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Review on Production, Husbandry and Sustainability of Free-Ranging Poultry Production Systems in Ethiopia

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Abstract: A review was undertaken to obtain the related research results and facts on production, husbandry and sustainability of free-range poultry production systems in Ethiopia with the aim of delivering synthesized and summarized information to the beneficiaries. Poultry production has a major role in poverty alleviation by means of income generation and household food security. Free-range chicken production is characterized by low input and output scavenging, with minimal investment in housing, feeding, watering and health care, and hence weak biosecurity, high off take rates and high mortality rates. The production system in Ethiopia is extensive and dominated by indigenous chickens that exhibit remarkable adaptation to local environments. Generally, it is concluded that, the free-range chicken production system offers many people the opportunity to improve their livelihoods, suggesting that improvement of chicken breeding, production environment, farmers' access to inputs and markets needs to focus on the free-range chicken production system.

Keywords: Free-range Poultry, Husbandry, Production, Sustainability

Introduction

Livestock production in general and chickens in particular play important socioeconomic roles in developing countries (Alders, 2004; Salam, 2005). Poultry production has a major role in the economy of developing countries, including an important role in poverty alleviation by means of income generation and household food security (FAO,1997; Gondwe, 2004 and Abdelqader et al., 2007). Provision of animal protein, generation of extra cash incomes and religious/cultural considerations are amongst the major reasons for keeping village chickens by rural communities (Alders et al., 2009). Nearly all rural and peri urban families in developing countries keep a small flock of free range chickens (Jens et al., 2004).

Village chickens are also an integrated component of nearly all rural, many peri-urban and some urban households and accounts for more than 60% of the total national chicken population in most African countries (Branckaert et al., 1999; Sonaiya, 1990). According to Robert et al. (1992) and Sonaiya (2005) reports; small farming families, landless laborers and people with incomes below the poverty line were able to raise village birds with low inputs and harvested the benefits of eggs and meat via scavenging feed resources. However, most rural communities lack the required husbandry skills, training and opportunity to effectively improve their chicken production (Mlozi et al., 2003).

In Ethiopia chickens are the most widespread and almost every rural family owns chickens, which provide a valuable source of family protein and income (Tadelle et al., 2003). The total chicken population in Ethiopia is estimated at 49.3 million (CSA 2011), with 99% of the population consisting of indigenous breeds reared under village production systems, and the remaining 1% being exotic breeds reared under intensive management (Tadelle and Ogle, 2001). However, Ethiopian CSA (2013) reported that 96.9, 0.54 and 2.56% of the total poultry were reported to be indigenous, hybrid and exotic, respectively. The majority (99%) of these chickens are maintained under a traditional system with little or no inputs for housing, feeding or health care. The most dominant chicken types reared in this system are local ecotypes, which show a large variation in body position, color, comb type and

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productivity (Teketel, 1986; Tadelle et al., 2003b; Halima et al., 2007). The greater part of the feed for village chicken is obtained through scavenging, which includes the household cooking waste, cereal and cereal by-products, pulses, roots and tubers, oilseeds, shrubs, fruits and animal proteins (Samson and Endalew, 2010).

More than half of Ethiopian households both in rural and urban areas keep chickens, although there is considerable variation in the distribution of chicken keeping, with most households in highland areas are keeping chickens, and far fewer doing so in lowland pastoral areas (Ayele et al., 2009 and Wilson, 2010). It is difficult to design and implement chicken-based development programs that benefit rural people without understanding village chicken production systems (Gueye, 1998; Pedersen, 2002). Hellin et al. (2005) also reported that understanding of village chicken functioning and marketing structure are a prerequisite for developing market opportunities for rural households and could be used to inform policy makers and development workers in considering the commercial and institutional environment in which village chicken keepers have to operate.

To improve the productivity of free-ranging poultry production system; having basic knowledge about poultry production husbandry and sustainability are indispensable. However, there is a limitation to reviewing these and other related information and thereby to delivering such synthesized and summarized data to the beneficiaries.

Therefore, reviewing sensible findings on production, husbandry and sustainability of free-ranging poultry production system seems to be a milestone area to deliver combined information to the beneficiaries. Based on this outlined background, the objective of this paper was:

- Review on production, husbandry and sustainability of free-ranging poultry production system and thereby to deliver combined information for beneficiaries.

