International Journal of Veterinary and Animal Research 8(3): 76-83, 2025

RESEARCH ARTICLE

IJVAR

International Journal of Veterinary and Animal Research

Journal homepage: https://ijvar.org/index.php/ijvar

Assessment and Characterization of Challenges of Poultry Backyard Production in Baidoa District, Somalia

Mohamed Ali Yusuf – Isleged[1]✉, Omar Mohamud Salah[2], Moktar Omar Sheikh Mohamed [2],

[1]*University of Somalia (UNISO), Faculty of Veterinary Medicine and Animal Husbandry, Department of Veterinary Medicine, Mogadishu, Somalia*
[2]*Somali National University, Faculty of Veterinary Medicine and Animal Husbandry, Department of Clinics, Theriogenology and Surgery, Mogadishu, Somalia*

ARTICLE INFO

Received: 30/10/2024
Accepted: 25/12/2025

DOI: 10.5281/zenodo.18142480

✉**Corresponding Author:** m.aliyusuf@uniso.edu.so

Keywords

Biosecurity
Chickens
Poultry diseases
Practice management
Prevention and control

Cite this article as: *Yusuf – Isleged M.A., Salah O.M., Mohamed M.O.S. 2025. Assessment and Characterization of Challenges of Poultry Backyard Production in Baidoa District, Somalia. International Journal of Veterinary and Animal Research, 8(3): 76-83. DOI: 10.5281/zenodo.18142480.*

ABSTRACT

A cross-sectional study was carried between Feb 2024 to July 2024 and employed to assess and characterize the challenges of backyard poultry production in Baidoa district, Bay region Somalia. The sampling technique of the study was multi-stage sampling technique. The researchers first selected four villages in Baidoa district purposively. Then the researcher visits each village and meets household heads, elders, and local representatives to gain permission of data collection and list of households for each village before the data collection. Then the researcher selected 25 households randomly for each village which counts 100 households. A single visit survey was employed by researchers. Primary data was collected using semi-structured questionnaire to take relevant data from the backyard poultry raisers through English in both open-ended and close-ended questions and translated to local language Somali when interviewed the households. Data collected from households were entered into an excel spread sheet then transferred to Statistical Package for the Social Science (SPSS) version 22.0. The study found that the backyard raisers were 77% of female, aged between 36 to 45 years, were 81% of them illiterate. 72% of respondents had a poultry flock between 5 to 40 chickens an average of 12.5 chickens per household. The reasons for keeping poultry in backyard farms 53% of households raised poultry for family consumption. The finding that 41% of backyard poultry producers experienced the loss of 1-10 chickens in the past year, and 24% lost 11-20 chickens. Regarding the seasonality of mortality, the current study's finding that 61% of producers reported peak mortality during the winter months is consistent with previous research. The study found that diseases were the primary cause of mortality (71%), the most common diseases affecting backyard poultry farms in the Baidoa district were Newcastle disease, coccidiosis, respiratory disease, and Fowl pox. In conclusion, the findings of the study depicted that the main challenges faced by backyard poultry raisers in Baidoa district were diseases, inadequate housing, feed availability, predators, lack access to the veterinary services and limited education of most of backyard producers on proper poultry management. Infectious diseases were the primary causes of high mortality in chickens reared by households, Newcastle disease and coccidiosis were the most reported diseases.

INTRODUCTION

Livestock production, particularly chickens, plays important socio-economic roles in developing countries Abebe, A. (2015). Poultry production has a major role in the economies of developing nations, including contributing to poverty alleviation through income generation and household food security Fitsum, M., and Aliy, M. (2014).

Village poultry represents an economical source of animal protein and a means of generating family income. It also promotes self-reliance among women, as they typically manage the sales of poultry and eggs, which provide them with a direct source of income for household expenses and food Assefa, H. (2019). Backyard chickens are particularly advantageous as they require minimal space, feed, and initial investment, making them well-suited to the conditions of extensive farming practices in Somalia.

In Somalia, backyard chickens are the most widespread type of poultry, with traditional breeds like feather chickens, short chickens, naked neck chickens, and American chickens being commonly reared Abdi-Soojeede and Funwie, (2022). These scavenging backyard chickens require limited space, feed, and capital investment compared to other domestic animals kept in Somalia. Backyard chickens play an important role in the livelihood and income of many Somalis, contributing to household food security and providing a readily available source of protein.

