

Full Length Research Paper

Ethiopian Poultry Production System Dynamics: Opportunities, Challenges, and Marketing

Gebremeskel and Roba

Addis Ababa University, Addis Ababa, Ethiopia

Accepted 11 February, 2025

The goals This study summarizes previous, recent, and/or ongoing research on the dynamics of Ethiopia's poultry production system, including its prospects, restrictions, and marketing system. Ethiopian poultry production systems are currently divided into two categories: family poultry production systems and industrial and integrated/medium- and large-scale intensive systems. The small-scale intensive system is characterized by commercial day-old chicks (DOCs), commercially balanced rations, and high-quality houses. Extensive scavenging is defined as involving 5 to 50 birds made up of native and/or crossbred chickens and is carried out by households with access to rural markets and small-extensive scavenging systems. Semi-intensive scavenging is defined by flocks of 50 to 200 birds that use commercial, crossbred, or indigenous breeds raised under scavenging management conditions with regular supplementation. It is predicated on a flock of one to five native chickens raised in scavenging environments. The average number of chicks, cockerels, pullets, hens, cocks, and total chickens per home in Ethiopia was 5.3, 1.3, 1.7, 4, 1.5, and 11.1 per household, respectively. Every scavenger chicken producer uses 100% supplemental feeding from all kinds of feed, with 63% coming from supplemented maize. During the dry season, it must include a protein source of feed.

Key words: Production system, Ethiopia, Chicken, Productivity.

INTRODUCTION

The Many rural households in Ethiopia, like those in other developing nations, raise chickens in their farmyards. According to CSA (2016), there are an estimated 60.5 million chickens in the nation, with 94.33% of them being native, 3.21% hybrid, and 2.47% exotic. Chicken plays significant socioeconomic functions in developing nations and offers food, cash revenue, and gifts to improve social ties. (FOA, 2009, 2010). Although there is significant variation in the distribution of chicken keeping, over half of Ethiopian households in both rural and urban areas keep chickens. The majority of households in highland areas keep chickens, while far fewer do so in lowland pastoral areas (Ayele et al., 2009 and Wilson, 2010).

However, according to Ethiopian CSA (2013), indigenous, hybrid, and exotic poultry accounted for 96.9, 0.54, and 2.56% of the total poultry, respectively. The vast majority (99%) of these hens are kept in a conventional system with minimal or no

assistance with housing, nutrition, or medical care. Local ecotypes, which exhibit significant variety in body position, color, comb type, and productivity, are the most prevalent chicken types raised in this system (Tadelle et al., 2003b; Halima et al., 2007). Scavenging of family cooking waste, cereal and cereal by-products, pulses, roots and tubers, oilseeds, shrubs, fruits, and animal proteins provides the majority of the diet for village chickens (Samson and Endalew, 2010).

Disease, inadequate nutrition and housing, and inbreeding are the main problems affecting poultry production in rural areas. The marginal farmer would directly profit from higher productivity if these restrictions were lifted. In the majority of production systems, large losses are caused by chicken mortality. Accordingly, developmental choices for boosting indigenous chicken productivity in the near future should focus on enhancing fundamental management techniques including providing shelter,

supplemental feeding, and medical attention (Misba et al., 2011).

Fathers' participation in the labor division of chicken management increased as the number of scavenging chickens per household increased, but their decision-making for egg consumption at home decreased as the number of chickens per household increased. This suggests that fathers share or transfer responsibility to their mothers. In 2020, Alemayehu G. et al. Farmers who raised chickens for scavenging had the idea of supplementing their feed, but the feed's quality and quantity were insufficient because the majority of its ingredients were energy sources. Nearly all of the responders gave their chickens water, despite differences in the supply and frequency of watering. Along with price and a sustainable market, work is also required to address the issue of feed quality. Thus, this paper's goal was to examine the state of the chicken production system today, identify opportunities and restrictions, and provide beneficiaries with information that is easy to understand.

