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Exotic Chicken Status, Production Performance and Constraints in Ethiopia: A Review

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ABSTRACT

This study reviews the trends of exotic chicken production, potential and constraints with the aim of delivering summarized and synthesized information for the beneficiaries and reader. Poultry production and product consumption are progressively growing in the world. Poultry accounts for about 33% of the global meat consumption and is expected to grow at 2-3% year^{-1} in the world. In Ethiopia, chicken production plays a great role as a prime supplier of eggs and meat in rural and urban area and as a source of income, especially to women. Although traditional practices continue to dominate domestic poultry production in Ethiopia, there has been a shift to industrial production. Attempts have been made to introduce different exotic poultry breeds to small holder farming systems of Ethiopia because of low performance of indigenous chicken. The egg production potential of local chicken is 30-60 eggs year^{-1} hen^{-1} with an average of 38 g egg weight under village management conditions, while exotic breeds produce around 250 eggs year^{-1} hen^{-1} with around 60 g egg weight in Ethiopia. Even though, all available evidence indicates that all the imported breeds of chickens performed well under the intensive management system but still the contribution of exotic chicken to the Ethiopian economy is significantly lower than that of other African countries. Poultry meat and egg production is the most environmentally efficient animal protein production system. But, feed shortage, disease and other critical gaps that need to be filled by the institutions of research and development to improve the productive performance of exotic chicken breed in Ethiopia.

Key words: Challenge, chicken, ethiopia, exotic, potential

INTRODUCTION

Shortages of protein availability are a well-known problem in Africa. Poultry is by far the largest group of livestock species (FAO., 2000) contributing about 30% (Permin and Pedersen, 2000) of all animal protein consumed in the world. The poultry sector is characterized by its industrialization, faster growth in consumption and trade than any other major agricultural sectors in the world. Worldwide, industrial systems now account for approximately two-thirds of egg and poultry meat production (Dolberg, 2007). Moreover, FAO (2010) reported that poultry meat represents about 33% of the total global meat production. The total poultry population in Ethiopia is estimated to be about 51.35 million and with regard to breed, 96.83, 2.37 and 0.8% of the total poultry were reported to be indigenous, exotic and hybrid, respectively (CSA., 2013). From the total population of chicken in Ethiopia, 99% are raised under the traditional back yard system of management, while 1% is under intensive management system. The traditional poultry production system is characterized by small flock sizes, low input and output and periodic devastation of the flock by disease (Demeke, 2007).

It has been reported by researchers that the main problem of indigenous chickens in the tropics is that they are poor producer of egg and meat (Yami, 1995; Tadelle *et al*., 2000). But even if they show low productivity, they are well adapted to the tropics, resistant to poor management, feed shortages and tolerate some of the most common diseases and parasites. On the other hand, improved exotic chickens produce higher number of eggs and more meat than the indigenous chicken breeds, but tropical climate is a great challenge.

In Ethiopia, chicken production plays a great role as a prime supplier of eggs and meat in rural and urban area and as a source of income, especially to women. Alemu *et al*. (2009) reported also that the role of poultry in Ethiopia has been becoming more important over time. Attempts have been made to introduce different exotic poultry breeds to small holder farming systems of Ethiopia because of low performance of indigenous chicken. Therefore, the need of reviewing exotic chicken production trend, potential and constraints is a prioritized issue in the country. Moreover, reviewing the successful experiences of chicken production and its socioeconomics and thereby delivering synthesized form of information for beneficiaries is also another landmark to improving the production of poultry in the country. Therefore, the present study briefly reviews major reported exotic chicken production trend, potential and constraints in the wide geographical areas of Ethiopia.

ADOPTION OF IMPROVED POULTRY PRODUCTION PRACTICES

Even if there is no recorded evidence indicating the exact time and locations of introduction of the first batch of exotic breeds of chickens into Ethiopia for genetic improvement, it is widely believed that the importation of exotic breeds of chicken goes back to the early 1950s.Yet with large poultry population, Ethiopian poultry industry remain highly undeveloped, unorganized and the country export almost no poultry meat (Avery, 2004). Attempts have been made to introduce different exotic poultry breeds to small holder farming systems of Ethiopia because of low performance of indigenous chicken. With the aim of improving poultry productivity, different breeds of exotic chickens (Rhode Island Red, Australorp, New Hampshire and White Leghorns) were imported to Ethiopia since the 1950's. Since then higher learning institutions, research organizations, the Ministry of Agriculture and Non-Governmental Organizations (NGO's) have disseminated many exotic breeds of chicken to rural farmers and urban-based small-scale poultry producers (Demeke, 2008). Tamir *et al*. (2015) indicated 41.9% non adopter, 18.4% discontinued and 39.6% adopter exotic chicken breeds in Western part of Amhara region. The main reasons for discontinued in using the exotic poultry breeds are lack of sustainable supply of the breed, disease and improved feed problem and predation problem.

