

**Review Article****Poultry Production Status, Major Constraints, and Future Prospective**Teyib Abafogi Abadula, Sufian Abdo Jilo* , Johar Aliye Hussein, and Sadik Zakir Abadura

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ABSTRACT

Poultry production is a sector of livestock production to gain meat, egg, and other products from domesticated bird species, including chickens, ostriches, turkeys, ducks, and guinea fowls. Poultry production is different from country to country due to different economic activities, environmental situations, and cultural aspects of society. With this in mind, the current study aimed to review the literature to explore the current status of poultry production, highlight the constraints in poultry production, and predict the future of poultry production. In many societies, poultry plays an important socio-cultural role. Diseases, market problems, feed resources, lack of proper housing, predators, as well as social and cultural constraints are all obstacles to the future growth of the poultry industry. Despite the presence of a large chicken population in Ethiopia, contribution to the national economy or benefit exploited is very limited due to diseases, predators, and veterinary services. The main diseases affecting the chickens in Ethiopia include viral disease (Newcastle disease), gastrointestinal parasites, ectoparasites, aspergillosis, and different bacterial infections due to lack of biosecurity. In addition, chicken predators affecting poultry production in Ethiopia are wild mammals locally called ama, cats, and birds (vultures). However, the poultry production system has a bright future since different local and international humanitarian organizations have recognized that addressing this sector will benefit the poorest and most disadvantaged people in developing nations. With the need to increase animal protein sources in the world, there is general agreement that these areas are going to witness further expansion in the current decades. Therefore, it is recommended to increase productivity through improvements in health, management, and control of predators.

1. Introduction

Poultry is those avian species, including chickens, turkeys, ducks, pigeons, and geese, which are kept for economic significance throughout the world¹. Poultry production has important economic, cultural, and social benefits as well as a vital role in family nutrition in Ethiopia². Poultry is the leading livestock species worldwide, supplying more than 30% of the entire animal protein requirements³. Poultry production, as an essential sector of agricultural production, has faced an increased demand for poultry, meat, and eggs in fast-growing urban cities, and consequently, an increasing number of economic poultry farms around urban and peri-urban areas⁴. Ethiopia possesses about 60% of the entire chicken population of the East Africa subcontinent⁵. The poultry

population was estimated to be 42 million based on the census, excluding pastoral and agro-pastoral areas comprising 0.55%, 2.84%, and 96.61% of the entire poultry as hybrid and exotic indigenous, respectively⁶. Ethiopia is one of the few countries with a significantly large population of chickens, which is expected to be about 56.5 million chickens, out of which 99% are local chickens⁶.

Poultry production in Ethiopia is characterized by three major systems, namely a village or backyard poultry production system, small scale commercial poultry production system, and a large-scale Intensive Commercial poultry production system⁷. Each of the three production methods has its own chicken breeds, production characteristics, and inputs⁸.

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Global production of chicken meat has increased by 42% in the past decade, from just under 80 million metric tonnes (MT) in 2007 to 109 million in 2017⁹. Dominated by the Americas (the USA and Brazil) and Asia (China), all regions expanded their poultry production output. The Americas saw the slowest growth (30%), while Europe and Asia increased by 55% and 50% respectively. Africa grew by 46%, albeit from a small base, comprising just 5% of global chicken production¹⁰. If trends continue unchanged, the global supply of chicken meat will exceed 150 million MT by 2027, of which Africa will produce just under 8 million MT¹⁰.

Opportunities have also expanded for small-scale poultry enterprises due to improved market access infrastructure and a preference structure that might still favor free-range birds and eggs¹¹. In poor nations, such as Ethiopia, most chicken development projects have focused on the adoption of specialist exotic breeds, crossbreeding, and management intensification. Selection and controlled mating, as well as the introduction of exotic chickens, might be used to improve genetics¹².

With this in mind, the current study aimed to review the studies to examine the current status of poultry production, highlight the constraints in poultry production, and predict the future of poultry production.