Structure of the Ethiopian Poultry Production

Ethiopia's poultry production systems are divided into several categories, including family poultry production systems (i.e., small-scale intensive, semi-intensive, extensive scavenging, and small-extensive scavenging systems), industrial, integrated/medium-, and large-scale intensive systems (FAO, 2014). Location, farming system, breed, flock size, housing, nutrition, health care, biosecurity, and veterinarian availability are some of the specific criteria that determine the classification. services, mortality rate, and other technological advancements. A large-scale, medium-sized, and integrated intensive producer's system that houses more than 500 layers or 1000 broilers. Within these systems, manufacturers differ greatly in terms of their use of technology, level of management, and operational scale. Successful poultry interventions would enable the sub-sector to transition to better family poultry with semi-scavenging crossbreds and to significantly expand the scope of specialized layer and broiler enterprises, according to Ethiopia's 2015 livestock master plan. In addition to raising national income, such a change would significantly lower poverty and malnutrition among the impoverished in both rural and urban areas. Both urban and rural regions have small-scale intensive and semi-intensive poultry production systems. On the other hand, the former are mostly found in the country's core cities and peri-urban areas. In addition to a very limited supply from government sources, particularly research centers, these producers use a variety of exotic and native chicken breeds and get inputs (such as day-old broiler and layer chicks, pullets, feed, and vaccines) from medium- and large-scale intensive poultry producers. The majority of the country's poultry meat and eggs are produced utilizing low-producing indigenous breeds under scavenging family poultry farming systems (FAO, 2019). Nonetheless, a growing percentage of production is coming from exotic breeds in intensive production systems. Despite making up only 9% of the entire national flock, exotic breeds generated almost 27% of all eggs in the country in 2016.

Family poultry production systems

Utilizing specialized, commercial day-old chicks (DOCs) or pullets (200–1,000 broilers, 100–500 layers), commercially balanced

diets, and high-quality housing are the foundations of a small-scale intensive poultry production system. Under this system, producers have complete access to veterinary care, and the total bird fatality rate is low to medium (less than 20%). The country's urban and peri-urban areas are seeing a sharp increase in the small-scale intensive system. For many families, they are significant sources of revenue, and they are typically operated as family businesses. Youth employment is currently significantly influenced by small-scale intensive poultry production. (2019, FAO).

Flocks of 50–200 birds produced using commercial, crossbred, or native breeds raised in scavenging management circumstances with frequent supplements are the hallmark of a semi-intensive poultry production method. In contrast to scavenging systems, birds are given better housing and medical attention, which leads to low to medium mortality rates (between 20 and more than 50 percent) (FAO, 2019). According to Shapiro et al. (2015), the semi-intensive family poultry system was used by about 120 000 households in 2014, according to the Ethiopian Livestock Master Plan (LMP). However, according to the CSA report, there are only over 9,000 chicken owners with flock sizes between 50 and 199, with approximately 8,000 of those owners owning between 50 and 99 birds (CSA, 2017).

Nearly all of the characteristics listed below for small extensive systems are also present in vast scavenging systems. Nonetheless, it is practiced by households with access to rural markets and is centered on a greater flock size (between 5 and 50 birds) made up of native and/or crossbred chickens. In this system, producers typically raise their own replacement stock because they do not regularly have access to exotic chicks. The main motivations for keeping hens are to generate revenue and ensure food security. To hatch replacement stock, they use broody hens (FAO, 2019).

With the primary goal of raising chickens for domestic use, households in isolated areas with limited or no access to markets employ a small-to-extensive scavenging system. It is predicated on a flock of one to five native chickens raised in scavenging environments. Birds lack housing and receive little to no additional nutrition. The process of natural incubation produces chicks. Due to inadequate medical attention and veterinary services, this system is also marked by a high rate of chicken mortality, frequently exceeding 70% (FAO, 2019).

Production and Productivity Performance of Chicken

In 2016, around 91% of the nation's poultry population was made up of native chickens. (2019, FAO). Over the past few decades, numerous academics and rural development organizations have acknowledged the value of village poultry production in developing nations' national economies as well as its contribution to raising the incomes and nutritional status of numerous small farmers and landless communities (Abera and Tegene, 2011; Fisseha et al., 2010a). Because of its flavor and taste, local chicken always sells for more than imported ones. Ethiopia boasts abundant local chicken genetic resources with high-quality meat and/or eggs, low stress susceptibility, and other beneficial traits. Ethiopian native chickens have a great deal of genetic and morphological variety, which could be used to their advantage. (Tsega and Mammo, 2011) Village-based chicken farming can significantly improve the standard of living for impoverished village families because it requires less space and money (Samson and Endalew, 2010). The average age of scavenging cockerels at first mating and pullets at first egg was 24.2 and 24.2 weeks, respectively, and the average egg production potential of scavenging chicken is 76.3 eggs/year/hen. In 2017, Alemayehu G.

