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Backyard poultry system: A boon to rural livelihood

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Abstract
Nowadays, backyard poultry has been given impetus for improving rural livelihood. It is mainly concentrated in vast rural areas featured by low input and output scavenging, with minimal investment in housing, feeding, watering and health care. It is dominated by indigenous chickens that subject to significant adaptation to local environments. Different breeds and strains of poultry have been developed over the year for backyard poultry system and performing well in field conditions. Besides it can give employment to the rural small scale and marginal farmers and also play an important role in women empowerment. However development and enhancement of superior strains of backyard poultry can remarkably improve nutritional status and income of rural communities. Recent innovations in poultry sciences and related fields hold a bright future for poultry production in India.

Keywords: Backyard, production, scavenging, adaptation, rural

Introduction
Livestock production in general and chickens in particular play important socio-economic roles in developing countries (Alders, 2004; Salam, 2005) [1, 2]. In recent years, the livestock and poultry sectors have become one of the fastest growing segments in Indian agriculture and contributing a substantial proportion to the national GDP. The multifaceted growth in poultry and allied sectors is attributed due to the incessant efforts in advancement and application of new technologies. The development is not only in size but also in productivity and quality. Factors such as nutrition, housing, management and disease control have led to development of high yielding layer (310-340 eggs per annum) and broiler (2.4-2.6 kg at 6 wks) varieties which, in turn has contributed to an amazing growth rates in egg (4-6% per annum) and broiler production (8-10% per annum) in India during the last 40 years. As a result of an increase in productivity, the annual per capita availability also increased to 60 eggs and 2.5 Kg of meat which however, is far below the recommended level of consumption of 180 eggs and 10.8 kg poultry meat per person per annum as approved by Indian Council Medical Research. The impacts and contributions of extensive and small-scale scavenging poultry production systems in rural, varies from more intensive systems in urbanized settings. Rural backyard poultry plays an important role in poverty alleviation by means of income generation and household food security (FAO, 1997; Gondwe, 2004 and Abdelqader *et al.*, 2007) [3-5]. Provision of animal protein, generation of extra cash incomes and religious/cultural considerations are amongst the major reasons for possession village chickens by rural communities (Alders *et al*., 2009) [6]. Though it provides subsidiary incomes for landless poor farmers, it has always been untended. This is in spite of the fact that their products carry a much higher price than that from commercial poultry.

Backyard Poultry System
Every household can take up backyard poultry as an additional source of income by rearing colored bird units ranging from 10-20 birds per family in their backyards. Home-produced fertile eggs are hatched to provide replacements, birds feed by scavenging or are provided with household scraps and crop by-products. There are virtually no veterinary inputs and the remaining eggs and meat produced are utilized within the household. Such units demand very little hand feeding and can fetch a fairly handsome return with bare minimal night shelter. Village or backyard production systems are widely scattered and survive in both rural and urban areas. It is estimated that today in India, about 15 percent of total poultry output is derived from "backyard" production (Landes *et al*., 2004) [7].

According to Mandal *et al*. (2006) [8] it is a low input or no input business. It is characterized by indigenous night shelter system (Dana 1998; Saha, 2003) [9, 10], scavenging system (Okot 1990; Raveloson 1990) [11, 12] with little supplementary feeding (Dana1998; Rangnekar and Rangnekar 1996; Saha 2003) [9, 13, 10], natural hatching of chicks (Singh and Pani 1986) [14], poor productivity of birds (Agbede *et al*., 1995; Rashid *et al*., 1995) [15, 16], local marketing (Dana 1998; Rehman 1995; Saha 2003) [9, 17, 10] and no health care practice (Dana 1998 and Saha 2003) [9, 10].

Backyard poultry in Indian perspective

The OECD-FAO Agricultural Outlook (2008-2017) [18] has proposed that Indian requirement for poultry products will be increased by 4.8 percent whereas the output of poultry products will grow at 5.2 percent per year over the decade which is swifter than any other type of animal product. The production of agricultural crops has been rising at a rate of 1.5–2% per annum, where as eggs and broilers has been shown to increase at a rate of 8–10% per annum but the growth has been mainly limited to commercial poultry. However, the Government of India recognizes that growth in the poultry sector has not been able to contribute much to poverty reduction and improved nutrition (Pica-Ciamarra and Otte, 2008) [19]. According to them, statistically a landless poor agricultural family unit keeps 1.2 non-descript low yielding local birds in the backyard, which would sum up into an average flock size of 8 to 9 birds per poultry keeping household. Such backyard flocks only make a very negligible contribution to rural livelihoods, as the net income per bird per month ranges was very low with respect to a rural poverty line set by the Government of India. But an uncertain market with respect to the accessibility of grains and animal proteins and their prices along with low input requirements to poultry makes backyard poultry farming a reasonable source to attain an inexpensive and reasonable source of highly nutritious food items at low cost.

