Journal of Poultry Sciences and Avian Diseases

Journal homepage: www.jpsad.com

A Literature Review on Sustainability of Poultry Production: Socio-Economic Role and Alternative as Climate Change Resilience of Livestock Production in Ethiopia

Seyoum Bekele[1*], Meseret Girma Abebe[1]

[1] School of Animal and Range Sciences, College of Agriculture and Environmental Sciences, Haramaya University, Ethiopia

*** Corresponding author email address**: seyoumbekele01@gmail.com

A r t i c l e I n f o

Article type:
Review Article

How to cite this article:
Bekele, S., & Girma Abebe, M. (2025). A Literature Review on Sustainability of Poultry Production: Socio-Economic Role and Alternative as Climate Change Resilience of Livestock Production in Ethiopia. *Journal of Poultry Sciences and Avian Diseases, 3*(4), 73-81.
http://dx.doi.org/10.61838/kman.jpsad.3.4.8

A B S T R A C T

The development of family-based poultry production is becoming a pressing business issue for all governmental, non-governmental, and private investors due to the rapid increase in urbanization and the Ethiopian population. Starting with individual households nationwide, the poultry enterprise sector is a significant part of the livestock industry that is essential for the sustainability and growth of the national economy. The poultry sector presents numerous alternative business opportunities for millions of young people and rural households. Family-based poultry production is a growing concern for the development of a green economy, as it has the potential to mitigate the effects of climate change. However, these days, the poultry production business faces several obstacles to its successful growth, starting with supply and processing constraints of inputs, as well as a shortage of high-quality technology, equipment, and feed ingredients. Additionally, the value chain for feed processing is limited, and locally accessible poultry feed resources are not used effectively. Another factor stemmed from producers and consumers who did not fully understand the importance of family-based poultry production in society. This was caused by a shortage of day-old chicks (DOCs) and parent stock, as well as poor breed improvement practices that resulted in inconsistent and unprofitable poultry products in terms of both quantity and quality. Ethiopian poultry breeding projects should consider farmers' preferences and production goals to achieve the dual objectives of increasing output and conserving the native chicken gene pool's adaptability. The introduction of chicken strains that can adapt to the tropics and mimic the indigenous chicken features that farmers value is an alternative to using local genetic resources.

Keywords: *Climate-change, Family-poultry, Resilience, Socio-Economic values*

Article history:
Received 14 March 2025
Revised 22 April 2025
Accepted 06 June 2025
Published online 01 October 2025

1 Introduction

Family-based poultry production is a substantial segment of the livestock industry that plays a crucial role in the sustainability and development of the national economy, covering every household across the country. This sector encompasses various production levels and classes, including breeder breeding, hatcheries, broiler and layer farms, and feed processing factories. Family-based Poultry farming plays a crucial role in poverty reduction, combating malnutrition, and promoting economic development that is feasible with limited resources.

The rapid increase in urbanization and Ethiopia's large population create numerous alternative business opportunities for millions of young people and rural households, making the development of small-scale poultry production a top priority (1). These days, poultry products are processed into a variety of food items, and foreign brand names and global franchises are expanding into Ethiopian food processing sectors (hotels, restaurants, and cafes). Additionally, the quick and simple ready-made food processing chains are expanding. Furthermore, poultry is more than just a business; it also generates opportunities for product exports and serves as a symbol of nutrition, helping to ensure food security.

However, several obstacles currently hinder the poultry production industry's ability to grow effectively, starting with supply and processing constraints of inputs, as well as a shortage of high-quality machinery, equipment, and feed ingredients (1). Additionally, the value chain for feed processing is limited, and locally accessible poultry feed resources are not used effectively. Another factor stemmed from producers and consumers who did not fully understand the importance of small-scale poultry production in society. This was due to a lack of parent stock and day-old chicks (DOCs), as well as poor breed improvement practices that resulted in inconsistent and unprofitable poultry products in terms of both quantity and quality. Therefore, the purpose of this review study was to evaluate and provide an informative summary of the perceptions of farmers, customers, and stakeholders and to raise awareness among both governmental organizations and NGOs regarding local chicken improvement for both production and reproductive efficiency.

