

Cross-Sectional Study

Study on Major Health and Constraints of Backyard and Commercial Poultry Production in Hawassa and Yirgalem Town, Southern Ethiopia

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ABSTRACT**Background**

Poultry provide nutrient-rich food and are raised with insufficient resources because they convert scavenged feed resources into animal protein.

Methodology

A cross-sectional study was conducted to assess the major health and associated constraints of backyard and commercial poultry production in Hawassa and Yirgalem Town, southern Ethiopia. A total of 150 purposefully selected households were included in the study from 15 randomly selected kebeles. Semi-structured questionnaires and observation were used to collect data.

Results

Regarding educational status, the majority of the respondents (88%) were found to be literate. Most of the respondents reared exotic types of breeds (44%). Among the households, 50% used their chicken for consumption and additional income. Assessments of the housing condition of poultry showed that 46.67% were shared with people. Most of the respondents (71.3%) provide water for their chickens from different sources. The respondents revealed that the occurrence of coccidiosis (60.7%) at the farm and household level had the most economic importance, followed by Newcastle disease (49.4%). Of the respondents, 74% didn't practice biosecurity, and it is noted that 52% of the respondents leave sick birds with healthy flocks. Similarly, the majority of the respondents (52.7%) didn't provide vaccination and only 36.7% had market access to sell poultry products. Nearly 89.3% of respondents believed that the first-ranked problem affecting poultry productivity was poultry disease. Moreover, 77.3% of the respondents revealed that at village and semi-intensive levels, the available veterinary services were inadequate and ranked as the second constraint. Besides this, lack of adequate veterinary service, lack of knowledge about modern poultry production, lack of good bio-security practices, cannibalism, thieves, predators, and lack of market access were the other constraints limiting the productivity of their chicken.

Conclusion

This study revealed the presence of management problems in backyard and commercial poultry production in the study area. Thus, training for farmers and extension staff focusing on disease control, improved housing and feeding, biosecurity, and proper record-keeping systems should be improved.

Keywords

Constraints, Hawassa, Health, Poultry, Yirgalem.

INTRODUCTION

The majority of the world's poultry population consists of mainly chickens, ducks, and turkeys, which are estimated to be around 23.39 billion. Poultry provide nutrient-rich food (animal protein), and they can also be raised with insufficient resources because they convert scavenged feed resources into animal protein.¹

In Africa, until recently, a local backyard system and a commercial production system that used hybrid birds from multinational breeding corporations, professional housing, feeding, and veterinary control systems dominated the poultry industry.² East Africans consume much less poultry than the African and worldwide averages. This is relatively understandable given that poultry products are more expensive overall. It's vital to remember that eating poultry meat is frequently reserved for rare occasions or gatherings, making it a luxurious food for most people.³

Based on a few key factors such as breed, flock size, housing, nutrition, health, technology, and biosecurity, the poultry industry in Ethiopia can be divided into three main production systems. Small-scale commercial poultry production systems, village or backyard poultry production systems, and large-scale commercial poultry production systems.⁴ The traditional poultry production system comprises indigenous dwellings together with human beings. Scavenging is nearly the only source of food for the chickens, which are not intentionally fed.⁵ Furthermore, diseases, low veterinary service input, inadequate housing, inadequate biosecurity, predators, and the cost and quality of feed are just a few of the factors that have been identified as restricting the success and profitability of both backyard and semi-intensive production.⁶ At the national level in the country, only 1% of the exotic breed is maintained under an intensive management system.⁷ Commercial poultry farmers' capabilities vary depending on their location, technological expertise, and available resources for beginning intensive poultry production.⁸

Feed supplementation has been reported in both backyard and commercial productions in various countries as a common practice to promote chicken performance, especially in commercial production systems where feeds are available in modern formulation forms and management and housing conditions are standardized.⁹ The majority of commercial poultry farms' feed, or 57%, comes from outside sources, although 43% of them have their own feed mill, and the remaining 17% comes from both purchased and ready-made feed.¹⁰

Despite their poor productivity, backyard chickens are recognized to have desirable traits like high dressing percentages, good egg and meat flavors, disease resistance, and thermal tolerance compared to exotic birds.⁷ The consensus is that the backyard poultry production system's health status is very poor and dangerous because scavenging birds coexist with people and other livestock species. In contrast, intensive poultry production has better health management and disease control because of the housing, feeding, and isolation of sick birds' management implemented.¹¹

The two most important inputs for improving chicken

output and productivity in Ethiopia are a good extension approach and tailored-based training. To bring improvements to the system, these activities must be given by professionals, and continuous assessment and improvement have to be in place. The training should include issues related to breed and productive chicken selection, housing, nutrition, management, disease control, and bio-security for a village production system.⁸

Disease, predator attacks, inadequate disease prevention and control, a lack of management skills, the inability to provide feed, water, or housing, and inadequate marketing information were all cited as constraints.¹ Predators are additional sources of loss, but among infectious diseases, Newcastle disease, salmonellosis, coccidiosis, and fowl pox are thought to be the most significant killers of commercial and backyard chickens.¹²

In the study area, challenges of disease, poor housing conditions, shortage of feed, poor biosecurity practices, inadequate veterinary service, lack of updated poultry management, thieves, predators, cannibalism, a poor market to sell poultry products, a wide range of area to extend flock size, and losing other poultry input were observed. Therefore, the current study was conducted to rank the major constraints according to their importance toward poultry production and evaluate the characteristics of the performance of chickens, management practices, and production systems in Hawassa and Yirgalem City, southern Ethiopia.