Generally, adoption of improved poultry production practices may involve the transfer of appropriate new technologies and local experiences to be used in improving productivity of the stocks. The pace of adopting new technologies by farmers can vary due to controversial reasons. Teklewold *et al*. (2006) reported in Ethiopia that farmer's decision on the extent of adoption of exotic poultry breed was positively influenced by age of the household head, experience in adoption of poultry technology, expected benefit from poultry and market problem. According to Augustine (2010), the socioeconomic characteristics of the poultry farmers collectively have positive but low relationship with the cost of inputs adopted by the farmers.

EXOTIC POULTRY PRODUCTION TREND

Although traditional practices continue to dominate domestic poultry production in Ethiopia; there has been a shift to industrial production (FAO., 2008). According to CSA. (2007) reports,

chicken population in Ethiopia was around 50.38 million; however, this number was increased to 51.35 millions (CSA., 2013). There has been an increase in the number of exotic breeds of chickens and at present it is estimated that these make up about 2.56% of the national poultry population (CSA., 2007). The contribution of exotic poultry to the Ethiopian economy is significantly lower than that of other African countries (Yami and Desie, 1997). About 99% of the annual poultry meat and egg production comes from the indigenous chickens kept under the traditional systems (FAO., 2008) in Ethiopia. All of these, except some managed by small scale intensive are used by large scale (private and government) commercial poultry farms (FAO., 2008) in Ethiopia. Inputs and technologies are always required to improve poultry production and thereby to satisfy the socio-economical needs of the producers.

PRODUCTION PERFORMANCE OF EXOTIC CHICKEN

Production performance of exotic birds in 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 to improve the sector (Moges *et al*., 2010). All the available evidence indicates that all the imported breeds of chickens performed well under the intensive management system (Yami and Desie, 1997).

In Ethiopia, the idea of distributing exotic chickens particularly Rhode Island Red (RIR) was to improve the productivity of local birds by mating them with improved cocks. According to Permin (2008), this scheme usually failed to work due to the fact that the introduced breeds could not adapt to the hot climate, low feeding and extensive management. The egg production potential of local chicken is 30-60 eggs $year^{-1}$ hen^{-1} with an average of 38 g egg weight under village management conditions, while exotic breeds produce around 250 eggs $year^{-1}$ hen^{-1} with around 60 g egg weight (Alganesh *et al*., 2003) in Ethiopia. With this potential of indigenous chicken, the demand of egg and chicken meat of Ethiopian populations cannot be satisfied (Geleta *et al*., 2013). The maximum number of eggs/year under Oromia Agricultural Research Institute for Fayoumi chicken (156 egg) was lower than 185 eggs $year^{-1}$ hen^{-1} for Rhode Island Red and White Leghorn (176 eggs) but higher than Fayoumi (144 egg) as reported by Abraham and Yayneshet (2010) in North Ethiopia. Moreover, Alem (2014) reported average egg production per year per hen of exotic chicken (RIR) was 118.6 and 148.2 in lowland and highland agroecological zone of central Tigray, respectively. Most results showed that the overall performance of the crosses was better than either the native or the exotic parents under the existing management condition (Hailemariam, 1998; Aberra *et al*., 2005). From the report of CSA (2011), the average length egg-laying period/hen was also determined in breeds and environmental managements systems of which estimated numbers of days were 21, 36 and 105 days for local, hybrid and exotic breeds, respectively. Similarly, Alem (2014) reported average egg production per clutch per hen of exotic chicken (RIR) was 38.5 and 45.2 in lowland and highland agroecological zone of central Tigray, respectively. Sexual maturity of White Leghorn under intensive and extensive management ranged from 149-169 days (Demeke, 2004, 2007). Geleta *et al.* (2013) 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 for Rhode Island Red (52.5 g) and White Leghorn (52.1 g) reported by Abraham and Yayneshet (2010) in North Ethiopia. From this we can conclude that exotic breed and cross breed chicken can produce large number of eggs in the presence of adequate amount of feed.

