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### Review Article

# Exotic chicken production performance, status and challenges in Ethiopia

### Abstract

Poultry is the largest group of livestock species in the world in which chickens largely dominate the flock composition. The poultry sector in Ethiopia can be characterized into three major production systems based on selected parameters like breed, flock size, housing, feeding, health, technology, bio-security and others. These are large scale commercial, small scale commercial and village poultry production systems. The majority of chicken production systems remain as village production which consists of the indigenous breeds widely. Attempts have been made to introduce different exotic poultry breeds to small holder farming systems of Ethiopia to improve the existing low performance of indigenous chickens. The egg production potential of local chickens is between 30-60 eggs per year/hen with an average weight of 38g each under village management condition. However, exotic breeds produce around 250 eggs per year/hen each weighing around 60g in Ethiopia. Evidences indicate that all the imported breeds of chickens performed well under the intensive management system. However, the contribution of exotic chicken to the Ethiopian economy is still significantly lower than that of other African countries due to dominance by village production systems. In general, poultry egg and meat production is the most environmentally efficient animal protein production system. Therefore, feed shortage, disease and other critical gaps need to be filled by research institutions and development agencies to improve the productive performance of exotic chicken breeds in Ethiopia.

## Introduction

Ethiopia has about 60% of the total chicken population of East Africa, which includes local, exotic, and hybrid chicken breeds. Report on population of Ethiopian chickens estimated to be about 56.53 Million and with regard to breed, 94.3%, 3.21% and 2.49% of the total poultry population to be indigenous, hybrid and exotic, respectively [1]. In spite of global and regional economic growth, food insecurity remains a pressing problem in many parts of the world and this is true especially in Africa [2]. In all these aspects, rearing of chickens can create additional income besides consumption of eggs which can help improve nutritional security to the most vulnerable sections of the urban resource challenged specifically, pregnant and nursing mothers, old and infirm people, growing children and those who are suffering from immune compromising diseases [3].

It has widely been reported that chickens are the most widely kept livestock species in the world. In developing world, indigenous chickens are widely distributed in almost all the rural and peri-urban areas where they play the important

role of income generation and food production [4]. Even if the indigenous chickens are better to adapt the harsh environment, they are tolerant to many diseases and are good brooders, but they are poor in their reproductive and productive performance. Therefore, in order to improve the performance of the local chickens, the exotic chickens are imported including *White* and *brown Leghorns*, *Rhode Island Red*, *New Hampshire*, *Cornish*, *Australorp Light Sussex* and others were then crossed with local chickens to improve the genetic potential of indigenous breeds [5].

The diverse agro ecology and agronomic practice prevailing in Ethiopia together with the huge population of livestock in general and poultry in particular, could be a promising attribute to boost up the sector and increase its contribution to the total agricultural output as well as to improve the living standards of the poor livestock keepers. Even if, Ethiopia owned huge chicken flock; there are different factors like diseases, predators, lack of proper healthcare, feed source and poor marketing information that hinder the productivity of the chickens in most area of the country. Among the above obstacles, diseases are the main constraints incriminated for reduction of total numbers and compromised productivity [6].

The most important thing has been the introduction of exotic breed of chicken [12]. Currently, one of the extension options to attempt is the use of full packages jointly with improved exotic breeds that are better in terms of productivity. The Extension Department of the Ministry of Agriculture of Ethiopia has shown more preference and interest in the use of the Rhode Island Red breed that could be serving as a dual-purpose for both egg and meat production. Additionally, Fayoumi breed has been imported with the expectation of better productivity, adaptation and disease resistance than the other exotic breeds in rural setting of Ethiopia [7]. Tadesse *et al.*, [8], Akililu *et al.*, [9,10] and Aman *et al.*, [11], reported that the exotic chicken such as Brown, Bovans Brown, Potchefstroom Koekoek and Sasso were distributed to smallholder farmers of some parts of the country. Having an introduction of this way; the objectives of this review are therefore, to assess the current status and production performance of exotic chickens, and to discuss the major constraints of improved or exotic chickens production in Ethiopia.