MATERIALS AND METHODS

Study Area

The study was carried out in Yirgalem and Hawassa cities in the Sidama Region of southern Ethiopia (Figure 1). Yirgalem is situated at a latitude and longitude of 6°45' and an elevation of 1776 meters, while Hawassa is situated at a latitude and longitude of 07°02' 22 N and 38°29' 16 E. Hawassa is located 275 km south of Addis Ababa in the Ethiopian Great Rift Valley, and Yirgalem is 310 km south of Addis Ababa. The average monthly minimum and maximum temperatures of Hawassa and Yirgalem were 10.5 °C, 27.5 °C, and 10 °C and 30 °C, respectively. Correspondingly, the mean annual rainfall is 951 mm and 1216 mm, respectively. The wet season begins in April and lasts until the end of September, whereas the dry season lasts from October to March. According to the report of Milkias,¹³ the zones of Sidama, Hadiya, and Gurage combined account for around 43.6% of the entire regional indigenous chicken population of Southern Nations Nationalities and People's Region (SNNPR) and the urban area makes up about 2.1% of that number.¹⁴

Study Population

The study populations were indigenous, exogenous, and crossbreds of poultry farms owned by the Adarre poultry farm enterprise, Suprova Agro Industry poultry farm, different privatized poultry farms, and smallholders and local farmers in Hawassa and Yirgalem towns. The poultry management system ranged from extensive backyards to intensive, deep litter and cage systems. The intensive and semi-intensive farms use cage systems, deep litter systems, and half litter systems, respectively. Conversely, in the extensive

backyard rearing system, chickens are kept mostly on the ground, unlike in the traditional slated system. The age of the chickens is classified as day old, young, and adult laying stage. Information about flock size, breeding practices, management system, source of poultry, purpose of the chicken production, housing condition, use of litter material, disinfectant, feeding, and watering practices, health management and disease, extension and animal health service, poultry production, marketing system, and other constraints of poultry production in addition to disease was recorded.

Study Design and Sampling Procedure

A questionnaire-based cross-sectional type of study was carried out from January 2022 to July 2022. The fifteen kebeles were selected by the purposive sampling method. A total of 150 households were selected. During the study period only, those farmers who owned chickens and were willing to participate in this study were considered.

Data Collections

In the present investigation, both qualitative and quantitative data were considered. Qualitative data included household, training during production, type of breed of chicken present, purpose of chicken production, flock structure, and production constraints of the chickens. Whereas, quantitative data included flock size and the performance of chickens.

Questionnaire: Performance data like households, level of education of the owner, flock characteristics, the purpose of chicken production, housing condition, breeding practice, feeding and watering practice, health management and disease, extension, and animal health services, poultry production and marketing, and major constraints facing poultry production of respondents were documented using a semi-structured questionnaire.

Data Management and Analysis

The raw data collected from the semi-structured questionnaire were entered into Excel after encoding for data management, and then a table was constructed. The proportion of respondents and the data were analyzed using Stata version 11.

RESULTS

Demographic Characteristics of the Households

Assessment of the demographic characteristics of the respondents revealed that the proportion of female respondents (64.7%) was higher than males (35.3%). Regarding the educational status, the majority of the respondents (88%) were found to be literate, out of which 20% completed primary education, 48% had secondary education, and 20% had tertiary education (diploma and above in some colleges and universities). Moreover, 30% of them have taken special training in poultry production (Table 1).

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Sex of respondent	Male	39	35.45	14	35	35.3
	Female	71	64.5	26	65	64.7
Education Status	Illiterate	13	11.8	5	12.5	12
	Elementary	21	20.1	8	20	20
	High school	52	47.2	20	50	48
	College and university	23	20.9	7	17.5	20
Training on poultry	Yes	33	30	12	30	30
	No	77	70	28	70	70

Flock Characteristics

There was a large variation in the flock size of chickens in both commercial and backyard (village) poultry production systems when they started and during the time of production. The breed type of almost all commercial-purpose chickens was exotic, such as Bovance Brown, Bovance White, TetraH, TetraSL, and Koekoek, but in the case of backyard poultry production, more chickens were local breeds. Besides local breeds, the backyard producers keep crossbreds that they brought from commercial producers and cross them with local breeds or exotic breeds purchased from the market or provided by the government of the agricultural center. For ease of description about flock size, it was grouped into those

having less than 50 flocks that cover (79%), 50-500 flocks (11%), and above 500 flocks (10%). Out of these, the lowest percentage, but the larger flock size, was covered by commercial producers, which was almost greater than 500 flocks. At the start of production, the source of the flock was either bought from the market or provided by the government from the agriculture center. However, most of the time, they prefer to buy privately from the market or hatch at home. About 73% of the respondents were provided by the government, 24% bought from the market, and only 3% hatched at home.

The age of the poultry at the time of which production began was a day old (18%), young (46%), and adult (36%). A day-

old chicken was obtained directly from the hatchery and mostly owned by commercial producers, but the young and adults were bought from the market and owned by both backyard and commercial producers.