TECHNOLOGIES TO IMPROVE POULTRY PRODUCTION

In the recent decades the demand for poultry products and livestock products, in general has been increased significantly that leads most to poultry-related development interventions

promoting intensification of traditional poultry systems (FAO., 2009). The most important inputs have been the introduction of improved (exotic) breed, improved feed, vaccine and medicaments and credit aiming at increased productivity (Tamir *et al*., 2015). The past genetic improvement efforts of the Ethiopian village chicken via exotic chicken extension was constrained by lack of comprehensive poultry technology package extension to the end users (Teklewold *et al*., 2006; Reta, 2009). 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, adaptability and disease resistance. Wilson (2010) reported that 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 that could serve as a dual-purpose for egg and meat. 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. The high cost of commercial poultry feed discourages farmers from supplementing local chicken, therefore farm feed formulations using locally available materials should be encouraged (Njue *et al*., 2004). Yami and Desie (1997) reported that the quality of mixed feed for commercial poultry production is generally poor in Ethiopia. Various scholars are always advising poultry producers to adopt appropriate technologies and practices in order to improve production.

POULTRY PRODUCTS DEMAND AND CONSUMPTION TRENDS

Chicken production used for efficient transforming feed protein and energy in to consumable human diets. Among the different food sources, poultry products contribute significantly to the Ethiopia's protein demand. The demand of protein food is progressively growing with the improvements of society's income and population growth that affects trends of chicken production. With an annual human population growth rate of 2.4%, the present 77.4 million Ethiopia's human population will increase to about 149.3 million by the year 2040 (FAO., 2005). With the increasing population of the country, there is an increasing demand for the supply of food. Thus, the demand for animal products is expected to increase substantially. To meet the ever-increasing demand for meat and eggs, introduction of superior/exotic breed has been proposed as one of the plausible option. Under the prevailing management situations, it may be difficult to fulfill these demands in short time. Therefore, intensification and upgrading of the potential of birds will be inevitable to provide surplus products. In line with this aim different chicken breeds have been introduced into this country (Yami, 1995; Ashenafi, 2000).

Similarly, FAO (2009) reported that there is a strong positive relationship between the level of income and the consumption of animal proteins. According to Daghir (2009) the current growth of poultry production and consumption makes a good case for the need and desire for future growth of the poultry industry. Estimated egg and poultry meat per capital consumption in the mid 1990s was 57 eggs and about 2.85 kg (ILCA., 1993), respectively in Ethiopia. However, the per capital annual poultry meat and egg consumption has been declining and estimated at the national average of close to 0.12 and 0.14 kg, respectively (USAID., 2006, 2010). According to Windhorst (2008), an increase in egg and poultry meat consumption for developing countries is 26 and 2.4%, compared with only 2.4 and 1.6% in the most developed countries.

HATCHABILITY AND MORTALITY RATES OF EXOTIC CHICKENS

Hatchability and rate of chick survival are one of the major determinant factors of productivity in poultry. As reported by Geleta *et al.* (2013) egg produced from Fayoumi chickens under

Table 1: Mortality at different ages of three exotic breeds managed by smallholder farmers in Northern Ethiopia

	Breed		
Mortality	Fayoumi	Rhode island red	White leghorn
Chicks	67.9	33.3	48.8
Pullets	22.4	27.3	48.5
Layers	35.3	16.3	21.3

Source: Abraham and Yayneshet (2010)

Oromia Agricultural Research Institute had lower hatchability (63.5%) compared to hatchability reported by Abraham and Yayneshet (2010), 67.9% for Fayoumi and 76.1% for White Leghorn but higher than for Rhode Island Red (39.3%) in northern Ethiopia. similarly, Kebede *et al*. (2014) reported eggs collected from White Leghorn under intensive management have higher (78.6-81.4%) hatchability.