2 Socio-Economic Roles of Family-based Poultry Production

Family-based chicken production is profitable and sustainable from a socio-economic perspective for several reasons. Egg sales are the main reason why Ethiopians raise local chickens, followed by egg consumption at home and chick production (2). The objective of indigenous chicken production was to generate income for households, even if the hens were raised in settings with limited feed and housing resources (3).

Frequently, the only and most popular products that women sell at the market are eggs and chickens. Poultry, particularly in Ethiopia's rural areas, provides women with instant cash, allowing them to cover household expenses (such as food) independently rather than relying on men to do so. In order to generate revenue and buy necessities like sugar, cooking oil, salt, and other items, rural women keep chickens (2).

2.1 Importance of Family-based Poultry Production

Family-based poultry production aims to produce eggs that hatch and replenish the flock with new chicks. Eggs can also serve as a substitute source of income and employment prospects, as well as for domestic use and in cultural and religious events involving meat and eggs. Overall, village poultry production plays a significant role in income generation, providing easily accessible balanced nutrition and contributing to poverty alleviation (4).

Table 1. Purpose of Raising Local Chicken

Production Types	Priority for	Economical traits	Ranks	References
Egg Production	Hatching/mothering ability	Mothering ability to replace the flock easily	1	(2)
	Home consumption	Easily and cheaply available protein meat	2	
	Sale for income-generating	Cull old and non-productive birds	3	(4)
Dual Purpose Production	Replacement (breeding) for both broiler and layer	Fast growth rate as well as fertile egg production	1	
	Sale for income	Culled aged and non-productive birds	3	
	Home consumption	Easily and cheaply available protein meat	2	
	Cultural/religious ceremonies	Gift and gratitude to strengthen social bond	4	
	Create Job opportunity	Only jobless family members participate	5	
Meat Production	Home consumption	To cull old and non-productive birds	3	(5)
	Sale for income	Sold for their meat markets	1	
	Cultural/religious ceremonies	Consumed during cultural, religious, and holidays	2	

2.2 *Management Practices of Family-Based Poultry Production*

2.2.1 *Feeds and Feeding System*

Approximately 96% of poultry production systems in Ethiopia are based on a traditional scavenging system, which includes some form of supplemental nutrition. A variety of on-farm crops make up the majority of the supplemental feed. Due to the scarcity of grain and the difficulty of scavenging during the rainy season, these supplemental feeds are used more frequently during the rainy/wet season (July to September) than during the dry season. The quantity of extra feed given is determined by the resources that are available in the home (6).

2.2.2 *Water and Watering Frequencies*

Water is provided to chickens on an as-needed basis in family-based poultry production systems, although the frequency varies throughout the country. In different parts of Ethiopia, water provision for chickens is done freely, available all day, three times a day, twice a day, and once a day (7). Approximately 42.2% of the clean water used for chicken production during the dry season comes from tap water, thanks to initiatives by the government and non-governmental organizations (NGOs). River water (21.1%) and ground and spring water (15.6%) are the other sources of water for village chickens. Water is supplied by farmers using locally produced broken clay, bucket covers, and any other broken plastics (8).

2.2.3 *Breeding Practices and Housing System*

Farmers primarily prefer traits such as growth rate, disease resistance, egg production, body size, fertility, and mothering ability as the basis for their breeding procedures (9). A separate house was constructed just for chickens, using a bamboo (kirchat) basket on the main house's roof. On the floor of the house, starting from the ground, farmers made a sitting and resting area (‘Medeb’) used by local birds during the night. Nonetheless, some farmers share their chicken with family members while keeping it in different places inside the main house (10).

2.2.4 *Economical Trait Preferences of Local Chicken*

Framers may choose several economically significant characteristics in addition to birds' environmental adaptation in the majority of Ethiopia (11).