Modern poultry production started in Somalia some years ago, primarily initiated by colleges, research stations, and other institutions. Poultry experts began introducing and farming exotic breeds of chickens, along with disseminating improved management, feeding, housing, and healthcare practices to farmers. The introduction of these exotic breeds and modern production methods represents an important development in Somalia's poultry sector. The goal has been to transition some Somali poultry producers away from the traditional extensive systems towards more intensive, commercially oriented production Barre, A. et al. (2023).

However, traditional backyard poultry farming, characterized by small, unimproved indigenous flocks, remains the predominant model in many parts of the country. This extensive system continues to prevail, as the adoption and spread of modern poultry farming techniques have been limited so far Hagi, MO., (2023).

Despite the challenges in replacing traditional practices, the growth of a more efficient, commercial-scale poultry industry could play a significant role as Somalia seeks to enhance food security, increase incomes, and modernize its agricultural systems. Evaluating the progress, obstacles, and potential of these modern poultry production initiatives is crucial for understanding the evolving landscape of the poultry sector in Somalia Barre, A., et al. (2023).

Although backyard poultry farms are exposed to various challenges, there is limited assessment and documentation to characterize the major challenges in Baidoa backyard poultry farms. The overall production system in this region requires further study to better understand the constraints and opportunities for improving productivity and sustainability. By addressing the challenges faced by backyard poultry producers in the Baidoa district, interventions could potentially enhance the contribution of this important sector to household food security and income generation.

Therefore, this study was carried out to characterize the challenges of backyard poultry production in the Baidoa district of Somalia and to identify strategies for improving the productivity and resilience of this vital component of the local agricultural system, enhancing biosecurity strategies, and adopting disease prevention measures.

MATERIALS AND METHODS

Study area

Baidoa is the capital, largest city, and economic center of the Bay region in Southwestern Somalia. The region has borders with the Gedo, Bakool, and Shabelle regions. It is located approximately 250 km southwest of the national capital Mogadishu, in the heart of the inter-riverine region between the Shebelle and Jubba rivers.

The city is situated on a flat, arid plain at an elevation of around 510 meters above sea level. The climate is hot and semi-arid, with two rainy seasons- the gu (spring) rains from April to June and the deyr (Autumn) rains from October to November. The regional economy is primarily agricultural, relying on livestock production, farming, and the harvest of gum arabic.

Sampling

The sampling technique of the study was multi-stage sampling technique. The researchers first selected four villages in Baidoa district purposively. Then the researcher visits each village and meets household heads, elders, and local representatives to gain permission of data collection and list of households for each village before the data collection. Then the researcher selected 25 households randomly for each village which counts 100 households.

Research Population

The target populations for this study were 134 of households raising poultry from Baidoa district, Bay region, Somalia; the target population were households whose engage poultry farming in Baidoa district.

Sample Size

The sample size was determined by using Slovene's formula for sample-size determination:

This study was performed with written owner consent and confirmed by Aydın Adnan Menderes University, Local Ethics Committee for Animal Researches (HADYEK) with report no: 64583101/2024/119.

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

N = Total Population
n = Sample size
e = is the confidence level at 5%
Substituting into the formula,
n = 134/ (1+ (134*0.0025))
= 134/ 1.335 Therefore n= 100 household heads.

Research Instrument

A semi-structured questionnaire was administered to obtain information from household heads. It contains closed and open-ended questions for collecting backyard poultry raisers their own information. The questionnaire was developed for this study and uploaded as a supplementary file.

Data Gathering Procedures

A single visit survey was employed by researchers. Primary data was collected using semi-structured questionnaire to take relevant data from the backyard

poultry raisers through English in both open-ended and close-ended questions and translated to local language Somali when interviewed the households. Data collection was done by a face-to-face personal interview method, and interviewer visits each household from four villages in Baidoa districts to administer the questionnaire personally. The interview questionnaire was focusing mainly on flock size reared, feed availability, market access, reasons for rearing, major challenges facing, and diseases that cause mortality in chicken of backyard poultry raisers.