To increase their flock size, they either hatch at home or buy from a hatchery. Most of the commercial producers bought from the source or either hatched by hatchery instead of naturally hatching at their farm. In the case of the backyard system, most of them traditionally hatch at home, but some of them were bought to increase or replace the flock. From the respondents, 55% hatch at home, and 45% buy from the market or government to replace or increase their flock size.

Most of the respondents (59%) said that there was no specific time to buy or replace the flock, but 41% of the respondents had their reason to buy and replace the flock at a specific time. Among the reasons they raised during the interview were disease occurrence, availability of feed, especially in cases of scavenging, fasting times of most of society and festivals, time of the farmer to guard the birds, times when predators are present, and the like to have a specific time to buy, replace, and hatch the flock. The purpose of the poultry production includes (50%) of rear chicken for both household consumption and additional income generation, (20%) entirely for commercial purposes, (28%) for household consumption only, and the remaining (2%) used to distribute day-old chicken to the community (Table 2).

Table 2. Flock Characteristics

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Flock size at Present	<50	88	80	31	72.5	79
	50-500	11	10	5	12.5	11
	>500	11	10	4	10	10
Breed	Local	40	36	14	35	36
	Cross	22	19	8	20	20
	Exotic	48	44	18	45	44
Source of foundation	Government/agriculture center	80	72.72	30	75	73
	Naturally hatched at home	4	3.54	1	2.5	3
	Market	26	23.74	9	22.5	24
Number of chickens at the start	1-10	63	57.27	23	57.5	57
	11-100	34	30.9	12	30	31
	>100	13	11.83	5	12.5	12
Age	Day old	19	17.3	8	20	18
	Pullet	51	46.4	18	45	46
	laying stage	40	36.3	14	35	36
How to replace/increase flock	Buy	50	45.5	18	45	45
	Hatch	60	54.5	22	55	55
Select a specific time to buy/replace	Yes	46	41.8	16	40	41
	No	64	58.2	24	60	59
Purpose of production	Household consumption only	31	28.2	11	27.5	28
	For household consumption and additional income	55	50	20	50	50
	Entirely for commercial	22	20	8	20	20
	To distribute day-old chickens	2	1.8	0	0	2

Housing Condition and Hygienic Practices of the Chicken

The poultry housing and facilities assessment is presented in Table 3. The house management system of the poultry house can be intensive, semi-intensive, or free-ranging (extensive). Accordingly, most of the respondents (60.67%) included in the survey practiced a semi-intensive system of rearing, and the remaining followed an extensive (27.33%) and intensive (12%) management system.

The majority of the backyard poultry producers indicated that at night they keep their chickens at various sheltering places in the main house, including on the floored ground, followed by perches inside the house and perches in the kitchen, which were called traditional in this study. These sites are the most secure overnight locations to avoid predators and theft. Almost all of the intensive and a few semi-intensive poultry farmers were entirely commercial producers, but the remaining semi-intensive and free-

Table 3. Housing Condition and Hygienic Practice of Chicken Flock

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Management Practice	Intensive	14	12.7	4	10	12
	Semi-intensive	67	61	24	60	60.67
	Extensive	29	26.3	12	30	27.33
Housing Condition	Shared shelter with people	51	46.3	19	47.5	46.67
	Separately constructed	33	30	12	30	30
	House shared with animals	26	23.7	9	22.5	23.33
Internal arrangement	Deep litter	11	10	8	20	12.67
	Cage	2	1.8	0	0	2
	Slated	32	29	11	27.5	26.67
	Half litter	19	17.2	6	15	16.67
	Ground	46	42	15	37.5	41.99
Litter usage in the poultry house	Yes	32	29	12	30	29.33
	No	78	71	28	70	70.67
Types of litter materials	Teff straw	8	7	3	7.5	7.33
	Dry hay	7	6.4	2	5	6
	Wood Sow dust	22	20	8	20	20
Frequency of Cleaning	Daily	68	62	24	60	61.34
	Weekly	10	9	4	10	9.33
	Monthly	21	19	8	20	19.33
	All in all out	11	10	4	10	10
Waste dealt for	Burning	12	11	4	10	10.67
	Fertilizer	20	18	8	20	18.67
	Fattening	10	9	4	10	9.33
	Throwing	68	62	24	60	61.33
Spray the poultry house with disinfectant	Yes	22	20	8	20	20
	No	88	80	32	80	80
Ventilation	Yes	16	14.5	6	15	14.67
	No	94	85.5	34	85	85.33

ranging poultry were used for both household consumption and as a source of additional income.

In the intensive system, the housing conditions were entirely separated, and they used deep litter, which is wood sawdust. The assessments of the housing condition of poultry showed that 30% separated from people and other animals, 46.67% shared with people, and the remaining 23.33% shared with other animals. The majority of separately constructed poultry houses were covered by intensive and semi-intensive management systems. Regarding the arrangement of the floor in the poultry houses, (12.67%) was covered by deep litter, (2%) cage, (26.67%) slated, (16.67%) half litter, and (41.9%) ground. The types of litter materials used, especially in intensive and semi-intensive, were wood sawdust (15.33%), teff straw (7.33%), and dry hay (6%).