In rural areas, chicken reared in backyard are generally Desi type which are low producing with respect to egg and meat (Ghosh *et al*., 2005) [20]. The desi chicken breeds adopted in free- range backyard conditions for centuries contribute about 11% of total egg production in India (Kumaresan *et al*., 2008) [21]. Their contribution to the total egg yield has been dormant for the last few decades due to their low productivity (50-60 eggs per annum). Usually non-descript desi birds are reared but in some areas, local breeds and crossbreeds derived from them are also reared. Specific improved varieties of birds are now available for meat or eggs and few varieties for dual purpose.

Several research organizations have understood the significance of backyard rural poultry farming in India thereby developing different backyard chicken varieties which have been reared by farmers from many parts of the country successfully. These improved varieties include:

Dual purpose Vanaraja, Giriraja, Swarnadhara, Gramalakshmi, Gramasree, Srinidhi, Kamrupa, Narmadanidhi, Pratapdhan, Jharsim, CARl Debendra, CARI Hitcari, CARI Upkari, CARI Shyama, CARI Nirbheek.

Egg type Gramapriya, Athulya, Krishi layer, Swethapriya, CARI Sonali, CARl Priya.

Meat type Krishibro, CARIBRO Vishal, CARIBRO Dhanraja, CARIBRO Mrityunjay, CARIBRO Tropicana.

Rural Backyard Poultry Development is an initiative by the Central Government of India in this direction whose beneficiaries are from Below Poverty Line so as to enable them to gain subsidiary income and nutritional support for livelihood. During 2013-14, around 40 crore had been sanctioned which covered for assistance to nearly 1.66 lakh BPL beneficiaries. Under Rural Backyard Poultry Development program, since introduction in 2009-10, till date funding has been done to include around 6.13 lakh BPL beneficiaries (DAH annual report, 2013-2014).

Salient features

Flock size and Structures: Generally 5-25 birds constitute the flock size. The average flock size per household differs between seasons mainly due to feed availability, the occurrence of diseases and predators (Moges *et al*., 2010) [22]. The chicks, hens and pullets (80 %) dominated the flock structure and were mainly retained for production purposes in Western Kenya (Ochieng *et al*., 2013) [23]. Decrease in flock sizes may be ascribed to the limited availability of scavenging feed sources. The reduced land sizes of the backyards, deforestation of the homesteads and lack of decomposition materials from the vicinity of the backyards in the country has enhanced the shortage of scavenging feed source.

Housing system: Chicken houses are constructed from locally available materials which are adequately equipped with watering and feeding facilities and provided with litter material. Muchadeyi *et al*. (2004) [24] and Mandal *et al*. (2006) [8] reported 82% of the households in Zimbabwe and 97.5% households in India provided separate housing for their chicken as night enclosures respectively.

On the other hand, Kingori *et al*. (2010) [25] reported that in backyard rearing method, chickens sleep in houses at night and scavenges during the day. However, they may get grains in the morning and evening to add extra feeds to scavenging. According to Desalew *et al*. (2013) [26] 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%).

Feeding and watering practices: The major feed sources are earthworms, insects, seeds, green leaves and other plant materials in the household yard. According to Mutayoba *et al.* (2011) [27] in developing countries scavenge-able feeds varies with seasons and districts. Chowdhury (2013) [28] showed that scavenge-able feed mainly consists of household leftover, green materials, insects, earthworms, crop residues, grass shoots, and fruits. Gunaratne, (2013) [29] pointed out that scavenge-able feed does not contain enough nutrients needed by local chickens. Nutrients that local chickens get from scavenge-able feeds are depending on foraging habits, which varies with chickens. Furthermore, foraging habits of young chickens varies with that of old chickens, because they cannot compete with old and aggressive chickens for feed available from scavenging. Chickens hardly get extra feeds in developing countries. In addition, if they do, it is small amounts of grains thrown on the ground. Extra feeds reported are small amounts of cereals, which include millets, sorghum, and maize (Kyule *et al.* 2014) [30]. Desalew *et al*. (2013) [26] revealed that, about 96% of respondents were provided water

with free access. Likewise, Moges *et al*. (2010) [22] and Mengesha *et al* (2011) [31] reported similar, watering practices in Bure.