2. Poultry production systems

In developing countries, there are three poultry husbandry systems, namely intensive, semi-intensive, and backyard poultry production systems¹³. Poultry production in Ethiopia is characterized by three major systems of village or backyard poultry production system, small-scale commercial poultry production system, and large-scale Intensive Commercial poultry production system⁸.

2.1. Intensive systems

Medium to large-scale commercial enterprises as well as householders utilize these systems. Birds are kept in complete confinement, either in homes or cages. Capital outlay is higher and the birds are dependent on their owners for all their requirements; production however is higher¹³. Deep litter, slatted floor, and battery cage systems are three types of intensive systems.

In deep litter system, birds are fully confined (with a floor space allowance of 3 to 4 birds/m² within a house), but can move around freely. The floor is covered with a deep litter (5 to 10 cm deep layer) of grain husks (maize or rice), straw, wood shavings, or a similarly absorbent (but non-toxic) material. The fully enclosed system protects the birds from thieves and predators and is suitable for specially selected commercial breeds of egg or meat-producing poultry (layers, breeder flocks, and broilers)¹⁴. In the slatted floor systems, deep litter is replaced by wire or wooden slatted flooring, allowing stocking rates to reach five birds per m² of floor space. Birds are less likely to contact feces and can freely move¹⁴.

The battery cage system is commonly good for laying birds, kept in cages during their productive lives. The

method is largely limited to large-scale commercial egg layer operations due to high investment costs. Intensive systems for economically producing indigenous chickens are unusual, with the exception of Malaysia, where the business arose in response to the high demand for indigenous chickens in urban areas¹⁵.

2.2. Semi-intensive systems

Semi-intensive systems are the combination of extensive and intensive systems in which birds are housed in a certain area and can access the shelter. This system can be commonly found in urban, peri-urban, and rural areas, where the birds are confined in an enclosed area outside during the day and housed at night¹⁶.

2.3. Backyard poultry production system

Approximately 80% of farmers in Latin America, Africa, and Asia use the backyard production system for rearing poultry. In this system, the birds are not confined and search for food over a large area. There may be rudimentary shelters available, which may or may not be utilized. The birds may roost outside in trees and lay their eggs in the bush. The flock is made up of birds of various types and ages. Poultry is kept in cages at night but is free to roam during the day. The rearing system of chickens for 85% of families in sub-Saharan Africa raise is based on a free-range/extensive basis, in which 70% of the owners are women. This rearing system provides limited sources of meat and eggs as well as income^{17,18}.

3. Poultry production systems in Ethiopia

Poultry production systems in most countries, including Ethiopia, show a clear distinction between traditional low input systems and modern production systems using relatively advanced technology. There is also a third emerging small-scale intensive system as an urban and peri-urban small-scale commercial system¹⁹. Ethiopia is one of the few African countries with a significantly large population of chickens, estimated at 38.1 million. However, the number of chicken flocks per household in most Ethiopian rural communities is small, constituting an average of 7-10 mature chickens, 2-4 adult hens, a male bird (cock), and a number of growers of various ages²⁰.

Various selected factors, including flock size, food, health, housing, breed, bio-security, and technology, have divided the poultry business of Ethiopia into three primary production systems of indigenous, small-scale, and large-scale commercial poultry production⁸.

3.1. Indigenous poultry production system

The chicken production system in Ethiopia is characterized by an increased risk of exposure of birds to disease and predators, extensive scavenging management, and no immunization programs based on uncontrolled natural mating and hatching of eggs using broody hens,

where there is no or minimum intervention to maximize their production and reproductive performance. Disease resistance, cold and heat tolerance, scavenging and brooding behaviors, ability to escape from predators and hatchability of eggs are the criteria according to which indigenous chickens are all rated. These characteristics are important in adaptation to the village environment, and traits, such as the taste of egg and meat, affect consumption preference and consequently market value^{10, 21}.