Table 2. Trait Preferences by Farmers

Colors/plumage	Reason for Preferences	Culling Criteria	Reference
White rose comb	Preferred for plumage color and cultural ceremony	Easily detected by predators	(12)
Black ‘Tikur’	Preferred for sale and plumage/camouflage and resistance from predators They cannot be easily stolen by predators or even thefts	Culturally believed as unlucky and indicate unfortunate phenomena	(13)
Red ‘key’	Preferred for cultural ceremonies, gifts for children, relatives, and guests Used as ornamental birds for the owners of households	Easily detected and exposed to vulnerable by predators	
Black grey ‘gebsima’	Reared for sale and plumage/resistance from predators and thefts	Lack of defined color leads to failure preferred by farmers	(11)
White reddish” wesera”	Preferred for plumage for cultural ceremonies Used as ornamental birds for the owner of the households	Easily detected by predators	(14)
White grey ‘gebsima’	Preferred for cultural ceremonies and gifts for children, relatives, and guests	Lack defined color	
Spotted”teterima”	Preferred cultural ceremony for plumage and ornamental birds in households	Lack defined color	
Rose/double comb	Resistant to be attacked/cannibalism by other birds	-	(15)
Single combs	Preferred for ornamentals and game birds for their combs	Vulnerable to cannibalism by other birds	

Table 3. Household Participation in Family-based Poultry Production

Households	Roles/Activities	Education level	Shares/owners of the birds	Rank	Reference
Women	Manage and decide the purpose of chicken production (for sale, breeding, home consumption) Marketing (sale and buy)	Any level	Family/house queen	2	(4)
Men (head of household)	Manage and decide the purpose of chicken production (for sale, breeding, home consumption)	Any level	Family/house head	3	(16)
Children (boys and girls)	Manage the birds (provision of feed, watering, guide to shelter at night) Marketing (sale and buy)	Primary- High school	Family/children only	1	
Other members	Manage the birds (provision of feed, watering, guide to shelter at night)	Any level	Family/children only	4	

The traits of cultural value could be used officially at different events when feather color is significant. During most holidays (such as New Year's), white-plumed chickens are preferred, while primarily black-plumed chickens are typically thought to bring bad luck as a manifestation of magical occurrences (13). To determine how to select traits for egg and meat production, Ethiopian farmers primarily look for high egg production, followed by body size and weight, brooding ability, and growth rate. In other ways, body size and weight were ranked first, followed by egg productivity, brooding ability, and growth rate. Most farmers chose breeding hens based on these factors, as well as plumage color, comb type, and egg production (14).

Farmers prioritize disease resistance, indicating the value of hens' adaptive qualities from an economic standpoint. Genetic improvement for improved antibody response, parasitism resistance, and productivity within and across chicken ecotypes is possible in Ethiopia due to the country's varied indigenous chicken gene pool (15). A variety of genetic and breed-improvement techniques are employed to enhance the productivity of existing hens, including the introduction of exotic breeds, crossbreeding, and selective breeding. The problem of developing and modifying chicken breeds remains one of the largest barriers to increasing the sector's economic contribution (17).

Farmers develop a range of alternative strategies to enhance village poultry productivity, focusing on genetic resources that are most valuable in their local context. These strategies help conserve locally adaptive genetic resources of chickens that are disease-resistant, resulting in healthier chicks that farmers need to raise. The qualities of egg production performance and chicken body size are ranked lower than the trait of mothering skill, which is necessary for excellent production performance and is determined by the capacity to hatch and care for an optimal number of eggs that are incubated (18).

This is likely because poultry keeping in rural Ethiopia is semi-subsistence-oriented; farmers have limited access to markets and hence place less value on egg production. However, the farmers' preference for traits contradicts the Ethiopian government's ongoing efforts to enhance the productivity of village poultry by introducing commercial and specialized egg-layer improved chickens (19). It is important to understand farmers' preferences and production objectives in the prevailing production system to achieve increased productivity in village poultry. Good mothering ability, a preferred trait among farmers, is characteristic of indigenous chickens in rural Ethiopia (5).

Native chicken genetic resources should be the focus of efforts to increase productivity and promote the broader use of new breed technology. Especially the flavor of meat and eggs characteristic of native chicken was also one of the most favored and valued characteristics of chicken. This provides farmers with a motivation to maintain native chickens and a chance to protect the local genetic pool at the farm level (15). To improve village poultry productivity, future breeding projects should consider local genetic resources and focus on the most desirable and valued characteristics of chickens in the current production system (12). Smallholder farmers raise native, unimproved flocks of hens that are suited to their surroundings, but these flocks grow slowly and produce a limited number of eggs (20).