Mortality rate of distributed exotic chickens at the age day-old in three agro-climatic zones of Amahara regional State was 45% (Mazengia *et al*., 2012), 68% chick and pullet mortalities in Fayoumi and 48.5% in White Leghorn were observed in northern Ethiopia (Abraham and Yayneshet, 2010). Alamargot (1987) indicated the mortality of commercial chickens from egg to adult in Ethiopia is in the range of 20-50%. However, Geleta *et al*. (2013) mortality rate of Fayoumi chicken under Adami Tulu Research center (7.2%) is similar with the mortality rate (7.1%) reported by Kebede *et al*. (2014) for white leghorn breed under intensive management condition and average mortality of exotic chickens was 7.8 chicken/year in lowland and 6.1 chicken/year in midland agro ecology, respectively (Alem, 2014). Chickens mortality up to 8 weeks of age ranged from 4.3-5.3% for RIR and from 4.3-5.7% for Fayoumi in central Oromia (Reta *et al*., 2012). Similarly, 29.9% exotic chick mortality reported by Mazengia and Eshetie (2008). Moreover, Mazengia *et al*. (2012) reported mortality rate of exotic chickens in low altitude districts (52.98%) was found higher than high altitude (48.88%) and mid-altitude (43.25%) districts. higher mortality rate of exotic chickens in low-and high altitude areas may be associated with extreme cold and hot temperature for newly distributed day-old chicks in these areas. The mortality rates of chickens in dry, rainy, before rainy and after rainy seasons were 47.35, 47.51, 44.90 and 43.66%, respectively (Mazengia *et al*., 2012). Mazengia and Eshetie (2008) reported higher mortality rate in wet season than dry season in parent stock flocks of RIR (Table 1).

MAJOR CONSTRAINTS OF CHICKEN PRODUCTION

Under farmer management poultry production, prevailing disease, predators, market problem, lack of water, lack of proper health care, poor feeding and extension together with veterinary services were reported as the major constraint by Moges *et al*. (2010), Getu and Birhan (2014), Negussie and Ogle (1999) and Mengesha *et al*. (2011). While diseases were the first frequently occurred chicken production constraint. The other comprehensive study showed that NCD is highly infectious and causes more losses than any other diseases in the tropics and it spreads rapidly through the flock and mortality could reach up to 100% (Nigussie *et al*., 2003). Moges *et al*. (2010) and Mengesha *et al*. (2011) suggested that improvement in veterinary and advisory service could help to achieve control of diseases at village level. The same author reported 96.4% of village chicken owners had no culture of vaccination against poultry diseases in North West Ethiopia.

Feed availability: 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, when available. Regular availability of good quality 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 (Tadelle *et al*., 2002; Demeke, 2004; Dessie *et al*., 2013; Mazengia *et al*., 2012).

Feed quality: Yami and Desie (1997) reported that the quality of mixed feed for commercial poultry production is generally poor in Ethiopia. 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 (Tadelle *et al*., 2002; Demeke, 2004; Dessie *et al*., 2013; Mazengia *et al*., 2012).

Feed cost: The price of raw materials varies according to source of supply and region. 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. Transport costs add significantly to the cost of feed in areas distant from the source of supply. Similarly, Achoja *et al*. (2006) in Nigeria reported that the price per bag and poor road network (market access condition) were the major problems affecting efficient marketing of poultry feeds in the study area. 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 (Tadelle *et al*., 2002; Demeke, 2004; Dessie *et al*., 2013).

CONCLUSION

Attempts have been made to introduce different exotic poultry breeds to small holder farming systems of Ethiopia because of low performance of indigenous chicken. The egg production potential of local chicken is 30-60 eggs year^{-1} hen^{-1} with an average of 38 g egg weight under village management conditions, while exotic breeds produce around 250 eggs year^{-1} hen^{-1} with around 60 g egg weight in Ethiopia. Even though, all available evidence indicates that all the imported breeds of chickens performed well under the intensive management system but still the contribution of exotic chicken to the Ethiopian economy is significantly lower than that of other African countries. Despite management problems involved in rearing poultry, the exotic breed chicken are appreciated for their more egg production but sensitive to disease, predators and feed shortage in Ethiopia.

Generally the present observations indicated that exotic chicken distributed to farmers in different agro-climatic zones are exposed for to various risk factors that predispose for high chicken losses. The most important constraints impairing the exotic chicken production system under farmer's management condition in Ethiopia were disease, lack of veterinary health service, traditional management system with limited feed supplementation, poor house construction and limited extension service. Hence, appropriate intervention in chicken disease and predator control activities, proper management strategies like providing frequent extension services interims of regular training to farmers focusing on disease prevention, improved housing, feeding and watering of chicken are highly recommended so as to improve productivity of chicken and farmers in the village will economically benefit from the existing market and high demand of products.

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