Research Design

A cross-sectional study design was employed to assess and characterize the challenges of backyard poultry production in Baidoa district, Bay region Somalia. The study was also quantitative in design which determines the challenges of backyard poultry farms numerically.

Data Analysis

Household data were initially entered into an Excel spreadsheet (2010) and subsequently transferred to the Statistical Package for the Social Sciences (SPSS) version 22.0 for analysis. Descriptive statistics, including frequencies and percentages, were used to identify challenges in backyard poultry production, with the results presented in tables and charts.

RESULTS

The study sample initially included 100 households raising poultry. However, subsequent analysis was based on 76 participants, as 24 reported not having poultry. Among these 76, 74 households stated their poultry had died, while two reported no poultry deaths as shown table 1.

Table 1. How many chickens died from your flock in the past year

No. chicken died	Frequency	Percent	Valid Percent	Cumulative Percent
Non	2	2.0	2.6	2.6
1-10	41	41.0	53.9	56.6
11-20	24	24.0	31.6	88.2
21-30	6	6.0	7.9	96.1
31-40	2	2.0	2.6	98.7
more than 40	1	1.0	1.3	100.0
Total	76	76.0	100.0	

According to the table, the majority of backyard chicken raisers (41%) had 1 to 10 chickens die from their flock in the past year. 24% of them had 11 to 20 chickens die, 6% had 21 to 30 chickens die, 2% had 31 to 40 chickens die, 1% had more than 40 chickens die, but 2% of backyard chicken raisers reported no deaths in their flock in the past year.

The study found that the main challenges faced by backyard poultry farmers were a combination of lack of housing, predators, and diseases, and treatment availability as presented in Table 2. The most common diseases affecting backyard poultry farms in the Baidoa district were Newcastle disease, coccidiosis, respiratory disease, and Fowl pox as demonstrated in Table 3, and the season with the highest mortality peak for the chickens was winter as shown in Table 4.

Table 2. What are the main challenges that you faced in poultry farming

Main challenges that you faced in poultry farming	Frequency	Percent	Valid Percent	Cumulative Percent
Lack of housing, predators, disease	40	40.0	54.1	54.1
Feed, diseases	7	7.0	9.5	63.5
Diseases feed challenge, capacity	4	4.0	5.4	68.9
Feed availability, disease, predator, housing	7	7.0	9.5	78.4
Diseases, Treatment availability	16	16.0	21.6	100.0
Total	74	74.0	100.0	

According to the above table, the main challenges faced by the backyard chicken raisers were a combination of lack of housing, predators, and diseases, reported by 40% of respondents. The remaining respondents cited other challenges, including diseases and treatment availability (16%), feed availability, diseases, predators, and housing (7%), feed and diseases (7%), and diseases, feed challenges, and capacity (4%).

Table 3. Most common diseases that affect your flock

Most common diseases that affect your flock	No of Mentions	Rank of Disease
New castle disease	36	1
Chickenpox	2	7
Nutritional diseases	2	7
Salmonellosis	2	7
Fowl pox	19	4
Coccidiosis	35	2
Respiratory problem	21	3
Predators	4	6
Ectoparasites	7	5

According to the above table, the most common diseases that affected the backyard poultry raisers' flocks were Newcastle disease, which was ranked as the top issue, followed by Coccidiosis as the second most prevalent disease. Other diseases mentioned, in order of ranking, were respiratory problems, fowl pox, ectoparasites, predators, chickenpox, nutritional diseases, and salmonellosis.

Table 4. what season is the morality higher

Season morality higher	Frequency	Percent	Valid Percent	Cumulative Percent
Winter and summer	5	5.0	6.8	6.8
Winter	61	61.0	82.4	89.2
Summer	5	5.0	6.8	95.9
Winter, spring	2	2.0	2.7	98.6
Spring	1	1.0	1.4	100.0
Total	74	74.0	100.0	

According to the above table, the majority of backyard chicken raisers (61%) reported that the season with the highest mortality peak for their chickens was winter. The remaining respondents indicated other seasons with high mortality, including winter and summer (5%), summer (5%), winter and spring (2%), and spring (1%).