The introduction of high-yielding exotic chickens to replace native stocks is the primary strategy employed in Ethiopia to enhance the productivity of indigenous chicken ecotypes. However, this approach is still limited because

imported exotic breeds have failed to adapt to local environmental conditions, have been poorly managed, lack input and output markets, and have a shortage of high-quality feeds, vaccines, and veterinary inputs (21).

As resources for creating suitable breeding strategies, Ethiopian poultry breeding programs prioritize and require the definition of production conditions as well as the identification of breeding techniques, production goals, and trait preferences of village farmers. Ethiopian poultry breeding projects should consider farmers' preferences and production goals to achieve the dual objectives of increasing output and conserving the native chicken gene pool's adaptability. The introduction of chicken strains that are tropically adapted and closely resemble the local chicken features that farmers want and highly value can serve as an alternative to local genetic resources (16).

It was determined that the age, education, and religious background of farmers contributed to heterogeneity in preferences. Due to the social significance of chickens with predominantly red plumage, believers of Ethiopian Orthodox Christianity did not choose chickens with predominantly white plumage. Older respondents chose disease-resistant chickens, which may be due to their lack of access to animal health services and greater risk aversion. Similarly, farmers with higher levels of education preferred chicken profiles with flavorful meat and eggs (22).

Compared to smaller chickens, farmers favored larger-bodied birds. Farmers favor hens that lay more eggs per clutch, as indicated by the attribute "eggs per clutch" having a positive mean parameter. To increase the productivity of the village poultry sector, farmers prefer exotic chickens with good disease resistance over those with poor mothering ability. Ethiopian native breeds of poultry are renowned for their maternal abilities, as well as their high-quality meat and eggs (5).

There is much more to discover about the genetic diversity of both adaptive and productive features. The foundation for converting the subsistence mode of production into a more economically viable base is the availability of village chicken resources. It is necessary to conclude that a comprehensive interdisciplinary approach to rural poultry production, encompassing institutional and organizational capacity, is crucial for addressing the major constraints and achieving the expected improvements, given the identification of potential opportunities, key constraints, and potential solutions for enhanced production. A novel strategy is proposed to increase flock productivity rather than individual animal output, utilizing locally accessible resources, in light of lessons learned from previous chicken improvement initiatives that focused on introducing commercial exotic stocks (17).

3 Egg Production Performance of Local (Indigenous) Chickens

Egg quality traits were evaluated using both internal and external quality parameters. The form, texture, color, shape index, shell, and total weight of the egg and shell are all considered aspects of external egg quality (17). Local hen eggs weigh an average of 43 grams (with a range of 34 to 60 grams), and Ethiopian local breed chicken weighs 47 grams (23). Compared to eggs with lower shape index percentages, those with higher shape index percentages have a more circular shape. In the developed world, "normal" chicken eggs are expected to be elliptical (oval) in shape, and eggs with unusual shapes, such as long or thin, spherical, or flat-sided, would not be assigned to grades AA or A (24).

3.1 Feed intake

Farmers offered feeds for their chickens, including locally produced poultry feeds such as sorghum, maize, wheat, barley grain, and grain by-products, as well as human food that was either left as is or supplemented with additional nutrients. The difference between the feed offered and refused for each will be taken as feed consumed and feed intake, divided by the total number of chickens owned by individual farmers (25).

3.2 Feed Conversion Ratio (FCR)

The feed conversion ratio was determined by calculating the weight of feed consumed and the weight of eggs produced (26). However, smallholder poultry farmers may lack proper feed inventory records, which leads to feed wastage and worsens poultry production costs.

$$\text{Feed Intake(gram/day} = \frac{(\text{Feed offered(gram)} - \text{Feed refused(gram)})}{\text{No of layers in replication}}$$

$$\text{FCR} = \frac{\text{Feed consumed (gram / hen / day)}}{\text{Egg mass (gram / hen / day)}}$$

3.3 Egg production Performance of local chickens

Local chicken performance will be evaluated based on daily egg production, the number of birds that are alive, and the total number of eggs produced each day. For every day (27), all eggs were weighed as soon as they were collected.