Most of the respondents from the backyard rearing system and some of the semi-intensively cleaned waste daily since they housed poultry with people or other animals. Of the respon-

dents (61.34%), they cleaned their poultry house daily, (9.33%) weekly, (19.3%) monthly, and (10%) only when there was flock replacement, which means that when the flock was replaced with an all-in-and-all-out strategy, this system was mostly practiced when a day chicken was reared, sold, and replaced by a new one up to 45 days or greater days and above a year.

The waste material from poultry houses was dealt with for either burning, fertilization, or fattening purposes and thrown away with other waste materials. From the respondents, 61.33% threw poultry waste with other household waste products, 10.67% for burning, 18.67% used it for fertilization, and 9.33% for fattening. The respondents from intensive and deep litter systems sold poultry waste to those used for fattening due to the waste containing poultry feed by-products of different nutritive value.

Most commercial or intensive poultry producers used foot baths (disinfectants) at the entrance of their houses and disinfected their houses based on the period of flock replacement or

any other means, but in the case of yard and most semi-intensive systems of production, they even didn't know how and when to use disinfectants. Of the respondents, about 80% didn't use disinfectants, but only 20% used them. The respondents revealed that electricity and ventilation facilities were available most of the time in the intensive housing system, but in other cases, they didn't know whether these facilities were necessary or not. Of the respondents, only 14.67% used ventilation (Table 3).

Breeding Practice

According to the number of eggs produced per month by the poultry farmers, they were grouped into those that produce 8-15 eggs per month (35.33%), 16-20 eggs per month (43.33%), and 21-27 eggs per month (20.67%). From the result of this study, it was seen that most backyard and some improved breed producers get no more than 8-15 eggs per month, but most semi-intensive and intensive producers, those reared mostly cross, and some exotic breeds get 16-20 eggs per month, and those producing 21-27 were pure exotic producers.

Most respondents (56%) didn't have specific times at which too many or too few eggs were laid by their chickens, but 44% of the respondents mentioned that there are specific times

that their birds produce more or fewer eggs. This had been mostly observed in backyard systems, some of which were semi-intensive due to the seasonality of the availability of feed, improper treatment when disease occurred or even the absence of treatment, a lack of extension services based on poultry production and health management, and the inability to provide supplementary feed for poultry. Such reasons caused poultry to have low egg production.

The respondents stated that they use the eggs laid for different purposes, which are either for selling, hatching, or consumption. It is observed that 9.33% of the respondents used eggs for sale. On about 3.33% of the poultry farms, all the laid eggs were used for hatching. On the other hand, most of the respondents (32.67%) used the eggs laid for consumption, whereas 8.67% used the eggs for sale as well as hatching, and 6.67% of the laid eggs were used for both sale and consumption. On the other hand, 13.33% of laid eggs were used for hatching as well as consumption, and 26% of eggs were used for selling, hatching, and consuming purposes. As a result, most of the commercial producers, who are mostly concerned with table egg production, sold all the eggs they produced to merchants and others, either directly or indirectly. In the backyard and in some semi-intensive production, they used the eggs laid both for consumption and naturally hatching at home in addition to the source of income by selling them (Table 4).

Table 4. Management of Eggs Laid by the Chickens

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Egg produced in a month per bird	8-15	39	35	14	35	35.33
	16-20	47	43	18	45	43.33
	21-27	23	21	8	20	20.67
Specific times chicken produce more or fewer eggs	Yes	48	44	18	44.5	44
	No	62	56	22	55.5	56
Egg used for	Sell	9	8	5	13.75	9.33
	Hatch	4	4	1	2.5	3.33
	Consumption	36	32.7	13	32.5	32.67
	Sell and hatch	10	9	3	7.5	8.67
	Sell and consumption	7	6.4	3	6.25	6.67
	Hatch and consumption	15	13.6	5	12.5	13.33
	Sell, hatch, and consumption	29	26.3	10	25	26

Feeding and Watering

In commercial poultry production systems, feed supplementation is a common activity. Of the respondents, (38%) provide their chick-purchased feed; (1.3%) prepare it on their farm; (50.7%) use both scavenging and supplementary feed provided; and (10%) only scavenging. The purchased feed suppliers were commercial poultry producers. Those farms using scavenging with supplementary feed were mostly semi-intensive ones and some backyard producers, and those entirely relying on scavenging were backyard farms. Regarding the frequency of feeding, (12%) provide feed in the morning and evening (especially those who provide supplementary and purchased

feeds), (68.7%) in the morning and afternoon, (9.3%) three times a day (morning, afternoon, and evening), and (10%) don't provide feed for their chickens (these were backyard producers). Those respondents who provided feed for poultry three times per day were intensive and commercial-purpose producers.

Most of the respondents (71.3%) provided water for their chickens, and only 28.7% did not provide it at all. The source of water for poultry was well water (38%), tap water (25.4%), or pond water (3.4%). As to the frequency of water provision, most respondents (32.7%) provide water at any time (17.3%) in the morning only, (17.3%) in the afternoon, (2.7%) in the morning and the afternoon,

and (25.8%) of respondents didn't provide water at all (Table 5).