Indigenous production systems have little or no inputs for housing, feeding (scavenging is the only source of diet), and health care with a minimal level of bio-security, high off-take rates, and a high level of mortality. As a result, it requires no investment other than the cost of the foundation stock, a few handfuls of local grains, and potentially simple nightshades, which are used largely at night in the family residences. Although some hybrids and exotic breeds may be kept under this system, the majority of chickens kept are indigenous²².

3.2. Small-Scales intensive production system

Small-scale intensive production systems have a medium level of water, feed, and veterinary service inputs, as well as low to no biosecurity. Large-scale commercial farms provide feed and foundation stock to the majority of small-scale chicken farms²³. New Castle Disease is identified to be the most important disease in all production systems, being responsible for the largest proportion of morbidity and mortality in all parts of Ethiopia²⁴. Coccidiosis was reported as a cause of death, decreased weight gain and egg production, and a decrease in the market value of infected birds²³.

3.3. Large-scale commercial systems

These farms and their contractors keep tens of thousands to hundreds of thousands of chickens in purpose-built, sometimes partially-automated, and climate-controlled commercial broiler and layer facilities. They are generally smaller than commercial farms in developed countries¹⁴ but rely on the same principles. High-quality commercial feed, strict control of animal health, and quality genetics are absolute requirements¹⁰.

The large-scale commercial production system is a very intensive production method that incorporates an average of greater than or equal to 10,000 birds housed indoors under medium to high biosecurity settings. This system is primarily reliant on imported exotic breeds, which need high levels of health, housing, feed, and modern management methods. This system is distinguished by a higher level of productivity, as poultry production is totally market-driven to fulfill the high demand for chickens in major cities. Better biosecurity practices have reduced chick mortality rates to merely 5%⁸.

Though some modern poultry firms, such as ELFORA, Genesis, and Alema farms, have come up over time (mainly in the Debre Zeit region), their share in the poultry sector remains small. Currently, there are about 7 regional poultry multiplication and distribution centers with a total

annual capacity of producing about 1,236,000 day-old chicks and about 486,000 pullets and cocks. There are also about 10 commercial poultry farms with an estimated annual production capacity of 1,500,000 chicks. Most farms import day-old chicks from abroad²⁵. Ethiopia has almost zero poultry exports, and the little it exports at times comes from firms like ELFORA.

4. Socioeconomic aspects of poultry production

Chickens are widely available in Ethiopia, and practically every rural family has one. Chickens provide an important source of protein and revenue for the family⁷. Because of the short generation interval and high rate of productivity, chickens provide a significant opportunity for smallholder farmers to enhance protein output and revenue. Additionally, the simple transmission system required for delivery of the products to various locations, the ease with which the products can be sold owing to their relatively low economic values, its limited link with religious taboos, and its complementary position in relation to other crop-livestock activities²⁶.

Almost every rural family keeps a small flock of chickens, and poultry keeping has been performed for many generations for many cultural and social reasons. The most prevalent reasons for raising hens and eggs were money and hatching. In comparison to swine and cattle, there are fewer religious and societal taboos linked with chicken rearing. Poultry keeping, on the other hand, has a symbolic value in terms of social, cultural, and religious functions. Certain sex and plumage color of chicken are required for the majority of these social and cultural events or sacrifices²⁷.

Poultry as capital to youth, gift for relatives and religious ceremonies, alarm clock, and treatment for a sick individual, play an important part in the social and cultural life of rural people. Farmers in rural areas, for example, invite special visitors to sample the traditional delicacy "doro wat", which is a combination of both eggs and chicken meat^{20, 28}. Therefore, due to their cheap cost of production, village chickens have a considerable influence on the national economies of developing nations, as well as improving the nutritional status, income, food security, and livelihood of many smallholders²⁹.