The average percentage of hen-day egg production (HDEP %) was used to indicate the rate of lay for each day. The average values from each day were then calculated using Hunton's (1995) approach. After that, egg mass was determined daily by multiplying the average egg weight by the HDEP percentage (28).

$$\text{Hen-day egg production \%} = \frac{\text{No of eggs collected per day}}{\text{No of the hens present that day}} x100$$

M = P * W, W =M/P

Where M=average egg mass/hen/day

P=number of egg production/hen

W= average egg weight (g)

3.4 *Assessment of Internal Quality of Table Eggs*

3.4.1 *Eggshell weight and strength*

Representative samples of eggs were randomly collected from farmers and markets, as the majority of consumers buy eggs for consumption. Then, each sample was weighed. Then, it thoroughly broke and separated from the shell membrane. The eggshell weight was measured using an electronically sensitive balance, and the shell thickness was measured with a screw gauge micrometer having a sensitivity of 0.001 mm at three positions on the egg: the air cell (broad end), the equator, and the sharp endpoints. The average of the three measurements was taken as the thickness of each eggshell. The eggshell was air-dried for approximately 24 hours and weighed using a sensitive balance (29).

3.4.2 *Albumen quality*

Albumen quality was determined from albumen height, albumen ratio, and Haugh unit. Representative samples of eggs were randomly selected and carefully broken, then spread on a flat tray. The standing-up ability (viscosity) of the albumen was measured using a tripod micrometer. The albumen ratio was calculated from the sample egg weight and albumen weight using the formula suggested by Pradeepta (2015). Haugh unit (HU) score was calculated from the albumen height and egg weight using the following formula (29).

$$\text{Albumen ratio}(\%) = \frac{\text{Albumen weight}}{\text{Egg weight}} X100$$

$$HU = 100\log(H - 1.7W^{0.37} + 7.6)$$

Where: HU= Haugh Unit, H= albumen height (mm), W= egg weight (g).

3.4.3 *Egg yolk quality*

Egg yolk quality was determined by measuring yolk weight, yolk height, yolk diameter, yolk ratio, yolk index, and yolk color (30). Yolk weight was measured by digital sensitive balance. The yolk height and the diameter were measured using a tripod micrometer and ruler, respectively. Yolk color was measured by removing the yolk membrane, thoroughly mixing the yolk, and taking droplets on pieces of white paper. These droplets were then compared with Roche fan measurement strips, which ranged from 1 to 15. The yolk ratio and yolk index were also computed using the following formula (31).

$$\text{Yolk ratio}(\%) = \frac{\text{Yolk weight}}{\text{Egg weight}} x100$$

$$\text{Yolk index}(\%) = \frac{\text{Yolk height}}{\text{Yolk diameter}} x100$$

4 Climate Change Resilience: Future Alternative Opportunities of Poultry Production

The term "climate change" refers to variations in long-term climatic patterns (32). GHG emissions that warm the atmosphere are the main cause of global climate change (33). Due to its 14.5% present contribution to global GHG emissions, the cattle industry is largely responsible for declines in biodiversity, air and water pollution, and land degradation. Finding strategies to cut waste and greenhouse gas emissions while allowing for future increases in animal production is crucial (34). Climate change poses a significant challenge to agricultural and socio-economic development. Competition for natural resources (especially water), the amount and quality of feeds and fodder, heat stress, livestock diseases and pests, and biodiversity loss all have an impact on livestock production at a time when demand for livestock products is predicted to rise by 100% by the middle of the twenty-first century. Finding a balance between environmental preservation, food security, and productivity is difficult(33).

Ethiopia's heavy reliance on rainfed agriculture and natural resources, combined with its comparatively limited ability to adapt to these anticipated changes, makes it one of the most vulnerable nations to climate variability and climate change. Water resource underdevelopment, low healthcare coverage, rapid population growth, limited economic development, poor road infrastructure in drought-prone areas, weak institutional frameworks, and a lack of knowledge are some of the challenges. Along with

unpredictable rainfall and rising temperatures, Ethiopia has regularly seen extreme events, including droughts and floods, all of which have a negative influence on livelihoods. Soil erosion, deforestation, frequent droughts, desertification, land degradation, and the decline of species and biodiversity are the main environmental issues. All sectors urgently need to adjust to the effects of climate change, given the country's susceptibility to them.