DISCUSSION AND CONCLUSION

This study provided information about the assessment of challenges and characterization of poultry backyard production in the Baidoa district of Baay region, Somalia. The study found that the majority of backyard poultry raisers were women (77 %), married (91%) as shown in Figure 1, and aged between 36 and 45 years old (45%) as presented in Figure 2. Most were housewives 69% (Figure 3) and owned and raised backyard chickens (76%) as presented in Figure 4.

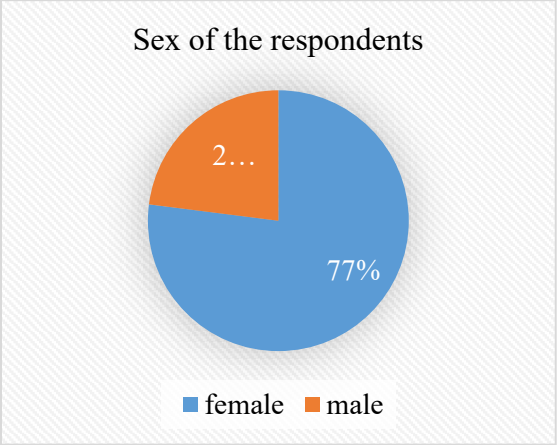

Figure 1. Sex of the respondent

The above chart shows that the majority of the backyard poultry raisers, 77%, were female, while only 23% were male. (Fig. 1).

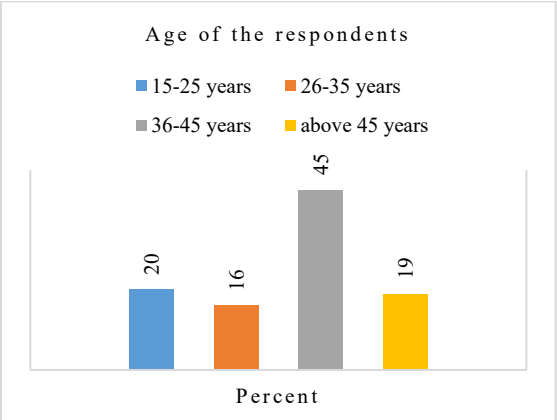

Figure 2. Age of the respondents

The above chart shows that most of the backyard chicken raisers were aged between 36 to 45 years. The other age groups represented were 15 to 25 years (20%), above 45 years (19%), and 26 to 35 years (16%) (Fig. 2).

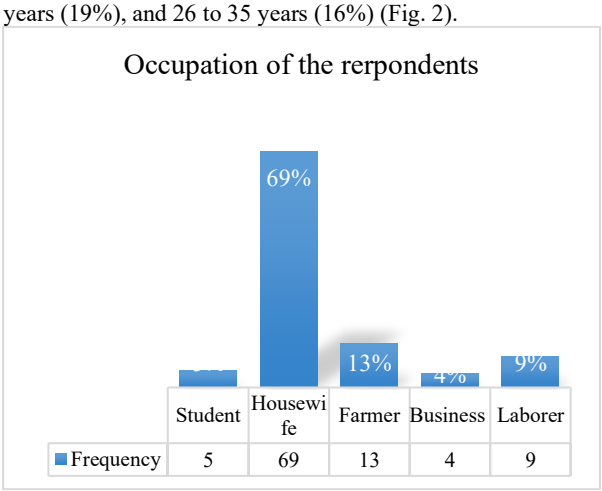

Figure 3. Occupation of respondents

The above chart indicates that the majority of the backyard chicken raisers (69%) were housewives. The remaining respondents were engaged in the following occupations: Farmers (13%), laborers (9%), students (5%), and business owners (4%).

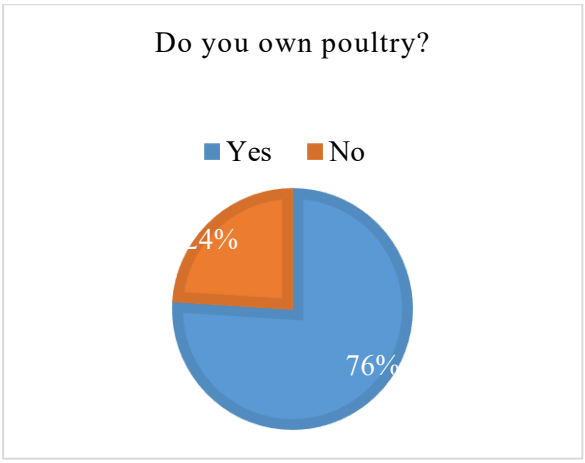

Figure 4. Do you own Poultry?