## Exotic Chicken Breeds: An Introduction

The most important thing is the introduction of exotic breed of chicken [12]. Even if there is no record or evidence indicating the exact time and locations of introduction of the first batch of exotic breeds of chickens into the country for genetic improvement, it is widely believed that the importation of exotic breeds of chicken goes back to the early 1950s [13]. It has been reported that many exotic breeds of chicken (White and brown Leghorns, Rhode Island Red, Bovans, New Hampshire, Cornish, Australoup and Light Sussex) were introduced over the past years. The most important inputs have been the introduction of improved (exotic) breed, improved feed, vaccine and medicaments and credit aiming at increased productivity [14].

Most of the urban and Peri-urban community keeps indigenous breeds because they are well adapted to the current environmental condition. The egg laying period and number of eggs laid per period are to some extent higher in urban than in rural areas. The carcass weight of local chickens at 6 months of age was 559g which was significantly lower than that of the 875g found for Leghorn but higher in dressing percentage than exotic chickens [15]. Though productivity of the local chicken breed was reported to be low these chickens can survive well with low input and the taste of their eggs and meats is flavorful [16]. Therefore, breed improvement and subsequent proper utilization of these local chicken genotypes strongly demands comprehensive characterization including, production system and breeding practice.

## Poultry production systems in Ethiopia

Chicken can be reared in different management and production systems. Based on chicken breed type, input and output level, mortality rate, type of producer, purpose of production, length of broodiness, growth rate and number of chicken reared. In Ethiopia, there are three types of chicken production systems [17]. These are free-range production system (extensive production system), semi-intensive production system and intensive production system.

**The Free Range (Extensive) Poultry Production System:** The sources of replacement stocks are usually rough purchasing followed by household hatching and others. In this system chickens are usually kept under free-range system and the major proportion of the feed is obtained through scavenging. There are high off-take rates especially during national holidays and occasionally high mortality rates [18] and [19]. Women are the primary owners and managers of chickens in the traditional poultry production sector. Rural women raises poultry for income generation aimed at purchasing of basic commodities such as salt, cooking oil, sugars and others [20]. In this system chickens are usually kept under free-range system and the major proportion of the feed is obtained through scavenging. There are high off-take rates especially during national holidays and occasionally high mortality rates [21].

**Small-scale Commercial Poultry Production System:** The small scale intensive poultry is newly emerging system in urban and per-urban areas, where either broilers or egg type exotic breeds of chicken are produced along commercial lines using relatively modern management methods. This activity is being undertaken as a source of income in and around major cities and towns [22]. Most of these farms obtain their feeds and foundation stocks from the large scale commercial poultry farms and involved in the supply of table eggs and broilers to various supermarkets, kiosks and hotels through middlemen [22].

**The Intensive Poultry Production System:** The large-scale commercial production system is highly intensive production system involves an average of 10,000 chickens kept under indoor conditions with a medium to high bio-security level. This system heavily depends on imported exotic breeds that require intensive inputs such as feed, housing, health, and modern management systems. It is estimated that this sector accounts for nearly 2% of the Ethiopian poultry population. This system is characterized by higher level of productivity and entirely market oriented to meet the large poultry demand in major cities. The existence of somehow better bio-security practices has reduced chicken mortality rates to merely 5% [23].

The large scale commercial poultry Provide fertile eggs, table eggs, day old chicks, broiler meat and adult breeding stocks to the small scale modern poultry farms. The general indications are that the intensive poultry industry plays a key role in supplying poultry meat and eggs to urban markets at a competitive price. The industry also provides employment for a range of workers from poultry attendants to truck drivers to professional manager [24].