Marketing: Farmers sold chickens when they need cash to neighbours, hawkers and to people who need to slaughter during weddings, birthday parties, and celebration. There were no specific market where farmers could sell chickens and their products. Similarly, backyard poultry owners were selling their birds at their own doorstep, to village market, after specific weight gain, to local shopkeeper and middleman in Bhandara district of India (Khandait *et al.*, 2011) [32]. Research conducted in Ethiopia by Mesert *et al.* (2011) [33] reported a lack of specific markets where farmers could sell their chickens, described them as informal, and poorly developed.

Consumption: Majority of farmers consumed chickens occasionally when the need arise. Farmers listed the following as reasons for slaughtering chickens; to reduce number of cocks, infertile chickens; hens with a tendency of laying eggs on roofs; and injured chickens. According to farmers, slaughtering chickens for consumption depends on flock sizes in a household. Therefore, there is a need to increase flock sizes through good care management.
The primary role of eggs is incubation, and hatching and then consumption. These findings are similar to research from Ethiopia by Kebede *et al.* (2012) [34] in which availability of commercial eggs and hatching of all eggs to produce chicks as reasons for farmers, not consuming eggs. Similarly, Blackie (2014) [35], stressed that enough protein would be available to farmers, if they consume eggs than allowing hens to hatch them into chicks, which eventually die before reaching sexual maturity.

Ownership: Income generated from poultry productions are most of the time controlled by women (Aklilu, 2007; Tadelle, 1996) [36, 37]. Women have been considered to be the predominant owners of rural poultry (Okitoi *et al*., 2007) [38]. According to Abubakar *et al*. (2007) [39], in a study conducted on village chicken production in some parts of Nigeria and Cameroon, women own the majority of chicken (52.7%) followed by children (26.9%) and men (20.4%) in Cameroon; unlike the situation in Nigeria, where the majority of the chickens are owned by men (55.6%) followed by women (38.9%) and children (11.1%). Halima (2007) [40] also reported that rural women in North-West Ethiopia are more responsible for chicken rearing in both male and female headed households, while men are responsible for crop cultivation and other off-farm activities.

Food security: Eggs stored under proper conditions are easy to cook. Chickens can be slaughtered and consumed by households in a single meal, eliminating the need for meat storage, which is required for larger livestock species. Effective husbandry and disease control leads to increased flock sizes and provides assurance of stability of supply of poultry products.

Advantages
The different advantages of Backyard poultry rearing have been listed below.

- Gives employment to the rural small scale and marginal farmers.
- Provides additional income to the rural households.
- Aids in improving the soil fertility in backyards (15 chickens produce 1-1.2 kg of manure/ day).
- Products from rural poultry farming fetches high price compared to those from intensive poultry Farming.
- Provides egg and meat with almost no or very less investment.
- Birds reared under free range conditions give eggs and meat of low cholesterol concentration compared to those produced under intensive poultry farming.
- Lessens protein malnutrition in susceptible groups like pregnant women, feeding mothers and children.

Constraints
Low productive and reproductive efficiency: Even under ideal housing and feeding conditions, productivity in indigenous breed chickens is much lower than in their commercial counterparts (Sørensen, 2010) [41]. Hens usually lay 30-80 small eggs/hen/year under backyard conditions compared to commercial strains that produce up to 300 eggs.
The reproductive performance is generally poor. The number of eggs incubated per clutch varies from 8-14 and the average clutch size range from 2-3 clutches/hen/year (Kusina and Kusina, 1999; Pedersen, 2002) [42, 43]. Village chickens reach point of lay at 26-30 weeks (Pedersen, 2002) [43]. This is fairly late compared to layer breeds that normally reach point of lay at 18-22 weeks old. The local average egg weight is 52 g (with a range of 35-60 g) (Mapiye and Sibanda, 2005) [44], thus very low compared to commercial strains that have an average egg weight of 60-70 g. Hatchability and survivability levels vary from 20-70% (Muchadeyi *et al*., 2005; Pedersen, 2002) [45, 43]. Inspite of this, these birds survive and reproduce in the harsh village environment where commercial breeds perform very poorly.

