

Review paper

Analysis of poultry breeding programs and techniques.

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Chicken are the most popular poultry species worldwide in terms of their economic importance. Chicken are believed to have been domesticated from the jungle fowl. Once a breeding goal and selection criteria have been established, a selection strategy must be proposed and implemented. This flock could have been established during the on-station characterization of local breeds. In this case, the superior breed according to the outcomes of this characterization is maintained, although more birds of the chosen breed or ecotype might need to be gathered to have a sufficiently large base population. The breeding companies utilized different breeding and selection technologies at different period of time for the genetic improvement of poultry. The indigenous chicken seemed the ideal starting material to increase production level, while maintaining the resilience to sub-optimal circumstances such as food (and water) of irregular quality and quantity. Therefore, the objective of this review was aimed to analysis of poultry breeding programs and techniques.

Keywords: breeding, chicken, indigenous, management, poultry

INTRODUCTION

Poultry of all types require housing that will protect them from the predator, wind and rain, as well as the effects of rapid changes in temperature. The house should be dry at all times, and provide good ventilation while being free from draughts. Village chicken housing system in Ethiopia is mostly perch in the house, perch in the kitchen, perch in the veranda and separate shelter Melkamu (2013). Village chicken production fits quite well with the conditions of rural households due small feed cost, space requirement and low price of the animals Solomon (2003). According to Halima et al., 2007 b about 99% of chicken owners of North-West Amhara provided supplementary feed to village birds once per day, mainly during feed shortage seasons. Poultry especially chicken is the cheapest source of animal protein in the form of meat and eggs throughout the world including Bangladesh (Simon, 2009). It is estimated that there are 188 million chickens including commercial hybrids as well as native chickens (BBS,

2006).

Due to extreme pressure of increasing population on food, most of the developing countries are suffering from malnutrition. In our daily diets, an egg contributes a good portion of our daily nutritional requirements as additives serves as supplementary food for any age that meet the protein deficiency. People always try to find the indigenous (Deshi) cockerel for its tenderness and special taste (Ahmed and Ali, 2007). Though the price of Deshi chicken is more than broiler (Islam, 2003) and are more demanded compared to broiler meat.

Recent studies showed that despite their low overall productivity indigenous chicken display wide range of variability in terms of morphological, production and genetic characteristics (Halima, 2007) implying the potential for improvement through selective breeding. A study conducted by Faruque *et al.* (2010a) under intensive management in three indigenous chicken genotypes viz. Non-descript deshi, Hilly and Naked

Neck have shown existence of significant variation in various traits and hence expecting adequate response to selection. Poultry are usually raised together with other livestock (e.g. other monogastric species such as pigs and rabbits, and small and large ruminants) and in some cases with fish. Depending on the level of inputs provided, three types of village poultry production system can be distinguished.

Chicken are the most popular poultry species worldwide in terms of their economic importance. Chicken are believed to have been domesticated from the jungle fowl. Four wild species of the jungle fowl exist: the red jungle fowl (*G. gallus*), the grey jungle fowl (*G. sonnerati*), the Ceylon jungle fowl (*G. lafayettei*) and the green jungle fowl (*G. varius*).

The conflict between archaeological findings to date on one hand and the apparently deep embedding of chicken in many African cultures, as well as the linguistic and ethnographic evidences on the other hand, suggest presence of chicken in Africa at much earlier dates (Williamson, 2000). Hence, it is possible that chicken was present in Africa well before the earliest date yet attested by archaeological findings. Indigenous chicken have a number of adaptive traits and genes such as naked necks, minimum and frizzle feathers, black bones and meat, which have special utility in the hot and humid tropics (Horst, 1989). A review by Islam and Nishibori (2009) indicated that in Bangladesh and many other developing countries, the meat and eggs of indigenous chicken is highly preferred for its taste and suitability for special dishes resulting in even higher market prices for these chickens than their exotic counterpart. Despite their importance indigenous breeds are under threat due to various factors such as changing production systems and indiscriminate cross-breeding (Besbes, 2009) and because of the low level of commercial interest on them. In general, their value remains underestimated and poorly documented compared to the specialized breeds in the western world. Therefore, the objective of this review was aimed to analysis of poultry breeding programs and techniques.

Major problems of Village Poultry Production.

Village poultry production is constrained by poor access to markets, goods and services, weak institutions, and lack of skills, knowledge and appropriate technologies (Guèye, 2002). The productivity of scavenging chickens is limited by both poor nutrition and health problems. The disease seems to be endemic. Vaccination has, until recently, been ineffective due to the nature of the production systems (scavenging), the epidemiological factors of the disease and the heat ability of the vaccine (Spradbrow, 2001). The outbreaks of the highly pathogenic H5N1 avian influenza in Asia and Africa are

of great concern for human as well as animal health as village chickens mingle freely with wild birds and household members, especially children. It is worth noting that significant losses of village poultry are due to predation and theft, as most of the households do not provide housing for their birds.

Morphological types of some indigenous chicken of Ethiopia.

The indigenous chicken of Ethiopia was referred to in various names and characterized on different grounds, as in many other parts of Africa. Teketel (1986) characterized them on the basis of plumage colour as, for example, Kei (meaning red) or Tikur (black). Tadelle (2003) referred to them as local chicken ecotypes and Halima *et al.* (2007) as native chicken populations both named on the basis of geographic region of sampling. Each local ecotype /native population actually comprised chickens with wide range of morphologic or genetic diversity. In any case, thus far only 5 chicken types of Ethiopia were listed in DAD-IS (FAO, 2008) and 10 in DAGRIS (DAGRIS, 2007) including those listed in DAD-IS. This small number represented in the databases indicates the shortage of data on chicken genetic resources of Ethiopia suggesting that much of the diversity that exists in the locally adapted populations still remains undocumented.