## Poultry meat and egg consumption in Ethiopia

In Ethiopia, about 95.86% of the total national poultry products (eggs and meat) are comes from indigenous chickens kept under village management system while the remaining 1.35% is obtained from intensively kept exotic breed of chickens and 2.79% are obtained from hybrids [24]. Poultry products offer affordable quality animal protein sources

for the smallholder farm households. Rural households consume a very limited quantity of poultry products. They rank income generation as the primary purpose of village chicken production. Poultry consumption is moreover closely associated with wealth status. The poorer the household, the fewer poultry products are eaten, chickens is not a daily food [26] (Table 1).

### Current status of exotic poultry farming in Ethiopia

The extension department of the Ministry of Agriculture (MoA) of Ethiopia has shown more preference and interest in the use of the Rhode Island Red (RIR) breed of chicken, dual purpose that could serve both as source of egg and meat production. In the recent years, the Egyptian Fayoumi breed has been imported with the expectation of better productivity, adaptation and disease resistance than the other exotic breeds in rural setting of Ethiopia [7] (Table 2).

**Small Scale Modern Poultry Farms:** The small-scale intensive poultry production system is characterized by medium level of feed, water and veterinary service inputs and minimal to low bio-security. Most small-scale poultry farms obtain their feed and foundation stock from large-scale commercial farms. Small scale flock sizes usually ranging from 50 to 500. Exotic breeds kept for operating on a more commercial basis are common in the urban and per-urban areas of Addis Ababa. Reliable economic data concerning the value of commercial poultry products sold in any year is not available. The general indications are that they supply eggs and meat to urban and per-urban population, particularly to supermarkets, kiosks and hotels [32].

**Large Scale Commercial Farms:** There are few private large

scale commercial poultry farms in our country, all of which are located in Debre Zeit. ELFORA, Alema and Genesis are the top three largest commercial poultry farms with modern production and processing facilities [33]. ELFORA annually delivers (www.ethiomarket.org elfora), around 420,000 chickens and over 34 million eggs to the market of Addis Ababa. Alema poultry farms is the 2<sup>nd</sup> largest commercial poultry farms in the country delivering nearly half a million broilers to Addis Ababa market in each year. The farm has its own broilers parent stock, feed processing plants, hatchery, slaughter houses, cold storage and transportation facilities.

The large scale commercial poultry provide fertile eggs, table eggs, day old chicks, broiler meat and adult breeding stocks to the small scale modern poultry farms. They are kept as full time business and highly dependent on market for inputs. The general indications are that the intensive poultry industry plays a key role in supplying poultry meat and eggs to urban markets at a competitive price. The industry also provides employment for a range of workers from poultry attendants to truck drivers to professional managers [33].

### Production performance of exotic chicken

The production performance of exotic birds under the Ethiopian condition needs to be monitored regularly to provide guidelines for policy makers. Lack of recorded data on the productive performance of chicken makes it difficult to assess the importance and contributions of the past attempts made to improve the sector [34].

It was indicated that all the imported breeds of chickens performed well under the intensive management system in Ethiopia. Currently the commercial breeds are either layers or broilers. There are also pure, exotic breeds but currently they are not available in the commercial markets of Ethiopia. Formerly Rhode Island Red and White Leghorns were available in Ethiopia. We can roughly divide commercial breeds according to their main production aim as egg laying, mainly with lightweight laying breeds or layers; meat production, mainly by heavyweight breeds or broilers; both egg-laying and meat production by so-called dual-purpose breeds [35] (Table 3).

**Egg Production:** These breeds are used primarily for egg production. Most of the time, the eggs of the parent stock are imported. Then the generations are used for their egg production while the parent stock is used for hatchery purposes. Previously, several layer breeds were imported to Ethiopia, but currently there are just three of them used for egg production [36]. Egg production performance of exotic chicken in our

**Table 1:** African Human Population and Poultry Meat Consumption.

Country	Human Population in Million in the Year				Poultry Meat Consumption (kg/person/year) in the Year		
	2000	2010	2015	2020	2000	2007	2009
Ethiopia	65.6	83.0	92.0	101.1	0.6	0.6	0.6
Egypt	67.7	81.1	88.2	94.8	8.6	10.5	10.0
Kenya	31.3	40.5	46.3	52.6	0.4	0.6	0.6
Nigeria	123.7	158.4	179.8	203.9	1.3	1.7	1.7
Somalia	7.4	9.3	10.6	12.2	-	-	-
Togo	4.8	6.0	6.7	7.3	4.1	4.4	6.0
Uganda	24.2	33.4	39.1	45.4	1.8	1.4	1.4

Source: Milkias [27].