Most of the related research findings of production, husbandry and sustainability of free-ranging poultry production system were reviewed. Related reports which focus on housing, flock size, village chicken production, management, feeding and watering practices were also reviewed. Findings on poultry production that have been reported by various scholars were also reviewed and combined.

Description of Free-range Poultry production Systems

The poultry sector in Ethiopia can be characterized into three major production systems, namely the large-scale commercial, the small scale commercial and the village or backyard poultry production system. Each can sustainably coexist and contribute to solve the socio-economic problems of different target societies (Tadelle et al., 2003a). The backyard poultry production system is characterized by low input, low output and periodic destruction of large proportion of the flock due to disease outbreaks (Tadelle et al., 2003b).

Free-range chicken production systems are the techniques under which the birds are unrestricted in their movements except that they are usually shut up at night for protection from predators. Local chicken production is predominantly based on scavenging, a low input and low output production system. Scavenging made up 82.9% of the production system using a majority (96.8%) of local chicken ecotypes, with only seasonal/conditional feed supplementation. Safalaoh (2001) and Lwesya et al. (2004) reported that almost 83% of the total chicken population in Malawi smallholder extensive chicken production system was indigenous chicken eco-types, forming the largest proportion of birds kept. Huque and Paul (2001) also reported that chicken production systems of Bangladesh depend mainly on locally scavenging chickens that were reared in villages and they constituted more than 70% of the country's chicken population.

Free-range chicken production is characterized by low input and output scavenging, with minimal investment in housing, feeding and health care, and hence weak biosecurity, high off take rates and high mortality rates. The system is only partially market-oriented, production being targeted for both household consumption and the open market (Gezahegn and Karl, 2010). The system generally does not involve investments beyond the cost of the foundation stock (USAID, 2010). The majority of village chickens are kept during available feed resource and when the risk of predators is low. Different authors (Mengesha, 2012; Dessie et al., 2013) that there were no cultural/religious taboos against consumption and marketing of chicken and eggs in Ethiopia.

Free-range Poultry Husbandry

Housing system of free-range chicken

Chicken houses constructed from locally available materials, with well built wall, adequately ventilated with corrugated wire, equipped with watering and feeding materials and provided with litter material was considered as constructed based on the recommended government extension package for poultry housing. The lesser use of recommended specifications in poultry house construction indicates the lack of technical training on scientific poultry rearing to the producers. Generally, it was also

observed that few households residing near the town and main road to Addis Ababa provided electricity and litter material in poultry houses. Moges et al. (2010) and Takele and Ali (2011) reported that, the provision of electricity and litter material for village chicken was not practices in most parts of Ethiopia. Bothe fixed and mobile shedding are common used in free-range systems. The fixed sheds have litter, perches and nest boxes. However, fixed housing is rarely used in free-range operations, with the most popular system being the use of movable shelters and birds provided an area of pasture in a rotational system (Glatz and Yingjun, 2004).

According to Desalew et al. (2013) finding, from the total of 280 chicken owners interviewed, only 62 farmers (22.1%) prepared separate overnight houses for village birds. Majority (77.9%) of village chicken owners kept birds on various night sheltering places including; perches inside the house (45.7%) on the floor covered by bamboo made materials (27.1%), on ceilings of the house (3.6%) and under locally constructed sitting place (1.4%). On the other hand, Mandal et al. (2006) reported that 97.5% households construct separate house in India for chickens as night enclosure. Muchadeyi et al. (2004) also reported that 82% of the households in Zimbabwe provided separate housing for their chicken, while the remaining 18% had no separate chicken housing.

Feeding and watering practices of free-range chicken

The dominant system of poultry feeding practiced in Ethiopia is free scavenging with supplementary feeding. However, the proportion of those that supplement their chicks with a commercial ration is very small (Halima, 2007; Moges et al., 2010 and Mengesha et al., 2011).

Supplementary feed was provided by majority (97.5%) of chicken owners, while 84.3% of them did this between the months of July to September. Grains and household leftovers were the major kinds of feeds stuffs (56.4%) supplemented by chicken owner farmers. Most these chicken owners (87.1%) used cereal crop harvest (self produced grains) as supplementary feed (Fisseha et al., 2010). Halima (2007) also reported that 99.3% of chicken owners in North West Amhara Region provided supplementary feeds to village birds. Similarly, Mapiye et al. (2005) reported that 95.5% of the farmers in Rushinga district of Zimbabwe produced their own supplementary feeds and only 4.5% used purchased feed.