Health Management and Disease

Based on the results of the distributed questionnaire to poultry owners, farm managers, animal health professionals, and veterinarians in the study area, the most commonly encountered diseases

during the study period were coccidiosis (60.7%), newcastle disease (NCD) (49.4%), IBD (6%), Marek's disease (17.4%), fowl typhoid (19.4%), infectious coryza (32%), fowl pox (34.7%), and external parasites (2%). The respondents reported that the occurrence of coccidiosis at the farm and household level had the most economic importance, followed by Newcastle disease and other diseases, but the effect of the external parasite was the lowest (Table 6).

Table 5. Chicken Feeding and Watering Practice

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Feeding system	Scavenging only	11	10	4	10	10
	Scavenging with supplement	56	51	20	50	50.7
	Purchased feed	41	37	16	40	38
	Home prepared feed	2	2	0	0	1.3
Frequency of feeding	Morning and evening	13	12	5	12.5	12
	Morning and afternoon	76	69	27	67.5	68.7
	Morning afternoon and evening	10	9	4	10	9.3
Provision of watering	Yes	78	70.9	29	72.5	71.3
	No	32	29.1	11	27.5	28.7
Frequency of watering	Free access	35	32	14	35	32.7
	Morning only	20	18	6	15	17.3
	Morning and afternoon	3	3	1	2.5	2.7
	Afternoon only	21	19	8	20	19.4
Source of water	Well water	42	38	15	37.5	38
	Tape water	28	25	10	25	25.4
	Pond water	4	4	1	2.5	3.4

Table 6. Disease Occurred in the Chicken Flock of the Household During the Study Time of Period

Type of Disease	Hawassa		Yirgalem		Total
	No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Coccidiosis	66	60	25	62.5	60.7
NCD	53	48.2	21	52.5	49.4
IBD	6	5.5	3	7.5	6
Marke's	18	16.4	8	20	17.4
Fowl typhoid	20	18.2	9	22.5	19.4
Coryza	35	31.8	13	32.5	32
Fowl pox	37	33.63	15	37.5	34.7
Ecto parasite	2	1.8	1	2.5	2

Disease Outbreak and Management of Sick Chickens

The biosecurity practice had been done in all of the intensive and some semi-intensive farms, but in almost entire backyard systems it was not practiced at all. Of the respondents, 74% didn't practice biosecurity, and only 26% used biosecurity practices. Most of the infected birds died, and in the case of the backyard management system, they didn't even separate the sick from the uninfected flock. It is noted that 52% of the respondents leave sick birds with

healthy flocks, but 48% separate from the infected flock. About 60.7% of the respondents said that there were disease outbreaks in their poultry at one time in the past, and the majority (38.2%) reported an absence of disease outbreaks (Table 7).

Poultry Health Care and Extension

In the backyard production system, they didn't get any advisory service, but in most commercial systems and some semi-intensive

Table 7. History of Disease Outbreak, Management of Sick Chicken and Biosecurity

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Biosecurity Practice	Yes	28	25.5	11	27.5	26
	No	82	74.5	29	72.5	74
Management of sick bird	Separate from flock	53	48.2	19	47.5	48
	Leave with a healthy flock	57	51.8	21	52.5	52
History of disease of the outbreak	Yes	66	60	25	62.5	60.7
	No	44	40	15	37.5	39.3

farmers, before they started and during production, they got advisory service. Based on the results, only 44.7% of the respondents were told to get advice, but the majority of the respondents (55.3%) did not. Poultry health care services were being provided in the study area, but they were not satisfactory. It was found that (54.7%) of the respondents got poultry health services from the nearby clinic, (29.3%) from part-time animal health professionals, (6%) from employed health professionals, and (10.9%) from owners, and they didn't provide vaccination at all. Regarding vaccination, only 47.3% of the respondents provided vaccination, of

which 76.1% did the vaccination based on the manufacturer's recommendation and the other 23.9% without recommendation.

The majority of the respondents (52.7%) didn't provide vaccinations. Almost all the respondents except the animal health professionals didn't know how about the chemoprophylaxis for poultry. Of the respondents who provided chemoprophylaxis, 42% were commercial-purpose poultry producers. Moreover, 55.3% didn't consider the withdrawal period, and 58% didn't provide chemoprophylaxis (Table 8).

Table 8. Poultry Health and Consultancy Service

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Consultancy service on poultry	Yes	49	44.54	18	45	44.7
	No	61	55.46	22	55	55.3
Provision of poultry health service	Employed animal health profession	8	7.3	1	2.5	6
	Par-time health profession	32	29	12	30	29.3
	Nearby clinic	59	53.7	23	57.5	54.7
	By owner	11	10	4	10	10
Provision of protective	Yes	52	47.3	19	47.5	47.3
	No	58	52.7	21	52.5	52.7
Provision of chemotherapy	Yes	37	33.6	26	65	42
	No	73	66.4	14	35	58
Withdrawal period	Yes	43	39.1	24	60	44.7
	No	67	60.9	16	40	55.3
Market access to buy poultry production input	Yes	32	29.1	11	27.5	28.7
	No	78	70.9	28	70	71.3
Availability of market to sell poultry product	Yes	41	37.3	14	35	36.7
	No	69	62.7	26	65	63.3
To whom poultry products sold	Village market	31	28.2	11	27.5	28
	Local shopkeepers	42	38.2	17	42.5	39.3
	Merchants	17	15.45	5	12.5	14.7
	Retailers	11	10	4	10	10
	Whole sellers	7	6.35	2	5	6
Breed type of poultry whose eggs are most preferred by consumers	Local chicken's egg	79	71.8	28	70	71.3
	Improved breed's egg	29	26.4	11	27.5	26.7
	Exotic's breed	2	1.8	1	2.5	2

