

Impacts of Introducing Exotic Chicken Breeds and Their Crosses on Local Chickens in Ethiopia

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ABSTRACT: *This study reviews the introduction of the exotic breeds and cross breeding of local chicken in Ethiopia, solution to genetic erosion and needs for conservation with aim of delivering in the short form and clear information for beneficiaries. Poultry production and its product consumption are progressively increasing globally. In Ethiopia, chicken production plays a great role as a primary supply of eggs and meat in rural and urban areas and as a source of income for smallholder farmers. The interest of the farmers to maximize poultry products is increasing. Therefore, different parts of the farmers are practicing crossbreeding unsystematically. However, crossbreeding is not advised and recommended by government due to its impact on genetic diversity and losing of the important traits of local chickens; thus, policy of the government has prepared different strategies to improve livestock development. There is no good breeding scheme introduced so far to avoid such kind of impacts or else regulator laws to avoid uncontrolled breeding activities. Therefore, conservation of locally adapted indigenous chicken breeds has become an important objective in sustainable animal breeding, as these breeds represent a unique genetic resource. And even if the indigenous chickens are low in productive performance, it has its unique and important characteristics such as brooding, tolerance of the disease and harsh environment of tropics, and giving good product under good management condition. Hence, breeding program targeting improvement of indigenous chicken should focus on within breed selection rather than crossbreeding with exotic chicken breeds, this would help to maintain the indigenous chicken unique attributes which are appreciated by producers and avoid genetic erosion and dilution and contribute to their conservation. Nevertheless, the indigenous chicken breeds in most African specifically in Ethiopia countries are little studied and the existing reports lack consistency. Therefore, further research is recommended to evaluate the performance, egg quality and carcass yield potentials of indigenous chickens under improved feeding and management systems.*

KEY WORDS: Conservation, cross breeding, indigenous chickens, genetic erosion

INTRODUCTION

In sub Saharan Africa, 85% of all households keep chicken under free-range system, with women owning 70% of it providing cheap/affordable animal protein in the form of meat and eggs as well as being a reliable source of cash income { 1 }. Native breeds of chicken for rural economy in developing and underdeveloped

countries mostly in Asia and Africa is very high; since they are part of balanced farming system in the rural households as a source of high quality animal protein and emergency cash income and play a significant role in the socio-cultural life of the rural community and woman empowerment {2}. Indigenous chickens are better to adapt the harsh environment, disease tolerance and good brooders, but they are poor in the reproductive performance {3}.

However, due to lower productive performance of indigenous chicken, and having of the great interest on egg and meat production, the farmers trend in introducing; selecting and breeding exotic chickens are increasing from time to time {4}. Many of the exotic breed's chickens are distributed by higher learning institutions, research organizations, the Ministry of Agriculture and certain Non-Governmental Organizations (NGOs) to the rural farmers and urban based on small scale poultry producers. For instance, Aman *et al.*, {5} and Tadesse *et al.*{6} reported that the exotic chicken such as Isa Brown, Bovans Brown and Potchefstroom koekoek were distributed to smallholders of the Ethiopia.

This may cause the inbreeding and loss of important (selective) traits of the indigenous chicken {7 and 8}. As inbreeding usually leads to loss of vigor and fertility; therefore, the production recording has to be carried out for future development of chicken production {9}. According to different studies reported by Nega *et al.* {7}, and Gebremariam *et al.* {4}, there is uncontrolled breeding system of the chicken under the village chicken production system in the different parts of Ethiopia. However, crossbreeding is not advised and recommended by agricultural extension due to the impact on genetic diversity and losing the important traits of local chickens {4}. Although animal genetic resources are playing a vital role in ensuring food security and maintaining genetic diversity, the way of conservation of animal genetic resources in developing countries is minor {10}. Therefore, based on the above mentioned background, this review was conducted within objectives to review the impacts of introducing exotic breeds on local chicken and their cross in Ethiopia, solution to the genetic erosion and needs for conservation, breeding system and performance of the chicken in the country.

Poultry production systems in Ethiopia

The poultry sector in Ethiopia can be categorized into three major production systems based on some selected parameters such as genotype, flock size, housing, feed, health, technology, and bio-security. Thus, poultry production system can be classified as backyard, small scale and commercial poultry production system {11 and 12}.