Ethiopian poultry farming has the potential to boost both household and national economies significantly. Village poultry are essential to rural communities because they provide smallholder farmers' families with access to protein. This is especially true in Ethiopia, where there are no cultural or religious taboos regarding the consumption of eggs and poultry meat, and people have limited access to alternative sources of animal protein (35). In Ethiopia, poultry plays a significant role in the community's religious and cultural life, in addition to providing families with high-quality protein and modest economic benefits (36).

Furthermore, in Ethiopia, raising chickens is one of the most lucrative jobs for rural women, as well as for marginalized and landless farmers, who find it a significant source of revenue. Additionally, it creates jobs for the underprivileged while simultaneously expanding the community's total supply of high-quality animal protein (16). As the global standard of living rises over this period, the demand for agricultural products is expected to increase by almost 70%. We will need to produce more food on the land we already have in order to feed the world's projected population (37). Intensive farming methods, however, have the potential to harm ecosystems and land. Ecosystems and water supplies are adversely affected by the tendency to consume more animal products, especially in developing nations. Animal dung, fertilizers, and pesticides, and antibiotics used in the production of fodder, leftover farming by-products on the pasture (runoff) can all lead to contaminating sources of water (rivers, stream ponds) (38).

The main meat consumed in Ethiopia is beef, and the size of the cattle contributes to the high GHG emissions caused by the demand for beef. Compared to beef and other large ruminants, the emission intensity of chicken meat is far lower. Nonetheless, chicken consumption is currently lower than in other nations in terms of overall meat consumption. This scenario assessed lowering the consumption of cattle beef to 30% by 2030 while raising the consumption of small ruminant meat to 40% and poultry meat to 30%. The Ethiopian government plans to reduce beef and dairy cattle by 10% and 5%, respectively, while increasing small ruminants by 20% and poultry by 50% annually (34).

Increased productivity and less greenhouse gas emissions will result from farmers reducing the number of animals on their farms and replacing low-productivity animals with more productive ones. This will allow each animal to be properly fed and cared for. One of the best ways to lower GHG emissions per unit of livestock product is to increase animal productivity. Enhancing animal productivity and lowering the intensity of greenhouse gas emissions can be achieved by increasing the genetic potential of animals through planned crossbreeding or selection within breeds, achieving this genetic potential through appropriate nutrition, and improving reproductive efficiency, animal health, and reproductive lifespan. Although residual feed intake would seem like a useful method for identifying animals with low CH4 emissions, there is not enough data to conclude that animals with low residual feed intake produce less CH4 per unit of feed intake or animal product at this time (34).

Selection for feed efficiency will yield animals with lower GHG emission intensity. Breed differences in feed efficiency should also be considered as a mitigation option, although insufficient data are currently available on this subject. Reducing the age at slaughter of finished cattle and the number of days that animals are fed in the feedlot by improving nutrition and genetics can also have a significant impact on GHG emissions in beef and other meat animal production systems. Improved animal health, along with reduced mortality and morbidity, is expected to increase herd productivity and decrease GHG emission intensity in all livestock production systems.

5 Conclusion

Although family poultry production and reproduction were of low economic significance, the native chickens provided high-quality protein for family nutrition and generated income for smallholder households. For breeding purposes, most Ethiopian farmers select hens and cocks based on productivity qualities that indicate the production of eggs and meat, which was the main goal of chicken farming. As a foundation for future genetic improvement of local chickens, which have been adapted to tropical climates through selection and crossbreeding with exotic breeds, the identification and inclusion of farmers' preferences for local chicken traits may be used to integrate indigenous chickens and improve locally adapted chicken traits.

Acknowledgements

The authors thank all local farmers and egg marketing retailers of Awaday, Haramaya, Babile, and Adele Woredas for providing primary data on family-based poultry production.

Conflict of Interest

The authors declare no competing interests.

Author Contributions

Seyoum Bekele Alemu, the first author, generated the primary data, manipulated it, and organized it from published articles in different parts of Ethiopia. Meseret Girma Abebe (PhD, Associate Professor in Animal Nutrition), the corresponding author, designed the manuscript for publication format, translated it, and corrected the English language grammar.

Data Availability Statement

Brief quotations from this review article are not allowable without special permission, provided that accurate acknowledgment of the source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by permission must be obtained from the author and correspondences.