Poultry production and marketing: Most commercial poultry producers complained that there was a lack of market access to sell and buy poultry production inputs. Of the respondents, 71.3% didn't have market access to buy poultry production inputs, and only 36.7% had market access to sell poultry products. Poultry products are sold to village markets (28%), local shopkeepers (39.3%), merchants (14.7%), retailers (10%), and whole sellers/villagers (6%). A relatively higher proportion (71.3%) of respondents said that eggs from local breeds were most preferred by consumers. On the other hand, 26.7% replied that eggs from improved breeds were preferable, and almost no eggs from exotic breeds were preferred by consumers (2%) (Table 8).

Constraints

Information collected on constraints in poultry production in the

study area revealed that disease was the most important problem affecting poultry productivity, as claimed by 89.3% of the respondents. On the other hand, the available veterinary service was considered inadequate mostly at the village level by 77.3% of the respondents, ranking it at the second level. The third major constraint on poultry production claimed by 72% of the respondents was the lack of good biosecurity practices, and thieves were reported by 52.7%.

The other constraints in order of their importance were lack of knowledge about scientific poultry production (52%), cannibalism (50%), shortage of feed (41.3%), attack of predators (34.7%), lack of market to sell products (20%), lack of wide range area or land to extend the flock size (13.3%), lack of both access to other input (8.7%), and overcrowding or suffocation dealt by (10.7%) and summarized in Table 9.

Table 9. Major Constraints of Poultry Production in Order of Importance

Variable	Category	Hawassa		Yirgalem		Total
		No. of Households	Proportion (%)	No. of Households	Proportion (%)	
Presence of disease	98	89.09	36	90	89.3	44.7
Shortage of feed	45	40.9	17	42.5	41.3	55.3
Attack of predator	38	34.5	14	35	34.7	6
Thieve	59	53.64	20	50	52.7	29.3
Lack of market to sell product	20	18.2	10	25	20	54.7
Lack of wide range area or land to extend the flock size	14	12.8	6	15	13.3	10
Lack of access to other poultry input	10	9.09	3	7.5	8.7	47.3
Lack of adequate veterinary service in the nearby	86	78.2	30	75	77.3	52.7
Lack of knowledge about scientific poultry management practice	57	51.8	21	52.5	52	42
Overcrowding and suffocation	12	10.9	4	10	10.7	58
Cannibalism	54	49.09	21	52.5	50	44.7
Lack of good biosecurity practice	79	71.8	29	72.2	72	55.3

DISCUSSION

In this study, it was found that there were more female respondents than male respondents, which was consistent with the fact that women often rear poultry in villages. This result is supported by other studies,^{15,16} that reported women having greater management responsibilities for chicken production. On the other hand, the men in the households were responsible for building poultry houses and slaughtering chickens.

In the study areas, only men participated as the owners and managers of the farms for commercial production. Those who are interested in and eager to participate in the production, regardless of gender, disagree with this.¹⁷⁻¹⁹ Analysis of respondents' educational backgrounds showed that 12% of them were illiterate. Others were literate, good readers, and educated in formal educational institutions like primary, secondary, and post-secondary institutions. Special training on poultry production was offered by

the agriculture center to interested people, but only those respondents who had engaged in commercial poultry production and had a sizable flock before beginning production took the course. A related finding was also previously reported.²⁰

According to the study's findings, the majority of the families had flock sizes that ranged from 1-10 chickens at the beginning, 50 chickens or more in the backyard throughout production, and up to 50,000 chickens at a time in commercial operations. The study's range, particularly in the backyard system, was similar to the reported range flock size of 7-10 in Ethiopia's central highlands²¹ and 5-10 chickens per household in Africa.²² In this study, the majority of backyard and semi-intensive poultry farmers raise several age groups of chickens together.

According to a previous study,²³ 96% of village chicken producers keep all age groups of birds together, whereas intensive producers do not do this. About 18% of the respondents used

day-old chicks at the beginning of production, with commercial producers accounting for the majority of this finding. On the other hand, 46% and 36% of the chickens at the start of production were young and adults, respectively. According to recent findings,²⁴ the average age at which they first bought in backyard producers were adults and some young birds, but no result was obtained about a day old.

The source chicken was from the government as well as private from the market or was hatched at home. Of the respondents, 73% bought from governmental sources, while 24% bought from the market. This did not coincide with Alemu²⁵ findings that more than 80% of households in the Ada'a and Lome areas initially obtained their poultry from privately owned farms or markets. The majority of respondents who obtained poultry from government sources were commercial producers in intensive and semi-intensive management. The overall proportion of the local, cross-breed, and exotic breed chicken population kept by the respondents was 36%, 20% and 44%, respectively. These findings contrast sharply with CSA,²⁶ which stated that Ethiopian poultry output was (96.6%) local breeds, (2.8%) exotic breeds, and (5%) crossbreds. This can be due to the limited availability of better breeds and the producers' lack of understanding of the widespread adoption of improved breeds.