Breeding systems of the chicken in Ethiopia

There are different breeding systems in the world, selective breeding and cross breeding is the major one. Selective breeding for the improvement of the productivity in indigenous Horro chicken in Ethiopia was started in 2008 {13}. However, crossbreeding is not advised and recommended by agricultural extension due to the impact on genetic diversity and losing the important traits of local chickens {4}. There is no good breeding scheme introduced so far to avoid such kind of impacts or else regulate laws to avoid uncontrolled breeding activities {14 and 3}. According to different studies reported by Addisu *et al.*, {15}, Nega *et al.* {7} and Alemayehu {16} there is uncontrolled breeding system of the chicken under the village chicken production system in the different parts of the country. Crossbreeding between commercial cocks and indigenous hens may provide a way to produce productive dual-purpose chickens, and that can cope with harsh environments. For instance, the Rhode Island Red (RIR) has been the most common commercial line used to obtain dual-purpose chickens by crossing with indigenous birds {17 and 18}.

However, since crossbred chickens are usually heavier than indigenous chickens {19}, there are some potential disadvantages of such crossbreds. For example, they require higher amount of feed than indigenous chickens and therefore, crossbred chickens may suffer from poor nutrition and diseases in an environment where feed is limited {20}. Therefore, it was suggested that implementing a selective breeding program to improve indigenous chickens is an alternative for crossbreeding to increase productivity {21}.

Importance of genetic resource and its conservation

It is so clear that the importance of animal genetic resources is judged most often from the direct value of livestock breeds and conservation. The breed improvement programs solely depend on the direct values of animal genetic resources {10}. Naqvi {22} reported that the animal genetic resources are also very essential in research and training activities like research in immunology, nutrition, reproduction, genetics and adaptation to climatic and other environmental changes. Okeno *et al.*, {23} suggested that breeding program targeting improvement of indigenous chicken should focus on within breed selection rather than crossbreeding with commercial chicken breeds, this would help to maintain the indigenous chicken unique attributes which are appreciated by producers and avoid genetic erosion and dilution and contribute to their conservation. The report published by Padhi {24} suggested that upgrading the native chicken by different breeding techniques and conservation in their habitat is important. The same author reported that the rural people would be happy rearing the upgraded native chickens for they can adapt to too harsh environment beside improve productivity.

Causes for genetic erosion of chicken in Ethiopia

Pressure to adopt improved animal

Although IBC {25} reported that the threats for indigenous chicken population could be pictured as a pool of gene under pressure mainly by the replacement with the exotic breeds (crossbred). The crossbreeding and imports of exotic breeds are practical options for specialized and improved family poultry systems in all zones of the country {26}. FAO {27} also reported that the main cause of genetic erosion in developing countries is attributed to the fact that farmers have a strong pressure to switch to commercialized livestock production and breeding schemes, because of agricultural policies promoting rapid solutions to ensure food security or meeting the soaring demand for food {26}.

Paradigm shifts in the production system

In addition, due to the shift of production system from backyard to small-scale and large-commercialized system, the production system will become more intensive; the large input and highly producing exotic chicken will be needed. In effect, the paradigm shift in production system has led to increase the use of exotic genetic resources, often at the expense of indigenous livestock breeds {28}. Gebremariam *et al.* {4} from Northern Ethiopia also reported that there were higher number of the exotic chickens in the study area and the trend of the rearing of the exotic chicken was increasing due to the fact that the farmers get interest on egg and meat production.

Less contribution of extension and livestock development agents

Gebremariam *et al.* {4} suggested that the less number of the local breeds and comparative low contribution of crossbreds might be due to the impact of extension agents and disseminators training on negative effects of uncontrolled crossbreeding as a root cause of genetic erosion. LMP {26} reported the absence of the accessible information for decision-makers, no approved livestock breeding policies, regulations, and strategies for the breeding of chickens. Adabay *et al.* {10} also suggested that there should be strategy

for capacity building among farmers and local communities, through education and training, awareness raising, information sharing and the dissemination of case studies. The same author also suggested that a strategy for controlling imports of exotic breeds and provision of information on the potential consequences and priority for indigenous animal breeds conservation is also needed.