Various experts and rural development organizations have acknowledged the relevance of rural poultry in developing country economies and its role in improving the nutritional quality and earnings of many smallholder farmers and landless populations in the last two or three decades². Rural poultry, on the other hand, did not rank highly in mainstream national economies due to a lack of quantitative metrics of its contribution to macroeconomic indices, such as gross domestic product³⁰.

The findings indicated that the majority of chicken flocks were owned by women and that the revenue earned from chicken production belonged to them³¹. As indicated, 92% of the interviewed women kept the money from egg and chicken sales in their own hands and sent more of their children to school, particularly their daughters³². An

enabling economic environment must be created for family poultry farming to be economically sustainable. Improved chicken production enhanced farmer livelihood and women empowerment in Bangladesh. Women's engagement in rural poultry improvement programs helps to advance human development by boosting rural women's access to income and expertise, as well as enhancing production efficiency³³.

5. Major constraints of poultry production

Generally, the key problems in poultry production include a lack of information about poultry production, a scarcity of feed supplies, the frequency of illnesses, as well as institutional and socioeconomic productions³⁴. The biggest issue highlighted by poultry farmers was a high rate of mortality in chicks²⁰. According to the reports of the community, the principal causes of this problem were disease (63.8%), followed by predation, scarcity of nutrition, and lack of knowledge⁷. Attempts to replace indigenous chickens with exotic chicken breeds, on the other hand, have been highlighted as a serious threat to the degrading and dilution of indigenous chicken genetic resources³⁵. Prevalent infections, poor feeding, lack of good health care, predators, and insufficient marketing knowledge were noted as constraints in rural poultry farming³⁶.

5.1. Diseases and predators

Disease (mostly New Castle diseases, infectious bursal disease, and avian influenza) is the leading cause of death in chicken production, followed by predation³⁷. The high incidence of chicken diseases, particularly Newcastle Disease, is a major and economically significant barrier to the production system³⁶. Owing to disease outbreaks, village chicken mortality is greater during the short rainy season, especially in April (66.8%) and May (31.4%). This disease is one of the most important infectious diseases impacting the production and survival of village chickens in Ethiopia's central highlands³⁸.

Contact between chickens while scavenging and exchange of chickens from a flock where the illness is incubating and during marketing are the main routes of disease transmission from village to village³⁶.

Predators are included as a major cause of premature mortality alongside illnesses. The rainy season is closely connected with predation. The predators include primarily birds of prey, such as vultures, which prey only on chickens, and wild mammals, such as cats and foxes, which prey on mature birds as well as chickens²⁰. Predators, such as birds of prey (locally called Culullee, 34%), cats and dogs (16.3%), and wild animals (15%), were identified as the leading causes of village poultry in the Oromia rift valley of Ethiopia³⁵.

5.2. Feed shortage

Poultry production in Africa survives by scavenging and generally, no supplements are provided except that

sometimes, household waste is fed to the birds and grain boosted diets at other times³⁹.

The Grain feed resources in Ethiopia are facing a problem of competition with human foods. The current feed price increase may derail many plans for the expansion of industrial livestock and poultry production. Chicken production methods in Ethiopia are often run on a free-range basis, with scavenging as the main route of feeding⁴⁰. Insects, worms, seeds, and plant debris are thought to be the main components of the scavenging feed resource base, with a very small amount of grain and leftovers from the family table⁴¹.

Because there are no direct means of assessing the scavenged feed input in village chicken production systems, it is difficult to quantify the economic and/or physical worth of feed resource input. Feed shortages for village poultry are most common from June through August due to the lack of cereal harvesting in these months³⁵.

5.3. Inadequate housing

The local birds freely roam during the day and spend the night in the main house on the free-range system. In Ethiopia, the most popular housing patterns include overnight housing perched in trees or on roofs and overnight housing within the main house. Lack of housing is one of the constraints of the village poultry production systems. In several African nations, nocturnal predators account for a considerable amount of village poultry mortality due to a lack of suitable housing³⁹.

