of Mathematics Anxiety Among Secondary School Students In Minna Metropolis,” *Math. Assoc. Niger.*, p. 188, 1967.
- [12] M. Manjura, “Assessment of chicken husbandry practices in selected districts of Gamo zone,” *Int. J. Sci. Res. Arch.*, vol. 08, no. 02, pp. 429-444, 2023, <https://doi.org/10.30574/ijrsra.2023.8.2.0117>
- [13] N. Yemane, B. Tamir, and A. Mengistu, “Constraints, opportunities and socio-economic factors affecting flock size holding in small scale intensive urban poultry production in Addis Ababa,” *Agric. Biol. J. NORTH Am.*, pp. 146-152, 2016, <https://doi.org/10.5251/abjna.2016.7.3.146.152>
- [14] Z. Goraga, L. Caron, C. Wilbert, and G. A. Brockmann, “Characterization of village chicken production systems and challenges across agro-climatic zones in Ethiopia,” *Int. J. Livest. Prod.*, vol. 7, no. November, pp. 94-105, 2016, <https://doi.org/10.5897/IJLP2016.0320>
- [15] G. Melese and B. Melkamu, “Assessment of chicken production under farmers management condition in East Gojam Zone, Amhara Regional State, Ethiopia,” *Greener J. Anim. Breed. Genet.*, vol. 1, no. 1, pp. 1-10, 2014.
- [16] A. K. Aromolaran, I. O. Ademiluyi, and O. J. Itebu, “Challenges of small poultry farms in layer production in Ibadan, Oyo State, Nigeria,” *Glob. J. Sci. Front. Res. Agric. Vet. Sci.*, vol. 13, no. 2, pp. 5-12, 2013.
- [17] Z. Wondatir, “Livestock production systems in relation with feed availability in the highlands and central rift valley of Ethiopia,” *Haramaya, Ethiop. Haramaya Univ.*, 2010.
- [18] A. M. and T. D. Fisseha Moges, “Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district,” *African J. Agric. Res.*, vol. 5, no. 13, pp. 1739-1748, 2010.
- [19] S. Nzietchueng, “Characterization of poultry production systems and potential pathways for the introduction of highly pathogenic avian influenza in Ethiopia. Draft Report,” *Int. Livest. Res. Inst.*, 2008.
- [20] S. Salo, G. Tadesse, and D. Hilemeskel, “Village chicken production system and constraints in Lemo District, Hadiya Zone, Ethiopia,” *Poultry, Fish Wildl. Sci.*, vol. 4, p. 158, 2016.
- [21] A. Ahmedin, “Study of Production Practices, Fertility, Hatchability and Egg Quality of Rural Chicken in Gorogutu District, Eastern Hararghe, Ethiopia,” *Thesis. School of Graduate Studies (School of Animal and Range Sciences)*. Haramaya University Ethiopia, p. 85, 2014.
- [22] T. G. and H. D. Salo S, “Poultry, Fisheries & Wildlife Sciences Village Chicken Production System and Constraints in Lemo District, Hadiya,” *Poult Fish Wildl Sc*, vol. 4, no. 2, pp. 2-6, 2016, <https://doi.org/10.4172/2375-446X.1000158>

- [23] S. L. Samson Leta and E. B. Endalew Bekana, "Survey on village based chicken production and utilization system in mid rift valley of Oromia, Ethiopia.," *Glob. Vet.*, vol. 5, no. 4, pp. 198-203, 2010.
- [24] S. Rahman, "Management of broiler farms in Aizawl District of Mizoram, India," *Livest. Res. Rural Dev.*, vol. 27, no. 4, 2015.
- [25] L. G. Slassie, A. M. Aberra Melesse, S. B. Sandip Banerjee, and G. B. Gebremedhn Beyene, "Characterization of village chicken production system under traditional management in Gantaafeshum district of Eastern Tigray, Ethiopia.," 2015.
- [26] M. Molla, "Characterization of village chicken production and marketing system in Gomma Wereda, Jimma Zone, Ethiopia." Jimma University, 2010.
- [27] H. Assefa, A. Melesse, and M. Taye, "Characterization of indigenous chicken production systems in Sheka zone, south western Ethiopia," *Int. J. Res. Agric. Food Sci.*, vol. 2, no. 2, pp. 1-16, 2019.