During the day, the birds forage around the homestead, where they may be supplemented with cereal grains, cereal bran, broken grains,

and other household trash (Aklilu et al., 2007). With an estimated 56.87 million people, Ethiopia is one of the few nations in Africa with a sizable chicken population (CSA, 2015). Nonetheless, most Ethiopian rural communities have relatively few chicken flocks per family, consisting of an average of 7–10 mature chickens, 2–4 adult hens, a male fowl (cock), and several growers of different ages (Tadelle and Ogle 2001). Ethiopian local chickens differ greatly in terms of body size, conformation, plumage color, comb type, and feather cover, according to Alemu and Tadelle (1997).

Exotic chicken

There have been no documented attempts to assess exotic birds' performance in the context of local farmers. The performance of six distinct exotic breeds was compared in Ethiopia's sole significant on-station attempt. Layers breed Australorp, New Hampshire, White Leghorns, Bovan Brown, Dominant D102, Lohmann silver, Lohman Brown Classic, Dominant Sussex D104, Novo Brown, dual purpose breed Rhode Island Red, Fayomi, Potchefstroom Koekoek, Red Barred D922, Novo Color, and Lohman are just a few of the exotic chicken breeds that have been around since the 1950s. To increase poultry output and productivity, the dual and broiler breeds Hubbard Classic, Hubbard JV, and Cobb 500 were brought to Ethiopia (Alemayehu G. 2017). The two-layer breeds TETRA-SL LL and TETRA-L SUPERB are now available. The Bishoftu (Debre Zeit) Agricultural Research Center is evaluating parent stock that was brought from Hungary. As a result, 106.57 million eggs are estimated to be produced year (CSA, 2015), which is less than what other developing nations produce. Approximately 5.4 million exotic and hybrid chickens are currently in the country, making up 9% of all poultry.

Cross chickens

Due to the poor performance of native chicken, attempts have been undertaken to introduce various foreign poultry breeds into Ethiopia's smallholder agricultural system. Although farmers used both control and uncontrolled mating systems, the majority of families used the former (81.1%) and the latter (18.9%). According to Alemayehu et al. (2018a), this suggests that the homes have a variety of chicken genotypes, which fosters unintended, indiscriminate crossbreeding between the diverse genotypes.

Flock composition

Designing, planning, and implementing suitable breeding techniques and other management interventions requires knowledge of the size and makeup of a particular livestock breed's flock. In general, October, November, December, and January had larger flock sizes per home. The average number of hens per household in lowland and midland agro-ecology was 5.6 and 8, respectively, and ranged from 2 to 20. (Alem and others, 2013). The percentage of each sex and age group in the flock is used to characterize its structure. Meseret (2010) found that the average number of chickens per household was 6.23. The mean flock size in this study, however, was less than the mean flock size of 8.8 and 9.2 chickens/household, respectively, that Asefa (2007) reported for Awassa Zuria and Mekonnen (2007) reported for the Dale woreda in Ethiopia.

The average number of chickens per household was 7.13, according to the results of multiple studies. In Northwestern Ethiopia, flock sizes vary from season to season primarily due to factors like feed availability, disease, predators, and the owners' economic standing (Halima, 2007; 6.2 chickens in Gomma Wereda of Jimma zone (Meseret, 2010); in Burie, Fogera, and Dale woredas, they are 13.1, 12.4, and 9.22, respectively (Fesseha et

al., 2010b). In the western part of Tigray, the number of native, exotic, and crossbred chickens per household was 22.83, 0.96, and 1.57, respectively. Shishay (2014). The average number of chicks, cockerels, pullets, hens, cocks, and total chickens per home in Ethiopia was 5.3, 1.3, 1.7, 4, 1.5, and 11.1 per household, respectively.

Ownership and pattern and gender role

Because they demand less input (space, labor, capital, and other resources), chickens are raised by any member of a family in Ethiopia's rural and urban locations. In total, women made up the largest portion of those who offered chicken feed (53%) followed by mothers and fathers (13), hired workers (7%), all family members (9%), mothers with children and fathers and mothers with only one child (5%), mothers and children (3%) and mothers with male and female children equally (2%) and mothers with children (1%). (G. Alemayehu, 2017).