Improved housing has also been shown to lower scavenging bird mortality in other studies. In the Gambia, for instance, a livestock improvement program indicated that improved poultry housing decreased chick mortality (19%), compared to Ethiopia (66%) and Tanzania (33%), where no housing improvements were made⁴².

5.4. Market

In developing countries, particularly Ethiopia, the organization of poultry marketing has received little attention. Producers have a variety of market outlets or channels accessible to them in all marketplaces although their importance varies. The primary roots for producers/farmers are direct sales of their chicken to customers and/or small retail outlets that transport the chicken to big cities⁴³. Policymakers and developers frequently overlook the marketing aspects of smallholder poultry farming. Traditional chicken and egg collectors, who collect eggs and birds from villages, might help smallholders market their products; however, such a marketing system is often criticized or overlooked since it is not sustainable. These imply that something has to be done in this area⁷.

Without an understanding of village chicken production and selling systems, it is impossible to plan and implement chicken-based development projects that benefit rural people. Surplus males (cockerels and cocks), large-sized

birds, pullets and non-productive hens, aged hens, and sick birds are the most common birds sold from the village flock. Growing chickens are sold right before the beginning of Newcastle Disease, which is a disease with a high mortality rate⁴⁴. According to some study findings^{20, 26, 31,35}, research into improving village chicken production has focused on managerial improvements while disregarding the potential influence of socioeconomic concerns, such as marketing^{20, 26, 31, 35}. Due to market constraints, smallholder village chicken producers prefer to overlook new technology even when it looks superior to their present techniques⁴⁵.

The majority of farmers sell hens in their neighborhoods. This is due to the small number of chickens available for sale, the great distance to the high-demand urban, and peri-urban markets, and the fact that chicken sales are irregular and depend on the family's immediate requirements⁴³.

Despite the fact that local consumers favor indigenous birds, high consumption connected primarily with holy days resulted in the highest offtake rates from the flock, especially during holidays and festivals, as well as when disease outbreaks begin. As a result of the large supply compared to demand, prices fall drastically. In the end, it will have an impact on small-scale farmers⁷. To deliver chicken to terminal markets, most dealers utilize public transportation (buses and minibusses) or lease space in private trucks. During transportation, the chickens' legs may be bound together with other bags, sacks of grain, bundles of firewood, and other items, which can result in significant loss due to stressful conditions⁴³.

5.5. Social and cultural constraints

The importance put on poultry for use during rituals and festivals, or even as a source of revenue in times of need, is a socio-cultural barrier to poultry development. Poultry is neither a daily food supply nor a regular source of income. Due to the fact that some people consider chickens to be pets or members of their family, they are rarely used as food for home, even though they may be sold without remorse. Another restraint is the societal norm that governs livestock ownership. In most cases, where crop farming is the primary occupation of males, maintaining cattle is regarded as a sideline activity, disregarded by women and children. Therefore, there is no regular watering or feed boosting, and birds' night housing is not cleaned or no care is offered to the tiny chicks. Farmers are likewise unwilling to expand their poultry operations. Rural traditional poultry farming has remained unchanged for a long period due to such an attitude of farmers⁴⁶.

6. Future perspective for poultry production

Worldwide, most segments of animal production, including poultry, are increasingly affected by regulations, policy, and public perceptions. There is increased attention to and awareness of the environmental and human health impacts – real or perceived – of animal agriculture. The