**Table 2:** Exotic Chicken Status in Ethiopia.

Years	Breeds in Percent		
	Indigenous	Hybrid	Exotic
2010	97.3	0.38	2.32
2012	97	0.58	2.42
2013	96.83	0.8	2.37
2014	96.9	0.54	2.5
2017	94.3	3.21	2.49

Source: [1,25, 29-31].

**Table 3:** Production Performance of Exotic Chickens.

Production Performance	Breeds		
	Indigenous	Hybrid	Exotic
Egg production/year/hen	30-60	156-200	250
Egg weight in gram	38	49-56	60
Egg laying period in days	21	36	105
Body weight at 6 months	1.5	1.6-1.65	1.76

Source: Geleta *et al.* [38].

country is better than local chicken but not at its satisfactory level. Alem [37], reported that average egg production per clutch per hen of exotic chicken (RIR) was 38.5 and 45.2 in lowland and highland agro-ecological zone of central Tigray, respectively. Geleta *et al.* [38] indicated that egg weight of Fayoumi chicken under Adami Tulu Research center (44.3 g) was similar to Fayoumi (43 g) but lower than egg weight of Rhode Island Red (52.5g) and White Leghorn (52.1g), the egg production potential of local chicken is between 30–60 eggs per year/hen with an average of 38g egg weight under village management conditions. But, exotic breeds produce around 250 eggs per year/hen with around 60g egg weight in Ethiopia.

**Meat Production:** Bogale [39], indicated that the meat production ability and growth performance of indigenous chicken are limited and Local males may reach 1.5kg live weight at 6 months of age and females about 30% less. Modern commercial broilers are specially bred for large scale, hens or traditional dual purpose breeds. They are noted for having very fast growth rates, a high feed conversion ratio, and low levels of activity [40].

Broilers often reach a harvest weight of free-range and organic strains reach slaughter weight at 12–16 weeks of age. Typical broilers have white feathers and yellowish skin. This cross is also favorable for meat production because it lacks the typical “hair” which many breeds have that necessitates singeing after plucking. Both male and female broilers are slaughtered for their meat. Babcock is chicken breed that is currently imported in Ethiopia and used for fattening purpose [40].

### Economic contribution of exotic chickens

According to Sonaiya [41], smallholder-farming families, landless laborers and people with incomes below the poverty line are able to raise chicken with low inputs and harvest the benefits of eggs and meat via scavenging feed with small amount of supplementation. Family chicken meat and eggs contribute 20–30% to the total animal protein supply in low-income and food-deficit countries.

### Major constraints of exotic chicken production in Ethiopia

**Diseases:** According to Moges *et al.*, [34], under farmer management poultry production, prevailing disease, predators and veterinary services were reported as the major constraint, his suggestion improvement in veterinary and advisory service could help to achieve control of diseases at village level, better care of the flock starting from the age of hatching, maintenance of healthy environment, protection of birds from extreme climatic conditions, proper cleaning and disinfection of houses, equipment and workers, and appropriate floor and house construction are the key factors in preventing higher mortality.

The farmers engaged in village based exotic chicken development strategy manage chickens under backyard low input system in all three agro climatic zones. Farmers

raising improved exotic chickens have been applying various husbandry practices and management while rearing these chickens. However, low supply of inputs like balanced ration, veterinary drugs and vaccines are the major bottle-necks for production of village-based exotic chickens. Moreover, higher mortality of chicken is seriously affecting the survival of these chicken breeds and contribution of chickens to the households [42].