Ethical Considerations

The study, entitled “Sustainability of Poultry Production: Socio-Economic Roles and Alternative as Climate Change Resilience of Livestock Production in Ethiopia," followed the international guiding principles for Biomedical Research Involving Animals, as listed under Article 2012 of the International Council for Laboratory Animal Science (ICLAS). Therefore, the School of Animal and Range Sciences' Animal Ethics Committee and the Committee for Control and Supervision of Experiments on Animals in Ethiopia approved the experimental procedure dated May 5, 2021.

Funding

The authors declared that Haramaya University, Awaday, Adele, and Babile woredas farmers and egg marketing retailers are the sources of funding for data collection, the experimental sample of eggs, and all materials required for data collection.

References

1. Alemayehu Y, Harpal S, Goshu G. Challenges and chicken production status of poultry producers in Bishoftu, Ethiopia. Poultry Science. 2019;98. [PMID: 31264699] [PMCID: PMC6771543] [DOI]
2. Alebachew G, Ejigu A, Yizengaw L, Gebeyehu S. Poultry Production and Marketing Systems in Ethiopia: A Review. Annals of Agricultural & Crop Sciences. 2022;7:112. [DOI]
3. Tadesse A, Tinsae TG. Economic and social values of family poultry production and its constraints in Ethiopia. 2016.
4. Tesfahun JB, Fasil G, Tadelle D. Socio-economic, marketing and gender aspects of village chicken production in the tropics: A review of literature. 2018.
5. Terfa Z, Garikipati S, Kassie G, Dessie T, Christley R. Understanding farmers' preference for traits of chickens in rural Ethiopia. Agricultural Economics. 2019;50. [DOI]
6. Wondie D, Abebe A, Alebachew H. Assessment of poultry feed and handling mechanisms of poultry production challenges in Benishangul-Gumuz Region, Western Ethiopia. Cogent Food & Agriculture. 2024;10. [DOI]
7. Yihun A. Husbandry Practice and Reproductive Performance of Indigenous Chicken Ecotype in Awi Zone, Amhara Regional State, Ethiopia. International Journal of Applied Agricultural Sciences. 2020;6:179. [DOI]
8. Salo S, Tadesse G, D H. Village Chicken Production System and Constraints in Lemo District, Hadiya Zone, Ethiopia. Poultry, Fisheries & Wildlife Sciences. 2016;4.
9. Hailu A, Wuletaw Z, Mazengia H. Breeding practice and objective of indigenous chicken in North Wollo, Amhara regional State, Ethiopia. International Journal of Livestock Production. 2013:15-22. [DOI]
10. Tarekegn G, Senbeta EK, Kebede NA, Aemro T, Terefe A. Poultry Research Village Chicken Husbandry Practice, Marketing and Constraints in Eastern Ethiopia. Unknown. 2016;5:104-8.
11. Feleke A, Tadesse T, Dancho A. Challenges and Opportunities of Village Poultry Production in Arbegona Woreda, Sidama Zone, Southern Ethiopia. DEVELOPING COUNTRY STUDIES. 2015;5.
12. Dessie T, Yami A, Peters K. Indigenous chickens in Ethiopia: Genetic potential and attempts at improvement. Worlds Poultry Science Journal. 2000;56:45-54. [DOI]
13. Dessie T, Woldegiorgiss W, Van der Waaij L, Zegeye F, Gizaw S, Okeyo A. Village chicken production in the central and western highlands of Ethiopia: Characteristics and strategies for improvement. 2013.
14. Muluneh B, Taye M, Dessie T, Wondim D, Mengesha D, Tenagne A. Selection Criteria and Husbandry Practices of Indigenous Chicken Producers in Northwest Ethiopia. 2024. [DOI]
15. Chebo C, Nigussie H. Performances, Breeding Practices and Trait Preferences of Local Chicken Ecotypes in Southern Zone of Tigray, Northern Ethiopia. Asian Journal of Poultry Science. 2016;10:158-64. [DOI]
16. Tirfie F. Review on Poultry Production Status and Economic Contribution of the Sector in Ethiopia. 2023;109:1-9.
17. Alemneh T, Getabalew M. Exotic chicken production performance, status and challenges in Ethiopia. 2019;5:039-45. [DOI]
18. Neme Y, Ayele J, Asrat M. Village Chicken Production Performances and Producers Trait Preference in Buno Bedele and Ilu Aba Bor Zone South Western Ethiopia. 2019;8:34-43.