Improvement and conservation status of native breeds of chicken in Ethiopian

According to the LMP {26} report, the government would focus on local breed improvement through both within-breed selections of indigenous breeds and crossbreeding with exotics, giving due attention to bio-security and genetic conservation. As many breeds and species in Ethiopia are not well characterized, Niguse {3} characterized five breeds and studied the local breed production and reproduction, as well as other characteristics and he recommended that it has improved the performance through organization of within breed selection procedures. The government has also set the plan in the draft document on crossbreeding, the importation of exotic breeds (both pure and crossbreeds of exotics) and genetic materials, the establishment of multiplication centers, the development of national livestock recording schemes, breed quality, certification and control systems, and genetic improvement research {26}. However, the policy of the government has different strategies to improve livestock development such as identify breeding objectives for each species, undertake structured and continuous within-breed selection for best performing indigenous breeds and distribute and/or cross them with other indigenous breeds, implement community-based local breed improvement schemes, give training to farmers on genetic improvement activities and better animal husbandry {26}.

There is also the gap of the linkage between the strategies and the work done practically under farmer level. Uncontrolled breeding of the chicken occurring in the different parts of the country {4}, less contribution of the extension agents by giving training to farmers {4}, the chicken suppliers are not providing either technical or any other support to exotic poultry farm owners {29}.

Challenges to promote genetic improvement of chicken

However, some genetic improvement success has been reported in the poultry sector and the draft breeding policy focuses on local breed improvement {26}. Much of the work is needed to improve the indigenous chicken and many studies suggested lack of systematic breeding strategies under farmer's level in different parts of the country {16 and 4}. Therefore, the LMP {26} reported that there are many challenges in Ethiopian livestock genetic improvements; for instance, challenges listed in the country are lack of genetically-improved indigenous animals and genetic materials, no approved livestock breeding policies, regulations and strategies, absence of accessible information for decision-makers and finally, lack of a national database on genetic improvement and progress.

Genetic conservation and improvement of the indigenous chicken

Selective breeding Nigussie {3} reported that the selection program in Horro chicken of Ethiopia is the strong association between body weight at 16 weeks and egg production from 21 to 28 weeks. Moreover, the low to moderate heritability estimates for different traits indicates that the performance of Horro chicken can be improved through suitable selection program. An Iranian native population selected on the basis of breeding value recorded moderate to high heritability estimates and higher heritability estimates for body weight; this suggests that improving the body weight and egg weight through selection and breeding program can be achieved {30}. Haunshi *et al.*, {31} reported moderate to high heritability estimates in Aseel (0.22 to 0.49) and Kadaknath (0.22 to 0.37) for juvenile body weight and shank length which indicates as a scope for further improvement through selection. One of the most important positive characters of

native chicken is their hardiness, which is the ability to tolerate the harsh environmental conditions and poor husbandry practices without much loss in production {24}. Padhi {24} reported that low production performance of native breeds of chickens may be improved through improvement in husbandry practices, better healthcare, and supplementary feeds during lean season and also through selection.

CONCLUSION

The government of Ethiopia has made attempt to introduce different exotic poultry breeds to smallholder farming systems due to low performance of indigenous chicken. Despite management problems involved in rearing poultry, the exotic breed chickens are appreciated for their more egg production, but sensitive to disease, predators and feed shortage in Ethiopia. Therefore, most of the farmers are practicing crossbreeding (unsystematically). However, the policy of the government prepared different strategies to improve livestock development; there is also the gap of the linkage between strategies and the work done on practically under farmer level; for instance, uncontrolled breeding of the chicken occurring in the different parts of the country. Due to this reason, the indigenous chicken breed genetic is losing its value and economically important traits. Therefore, even if the indigenous chickens are low in productive performance, it has its unique and important characteristics such as brooding, tolerance of the disease and harsh environment of tropics, giving a good product within low management. Hence, breeding program targeting improvement of indigenous chicken should focus on within breed selection rather than crossbreeding with commercial chicken breeds, this would help to maintain the indigenous chicken unique attributes which are appreciated by producers and avoid genetic erosion and dilution and contribute to their conservation. Therefore, further research is recommended to evaluate the performance and production potentials of indigenous chickens under improved feeding and management systems.

RECOMMENDATION

The breeding program targeting improvement of indigenous chicken should focus on the following recommendations are forwarded.

- ❖ Adjusting the proper breeding strategies especially upgrading the local chicken for higher production through selective breeding system rather than cross breeding with exotic breeds in the country.
- ❖ Awareness among livestock keepers about the potential roles of animal genetic resources in the country in terms of adaptation of their natural environment and training the people for conservation of indigenous breed is essential.

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