According to a study done in the Amhara regional state's Fogera woreda (Bogale, 2008), women bear a greater share of the burden for providing water and feed (59.72%). Men were in charge of building the shelter (63.89%), while women were responsible for cleaning the chicken coop (62.5%) and selling the chicken (54.95%). In a study on village chicken production in some regions of Cameroon and Nigeria, Abubakar et al. (2007) found that all genders participate in chicken management, with children bearing the primary responsibility of keeping the chickens overnight and releasing them in the morning. In Cameroon, women own the majority of chickens (52.7%), followed by children (26.9%) and men (20.4%), according to the study's findings. In contrast, in Nigeria, males own the majority of hens (55.6%), followed by women (38.9%) and 15 children (11.1%). According to Halima (2007), men are in charge of crop cultivation and other off-farm tasks, whereas rural women in North-West Ethiopia are primarily in charge of raising chickens in homes with both male and female heads.

Feeding and feed resource

According to Alemayehu et al. (2020), all scavenging chicken producers use supplementary feeding (100%) from all types of feed and supplemented maize account (63%). The study's findings indicate that nearly all of the participants (97.8%) reported using a scavenging system in conjunction with supplemental feeding. This study's findings concurred with those of Asefa (2007) and Mekonnen (2007), who found that 95–98% of small-scale family poultry producers in Awassa Zuria and Dale provide their birds with additional nutrition. The current study's participants also attested to the fact that Gomma Woreda's scavenge feed supply includes insects, grass, ensent (Enseteventricosum), kitchen scraps, and harvest leftovers, suggesting that the village's chicken production system is environmentally beneficial. Ethiopian poultry farmers frequently lament the high price and poor quality of available poultry feed. The majority of commercial formulas lack vitamin or mineral premixes, and the mixed feed utilized is typically of low quality (EIAR, 2016).

Housing

According to Alemayehu et al. (2020), the majority of scavenging chicken producers (61.1%) built a separate housing for their chickens using materials that were readily available in the area, while the remaining 38.9% did not. Additionally, several studies showed that better housing decreased scavenging bird mortality. The results of a survey conducted in a Bangladeshi hamlet by Billah et al. (2013) show that the methods used for managing and raising chicken were inadequate. About 46% of farmers kept poultry in earthen shelters,

while 30% kept them in village homes. 10% are sheds or timber homes, 8% are bamboo or wooden homes, and 6% are concrete homes. Nyoni and Mssika (2012) state that although 97.7% of the chickens were housed in various types of structures, 3% of them spent the night in the Amatola Basin in the province of the Eastern Cape, South Africa. A variety of materials were used in the construction of the chicken house. Iron sheets covered the roof of the entire building. The structure's solid walls made up 8.6%. 76.5% had a mix of wire mesh and iron sheet, while 14.8% had wire mesh.

Disease and predators

Diseases are the main obstacle to the production of scavenging chickens, according to Alemayehu G and Solomon A (2018), who rated this as such by 40% of respondents. Other factors that were rated were: lack of chick management (16%), lack of feed (9%), lack of improved local chicken (8%), lack of medicine (6%), lack of regular vaccination (5%), predator (4%), lack of market chain and government favoritism for chicken producers (3%), lack of capital, exotic chicken, and weak extension (1%). Infectious bursal disease (IBD), Newcastle disease (ND), Marek's disease, mycoplasmosis, salmonellosis, colibacillosis, coccidiosis, toxoplasmosis, and helminthosis are among the poultry diseases that have a major economic impact in Ethiopia's intensive and family poultry production systems (FAO, 2019). With the highest rate of morbidity and death across the nation, ND is recognized as the most significant illness in all production systems (Desalegn, 2015).

Challenges and opportunities of chicken production

The FAO 2019 state chicken production challenges included: a lack of coordination in the value chains: links between input suppliers, service providers, producers, and actors in the marketing channel are poorly coordinated; fluctuating demand (especially as demand declines drastically during the Orthodox, Christians' fasting periods); low education among primary producers; a lack of feed quality control; a lack of credit services; and a tendency for most potential investors to adopt short-term investment strategies due to their risk aversion and inclination toward short-term investment strategies. Lack of expertise in preparing mixed feed, its high cost, the absence of commercial feed in the surrounding area, and the expense of feed ingredients were further barriers to Tigray's intensive management of chicken production (Tadesse et al., 2017).