According to the above chart, 76% of the respondents owned and reared backyard chickens, while 24% did not own any poultry. Since those who did not own poultry were excluded from the rest of the questions, the total number of respondents for the remaining questions was 76.

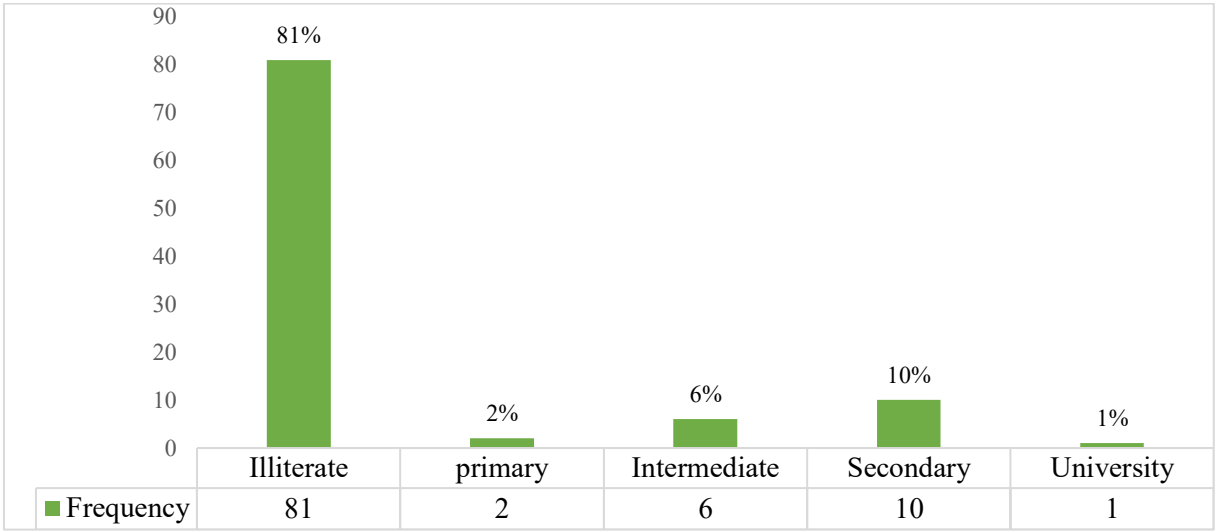

Figure 5. The education level of the respondents

According to the above chart, the majority of the backyard chicken raisers (81%) were illiterate. The remaining respondents had the following levels of education: Secondary (10%), Intermediate (6%), Primary (2%), and University (1%).

The current study revealed that the level of education of most of the family members involved in backyard rearing was illiterate, followed by a secondary education with 81% and 10% respectively as shown in Figure 5. The study has a support for previous study conducted in Bangladesh by Islam, M.S., et al. (2015). who reported that the family members and women typically involved in the rearing activities were mainly illiterate to a secondary educational background.

In this study, almost all poultry owners feed their chickens by giving them grains as indicated in Table 5. This result is close to the previous study conducted in Ethiopia by Abera, D., et al. (2024) who reported chickens was supplemented commonly with grain. Different feed types like maize mixed with sorghum (34.0%), sorghum (34.0%), sorghum, maize, soybean (4.0%) and wheat (2%) were used to supplement their chicken as presented in Table 6.

Table 5. What do you feed your poultry

Feed of chickens	Frequency	Percent	Valid Percent	Cumulative Percent
grain & rice	1	1.0	1.3	1.3
Grain	75	75.0	98.7	100.0
Total	76	76.0	100.0	

According to the table, the majority of backyard chicken raisers (75%) fed their poultry with grain. Only 1% of respondents fed their poultry a mix of grain and rice.