demand for poultry meat and eggs will probably increase in the next decades, but in most parts of the world, the proportion of the population participating in day-to-day on-farm activities is steadily decreasing, a trend that is likely to continue. Although small backyard and scavenging poultry flocks are becoming more popular in some urban areas of developed countries, global demand for production and economic efficiency are likely to result in larger concentrated production farms continuing to be more prevalent in most regions⁴⁷. Animal protein market trends are rising globally, and the sector is expected to be one of the fastest-growing agricultural sectors in the coming decades. Consumers in emerging economies are moving away from spending on basic foodstuffs in favor of higher-value items, including dairy, meat, and eggs⁴⁸. In some countries (including Nigeria), protein products, such as poultry and fish, are increasingly capturing market share from red meat driven by fast food expansion, consumer preferences, competitiveness, and concerns over the safety of red meat. Chicken meat production has been steadily increasing over the past decades, from under 8 MT in the early 1960s to over 109 million MT today. During that time, a shift from free-range poultry utilizing a variety of breeds to large, confined intensive poultry operations utilizing birds specifically bred for growth has become widespread. It is now more common for large chicken operations worldwide to move toward complete vertical integration of their operations to take advantage of economies of scale in feed, inputs, processing, and distribution¹⁰.

As urbanization rates and incomes continue to grow in developing countries, per-capita consumption of meats including poultry is expected to experience strong growth. The population of Sub-Saharan Africa (SSA) stands at more than 950 million people currently and is set to grow to 1.2 billion by 2025. This population growth, coupled with rapid urbanization, increased per-capita incomes, and a growing middle class will drive demand for higher-value food items such as poultry and eggs⁴⁸. Due to the relative ease in investment and quick returns in broiler production, which is bringing the cost of chicken meat down over time, consumers in SSA are expected to increase their consumption of chicken at a more rapid rate than other meats in the coming years⁴⁹. In general, the chicken-producing countries are more densely populated and have smaller land areas, while the cattle-producing countries are larger and less populated (or, as in Kenya and Ethiopia, have large sections of grazing land). Indicators omitted from this simple chart are wealth, urbanization rates, and cultural preferences. Concerning the latter, both Kenya and Ethiopia have strong preferences for cattle meat, but for different reasons. In Kenya, the influence of pastoral communities and large swathes of open grazing land has created a culture of cattle meat production and consumption. In Ethiopia, Ethiopian Orthodox Christians are partly vegetarian and rarely consume poultry, saving it for special religious holidays two or three times per year⁵⁰.

SSA chicken consumption is expected to grow more quickly than other meats in the coming years due to the

growth of large modern poultry facilities which are increasing the availability of chicken for consumers⁴⁹. This is an important point to note, in that the larger volumes of production will most likely come from large commercial integrated producers who benefit from scale economies. However, the growth in the sector can remain inclusive and create opportunities for small-scale and emerging producers in the value chains, though it will be critical to be realistic about where these opportunities lie and how these are likely to shift as the sector matures. Later sections of this Report explore this in more detail.

7. Conclusion

Ethiopia has been plagued by frequent droughts as well as massive population growth and environmental deterioration in recent decades, all of which have resulted in a severe food shortage in the country. To reverse the trend, the nation must interfere in every potential source of revenue in order to ensure the livelihood of its citizens. In this light, poultry production may become a top focus in order to achieve the aim. Furthermore, it is well known that poultry may be utilized to alleviate poverty, and each endeavor and/or choice to increase poultry production has a direct influence on the status of women. Poultry has minimal global warming potential, and its flesh is inexpensive and healthy, with none of the taboos associated with other livestock proteins. All of this means that poultry production, particularly intensive systems, will be preferred and recommended production methods for meeting people's protein needs. However, there are a number of obstacles that hinder the future development of the poultry industry. Therefore, it is recommended to increase productivity through improvements in health, management, and control of predators. Moreover, a market information system at the school level or grass root (the farmer) level can be considered a prerequisite for short-term improvement of the sector. Finally, government, research, and developmental organizations should supply improved hybrid chicks to the farmers.

Declarations

Competing interest

The authors declare that they have no conflicts of interest.

Author's contribution

Teyib A, and Sufian A generated the idea, and a paper write-up completed the paper. Both Sadik Z and Johar A have taken part in the paper write-up, and edition of the manuscript. All authors read and approved the final version of the manuscript and conceived the study.

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