Most people scavenge chicken producers, however 58% of households have not talked about their chicken production. This could be because the development agent assigned to the area focused solely on agricultural production (Alemayehu et al. 2018a). Chickens are very productive and have a short generation interval. In comparison to other agricultural animals like cattle and small ruminants, they are also easily transportable to various locations, reasonably priced, and consumed by rural residents. Additionally, chickens are complimentary to other crop-livestock operations. Compared to exotic varieties, native chickens are better at foraging and scavenging, have great disease tolerance, make good mothers, and are acclimated to harsh environments and subpar food.

Marketing systems of village chicken and egg in Ethiopia

One of the purposes of smallholder farmers' free-range chickens in Ethiopia is the sale of chickens and eggs. Depending on where the farm residence was located, producer farmers would sell village birds and eggs to dealers (collectors) or directly to consumers at

the local and urban markets. According to Aklilu (2007), poorer households have less market access and a greater distance to the market. Smallholder chicken owner farmers in various regions of Ethiopia sell chicken and eggs for the following reasons, according to Assefa (2000) and Halima (2007): to buy food, to pay for school fees, to pay for grain milling services, to buy better seeds, and to modify the size of the flock. Few poultry owner farmers in Ethiopia's central highlands trade their free-range hens for food and household goods, according to Tadelles et al. (2001).

Egg production

In the Bure district of North West Ethiopia, native hens under farmers' management produced 60 eggs per year, with a range of 24–112 eggs (Fisseha, 2009). The average yearly egg production of the native Gomma woreda hens was 43.8 eggs, according to Meseret (2010). This is comparable to the 18–57 eggs reported by Halima (2007) in North West Ethiopia and the 27–45 eggs reported by Ayalew & Adane (2013) in Changni town, Awi administrative zones of the Amhara region. However, it is less than the 60, 53, and 55 eggs reported by Fesseha et al. (2010) in Bure, Fogera, and Dale districts of Ethiopia, respectively. Another study found that in Wansho, Loka A, and Dale woredas in Southern Ethiopia, the average number of eggs per year per hen was 62.95 ± 2.29 , 54.9 ± 3.27 , and 51.44 ± 1.40 (Mekonnen, 2007). According to the findings of another recent study, in the Eastern Gojjam woreda of Enebeisi Sar Midir, the average number of eggs laid annually per hen under farmers' management conditions was 65 (Yitbarek & Zewudu, 2013).

Because consumers want higher-quality eggs, it is crucial to evaluate the internal and external quality of chicken eggs. In any consumer survey pertaining to egg quality, yolk color is a crucial component (Okeudo et al., 2003). It is widely acknowledged that every aspect of egg quality has a genetic foundation. When it comes to table and hatching eggs, egg quality is the most significant price contributing component. Consequently, the quantity of high-quality eggs produced is the one factor that determines a laying flock's financial success. A number of variables, including season, temperature, relative humidity, and rearing, can affect the quality of chicken eggs.

Conclusion

Ethiopia's chicken production system was categorized according to the circumstances and changes that occurred there. Family poultry production systems (small-scale intensive, semi-intensive, extensive scavenging, and small-extensive scavenging) are currently classified as industrial, integrated/medium-, and large-scale intensive systems. All scavenging chicken producers use supplementary feeding (100%) from all types of feed, supplemented maize account (63%) which is a source of full energy, thus it requires incorporated protein source feed. The majority of Ethiopian farmers use modest, comprehensive scavenging systems. The government must concentrate on raising the main feed ingredient in the nation in order to lower the cost of chicken feed.

Participate in the transition from small-scale extensive scavenging to small-scale intensive, semi-intensive, or and extensive scavenging by providing necessary resources such as vaccine, veterinary services, and skill development in order to address the Ethiopian government's chicken production. Additionally, the government supports the Synthetics Development Institute, which helps farmers simultaneously produce breeds for a sustainable grow economy and establish a grandparent chicken farm in Ethiopia.