19. Woldegiorgiss W. Farmers' preferences towards breeding objective for indigenous chickens in different agro-ecologies of Ethiopia. African Journal of Agricultural Research. 2020;16. [DOI]
20. Chaimiso S. Review on village/backyard/ poultry production system in Ethiopia. Pacific International Journal. 2018;1:105-10. [DOI]
21. Batiso Y. Introduction of the exotic breeds and cross breeding of local chicken in Ethiopia and solution to genetic erosion: A review. African Journal of Biotechnology. 2020;19:92-8. [DOI]
22. Belay F, Wolde A. Socio-economic importance and production characteristics of village poultry production in Ethiopia: A review. 2022:112-22.
23. Alemu S, Hanotte O, Kebede F, Woldegiorgiss W, Abegaz S, Bruno J. Evaluation of live-body weight and the number of eggs produced for introduced and local chickens in Ethiopia. Acta Agriculturae Scandinavica, Section A - Animal Science. 2021;70:1-7. [DOI]
24. Sebho H. Exotic Chicken Status, Production Performance and Constraints in Ethiopia: A Review. Asian Journal of Poultry Science. 2016;10:30-9. [DOI]
25. Kejela M, Diba D, Yusuf H, Ferade B, Duguma G, Mohammed H. Feed Intake, Weight Gain and Profitability of Sasso Chickens Fed Locally Formulated Rations at Wollega University, Nekemte, Ethiopia. Journal of World Applied Sciences. 2020;38:404-15.
26. Puvača N, Kostadinović L, Ljubojević Pelić D, Lukač D, Popović S, Novakov N. Effect of garlic, black pepper and hot red pepper on productive performances and blood lipid profile of broiler chickens. Archiv fur Geflugelkunde. 2015;79. [DOI]
27. Wegner M, Kokoszyński D, Biegniewska M. Effect of litter system and nest box type on egg production and performance of Ross 308 broiler breeders. Animal Production Science. 2022;62. [DOI]
28. Bekele B, Melesse A, Esatu W, Dessie T. Production performance and egg quality evaluation of indigenous chickens across different agro-ecologies of Southern Ethiopia. Veterinary Integrative Sciences. 2022;20:133-45. [DOI]
29. Khaleel R. Prediction of haugh unit by egg weight and albumen height. Mesopotamia Journal of Agriculture. 2019;47:37-43. [DOI]
30. Bonchev D, Lukanov H, Zlatev Z. Determination of Egg Yolk and Albumen Main Quality Characteristics by Image Processing Techniques. Journal of Intelligent Animal Husbandry. 2023.
31. Wesley R, Stadelman W. Measurements of Interior Egg Quality. Poultry Science. 1959;38:474-81. [DOI]
32. Digesa S. Climate Change Impacts on Livestock Production and Adaptation Strategy used by Households in Loka Abaya District, Southern Ethiopia. 2024:28-41.
33. Menghistu HT, Abraha A, Tadesse G, Tesfay G, Mersha T, Redda Y. Greenhouse gas emission and mitigation potential from livestock production in the drylands of Northern Ethiopia. Carbon Management. 2021;12:1-18. [DOI]
34. Berhe A, Bariagabre S, Balehegn M. Estimation of greenhouse gas emissions from three livestock production systems in Ethiopia. International Journal of Climate Change Strategies and Management. 2020. [DOI]
35. Biru S, Jo C, Lee M. Meat Consumption Culture in Ethiopia. Korean Journal for Food Science of Animal Resources. 2014;34. [DOI]
36. Assefa H. The role of poultry for poor livelihoods in Ethiopia. 2019:1-04.
37. Guèye E. The Role of Family Poultry in Poverty Alleviation, Food Security and the Promotion of Gender Equality in Rural Africa. Outlook on Agriculture. 2000;29:129-36. [DOI]
38. Shankar T, Praharaj S, Sahoo U, Maitra S. Intensive Farming: It's Effect on the Environment. 2021;12:377-480.