The current study found that 72% of respondents had a poultry flock between 5 to 40 chickens, an average of 12.5 chickens per household as shown in Table 7, the study was supported by a previous study carried out by Moges, F., et al. (2010). in Ethiopia who reported that the average flock size per household was 13 (ranged from 1 to 57). On other hand study conducted in Ethiopia by Abera, D., et al. (2024) showed that the average flock size was 10, ranging from 3 to 43 chickens per household. This difference could be the geographical location, and season carried out the studies, as backyard poultry size could be high in the rainy season due to the availability of scavenging feed in backyard poultry production.

Table 6. What type of grain do you feed your poultry

Type of grain	Frequency	Percent	Valid Percent	Cumulative Percent
maize, and sorghum	34	34.0	44.7	44.7
Sorghum	34	34.0	44.7	89.5
maize and wheat	2	2.0	2.6	92.1
sorghum, and wheat	2	2.0	2.6	94.7
sorghum, maize, soy pean	4	4.0	5.3	100.0
Total	76	76.0	100.0	

Table 7. What is the size of your flock

No. of chickens	Frequency	Percent	Valid Percent	Cumulative Percent
5-20	63	63.0	82.9	82.9
21-40	9	9.0	11.8	94.7
41-60	2	2.0	2.6	97.4
61-80	1	1.0	1.3	98.7
81-100	1	1.0	1.3	100.0
Total	76	76.0	100.0	

According to the table, the majority of the backyard poultry raisers (63%) had a poultry flock size between 5 to 20 chickens. The remaining respondents had the following flock sizes: 21 to 40 chickens (9%), 41 to 60 chickens (2%), and above 61 chickens (2%).

The reasons for keeping poultry in backyard farms were mostly 53% of households raised poultry for family consumption. Only 6% of households kept their poultry for family income as illustrated in Table 8. The study is not in line with other studies carried out in Bangladesh by Shanta, I. S., et al. (2017) who reported that 12% of households raised poultry solely for consumption.

Table 8. Reason for keeping poultry

Reason for keeping chicken	Frequency	Percent	Valid Percent	Cumulative Percent
Sale for income	7	7.0	9.2	9.2
Family consumption	53	53.0	69.7	78.9
Family consumption & sale	16	16.0	21.1	100.0
Total	76	76.0	100.0	

According to the above table, the primary reason for keeping poultry for most backyard chicken raisers (53%) was for family consumption. 16% of them kept poultry for both family consumption and sale, while only 7% kept poultry solely for the purpose of generating sale income.

The finding that 41% of backyard poultry producers experienced the loss of 1-10 chickens in the past year, and 24% lost 11-20 chickens as summarized in Table 1, aligns with a study by Smith, G. A., et al. (2020) that reported high mortality rates in small backyard flocks. However, a contrasting study by Johnson, K. A., et al. (2018) suggested that larger flock sizes were associated with higher mortality, which differs from the current findings.

Regarding the seasonality of mortality, the current study's finding that 61% of producers reported peak mortality during the winter months as presented in Table 4, is consistent with previous research Gómez, Y., et al. (2019) which identified winter as a critical period for increased disease prevalence and mortality in backyard poultry systems, likely due to environmental factors and resource constraints.

The current study's identification of diseases as the primary cause of mortality (71%) as shown in Table 9, is supported by several previous studies. Researchers have consistently found that infectious diseases, such as Newcastle disease, coccidiosis, and avian influenza, are major threats to the health and survival of backyard chickens Patel, K. K., et al. (2021); Lee, S. S., et al. (2016). However, a study by Williams, J. E., et al. (2022) suggests that predation may also be a significant contributor to mortality in some backyard poultry settings.

The current study's finding that the main challenges faced by backyard poultry producers include lack of housing, predators, and diseases (40%) as reflected in Table 2, aligns with previous research. Inadequate housing and protection from predators have been identified as common issues in small-scale poultry operations, which can increase the risk of disease outbreaks and mortality Farrell, P. H., et al. (2018); Sharma, B., et al. (2017). Additionally, the lack of access to treatment and feed availability has been highlighted as a significant challenge for backyard poultry producers in the Baidoa district.