Reference

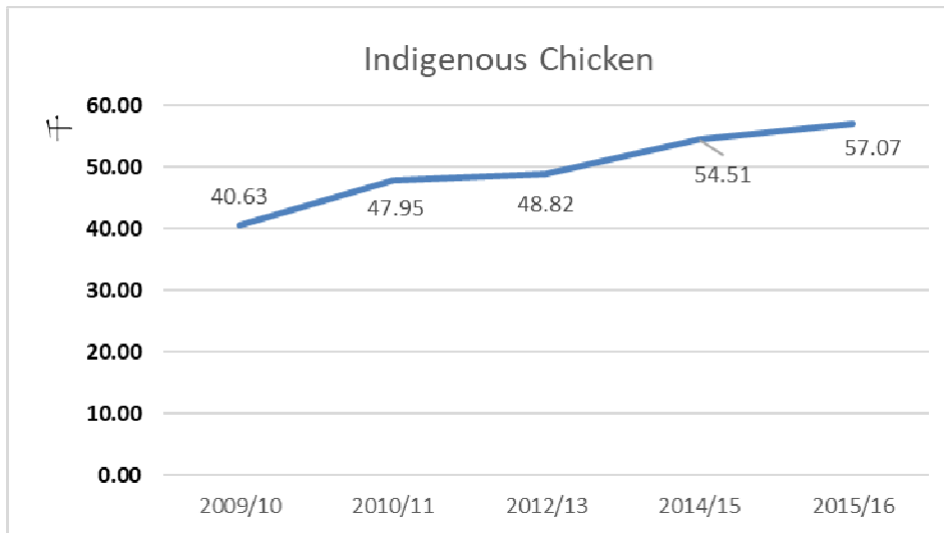
- Abera Melesse, Tegene Negesse and Werkinesh Tiruneh. 2011. Effects of feeding *Moringa stenopetala* leaf meal on nutrient intake and growth performance of Rhode Island Red chicks under tropical climate. *Tropical and Subtropical Agro ecosystems, Journal*. Vol 14 No 2
- Abubakar, M., Ambali, A. and Tamjdo, T. 2007. Rural chicken production: Effects of gender on ownership, and management responsibilities in some parts of Nigeria and Cameroon. *International Journal of Poultry Science*, 6 (6):413–416.
- Aklilu Hailemichael Asgedom. 2007. Village poultry in Ethiopia Socio-technical analysis and learning with farmers. Ph.D Thesis. Wageningen University, Wageningen, the Netherlands.
- Alem Tadesse and Yayneshet Tesfay. 2013. Flock dynamics and composition of rural chickens in lowland and midland agro-ecological zones of central Tigray, North Ethiopia.
- Alemayehu Guteta. 2017. Characterization of scavenging and intensive chicken production and marketing system in Lume district, East Shoa Zone, Oromia region state, Ethiopia M.Sc Thesis Haramaya University, Dire Dawa. Vol. 11(1), pp. 8-20, January-March 2020.
- Alemayehu Guteta and Solomon Abegaz. 2018. Chicken Production Constraints in Lume District, East Shoa Zone, Oromia Region State, Ethiopia. *World Journal of Agricultural Sciences* 14 (5): 170-179, 2018.
- Alemayehu Guteta & Misba Alewi. 2018. Farmers Breeding Practice & Traits of Economic Importance for Indigenous Chicken in Lume District, Oromia regional State, Ethiopia Volume 18 Issue 8 Version 1.0 Year 2018.
- Alemayehu Guteta and Negasi Ameha. 2020. Characterization of scavenging and intensive chicken production system in Lume District, East Showa Zone, Oromia Regional State, Ethiopia, *International Journal of Livestock Production*, Vol. 11(1), pp. 8-20, January-March 2020.
- Asefa, T. 2007. Poultry management practices and on farm performance evaluation of Rhode Island Red (RIR), Fayoumi and local chicken in Umbullo Wachu watershed.
- Alemu Yami and Tadele Dessie. 1997. The Status of Poultry Research and Development in Ethiopia, *Research Bulletin No.4. Poultry Commodity Research Program Debre Zeit Agricultural Research Center, Alemaya University of Agriculture, Ethiopia*. 62 p.
- Bogale, K. 2008. In situ Characterization of local eco-type for functional traits and production system in fogera woreda, Amhara regional state. MSc. Haramaya University, Haramaya, Ethiopia.
- Billah, S.M., Nargis, F., Hossain, M.E., Howlader, M.A.R & Lee, S. H. 2013. Family poultry production and consumption pattern in selected households of Bangladesh. *Journal of Agricultural Extension and rural development*, 5(4); 62-69.
- CSA (Central Statistics Authority). 2015. Agricultural sample survey 2014-2015. Survey on livestock and livestock characteristics, Vol. II. Statistical Bulletin No. 446. Addis Ababa, Ethiopia.
- CSA (Central Statistical Authority). 2013. Agricultural sample survey. Sample Survey on livestock and livestock characteristics. The Federal Democratic Republic of Ethiopia, Private Peasant Holdings, Statistical Bulletin 570 Central Statistical Authority (CSA) Addis Ababa Ethiopia April 2013.
- CSA (Central Statistical Authority). 2016. Federal Democratic Republic of Ethiopia Central Statistical Agency Agricultural Sample Survey 2016/17 [2009 E.C.] Volume II. Survey on Livestock and Livestock Characteristics. 573 Statistical Bulletin. Addis Ababa, Ethiopia.
- CSA Central Statistical Authority. 2017. Survey on livestock and livestock characteristics, Agricultural sample survey 2016/17 (2009 E.C.). Statistical Bulletin No.585, Vol. II. Addis Ababa.
- EIAR (Ethiopian Institute of Agricultural Research). 2016. National Poultry Research Commodity Strategy (2016-2030), EIAR..