Mortality: Factors such as diseases, parasites, predation, accidents and bad weather among many others affect the mortality rate (Kusina *et al*., 2001; Muchadeyi *et al*., 2005) [46, 45]. Reports by Adebayo *et al.* (2013) [47], Bell (2009) [48] and Njagi *et al.* (2010) [49] showcased that disease outbreak is one of the impediments to poultry production in developing countries. The most common reason of the high mortality rates observed in small scale poultry flocks, particularly in tropical countries, is Newcastle disease (Alders *et al*., 2010 and FAO, 2014) [49, 50]. Newcastle disease virus is highly infectious among chickens, and virulent strains can cause up to 100% mortality annually (Samal, 2011) [51]. Most common predators are dogs, cats, snakes, eagles, hawks and thieves. Predation can be reduced by close monitoring of village chickens during scavenging periods and keeping them in proper houses during the night. Adult chickens can be protected from predation through the provision of simple night-time housing designed to minimize predator access (Ahlers *et al*., 2009; Melesse, 2014) [52, 53].

Veterinary health care and extension services: In many rural areas, the widespread area and a lack of resources and infrastructure can result in restricted veterinary and extension services (FAO, 2014) [50]. However, the formation of networks of community-based animal health workers, where training and knowledge is passed between veterinarians, governments and communities, has been found to be effective

in both delivering services such as vaccination or health care, and reporting, investigating, or controlling animal diseases (FAO, 2010; Leyland *et al.*, 2014) [54, 55]. A lack of consideration of gender issues can also limit the effectiveness of extension services. Data from the FAO indicate that female farmers receive only 5% of agricultural extension services; that only 15% of extension workers are women; and that only 10% of agricultural aid goes to women (FAO, 2016) [56]. Gender equity during the selection of community animal health workers can result in more effective communication with both male and female poultry keepers (Bagnol, 2012) [57]. A gender sensitive approach at all levels of the intervention is necessary to ensure that women benefit from interventions involving poultry-raising activities (Bagnol *et al*., 2013) [58].

Housing and nutrition: The provision of dedicated nests for hens to brood, more intensive management of chicks including the provision of protective housing, and food and water supplementation, can help to reduce losses and contribute to increased flock size (Ahlers *et al*., 2009; Melesse, 2014) [52, 53]. Housing at night time also protects chickens from weather extremes facilitates feed supplementation, inspection or vaccination of chickens as required (Ahlers *et al*., 2009) [52].

Farmers use many fresh foods such as garden and kitchen waste, ash, fruits, plants, red soils and other local resources to meet minerals and vitamins needs for their chickens (Muchadeyi *et al*., 2004) [24]. However, there is a need to estimate the economic or physical value of the local scavenging feed resource base as it is important in the planning of the production cycle for optimization of utilization for better returns (Miao, 2005) [59]. In general, chickens given supplementary feed yield high flock sizes, high growth and fertility rates, and are less prone to diseases and parasites (Ogle *et al*., 2004) [60]. Hence, there is a need for a good feeding program made up of home-grown feeds that ensures greater returns in terms of tasty meat, abundant eggs and good fertility. Farmers should be trained to formulate rations using home-grown feeds.

Approaches or Strategies for improving backyard poultry production

Self Help Groups: Self Help Group (SHG) approach is a silent revolution promoting rural development. Women folk are an important workforce in the rural areas to carry out the farming activities. In this context, a scheme was implemented to empower the rural women SHG members through adoption of various biotechnological techniques in backyard poultry rearing.

Insurance: Morality due to disease and predation are important concerns for the sustainability of backyard poultry. To overcome this, Community Managed Insurance of birds could be done for protecting households against these risks and as well as to assure asset replacement.

Vaccination: Women can be trained on poultry vaccination. Total vaccination can be planned by SHGs at village level or gram panchayats. Animal Husbandry department can organize household level vaccination through trained women vaccinators.

Chick rearing centers: Expunging resulting from events like epidemics or after some festivals may take some time for the stock in area to restock. Regular availability of chicks is important making Chick Rearing Centers to play a crucial role.

Conclusion

Backyard poultry makes significant contribution to livestock economy. Advancement of the rural backyard poultry sector can definitely contribute to poverty alleviation and nutritional improvement in India. It is very much necessary to raise awareness about this venture. Major constraints include low productive and reproductive efficiency, high mortality, poor veterinary health care and extension services and poor housing and nutritional status. Improve food security and standards of living of the rural families are an outcome of a better understanding and modulation of these constraints. Use of locally available indigenous feed resources and ethno-veterinary medicine, and educating farmers can be viable options to improve backyard poultry production in rural areas. Besides it can give employment to the rural small scale and marginal farmers and also play an important role in women empowerment. With an emergence of new innovations in poultry, the future challenges will not be a hindrance and has a promising future for poultry production in India.

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