Exotic chicken distributed to farmers in different agro-climatic zones are exposed for to various risk factors that predispose for high chicken losses. Furthermore, the existing improper management such as improper nutrition, substandard hygienic standard, lack of appropriate disease prevention and control program are major constraints for exotic-chicken production and these contributed for high mortality rates chickens [42].

Another study from Benishangul-Gumuz Region, Western Ethiopia performed by Alemayehu *et al.* [43] reported that Newcastle disease were the most prevalent and economically important disease affecting chicken in the study areas mainly during the rainy season. Shortage of supplementing feeds during rainy season makes the chickens more vulnerable to diseases. In addition to Newcastle disease, coccidiosis and fowl typhoid are the major cause for chicken mortality [44]. In Ethiopia, sero-prevalence surveys in village chickens have identified the presence of infectious bursal disease (IBD) [45], salmonellosis [46], pasteurellosis and mycoplasma infections [47]; parasitic diseases, including coccidiosis [48] and helminthes [49].

**Feed Availability:** According to Tadelle *et al.*, [50] and Hailu *et al.*, [42], poultry feed and nutrition is one of the most critical constraints to poultry production under both the rural small holder and large-scale systems in Ethiopia. The problem is mainly associated with lack of processing facilities, inconsistent availability and distribution and sub-standard quality of processed feeds. Regular availability of good quality feed ingredients and a fully balanced complete feed are essential for efficient poultry production. Grains, cereal by-products, oil seed cakes and meat and bone meal are obtained locally. The shortage in the supply of grains especially corn is improving due to the increase in the production of corn in recent years. The most serious problems arise from the unavailability of suitable micro-nutrient sources: vitamins and minerals.

**Predation:** The predation is strongly associated with the rainy season. The predators include primarily birds of prey such as vultures, which prey only on chicken and wild mammals such as cats and foxes, which prey on mature birds as well as chicks.

Predators such as birds of prey (locally known as “Cululle”) (34%), cats and dogs (16.3%) and wild animals (15%) were identified as the major causes of village poultry in rift valley of Oromia, Ethiopia [50]. Another study from Benishangul-Gumuz Region, Western Ethiopia done by [43] reported that wild cat (locally known as shelemetmat), eagle and foxes

were the common chicken predators identified by the chicken owners in the Region. Eagle is a serious problem in dry season while the rest are commonly attacking chicken during wet season.

**Feed Quality:** Most formulations available do not have vitamin/mineral premixes, ingredients and processed feeds vary in nutritive value and there is no regular quality control mechanism in the country. Unavailability of feed quality legislation and laboratory facilities for chemical analysis also contributes greatly to the poor quality of processed feeds. Currently, understanding the problem the Ethiopian Quality and Standards Authority is working with the Ethiopian Society of Animal Production (ESAP) on feed quality standards and legislation [51,52].

**Feed Cost:** Little attention is given to the least cost formulation of rations; it is believed that considerable scope exists to reduce the price of feed in some areas without reducing its nutritive value. The lack of feed mills and dependence on supplies of some ingredients from large cities and its surroundings add to the overall cost of feed in many parts of the country. The absence of bulk deliveries and storage has increased feed costs. In some cases, a lot of wastage occurs due to weevil infestation. The shortage in the supply of protein supplements of animal origin has made the price of abattoir by-products extremely high. In many instances, the cost of mixed feed does not seem to follow reductions in ingredient cost. Prices of mixed feed remains unduly high even at times when the price of the major component of mixed rations (e.g. corn) fall by more than fifty percentage [51].

**Lack of Proper Housing:** Although no data are available about housing at national level, the local birds are set free on free range whereby they move freely during the day and spend the night in the main house. Overnight housing, perched in trees or on roofs and overnight housing within the main house are the common patterns of housing prevailing in the country. Lack of housing is one of the constraints of the village poultry production systems. In some African countries, a large proportion of village poultry mortality accounted due to nocturnal predators because of lack of proper housing [53].