Identification and characterization of animal genetic resources generally requires information on their population, adaptation to a specific environment, possession of traits of current or future value and socio-cultural importance, which are crucial inputs to decisions on conservation and utilization (Weigend and Romanov, 2001).

The genetic resources of indigenous chickens.

Village poultry are mainly indigenous or local, but commercial hybrids and crosses between these two genotypes also exist. According to the State of the World for Animal Genetic Resources for Food and Agriculture (FAO, 2007), 1644 local, 85 regional trans-boundary and 157 international trans-boundary avian breeds have been reported to FAO, 2008. The latter group includes the commercial breeds. These figures clearly indicate that indigenous or local breeds make up most of the world's poultry genetic diversity. Although the meat and eggs produced by indigenous birds are more expensive than those produced by commercial broilers or layers, the latter are still beyond the purchasing power of the rural poor, who continue to rely on their own indigenous birds for subsistence (Guèye, 1998; Sonaiya *et al.*, 1999).

Structured cross-breeding programmed.

Such programmes are based on a two-way cross between an improved exotic and a local breed, with the aim of combining the better production capacity of the former with the latter's adaptability to harsh environments. Such a scheme maximizes cross-breeding effects. Two examples are presented for illustration: the Bangladeshi and the Indian programmes.

Structured straight-breeding programmed.

The nucleus flock is maintained either in a central station or in a breeding farm. This flock could have been established during the on-station characterization of local breeds. In this case, the superior breed according to the outcomes of this characterization is maintained, although more birds of the chosen breed or ecotype might need to be gathered to have a sufficiently large base population. All the animals of the breeding nucleus are identified (full pedigree) and recorded for growth and egg production. Sire pedigreed offspring of candidate sires are produced and distributed among small holders in different villages, preferably in different regions, where they are recorded for egg production, market body weight, number of eggs set for natural incubation, number of chicks hatched and survival.

The recording should be as simple as possible. Field and on-station data are then used to select the best candidate sires to remain in the nucleus. Non selected sires are sold to smallholders to disseminate the genetic progress into the local populations. This will also be done through distribution of non-pedigreed offspring of elite animals.

These chicks, as well as those produced for testing candidate males, are sold at three weeks of age to ensure that they are vaccinated and have acquired the minimum body weight and vigour needed to survive in village conditions. When establishing the breeding nucleus and running the selection programme it is important to be aware of the possibility of $G \times E$ interaction. Therefore, the housing conditions should be close to rural free-range ones.

For example, one should not provide artificial ambient conditions (temperature, humidity); most of all, housing elite birds in cages should be avoided. Similarly, the feed provided at the breeding farm should not be too different from that found in the villages. The best way to improve the productivity of indigenous chickens, without altering any of the morphological characteristics that are appreciated by the villagers, is to select for production traits within a given population. In terms of rate of improvement, this is as low process compared to crossbreeding with a genetically superior breed.

Ways in Poultry Breeding.

As time progressed and competition between breeding companies intensified, the methods used in the genetic selection process applied to the pure lines were increasingly based on science. The major traits are improved by positive selection (high intensity), which is regenerated from the best families. Minor traits such as fertility, hatchability and livability are improved by eliminating the few worst families (low intensity). The breeding companies utilized different breeding and selection technologies at different period of time for the genetic improvement of poultry.

Breeders set breeding goals as a reflection of their expectations of future market demands with the ongoing changes of production and consumption trend. Broiler growth (body weight) has consistently been the prime selection trait, because of its ease of selection, high heritability and large impact on total meat production cost. The genetic approach has been hampered in the past because of lack of an accurate, non-destructive measure of breast meat yield in live animals. Recently several accurate non-destructive measures have been identified and used as selection tool. Initially thickness of the breast muscle was measured using needle catheters, but recently ultrasonic apparatus was employed.

Monitoring breeding program for indigenous chickens.

The indigenous chicken seemed the ideal starting material to increase production level, while maintaining the resilience to sub-optimal circumstances such as food (and water) of irregular quality and quantity. In addition, there are indications that indigenous chickens are better capable of dealing with infection pressure (Tadelle *et al.* (2000)). The starting generation consisted of chicks that were hatched from eggs collected at various locations in the Horro region in Ethiopia.

CONCLUSION

In breeding poultry for improved performance under village conditions, there is a debate as to whether to start with high-producing breeds and adapt them to the environment, or start with the low-producing local breeds and try to improve their performance. In most cases the choice has been to utilize high-yielding breeds to upgrade local ones. These breeds were often introduced with the assumption that the environment would be improved. In general, this assumption did not prove to be realistic, and the overall result has been a clear lack of success; smallholders are left with their non-improved local breeds which are not indigenous

anymore. Poultry genetic diversity and options for its utilization are usually discussed in terms of breeds. 'Breeds' are typically cultural concepts rather than physical entities. Indeed, several genetic diversity studies showed little differentiation between local breed or eco-zone populations, which, unless specific functional traits are identified, gives some flexibility for choosing the base population for the breeding programme. Such studies revealed high polymorphism and genetic variation within breed or eco-zone population coupled with low level of inbreeding, which constitutes a good basis for selection. Generally, as in the other parts of the country, village chicken management practices on feed and feeding need improvement.

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