- [28] A. Abegaz and T. Gemechu, "Indigenous chicken production system and their productive performance in Yeki Woreda, Southwestern Ethiopia," *Agric. Biol. J. North. Am.*, vol. 7, no. 5, pp. 266-274, 2016.
- [29] C. Stephen, "Best Practice Management for Meat Chicken Production in New South Wales-Manual 2 (Meat Chicken Growing Management)," *NSW Dep. Prim. Ind.*, vol. 6, pp. 4-20, 2012.
- [30] D. Tadesse, H. Singh, A. Mengistu, W. Esatu, and T. Dessie, "Study on productive performances and egg quality traits of exotic chickens under village production system in East Shewa, Ethiopia," *African J. Agric. Res.*, vol. 8, no. 13, pp. 1123-1128, 2013, <https://doi.org/10.5897/AJAR2013.6987>
- [31] F. Dolberg, "Poultry production for livelihood improvement and poverty alleviation," *Poult. 21st Century; FAO Rome, Italy*, p. 26, 2007.
- [32] H. Addisu, M. Hailu, and W. Zewdu, "Indigenous chicken production system and breeding practice in North Wollo, Amhara Region, Ethiopia," *Poultry, Fish. Wildl. Sci.*, vol. 1, no. 2, pp. 1-9, 2013.
- [33] S. Markos, B. Belay, and T. Dessie, "Phenotypic characterization of local chicken ecotypes in Western zone of Tigray, Northern Ethiopia, MSc Thesis, Jimma University, Ethiopia." MSc Thesis, Jimma University, Ethiopia, 2014.
- [34] M. Selam and B. Kelay, "Causes of village chicken mortality and interventions by farmers in Ada ' a District, Ethiopia," *Int. J. Livest. Prod.*, vol. 4, no. 6, pp. 88-94, 2013, <https://doi.org/10.5897/IJLP12.021>
- [35] B. A. Bereket Addis, D. T. Desalew Tadesse, and S. M. Shigdaf Mekuriaw, "Study on major causes of chicken mortality and associated risk factors in Bahir Dar Zuria District, Ethiopia.," *Afr. J. Agric. Res.*, vol. 9, no. 48, pp. 3465-3472, 2014.
- [36] M. B. Yitbarek, B. T. Mersso, and A. M. Wosen, "Disease management and biosecurity measures of small-scale commercial poultry farms in and around Debre Markos, Amhara Region, Ethiopia," *J. Vet. Med. Anim. Heal.*, vol. 8, no. 10, pp. 136-144, 2016.
- [37] Z. Huang, S. Elankumaran, A. S. Yunus, and S. K. Samal, "A Recombinant Newcastle Disease Virus (NDV) Expressing VP2 Protein of Infectious Bursal Disease Virus (IBDV) Protects against NDV and IBDV," *J. Virol.*, vol. 78, no. 18, pp. 10054-10063, 2004, <https://doi.org/10.1128/JVI.78.18.10054>
- [38] H. Halima, F. W. C. Nesor, E. Van Marle-Koster, and A. De Kock, "Village-based indigenous chicken production system in north-west Ethiopia," *Trop. Anim. Health Prod.*, vol. 39, pp. 189-197, 2007.
- [39] R. T. Wilson, "Poultry production and performance in the Federal Democratic Republic of Ethiopia," *Worlds. Poult. Sci. J.*, vol. 66, no. 3, pp. 441-454, 2010.
- [40] W. A. Melkamu Bezabih, "Constraints and Opportunities of Village Chicken Production in Debsan TiKara Keble at Gonder Zuria Woreda, North Gonder, Ethiopia," *Int. J. Sci. Res. Publ.*, vol. 3, no. 9, pp. 1-8, 2013.
- [41] K. Yadeta, L. Dadi, and A. Yami, *Poultry marketing: structure, spatial variation and determinants of prices in Eastern Shoa zone, Ethiopia. Proceedings of the 10th annual conference of the Ethiopian Society of Animal Production (ESAP), Addis Ababa, Ethiopia.* 2003.
- [42] Addis Getu and Malede Birhan, "Chicken Production Systems, Performance and Associated Constraints in North Gondar Zone, Ethiopia," *J. Fish. Livest. Prod.*, vol. 2, no. 2, 2014, <https://doi.org/10.4172/2332-2608>