The current study revealed that the most common diseases affecting backyard poultry farms in the Baidoa district were Newcastle disease, coccidiosis, respiratory disease, and Fowl pox as demonstrated in Table 12. This study is in line with previous studies on backyard poultry farming carried out in Ethiopia, Nigeria, Bangladesh, Pakistan, and India which reported similar patterns of diseases in chickens Islam M, et al. (2021), Balami AG, et al. (2014); Abebe E, Gugsa G. (2018).

Table 10. What is the common reason for most of the mortality

Common reason for most of the mortality	Frequency	Percent	Valid Percent	Cumulative Percent
Diseases	71	71.0	95.9	95.9
Diseases, paralysis	1	1.0	1.4	97.3
Diseases, predators	2	2.0	2.7	100.0
Total	74	74.0	100.0	

According to the above table, the most common reason cited by backyard chicken raisers for the mortality of their poultry was diseases, as indicated by 71% of the respondents. A small percentage, 2% and 1% respectively, reported that predators plus diseases and paralysis were the common reasons for poultry deaths.

In conclusion, the findings of the study depicted that the main challenges faced by backyard poultry raisers in Baidoa district were diseases, inadequate housing, feed availability, predators, lack access to the veterinary services and limited education of most of backyard producers on proper poultry management. Infectious diseases were the primary causes of high mortality in chickens reared by households, Newcastle disease and coccidiosis were the most reported diseases. Addressing the identified challenges, such as improving housing, biosecurity, feed availability, disease prevention, and access to veterinary support, and providing education and support to the backyard poultry raisers, could help enhance the sustainability and resilience of backyard poultry production in the Baidoa district.

Recommendations

Based on the conclusions of this study, the following are recommended:

- Authorities should provide education and support to help farmers construct suitable, well-ventilated chicken coops and implement basic biosecurity measures (e.g., fencing, pest control) to reduce the risk of disease outbreaks and predation.
- Authorities should take steps to promote vaccination programs, to protect against common poultry diseases, educate farmers on early disease detection and appropriate treatment options, and improve access to veterinary services and affordable medications.
- Ministry of livestock of Somalia should provide training and resources to help farmers diversify their feed sources and improve the nutritional quality of the feed to contribute to better bird health and productivity.
- Authorities and NGOs should organize training programs on best practices in backyard poultry management, establish demonstration farms or

model poultry units to showcase improved techniques, and facilitate access to information and resources on poultry husbandry, disease prevention, and marketing.
- Local NGOs provide support and guidance to help farmers access local markets, develop value-added products, and diversify their income sources to improve the overall sustainability of their backyard poultry operations.
- Bay region administrators and local veterinarians should facilitate the formation of farmer groups or cooperatives to share knowledge, resources, and collectively address common issues.
- Researchers should carry out further studies to determine the prevalence of poultry diseases prevailing in the study area to help develop a sustainable strategy of disease prevention and control.

Acknowledgement
The authors would like to thank the household heads in Baidoa district for their time and contribution to the study, and all colleagues who participated in the data collection and production. In Particularly, we would like to thank the Somali National University (SNU) – Research Centre and especially faculty of Veterinary Medicine and Animal Husbandry for providing research facilities during research study.

Ethical Declaration
The study was approved by the ethics committee of Somali National University - SNU (in line with the Declaration of Somali Data protection Authority, Mogadishu; (No. 005, 2023). The study follows data protection rules as of the Somali Data Protection act (2023). The researchers informed a written consent to all participants prior of data collection and all study household heads accept consent to participate the study voluntarily.

Conflict of Interest
The authors declare that they have no competing interests.

Authorship contributions
Concept: O.M.S., M.O.S., Design: O.M.S., M.O.S., Data Collection or Processing: O.M.S., M.O.S., M.A.Y.I., Analysis or Interpretation: O.M.S., M.O.S., M.A.Y.I., Literature Search: O.M.S., M.O.S., Writing: O.M.S., M.O.S., M.A.Y.I.,

Financial Support
This research received no grant from any funding agency/sector.

REFERENCES

Abdi-Soojeede MI, Funwie ADS. 2022. Challenges of chicken production on farmers in Mogadishu, Somalia. IQ Research Journal. 1: 531-541.

Abebe E, Gugsa G. 2018. A review on poultry coccidiosis. Abyssinia Journal of Science and Technology. 3(1): 1-2.