**Weak Agricultural Extension Services:** According to Moges *et al.*, [34] reported that agricultural extension service is provided almost solely by the government. A holistic and multi-disciplinary support of services like extension, training, veterinary and credit are critical in supporting village chicken improvement programs. He said that training for both farmers and extension staff focusing on disease control, improved housing, feeding, marketing and entrepreneurship could help to improve productivity of local chicken. An extension service is among the constraints that hinders development of poultry industry in developing countries. Although extension and research are well-organized systems that design and disseminate technological innovations to farmers, little emphasis has been given to Local Chicken research and extension [54].

**Imbalance between Demand and Supply of Improved Chickens:** There is a chronic shortage supply of day old chicks, pullets and cockerels in Ethiopia. This leads to many farmers abandoning poultry keeping because their poultry houses will often be empty for months on end whilst they are waiting for new supplies from the hatcheries. Although the available hatching capacity is adequate; its performance is rather poor and needs improvement [55].

### Challenges of poultry meat and egg consumption in Ethiopia

According to the belief of Ethiopian Orthodox Tewahedo Christians, the faithful must abstain from eating meat and dairy products to attain forgiveness of sins committed during the year, and undergo a rigorous schedule of prayers and atonement. Therefore, followers do not eat meat and dairy products (i.e. egg, butter, milk, and cheese) on fasting days such as Wednesdays and Fridays except the 50 days running from Easter, the Fast of the Prophets, the fast of Nineveh, Lent, the Fast of the Apostles and the fast of the Holy Virgin Mary. The Ethiopian Orthodox Christians follow fasts in a way similar to other Orthodox Christians but with a frequency of approximately 250 days in a year [56].

Consumption of chicken in respect to the Ethiopian people has very cultural practices, that is, the preparation process of the national dish, “Doro wat”, has strict traditional guidelines and gendered roles. Cuisine may vary from region to region but regardless of their religion, Ethiopian women learn the ritualized process of making this traditional dish as a ‘rite of passage’ [57]. The chicken is halal or kosher slaughtered by men after having been blessed. Killing animals is a job reserved for men but only women know how to cook it; men are not allowed into the kitchen. A ‘proper’ lady knows how to cut a chicken into 12 perfect pieces [58]. According to Natasha [58], women begin the laborious task of cleaning the carcass. The women then cut the chicken into 12 pieces. This is done very precisely so that each wing, leg, chest, thigh, back and breast mirror each other and all veins are done away with. In the West, of course, chicken is processed before being packaged and can be bought ready to cook from the grocery store. Ethiopian women, however, buy the whole live chicken and cut it up in the traditional manner.

### Challenges of poultry and egg marketing in Ethiopia

Poultry products in most developing countries, especially in Africa, are still expensive. The marketing system is generally informal and poorly developed [43]. Poultry marketing structure has not well studied in Ethiopia. The market outlets or channels available to producers are diverse at all markets, although their importance differs across markets. The major channels through which producers/farmers sell their chicken in the markets are direct sold to consumers and/or to small retailers that take the chicken to large urban centers. Unlike eggs and meat from commercial hybrid birds (derived from imported stock), local consumers generally prefer those from indigenous stocks [59].

## Conclusions

Exotic chickens are introduced to Ethiopia due to their high production performance and distributed to different parts of the country. The egg production potential of local chicken is 30–60 eggs /year/ hen with an average of 38g egg weight under village management conditions, while exotic breeds produce around 250 eggs /year/ hen with around 60g egg weight in Ethiopia. Imported breeds of chickens performed well under the intensive management system but still the contribution of this chicken to the Ethiopian economy is significantly lower than that of other African countries. Disease, low adoption status of farmers, marketing problem, inadequate feeding and watering systems greatly influence the performance of poultry in Ethiopia. Exotic chickens are easily attacked by predators, poor adaptive ability to harsh environments, and require intensive management system to produce well. Therefore; recommend that there should be appropriate intervention in disease and predator control activities so as to reduce chicken mortality and improve productivity at large.

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