Desalew et al. (2013) revealed that, about 96% of respondents were provided water with free access. Likewise, Moges et al. (2010) and Mengesha et al. (2011) reported similar, watering practices in Bure district of North West Zone of Amahra region and Jamma district of South Wollo, respectively. All village chicken owners (100%) of the district provided water to village chickens; 85.4% only during the dry season and 14.3% throughout the year. The major sources of water for chicken in the area were river (30.4%), spring (28.5%), locally made underground water (21.4%) and pipe water (19.7%). Majority of chicken owners (98.2%) had watering trough. Broken clay material, locally called “shekila”, (37.3%), wooden trough (32.7%) and plastic made trough (28.2%) were the most widely used types of watering troughs (Desalew et al., 2013).

Chicken health and disease control measures

Melesse and Negesse (2009) reported that disease was cited as the most important constraint of village chicken production in southern parts of Ethiopia. Newcastle disease (NCD) was the most (98.2%) prevalent and economically important disease problem affecting free-range birds and it is reported to be the first major causes of chicken death/loss (Fisseha et al., 2010). Similarly, Halima (2007) reported that the major causes of death for local birds in North West Amhara were seasonal outbreaks of diseases, specifically Newcastle disease. The prevalence of the NCD and mortality of chicken were higher at the start of rainy season, mainly on April (66.8%) and May (31.4%). Serkalem et al. (2005) also reported that NCD was one of the major infectious diseases affecting productivity and survival of village chickens in central highlands of Ethiopia. Similarly, Kusina et al. (2000) reported that NCD was identified and accepted as the greatest danger to the expansion of chicken production in Zimbabwe.

Free-range chicken owners had no any culture of vaccinating birds against diseases in Ethiopia. This might be due to lack of awareness about the presence of chicken vaccines, lack of attention to free-range chickens and low availability of vaccines. A traditional treatment was the major type of treatment used by majority of free-range chicken owners (95%) against NCD. Accordingly provision of a mixture of local alcohol (‘Arekie’), lemon and onion to sick birds against NCD was the most widely used type of traditional treatment. Other common types of traditional treatments observed were; use some herbs like ‘semiza’ (Justitia schemperina) and ‘endod’ (Phytolacca dodecandra) (33.2%) and use of tetracycline capsule (Fisseha et al., 2010).

Role of family in free-range chicken production system

All family members provided labor for chicken husbandry practices. Men were responsible for few activities like construction of shelter and taking sick birds for treatment. However, women were highly responsible for many activities like cleaning bird’s

house, feeding birds, selling birds and eggs. Children also participated in various husbandry activities like cleaning of bird's house, provision of supplementary feed and water (Fisseha et al., 2010).

Similarly, Bradley (1992) declared that management of village chicken had been highly associated with women for various historical and social factors. Riise et al. (2004) and Kitalyi (1998) also reported that women and children were generally in charge of village chicken husbandry practices in developing countries. Abubakar et al. (2007) also reported that women and children involvement was by far the highest on village flocks management labor profile activities included; sheltering birds, cleaning bird's house, feeding and watering of birds in some parts of Nigeria and Cameroon. Mapiye et al. (2005) also reported that women in Zimbabwe were dominated in most village chicken production activities like; feeding (37.7%), watering (51.2%) and cleaning of bird's house (37.2%) whereas men were dominant in shelter constructions (60%) and treatment of birds (40%).

Flock size and Structures

Chicken production has occurred largely on small farmer holdings, with an average flock size of 4.1 (CSA, 2005), limited capital investment and few inputs provides an overview of chicken production in Ethiopia (FAO, 2004; Alemu et al., 2008 and Wilson, 2010). The average flock size per household for hens, cocks, pullets, cockerels and young chicks was 3.3, 1, 2.3, 0.9 and 5.6, respectively; with a total flock size of 13 birds and a hen to cock ratio of 3.7:1. The average flock size per household varied between seasons mainly due to feed availability, the occurrence of diseases and predators (Fisseha et al., 2010). Likewise, the chicks, hens and pullets (80 %) dominated the flock structure and were mainly retained for production purposes in Western Kenya (Ochieng et al., 2013). On average households kept 23 chickens, two times higher than the reported average in Western Kenya (Njue et al., 2006). Reduction of flock sizes may be the attribution of the limited availability of scavenging feed sources in Ethiopia. Currently, shortage of scavenging feed source is aggravated by reduced land sizes of the backyards, deforestation of the homesteads and lack of decomposition materials from the vicinity of the backyards in the country.