Abebe A. 2015. Assessment of production performance of improved chickens under rural management practices in Dugda Woreda, East-Shewa Zone, Oromia Region, Ethiopia. Doctoral dissertation, Addis Ababa University.

Abera D, Abebe A, Alebachew H. 2024. Assessment of poultry feed and handling mechanisms of poultry production challenges in Benishangul-Gumuz Region, Western Ethiopia. Cogent Food & Agriculture. 10(1).

Assefa H. 2019. The role of poultry for poor livelihoods in Ethiopia. International Journal of Veterinary Science and Animal Husbandry. 4(3): 1-4.

Balami AG, Ndahi JJ, Zaifada AU, Mustapha M, Jarafu DJ, Asogwa NT, Hajara S. 2014. A retrospective study of poultry diseases diagnosed in Maiduguri, North-East, Nigeria. Poultry, Fish and Wildlife Science. 2(1): 1-4.

Barre A, Hirabe AH, Ali SB, Ali MA, Ahmed SH, Yusuf DH. 2023. Challenges and opportunities of small and large scale poultry production system in some selected farms at Banadir Region, Somalia. Poultry, Fish and Wildlife Science. 11: 231.

Farrell PH, Kalkstein AL, Feingold BJ. 2018. Predicting and mitigating avian mortality in small-scale backyard poultry operations. Preventive Veterinary Medicine. 159: 64-72.

Fitsum M, Aliy M. 2014. Poultry production system and role of poultry production in Tigray region, Northern Ethiopia: a review. Journal of Biology, Agriculture and Healthcare. 4(27): 154.

Gómez Y, Mathijs E, Humblet MF, Saegerman C. 2019. Identification of breeding practices and potential risk factors for avian influenza transmission in backyard poultry farms in the Cochabamba region in Bolivia. Transboundary and Emerging Diseases. 66(1): 432-443.

Hagi Mohamoud MO. 2023. Turkey's new strategic engagement in Sub-Saharan Africa: the case of Somalia and Sudan. Doctoral dissertation, Manchester Metropolitan University.

Islam M, Singha S, Belgrad JP, Hasib EM, Sayeed MA, Haque ME, Ahad A, Hoque MA. 2021. Common chicken diseases in Kishoreganj, Bangladesh: estimation through the veterinary hospital-based passive surveillance system. Advances in Animal and Veterinary Sciences. 9(11): 1951-1958.

Islam MS, Begum IA, Kausar AKMG, Hossain MR, Kamruzzaman M. 2015. Livelihood improvement of small farmers through family poultry in Bangladesh. International Journal of Business, Management and Social Research. 1: 61-70.

Johnson KA, Mack TD, Wilson WM. 2018. Factors influencing mortality in small-scale broiler production systems. Poultry Science. 97(9): 3186-3192.

Lee SS, Jiang Q, Lee M, Yoo D. 2016. Pathogenesis of Newcastle disease virus in young chickens: virological, histological, and cytokine responses. Veterinary Research Communications. 40(1): 1-10.

Moges F, Melesse A, Dessie T. 2010. Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, North West Ethiopia. African Journal of Agricultural Research. 5: 1739-1748.

Patel KK, Shah NM, Patil RD. 2021. Epidemiology and economic impact of major poultry diseases in backyard poultry farming. Veterinary World. 14(3): 767-774.

Shanta IS, Hasnat MA, Zeidner N, Gurley ES, Azziz-Baumgartner E, Sharker MAY, Luby SP. 2017. Raising backyard poultry in rural Bangladesh: financial and nutritional benefits, but persistent risky practices. Transboundary and Emerging Diseases. 64(5): 1454-1464.

Sharma B, Kataria M, Kumar S, Tuteja FC. 2017. Epidemiology of infectious bursal disease and its economic impact on small-scale commercial poultry farms in Rajasthan, India. Indian Journal of Animal Sciences. 87(2): 179-183.

Smith GA, Jones LR, Wills RW. 2020. Factors associated with mortality in small-scale poultry flocks in the United States. Avian Diseases. 64(2): 167-174.

Williams JE, Chang YF, Goldstein MI. 2022. Predation as a major cause of mortality in backyard poultry flocks. Journal of Avian Medicine and Surgery. 36(1): 45-54.