Only (30%) of the respondents built a separate house for their chickens in the study area, which is higher than the findings of Chebo²⁷ and Tolasa et al,²⁸ who reported (22.1%) and (21.2%) of chicken owners provided separate poultry houses in Bure district, North West Ethiopia, and Jamma district, South Wollo, respectively.

The majority of respondents who built separate houses for chickens were those who produced them intensively or semi-intensively, but the backyard producer was either shared with other animals or with people's houses. The sharing of the same house with human beings and with other animals might be due to the small flock size per household and/or giving low emphasis to their birds or the inability to construct separate houses. Sharing the same house with people, particularly overnight, might be associated with protection from predators, which is much more severe at night than during the daytime. This is in line with literature that claims that in Ethiopia and Kenya, chickens are not provided separate housing but are instead usually kept in the living room or kitchen, where they scavenge for feed.²⁹ In contrast to these, Zimbabwean researchers³⁰ found that the majority of farmers (>90%) had some facilities made specifically for holding chickens without internal facilities like egg-laying nests.

Almost all intensive and the majority of semi-intensive producers used deep litter (12.67%) and half litter (16.67%), respectively. In the case of the back-yard system, either traditional slated (26.67%) or simply on the ground (earth) (41.9%) were used. The majority of the respondents (60.1%) didn't use litter material. Among the respondents who used litter, 7.33% used teff straw, 6.33% used dry hay, and 20% used wood sawdust. On the other hand, intensive and semi-intensive producers cleaned most of the time monthly (19.33%), at flock replacement, or under an all-in-all-out system (10%). While those who cleaned their chicken houses

every month were largely semi-intensive producers, those who used the all-in-all-out cleaning approach were heavily focused on intensive management. Due to their large flock size, which would increase the risk of contamination, it would not be advisable to clean their home daily or weekly. In simpler terms, they cleaned the house before the arrival of the new batch and after the departure of the old one. Only 20% of the respondents, including all of the intensive and semi-intensive producers, reported disinfecting the chicken house. Most responders (80%) did not disinfect, with backyard producers making up the majority of this group. This primarily results from placing less attention on disinfecting the chicken houses due to their small flock size and lack of awareness. Similar to this, the backyard poultry house management report Tesshome³¹ used traditional means.

In the research area, the average number of eggs produced per hen each month was 11.5 eggs. On the other hand, on commercial farms, which almost all keep exotic layers, the mean egg production is 24 eggs per month. The average flock size in the present study area is comparable to the findings of Assefa³², who reported 12.94 eggs in Jarso. However, the figure is lower than the reported values of 15.7 and 14.9 eggs per month in Bure and Dale woreda in Sidama, Ethiopia, respectively.²⁷ This is due to various challenges in the study area, such as disease occurrence, insufficient feed supply, predator attacks, and a lack of other necessities. The current average of 24 eggs per hen per month in the commercial system was greater than the average of 17.7 eggs per hen per month reported for five regions in Ethiopia.²⁴

Feeds are a major input in poultry production systems. In the study area, 50.7% of the respondents provided additional feed supplements for their chickens. The major proportion of respondents providing supplementary feed to poultry were commercial producers, and they provided both purchased feed and feed prepared on their farms. In contrast, scavenging was the primary source of feed for the majority of backyard producers who received some form of supplementary feeding. In contrast, (99%), (97.5%) and (22.9%) of feed supplementation by chicken owners were reported by Chebo et al²⁷; Tolasa et al²⁸ and Pius³³ respectively.

Only 9.3% of the respondents in the study area provided feed supplements three times per day in the morning, midday (noon), and evening. This is most probably practiced in intensive and semi-intensive production, but in backyard systems, it is either totally scavenging or providing feed once or twice a day. This result agrees with³⁴ who reported that village chickens usually feed a handful of grain in the morning and get more of their supplement by scavenging. In the study area, 80.7% of respondents fed their chicks twice a day, with 68.7% feeding in the morning and afternoon and 12% feeding in the morning and evening. However, the current finding is greater than the report Hinsemu et al²² about 45.6% of respondents provide supplementary feed twice a day, usually in the morning and evening. This is probably due to the better awareness farmers created about the importance of production in the area.

Most of the village chicken owners in the study area pro-

vide water to their chickens year-round, especially during the dry season. In the rainy season, the amount and frequency of water provided to chickens are lower than in the dry season. This is because surface water is widely available during the rainy season. In the study area, poultry owners well-understood the importance of providing water for the productivity of their chickens, and about 71.3% of respondents provided water to their chickens, and most of them (32.7%) had free access. The majority of respondents (38%) used well water (clean water) for their chickens, whereas pond water was the other water source for the poultry, which was reported by (3.4%) of the respondents. Similar watering practices were reported by Tolasa et al²⁸.