Strategy of sustainable free-range chicken production systems

Smallholder free-range chicken production is the major source of chicken supply. Large-scale commercial chicken production is insignificant, accounting for only 1% the national chicken production (Tadelle et al., 2002). The free-range chicken production system offers many people the opportunity to improve their livelihoods, suggesting that improvement of chicken breeding needs to focus on the free-range chicken system. The genetic improvement strategy adopted to improve chicken productivity and production in Ethiopia focuses mainly on importation and dissemination of exotic breeds and crossbreeding. Utilization of the exotic resources needs to be rationalized so that distribution of exotic chickens is limited to commercial farms and villages with adequate access to production inputs, such as compound feeds, and close to markets that are generally located around urban areas (Dessie et al., 2013).

Collaborations with internationally operating poultry breeding companies are also required. Recurrent selection within the indigenous populations could facilitate conservation of the adapted indigenous genetic resources, which are at risk from the indiscriminate dissemination of the exotic breeds into villages. Improvement of the genetic merits of indigenous chicken ecotypes through breeding has been absent until recently when a nucleus-breeding program for Horro chicken was set up at Debre Zeit Research Centre (Dana, 2011). Recurrent selection breeding schemes suited to smallholder village conditions are usually difficult to design. One approach could be to disseminate improved cocks from the nucleus flock at Debre Zeit to villagers' organized in a cooperative breeding program. Improved birds in the nucleus flock could also be used alternatively in crossbreeding where they are crossed with exotic sires to produce crossbred hens and cocks to be distributed to villages.

Based on experiences from cooperative village-based sheep-breeding programs in Ethiopia, village breeding schemes for chickens could be designed. Breeding schemes suited to village conditions involving simple exchange of breeding roosters among cooperating villagers to more complex selection schemes involving pedigree records and performance evaluation need to be assessed for their feasibility and efficiency to bring about genetic improvement in local breeds (Gizaw et al., 2011).

Genetic improvement programs need to be coupled with improvement of the production environment. Feed shortages and diseases are mentioned by the surveyed farmers as major problems. Compound commercial feeds are currently very costly. Research on low-cost poultry rations based on farm produce is urgently required. Diseases, particularly New Castle Disease, remain to be a major problem for village chicken production, though preventive measures are now available. Controls for this persistent disease problem need to be addressed (Dessie et al., 2013).

CONCLUSION AND RECOMMENDATIONS

Poultry production in Ethiopia can be characterized into three major production systems, namely the large-scale commercial, the small scale commercial and the village or free-range poultry production system. Free-range chickens are predominantly produced under a scavenging, low input-output system and primarily used as the source of income and empowerment to the rural women and children. Chicken houses constructed from locally available materials and the dominant system of chicken feeding practiced in Ethiopia is free scavenging with supplementary feeding. Free-range chicken owners had no any culture of vaccinating birds against diseases in Ethiopia. This might be due to lack of awareness about the presence of chicken vaccines, lack of attention to free-range chickens and low availability of vaccines. All family members provided labor for chicken husbandry practices. Men were responsible for few activities like construction of shelter and taking sick birds for treatment. However, women were highly responsible for many activities like cleaning bird's house, feeding birds, selling birds and eggs. Currently, shortage of scavenging feed source is aggravated by reduced land sizes of the backyards, deforestation of the homesteads and lack of decomposition materials from the vicinity of the backyards in the country. Therefore, the following recommendations are suggested for the sustainability of free-range production system based on the result of the current review:

- Technical interventions in free-range chicken production would include control of disease, improved feeding and watering, housing and introduction of market-oriented improved breeding practices to improve the genetic merits of the indigenous genetic resources through recurrent selection within the indigenous population and crossbreeding with exotic breeds.
- Provision of credit facilities to chicken owners for the enhancement of inputs, access to more profitable markets and training of farmers are the major interventions for enhancing the contribution of free-range chicken production to farmers' livelihoods.
- As most of free-range chicken production activity is managed by women and children, provision of successive trainings on modern chicken husbandry practices to women would be essential for the improvement of chicken production and productivity.

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