- FAO (Food and Agriculture Organization of the United State Nations). 2009. A review of the current poultry disease control strategies in smallholder poultry production system and local poultry population in Uganda. Prepared by Terence Odaoch Amoki, Clovice Kankya, Eunice L Kyomugisha, Danis K. Byarugaba, Nicoline de Haan and Karin Schwabenbauer. AHBL-Promoting strategies for presentation and control of H₅PAI. Rome.
- FAO (Food and Agriculture Organization of the United State Nations). 2010. Chicken genetic resources used in smallholder production systems and opportunities for their development, by P. Sørensen. FAO Smallholder Poultry Production Paper No. 5. Rome.
- FAO (Food and Agriculture Organization of the United State Nations). 2007. Poultry sector country review, Animal Production and Health Division, Emergency center for trans-boundary animal diseases socio economics, production and biodiversity unit, Food and Agriculture Organization of the United, Nations, Rome., Italy. Available at <http://ftp.fao.org/docrep/fao/011/ai320e/ai320e00.pdf>.
- FAO. (Food and Agriculture Organization of the United State Nations). 2019. Poultry Sector Ethiopia. FAO Animal Production and Health Livestock Country Reviews. No. 11. Rome.
- Fisseha Moges, Abera Mellesse and Tadelde Dessie. 2010. Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, Northwest Ethiopia. *African Journal of Agricultural Research*. 5(13):1739-1748.
- Fesseha Moges. 2009. Studies on production and marketing system of local chicken ecotypes in Bure Woreda, North-West Amhara, M.Sc Thesis. Hawassa University, Hawassa.
- Halima Hassen. 2007. Phenotypic and genetic characterization of indigenous chicken populations in North-West Ethiopia. Ph.D. Thesis. Submitted to the faculty of natural and agricultural sciences department of animal, wildlife and grassland Sciences. University of the Free State, Bloemfontein, South Africa.
- Mekonnen Gebre Egizaber. 2007. Characterization of smallholder poultry production and marketing system of Dale, wonsho and loka abaya woredas of southern Ethiopia. MSc. Thesis presented to the School of Graduate Studies of Hawassa University.
- Meseret Molla. 2010. Characterization of village chicken production and marketing system in Gomma woreda, Jimma zone, Ethiopia. M.Sc Thesis. Jimma University, Ethiopia.
- Mengesha M. and Tsega W. 2011. Phenotypic and genotypic characteristics of indigenous chickens in Ethiopia: A review. *African Journal Agriculture Research*, 6(24): 5398-5404.
- Misba Alawi and Melesse Abera. 2011. Evaluating the growth performance of local kei chickens and their f1- crosses with Rhode Island Red and Fayoumi breeds in watershed areas of guraghe administrative zone, Southern Ethiopia. MSc. Thesis. Hawassa University, Ethiopia.
- Nyoni, N.M.B. & Masika, P.J. 2012. Village chicken production practice in the Amatola basin of the Eastern Cape province, South Africa. *Africa journal of agricultural Research* Vol.7 (17), pp. 2647-2652. Available online at <http://www.academicjournals.org/AJAR> DOI 10.589/AJAR11.1669 ISSN 1991-367X@2012 Academic journals.
- Okeudo, N, Onwuchekwa, C and Okoli, I. 2003. Effect of oil treatment and length of storage on the internal quality, organoleptic attributes and microbial profile of chicken eggs. *Tropical Animal Production*, 6:63-70. Samson L, Endalew B. 2010. Survey on Village Based Chicken Production and Utilization System in Mid Rift Valley of Oromia, Ethiopia. *Global Vet.*, 5 (4): 198-203.
- Shapiro, B.I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset, G. and Mechal, H. 2015. Ethiopia livestock master plan. ILRI. Nairobi, Kenya: International Livestock Research Institute (ILRI).
- Shishay Markos. 2014. Phenotypic characterization of local chicken ecotypes in Western zone of Tigray, Northern Ethiopia, MSc Thesis, Jimma university, Ethiopia.
- Tadelde Dessie and Ogle B. 2001. Village Poultry Production System in the Central Highlands of Ethiopia. *Tropical Animal Health and Production*, 33, 521- 537.