Information about the types of disease outbreaks that occurred in both backyard and commercial poultry farms during the study period was obtained from poultry owners, farm managers, animal health professionals, and veterinarians. Coccidiosis was the most frequently occurring disease reported by 60.7% of the respondents. This result does not agree with the finding of Mngumi et al³⁵ who reported that most households reduced their flock size mainly due to Newcastle diseases. In addition to coccidiosis (60.7%), NCD (49.4%), IBD (6%), fowl pox (34.7%), Marek's disease (17.4%), infectious coryza (32%), fowl typhoid (19.4%), and others were reported by the respondents as diseases contributing to the decrease in flock size. According to previous works, intensification is aggravating the rapid spread of the prevailing diseases between and within poultry farms, and the distribution of exotic breeds to farmers is creating a great threat to indigenous backyard chickens.^{36,37} In agreement with the present finding, previous studies in the country reported that diseases like NCD, Marek's disease, salmonellosis, coccidiosis, and IBD are the major health constraints inflicting heavy losses in poultry.^{38,39}

Vaccination against different poultry diseases has been performed by (44.7%) of the respondents, whereas (42%) of them used chemo-prophylactic methods. The majority of respondents who practiced vaccination and chemoprophylaxis were commercial producers, and only a few backyard producers were observed to practice them. This contradicts the point raised in the Pius³³ report that (33%) of farmers in North Ethiopia employed traditional medicines such as garlic, ginger, and lemon. In the case of commercial poultry production, both chemo-prophylactic measures and vaccination are done based on the recommended date and time. Previous studies conducted in the country have demonstrated that none of the chicken owners in the backyard system implemented vaccination and prophylactic measures against poultry diseases.^{27,28,40}

The results show that respondents sold eggs and chicken to local shopkeepers, village markets, retailers, and wholesalers. The last two selling practices were mostly practiced by commercial farmers. Similar egg and chicken sales practices have been reported by Kumar et al¹⁹ and Padhi et al²⁴. The majority of respondents in the research area prefer eggs from local chicken breeds over those from exotic species. The premium for local birds is attributed to more deeply colored egg yolks.²⁹

The disease is the major constraint on poultry production in the present study, reported by 89.3% of the respondents as the first major problem. This contradicts Sime's⁴¹ earlier findings that predators were the main constraint in the Gonder zuria woreda. Although the diagnosis of diseases was based on the symptoms explained by poultry owners who didn't know about poultry diseases, most of the respondents reported that the most frequently occurring disease in the studied areas was coccidiosis (locally named "*Nacurto or Mundeete dee*"). This is consistent with the findings of Nkukwana¹⁶ and Rajkumar³⁰ who reported that diseases were challenging to identify because poultry owners couldn't provide sufficient detail to enable a proper diagnosis. In contrast, it was claimed that ND had a significant economic impact in north-west Ethiopia.²⁷

About 77.3% of respondents said that there weren't sufficient veterinary services in the area, and the same issues were also mentioned by Markos⁴² and Tolasa²⁸ in different regions of Ethiopia. The other major constraint claimed was a lack of good biosecurity practices at the backyard level (72%), and thieves were another problem in backyard cases. Cannibalism, a shortage of feed during the non-harvesting season, and attacks by predators were additional causes of chick losses in the study area. This was in line with the report that wildcats and dogs were the causes of adult chicken losses in other parts of Ethiopia, such as the Central Highlands of Ethiopia²⁹ and the Wolaita zone of Southern Ethiopia.⁴⁰ Lack of modern poultry rearing knowledge through extension service and training was the other constraint for most of the respondents. Similar issues were earlier reported by Chebo et al²⁷ and Augustine et al⁴³.

CONCLUSION AND RECOMMENDATIONS

In the study area, both backyard and commercial poultry production systems are practiced. In the backyard system, chickens are provided only overnight shelter, which is shared with other animals and people, and only a few percent provide separate houses. Unlike this, in intensive and semi-intensive production systems, poultry houses are separately constructed and provided with deep litter (in the case of intensive) or half litter systems (in the case of semi-intensive). In general, the commercial poultry production system in the current study areas was characterized by a modern constructed housing system, better floor management, better feed formulation, the use of disinfectants for poultry houses and the farm workers on their farm, the use of proper medication for the diseases that occurred on the farm, vaccination based on the recommended program, and proper disposal of the waste products of the farm. Due to such reasons, poultry products from commercial producers are better than those from backyard production. In both cases, disease was the major constraint for poultry production. Besides this, lack of adequate veterinary service, lack of knowledge about modern poultry production, lack of good bio-security practices, cannibalism, thieves, predators, and lack of market access were the other constraints limiting the productivity of their chicken. Thus, the production of chickens in the yard and commercial poultry production systems could be enhanced through improved housing, feeding, health management, and management of other constraints

like predators, accessibility of animal extension services, and training of poultry owners and poultry farm managers. Given the above conclusion, the following recommendations are suggested:

- Government and developmental organizations should give attention to both the backyard and commercial poultry sectors and their development.
- The government and all concerned bodies should create awareness among the farmers about the poultry production system and the influence of different health and production problems.
- Training for farmers and extension staff focusing on disease control, improved housing and feeding, bio-security, and proper record-keeping systems should be arranged to be successful, especially on the farm.
- Further study is recommended to understand the interactions of different infectious poultry diseases and estimate their impact on the backyard and commercial poultry production systems.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The ethical consent was obtained from Wollega University, Research Review Committee to collect research, and conduct the research, and the committee approved this research work.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

All the datasets generated or analyzed during this study are included in this manuscript.

AUTHOR'S CONTRIBUTION

APB, DA and LB were contributed to study designed, methodology, collected the data, interpreted the data, and drafted and wrote the manuscript. IAK was responsible for the software, data curation, and validation; analyzed the data, interpreted the data; edited, and revised the manuscript; and searched for references. All authors have approved the submission of the final manuscript.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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