Tadelle Dessie, C. Kijora and K.J. Peters. 2003. Indigenous chicken ecotypes in Ethiopia, Growth and feed utilization potential. International Journal of Poultry Science 2: pp 144-152.

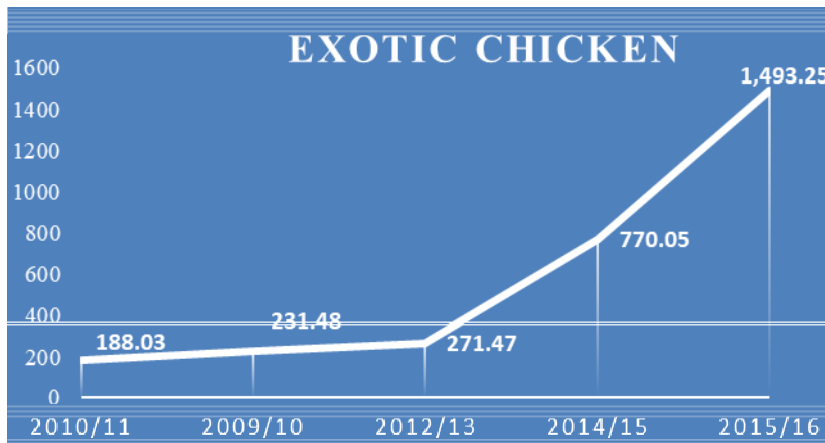
Tadesse, H. F., M. G. Banu, T. Awalom, H. Tadelle, and G. T.Mawcha. 2017. Assessment of chicken feed, feeding management and chicken productivity in intensive poultry farms at selected farms of three zones in Tigray region. J. Vet. Sci. Technol. 8:472.

Wilson, R. (2010): Poultry production and performance in the Federal Democratic Republic of Ethiopia. World's Poultry. Sci. J., 66.

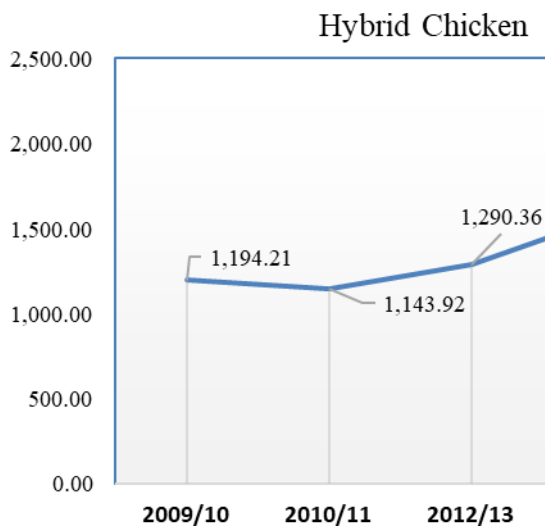
Yitbark, M.B., & Zewudu, A. 2013. Performance Evaluation of local chicken at Rnebsie Sar Midir Woreda Gojam, Ethiopia. Unique Research Journal of agricultural science, 1(2); 6-10.



Source CSA, 2009/10, 2010/11, 2012/13, 2015/16



Source CSA, 2009/10, 2010/11, 2012/13, 2015/16



Source CSA, 2009/10, 2010/11, 2012/13, 2015/16